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The Science of Golf Putting

A Complete Guide for Researchers, Players and Coaches

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Foreword

Golf is one of the most popular sports worldwide. For example, in 2013, the Professional Golfers' Association (PGA) estimated that there were over 26 million golfers solely registered to play in the United States of America (USA). This book is a necessary addition to the scientific and technological literature on one of the most important actions in golf: the 'putt'. Putting requires deftness, accuracy, and force control, and utilizes a cyclical relationship between perception (visual, proprioceptive, haptic, and acoustic) and action since it is the most precise aspect of the sport of golf. In fact, the PGA considers it as the most vital skill to master in the sport, representing about 43 % of the total number of strokes in a competitive round of golf. However, despite golf's ever-increasing popularity worldwide, the role that science and technology can play in enhancing performance and acquiring skill in putting needs to be better understood.

This book by Gonçalo Dias and Micael Couceiro provides a scientific and technical treatise on the process of golf putting, emphasizing the different pathways to achieving successful performance outcomes in this task. The engineering perspective for studying the *process of successful coordination* in golf putting is novel and warranted. There are many coach and player-oriented performance manuals available in the practical literature, especially on the golf swing, which fail to provide a bioengineering perspective addressing the human-equipment interface. This Springer Brief on the topic of golf putting is a useful contribution to the applied science literature since it focuses on a most important part of the game identified by performance analysts. This specialized Brief will be of major interest for engineers, sport scientists, human movement scientists, and many coaches/players who are interested in developing putting skills. The focus on measuring performance of the golf putting action through use of product and process variables is an excellent novel idea adopted in this book, which complements the existing literature on human movement science and sport science from a dynamical systems orientation, complexity sciences viewpoint, and an ecological dynamics perspective. It is my pleasure to write this preface since it is apparent that Gonçalo Dias and Micael Couceiro adopt a relevant and much-needed combination of engineering and sports science expertise, which can contribute to the bioengineering perspective

proposed. This book benefits from the academic perspective that the authors adopt, as well as their willingness to discuss the relevant research and applied sport science literature on this topic. The book utilizes their published research on process and product variables in analyzing sport performance and human movement. It is my belief that the material discussed herein will enhance the performance, practice and training of golfers at elite and sub-elite levels.

Sheffield, UK, December 2014 Keith Davids

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Technical Note

Undeniably, this publication fills an empty space in the bookshelf of all professional golfers. As the authors claim, the book presents both educational and training perspectives as well as professional and scientific aspects. The writing is accessible and the diagrams are splendid and deliberately prepared for the purpose of this manual. The book gives the impression that for 'ordinary men' the secret is far beyond hitting the ball with a club and hoping it enters the hole, which, in fact, is quite true.

Contrary to what one might think, putting is a rather complex motor skill, which involves a set of motor performance variables and measures that should be studied to understand the reason, or reasons, why one misses the hole. In spite of this, it is important for the coach and the athlete to know how it is possible to 'calibrate' and 'tune' their putting performance in the context of motor learning, training and competition. This remarkable compendium dissects all this information around putting in a scientifically clear and sound manner. The degree of innovative metrics that the authors have published over the past years in relevant journals, such as the *Journal of Motor Control* and the *Journal of Motor Behavior*, as well as in many chapters of Springer books, are noteworthy. This 'ecological perspective' of golf putting is described throughout this book, in harmony with the constraints arising from the action of the practitioner, the task and the environmental conditions. Additionally, the authors briefly discuss the different practice conditions, the intra- and inter-individual variability emerging from this pendulum-like motion, the influence of the contextual interference phenomenon, and the motor skill organization of experts and novices. All these topics end with some practical implications associated with learning and motor control.

The book also describes new technological outputs, highlighting the role of cameras, inertial sensors and other tools that are able to provide golf putting analysis as not seen before. In this particular aspect, one cannot neglect the outstanding contribution of the authors in the development of the new device *InPutter*. This engineered golf putter, invented by *Ingeniarius, Lda.*, revolutionizes the way that putting may be analyzed.

In summary, this book fills an emerging gap around the learning and training of golf putting portrayed in the literature. It is a remarkable contribution for researchers, coaches and athletes who wish to better understand the execution of putting in the laboratory and in real-life contexts of teaching and learning.

Finally, it is my belief that this book can effectively decode the 'science behind golf putting'.

Hugo Espirito Santo
European Champion of Pitch and Putt