

# Training for Sports Speed and Agility

An evidence-based approach

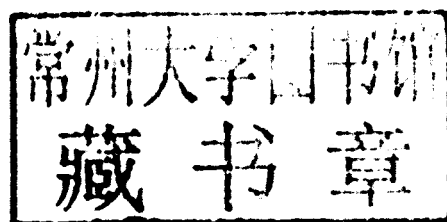
Paul Gamble



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*Paul Gamble*



First published 2012  
by Routledge  
2 Park Square, Milton Park, Abingdon, Oxon OX14 4RN

Simultaneously published in the USA and Canada  
by Routledge  
711 Third Avenue, New York, NY 10017

*Routledge is an imprint of the Taylor & Francis Group, an informa business*

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*British Library Cataloguing in Publication Data*

A catalogue record for this book is available from the British Library

*Library of Congress Cataloging in Publication Data*

Training for sports speed and agility : an evidence-based approach / edited by Paul Gamble.

p. cm.

Includes bibliographical references and index.

1. Physical education and training. 2. Athletes—Training of. 3. Muscle strength. I. Gamble, Paul.

GV711.5.T73 2012

613.71—dc22

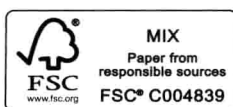
2011013051

ISBN: 978-0-415-59125-6 (hbk)

ISBN: 978-0-415-59126-3 (pbk)

ISBN: 978-0-203-80303-5 (ebk)

Typeset in Bembo and Stone Sans ITC Pro  
by Prepress Projects Ltd, Perth, UK



Printed and bound in Great Britain by  
TJ International Ltd, Padstow, Cornwall

# TRAINING FOR SPORTS SPEED AND AGILITY

Speed and agility are central to success in a wide range of sports. *Training for Sports Speed and Agility* is the first evidence-based study of all those aspects of athletic preparation that contribute to the expression of speed and agility during competition.

Drawing on the very latest scientific research in the fields of strength and conditioning, applied physiology, biomechanics, sports psychology and sports medicine, the book critically examines approaches to training for speed and agility. This book further explores the scientific rationale for all aspects of effective training to develop sports speed and agility, comprising a diverse range of topics that include:

- assessment;
- strength training for speed and agility development;
- speed–strength development and plyometric training;
- metabolic conditioning;
- mobility and flexibility;
- acceleration;
- straight-line speed development;
- developing change of direction capabilities;
- developing expression of agility during competition;
- periodisation.

Every chapter includes a review of current research as well as offering clear, practical guidelines for improving training and performance, including photographs illustrating different training modes and techniques. No other book offers a comparable blend of theory and practice. *Training for Sports Speed and Agility* is therefore crucial reading for all students, coaches and athletes looking to improve their understanding of this key component of sports performance.

**Dr Paul Gamble** currently works as national strength and conditioning lead for Scottish Squash and is also responsible for a number of national-level athletes in a variety of sports, having previously worked in professional rugby union with the English Premiership side London Irish. This is Paul's second textbook and he has published a number of articles on related topics, as well as developing course materials for postgraduate degree programmes.

# ACKNOWLEDGEMENTS

The ability to coach speed and agility performance is classically the skill that any strength and conditioning specialist will acquire last of all, as it stems from a great deal of observation and experience. On that basis I must thank the athletes, sports coaches and other practitioners that I have had the privilege of working with and learning from.

But above all else this book is for Sian . . .

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## **PART I**

# **Theory of sports speed and agility development**



# 1

## INTRODUCTION

### What defines sports speed and agility?

#### **Defining sports speed and agility**

An obvious first step when attempting to develop the capacities involved is to first define what constitutes speed and agility in sports. As will be discussed in the following chapter, a number of physical qualities and neuromuscular capabilities can be identified as contributing to speed and agility expression. There are therefore a number of avenues for the strength and conditioning specialist to explore; each of these may ultimately impact upon the athlete's ability to express speed and agility in competition.

It should also be recognised that both speed and agility are expressed in response to and according to the demands of the given situation in a match. The context in which these movements are performed therefore has a critical bearing on both the characteristics of the movement and in turn the nature of the physical, sensory and cognitive input required. Often tactical awareness or 'game sense' and decision-making are decisive attributes in terms of the athlete's ability to express their propensity for speed and change of direction performance.

The nature of the sport is clearly a defining aspect that governs what form speed and agility takes in the context of competition. However, even within the same sport, the types of speed and agility movement required vary according to the role allocated to the individual athlete, for example in a team context. Not only this, even for an individual player, the situation in a contest will further serve to determine the characteristic movement demands – an illustration of this is the different forms of speed and agility movement required when attacking versus defending. Focusing in further still, the unique constraints and demands of a given scenario in a match will ultimately define the specific movement response(s) necessitated by the situation.

#### **Can speed and agility be taught?**

The traditional view regarding speed performance has been that 'sprinters are born and not made'. Although some aspects of sprinting performance are dependent upon genetic

factors, the consensus on this point has shifted over recent years and it is now acknowledged that speed abilities are trainable. There is much the same ongoing debate with respect to agility performance. Anecdotally, particularly in evasion sports, many coaches and observers are of the belief that the best performers with respect to agility capabilities possess these qualities as a 'natural ability'.

In an attempt to resolve these debates, there is a growing body of data which indicates that both change of direction performance and reactive agility can be developed by means of appropriate training interventions. Various studies have shown that the mechanics of the movements that constitute change of direction activities are amenable to change through instruction and appropriate movement skill practice in a way that reduces injurious lower limb stresses and also confers improvements in performance in many cases (Hewett *et al.*, 2006a; Myers and Hawkins, 2010). Furthermore, the perceptual and decision-making aspects of agility also appear to be trainable even in elite performers. A short-term (3-week) training intervention designed to specifically develop these abilities by requiring the athlete to react to video images on a big screen during reactive agility drills successfully produced improvements in performance on a reactive agility test that were almost exclusively due to improved reaction time and decision-making (the movement time component of subjects scores was largely unchanged) (Serpell *et al.*, 2011). However, despite the growing evidence to the contrary, in the field many coaches still hold the view that quick and agile athletes are born and not made.

What is also clear from the previous section is that what constitutes speed and agility expression in a particular sport and athlete is highly distinct and clearly defined by the unique constraints associated with the sport, the athlete and the match situation. To an extent sports may share common aspects in terms of athleticism or movement skill competencies. To the same extent, athletes in these sports may benefit from a generic approach when training to develop speed and movement skill capacities. However, for the athlete to ultimately realise an improvement in their ability to express their agility in the context of a match, the strength and conditioning specialist must have an intimate understanding of the intricacies of the characteristic movements required and the associated physical, metabolic, perceptual, cognitive and decision-making aspects involved.

### **Aspects of training that influence sports speed and agility expression**

Part of the complexity of training to develop an athlete's speed and agility is that these abilities comprise a host of factors. Therefore a wide array of training aspects can conceivably contribute, individually and in combination, to improving these attributes. An obvious example of physical qualities that have the potential to influence performance is strength training. This training factor can increase the ground reaction force that the athlete is capable of generating, and in turn potentially increase propulsion and therefore running and change of direction speed.

The challenge is therefore not straightforward, particularly as the approach taken for each aspect of physical preparation must be considered and appropriate in order to positively influence speed and agility capabilities. Taking the previous strength training example, a number of different strength qualities are identified to predominate in different phases, even within a sprint in a straight line. Furthermore, conventional strength

training modes employed in isolation are shown to have limited transfer to speed and change of direction performance. Similarly, a range of different energy systems and metabolic processes are implicated in sprint and repeated sprint performance.

The sprinting action itself represents a complex movement task – each stride requires execution of several individual aspects that must be coordinated and executed in a sequenced fashion with precise timing. The change of direction movements involved in agility activities feature numerous variations, and the athlete must possess the required movement competencies and underlying physical qualities to execute each of these movements efficiently. What represents sound movement technique may also differ for a given sport. For example, in collision sports the ‘ideal’ upright posture identified for maximal sprinting must often be modified (along with stride length) in order to allow the player to evade opponents, particularly when in congested space. Athletes from different sports are similarly observed to employ different movement strategies for the same movement tasks (Cowley *et al.*, 2006).

A key consideration when designing training to develop sports speed and agility is the context in which these qualities are expressed during competition. The performance environment in the sport similarly involves perceptual and decision-making aspects that are unique to the sport and provide the context in which speed and agility movements are executed. In many sports, speed and agility activities are initiated in response to an event occurring in the competition environment – for example movement of an opponent. As such, perceptual and decision-making aspects are involved in the timing of the execution of these activities. The nature of the movement itself is similarly dictated by the situation facing the athlete.

## **An evidence-based approach to developing speed and agility performance**

The corollary of identifying the ‘physical’ factors that might contribute to the expression of sports speed and agility is identifying the best approach to developing each of these individual factors. This is not as simple as it sounds. The strength and conditioning specialist must identify how best to train each of the individual components in the most effective and efficient manner, based upon the available research evidence in the literature. However, this must also be undertaken in such a way that the athlete will ultimately be capable of enhanced speed and agility performance. The latter involves two major challenges:

- identifying the means of developing the particular physical capacity in a way that facilitates transfer of training effects to speed and/or agility expression;
- coordinating all of the different elements of training in order to take account of the interaction between each of the different training stimuli and minimise interference effects.

Although there is growing consensus that the components that comprise speed and agility performance are trainable, what is much less clear from the available scientific literature is what the optimal approach to training speed and agility performance might be. Both ‘sports speed’ and particularly agility represent open motor skills on the basis that



their expression is shaped by and initiated in response to events that occur in the competition environment. The approach taken to training sports speed and agility must therefore recognise the need for the coupling of perception and action, and the aim must be to develop these qualities as adaptive motor skills. There should therefore necessarily be an element of open motor skill learning during sports speed and agility development in order to incorporate perception–action coupling and account for development of perceptual and decision-making aspects, particularly in the latter stages of athletes' training (Serpell *et al.*, 2011).