INTRODUCTION: WHY BOTHER ABOUT POSTURAL CONTROL?

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What is posture and what is postural control?
Posture describes the relationship between the parts of the body, and between the body and an external reference frame. Posture also concerns the maintenance of the position of the body in relation to the frame. The central nervous system is in charge of the control of posture. Postural control primarily serves two goals. It aims at the maintenance of balance, which means that the centre of pressure and the projection of the centre of gravity remain inside the support surface. In other words, it prevents the subject from falling or toppling over. The other goal of postural control is to form an interface between perception and action. A person’s posture is a person’s frame of reference with respect to the external world. For instance, the frame of reference for a person standing upright differs from that of a person sitting in a wheelchair.

The control of posture in humans is very complex and involves virtually all parts of the nervous system. Therefore it is not too surprising that the development of postural control is a long-term process, which is not complete at preschool age, when children learn to run and jump, but lasts till adolescence.

Postural control in developmental disorders
The complex nature of the postural control system makes it vulnerable for adverse conditions during early life, such as a prenatally or perinatally acquired lesion of the brain or preterm birth. Indeed, children with disorders of the developing brain virtually always have minor or major dysfunctions in postural control. The postural control system of children with other neurodevelopmental disabilities such as spina bifida or muscle disease is also challenged: it has to find age-specific solutions for the postural problems posed by the disorder.

These postural problems have serious consequences for the activities of daily life, as adequate postural control is a prerequisite for adequate motility. Postural problems not only interfere with motility, they also affect social interaction; the way a person sits, stands or walks has an effect on the way the person is perceived. It is thus of great importance to understand the postural problems of children with developmental disorders.

However, it is not easy to understand the postural problems, the postural dysfunctions and the alternative postural strategies used by children with a developmental disorder. Although much still remains poorly understood, this book summarises and discusses what is currently known. In addition it highlights the consequences for postural management. In
daily practice we have a host of postural management techniques to our disposal, which vary from sleeping, sitting or standing equipment and orthoses to pharmacological, surgical or physiotherapeutic interventions. Which technique is used in which situation is usually based on tradition or clinical intuition and relatively seldom on the basis of scientifically proven evidence of effectiveness. The aim of the book is to provide insight into postural mechanisms, and into typical and atypical postural development, and to review current approaches to postural management.

Outline of the book
Following the first introductory chapter, Chapter 2 provides a concise overview of the processes involved in postural control. The complexity of the chapter reflects the complexity of the subject. Nowadays it is clear that the control of posture is not a simple matter of reactions and reflexes. Posture is regarded as an active process where the control system continually probes the limits of stability on the basis of continuous feedforward and feedback information. We are well aware that the chapter is in fact a bit of a brain-teaser, but we hope that readers will experience the in-depth neuroscience as more than rewarding.

Chapter 3 reviews the ontogeny of human postural control. It starts with an overview of the mechanisms of neuromotor development. Next it discusses the development of posture, including the development of postural sway and postural adjustments, and the development of the various sensory systems used for the control of posture.

Chapters 4 to 12 deal with postural dysfunctions, postural adaptation and postural management in various developmental disorders such as cerebral palsy, Down syndrome, spina bifida, muscle disease and developmental coordination disorder. The next two chapters (13 and 14) focus on the management of postural problems in children with cerebral palsy and developmental coordination disorder. Chapter 15 contains the concluding remarks.