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Infographic

Infographic: Development of postural control

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INTRODUCTION

An intriguing question was asked me at the beginning of my scientific training: "development of postural control is the development of what?" and almost after three decades, I still wonder and seek a convincing answer to this. At that time, researchers assumed postural control as the summation of parallel and hierarchical reflexes, although others as the output of complex interactions among multiple neural systems [1]. My answer, at that time, was that the development of postural control was the development of a coherent and stable coupling between sensory information and muscle activity [2]. This infographic aims to further elaborate on such an answer.

Horak and Macpherson [1] suggested that postural control would be better understood considering the two behavioral goals: postural orientation and equilibrium. To accomplish both goals, it is necessary sensory information and motor activity. Sensory cues provide information about the segments positioning and the forces acting on them and, based upon this information, the central nervous system (CNS) triggers specific muscle contractions to maintain or to acquire a new orientation. Therefore, postural control implies an intricate relationship between sensory information and motor activity.

At the early stage of life, infants have neither muscle strength nor well-developed sensory systems and, consequently, they cannot even control head positioning. As a matter of growth and development, motor and sensory systems improve and, shortly, infants can master head positioning control as other motor milestones. The early relationship between sensory information (e.g., visual) and motor activity was elegantly demonstrated by Lee and collaborators [3] (the "moving room paradigm"). The impact of the visual surrounding is so striking on the upright stance that could even lead infants to fall [3]. Similar results were obtained by others uncovering early perception-action coupling issues,

and as the coherent and stable relationship between sensory cues and motor activity would be the key issue in the development of postural control [4].

If the identification and the coupling to the most relevant sensory cues were not complex enough, it was suggested [5] that adults reweigh the use of sensory cues dynamically which is mastered only after the first decade of life. Thus, such reweighting process involves identifying the most relevant cues to be used whereas the importance of the less relevant cues is reduced. However, due to the constant changes in the environmental and task conditions, postural control also needs to constantly change the use of available sensory cues.

In summary, the development of postural control is the development of a coherent coupling between sensory information and muscle activity, but flexible and dynamically *adaptable*. Actually, one of the postural control goals is stability, maintaining postural orientation and equilibrium, and the development of postural control is the acquisition of a coherent and adaptable coupling between sensory information and muscle activity, which provides us with flexible and stable postural orientation and equilibrium and stability despite all the surrounding environment and conditions changes.

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