SENSOR FUNCTIONAL CONCEPT OF HUMAN BODY STABILITY

Vladimir Korenberg,
Moscow State Academy of Physical Culture, Moscow, Russia

KEY WORDS: human body stability, stability platform, body configuration, perception, stability area

INTRODUCTION: The study presents a new approach to the problem of body stability as related to both human body movement (locomotion) and static posture maintenance with constant support. The study of mechanisms and new visions of how the human body manages to maintain its balance seems to be very important in relation both to teaching and learning motor skills in different aspects of life, especially in sports and rehabilitation after trauma or disease. The existing models of human body stability based on the assumption of the human body as rigid seem inadequate. The passive supporting structures of the human body per se are unable to maintain body balance, while muscle activity greatly contributes to this process. The aim of the present study was to develop a functional concept of human body stability that could combine the level of muscular activity in the relevant muscle groups and the appropriate sensor information (subjective perceptions), both contributing to human body stability.

METHODS: 4000 male and female subjects aged 7-30 years (Moscow school children, and adult sports gymnasts of different competitive levels) participated in the study and performed specific tasks on a stability platform.

RESULTS: The results of our investigation made it possible to offer our sensor functional model of human body stability and to introduce several new terms to describe it. The concept of “stability area” (evaluated experimentally on the stability platform) characterizes the optimal ability of the human body to generate “recovery” moment and thus restore the body configuration. The ”stability area” was shown to be comprised of two parts: a “comfort zone” and a “reliable zone,” both determined on the basis of the analysis of the perceptions of the individuals studied. Within the “comfort zone” definite torque values did not induce feelings of discomfort while restoring the body configuration. Within the “reliable zone” subjects did worry about losing their balance (felt quite sure that they would not lose their balance under the influence of subsequent torque).

CONCLUSIONS: Our study showed the possibility to determine the points perceived as “maximally comfortable” and “maximally reliable” inside these respective zones. It was concluded that good stability skill seemed to be chiefly based on the subject’s ability to perceive the intensity level of disturbances, to quickly analyze tendencies in torque value variations, and the skill to generate adequate responses (recovery moment) to restore the body configuration within a minimal lag time. The described model proved to be efficient in sports and rehabilitation.