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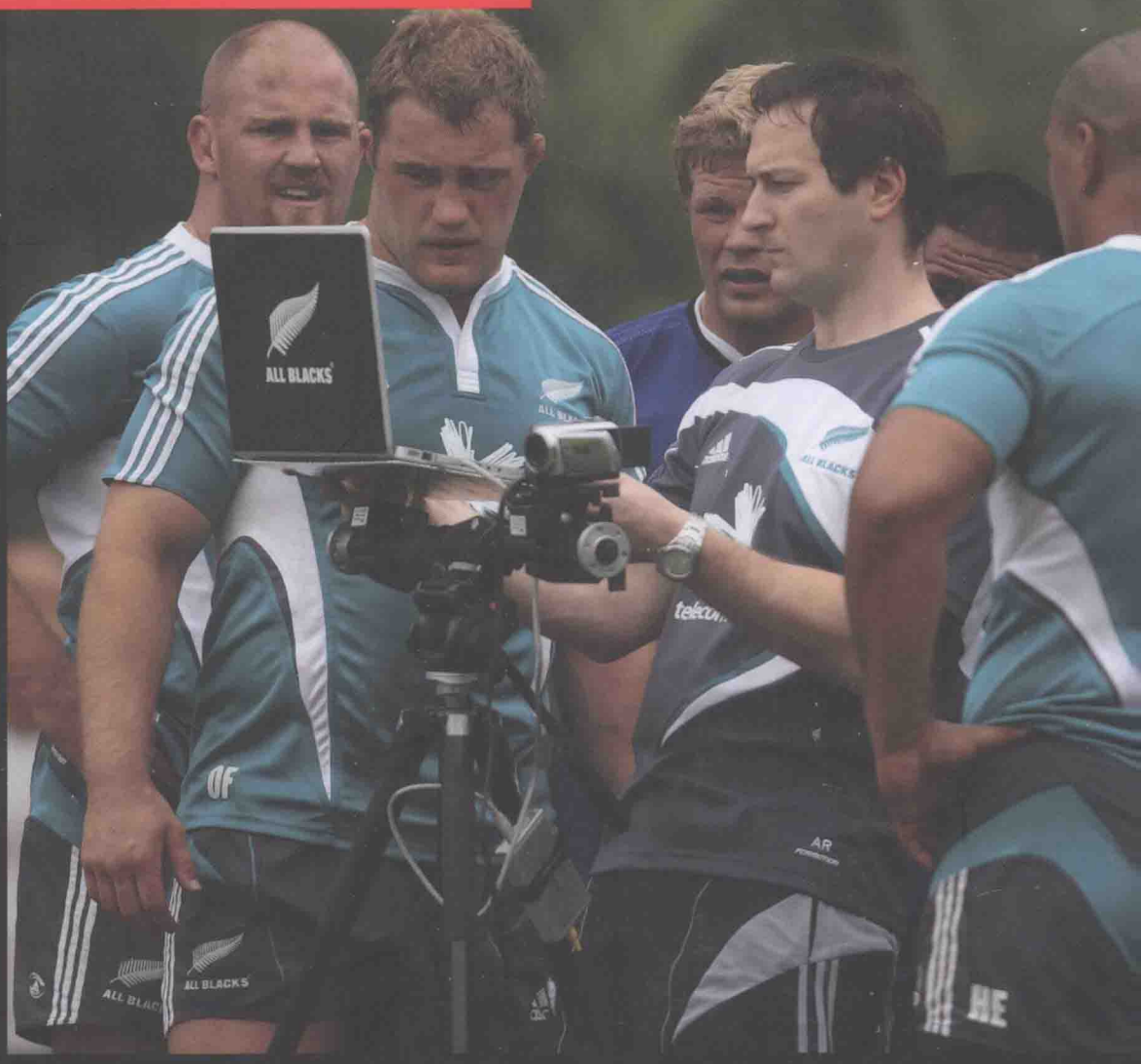

Routledge Handbook of Sports Performance Analysis

Edited by Tim McGarry, Peter O'Donoghue and Jaime Sampaio

ROUTLEDGE HANDBOOK OF SPORTS PERFORMANCE ANALYSIS

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ROUTLEDGE HANDBOOK OF SPORTS PERFORMANCE ANALYSIS

Sport performance analysis techniques help coaches, athletes and sport scientists develop an objective understanding of actual sport performance, as opposed to self-report, fitness tests or laboratory based experiments. For example, contemporary performance analysis enables elite sports people and coaches to obtain live feedback of match statistics and video sequences using flexible internet systems, systems that have become an indispensible tool for all those involved in high performance sport. The *Routledge Handbook of Sports Performance Analysis* is the most comprehensive guide to this exciting and dynamic branch of sport science to be published.

The book explores performance analysis across the four main contexts in which it is commonly used: support for coaches and athletes; the media; judging sport contests; and academic research. It offers an up-to-date account of methodological advances in performance analysis research, assesses the evidence underpinning contemporary theories of sport performance, and reviews developments in applied performance analysis across a wide range of sports, from soccer to track and field athletics. Covering every important aspect of performance analysis, including tactics, strategy, mechanical aspects of technique, physical aspects of performance such as work-rate, coach behaviour and referee behaviour, this is an essential reference for any serious student, researcher or practitioner working in sport performance analysis, sport coaching or high performance sport.

Tim McGarry is an associate professor of the Faculty of Kinesiology at the University of New Brunswick, Canada. He has published many journal articles and book chapters on various aspects of movement control and sports performance, and serves as an advisory editorial board member on the Journal of Sports Sciences and the International Journal of Performance Analysis in Sport.

Peter O'Donoghue is a Reader at Cardiff Metropolitan University, UK. He is a former Chair of the International Society of Performance Analysis of Sport and General Editor of the International Journal of Performance Analysis in Sport. His research interests include racket sport performance and opposition effects in sports performance.

Jaime Sampaio heads the Team Sports Laboratory at University of Trás-os-Montes and Alto Douro, Portugal. He heads several funded research projects, has published more than 50 ISI indexed papers, is on the editorial board of several international journals and is Editor-in-Chief for the *Open Sports Sciences Journal*.

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FOREWORD

Ian M. Franks

In 1979 I was in a rather unique and some would say enviable position at the beginning of my academic career: a coach of international athletes and a researcher of skill acquisition and motor learning at a major university. This would seem to be the perfect symbiotic relationship. I could apply my research in a sport specific context and ask what I believed to be relevant research questions in the laboratory. Moreover, the Coaching Association of Canada, Sport Canada and several sports governing bodies were willing to fund sport research. This was therefore an ideal time to develop a Centre for Sports Analysis (University of British Columbia) with the goal of improving performance in a variety of national sports. These were lofty goals, especially as the research was to be driven by questions from the sport and not from the sport scientists. Development of these research questions into operational experiments and solutions proved to be a major challenge which involved many hours of discussions with coaches of national teams. It became clear, however, that the main obstacle for coaches was the accurate, objective and reliable analysis of game or match performance, be it to provide feedback for players and coaches after performance or to develop a model of criterion performance with data gained from major international competitions.

Following the lead of such people as Rudolf Laban and Charles Reep, I set about using a pencil and paper checklist to record significant events that occurred during sports as diverse as fencing, field hockey, water polo, wrestling and soccer. During the event I would ask my research assistants to record all the significant events (along with time of event) that occurred in a specific sport. While after the event I would rely heavily on videotape slow motion manual playback to confirm the accuracy of the recordings and to select outtakes for use as feedback for athletes and coaches. This process was extremely time-consuming. The problem was that there were too many events and not enough research assistants. Given the preponderance of computers that had been established in Kinesiology laboratories for several years, especially in the areas of biomechanics and human motor control, the solution to this problem was not difficult to find.

In 1980 Dave Goodman from Simon Fraser University and a system analyst Paul Nagelkerke joined the Centre to help me develop an interactive computer-video capture program using an Apple II micro-computer. This system would allow one analyst to record multiple time-event pairs and then summarize these events after competition. More relevant was the system's ability to automatically find instances of performance that required review on the video tape.

A paper ("Computer assisted sport evaluation") that outlined this system and its use in collecting game related data from all of the games in the 1982 FIFA World Cup was presented at the "Micro-computers in Sport" conference organized by Liverpool University in 1983. Although there was a dearth of papers at this conference that actually had used computers to record game related data, it was clear that several research laboratories in the UK, Europe and North America were about to embrace this technology and make it a critical component of sport performance analysis. Notably Mike Hughes was leading the way in the UK in his laboratory at what was then known as Liverpool Polytechnic (later Liverpool John Moores University). Mike went on to organize the First World Congress of Notational Analysis of Sport at Burton Manor in 1991 and in the same year he formed the International Society of Notation Analysis of Sport (later to become the International Society of Performance Analysis of Sport).

What followed was an explosion of sport related data collected by many and varied methods from different laboratories all over the world, most of them computer based. It is no surprise therefore that the technology for collecting this data has become extremely sophisticated and researchers involved in information technology and engineering have solved the majority of the problems related to reliability and accuracy as well as those of context variability. Systems can now seemingly collect *all* game related information. For example, in a soccer game all player's, referee's and the ball positions can be obtained in real time allowing time-motion, as well as technical and tactical information to be extracted automatically from the game and be available at any time during or after competition. Issues related to system expense, portability and usability will be solved in short order and perhaps we are now close to realizing what Tim McGarry and I forecast in a paper we wrote for Science and Soccer (Second Edition) in 2003. In this chapter we advocated a true interdisciplinary approach to performance analysis of sport.

"The behaviour of an athlete in sport competition is the product of many complex processes. The aim of various disciplines within the sports sciences is to understand these processes at a fundamental level. Match [performance] analysis might help to integrate the separate contributions from various disciplines" (page 274).

We illustrated this by describing a futuristic scenario whereby sport analysts, physiologists, biomechanists, mathematicians, physiotherapists and coaches would come together to breakdown game performance from the observed behavioural data in order to uncover the processes that were responsible for either good or bad performance. This is now possible and in certain sports has already been used to good effect. In fact the following pages of this text are an excellent example of the progress that has been made by researchers in this field over the past 30 or more years.

Technological advances have now allowed scientists to answer most of the questions that have been generated by the coaches and players of these various sports. These types of questions while of immense value to sport may not be of critical importance to the scientist. Questions that speak to understanding human behavior in the specific contexts of sport are much more challenging to the researcher, although they may not be seen as being relevant to the people directly involved with athletes in sport. However, this type of discovery research has far reaching consequences for future application to solving practical questions in all types of situations, sport being just one. It is clear that discovery enquiry into more global issues surrounding active human involvement in sporting pursuits has begun and is seen in the following pages of this text albeit to a lesser extent than may be warranted given the preponderance of sport data now available.

While this text makes a valiant attempt at addressing these more general (and some may say esoteric) questions the work still appears to be in its infancy. This is somewhat surprising given the much earlier work of researchers such as Reep, Pollard and Benjamin (*Journal of the Royal*

Statistical Society, 1971, 623–629) and Gould and Greenawalt (*Journal of Sport Psychology*, 1981, 283–304) who used game related information to model team and individual performance. Let us hope that this text paves the way for a more concerted effort by sports scientists to engage in an examination of the underlying mechanisms responsible for sport performance. However, the large inductive leap to the generalized applied setting should be accompanied with caution. It becomes easy to speculate that models of behavior that can account for task specific findings, can also apply to most sport situations. This type of speculation is too readily taken as fact by coaches and players and therefore it is incumbent upon the sport science community to engage in task specific applied research to test these assumptions made from discovery research. To this end the following pages offer much in applied research and some tentative theoretical modeling of sport performance. It is a laudable attempt to cover all aspects of Sport Performance Analysis and the editors should be commended for bringing together the work of some excellent sports science researchers.

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