



Influence of Agility Dynamics on Motor Control and Development Capacities

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DEAR EDITOR

Agility is an inseparable part of training programs in many field sports. There are numerous training exercises suggested by experts to enhance athletic agility performance. There are also different tests specifically designed to assess agility. As an example, the four by nine agility test is commonly performed to assess the footballers. If, however, more complex assessments are required, tests such as Illinois agility tests are conducted. Athletic agility performance during all these tests is measured using the time taken to perform the task.

However, if one is asked to evaluate an individual performance as an observer (i.e. a coach), the story could be very different. The observer could focus on various movement aspects such as coordination and control. During the test, the athlete is controlling and coordinating limb movements, while following the task constraints set to minimise drill time. The body control cost function is thus set to maximise effort to compensate for time minimization constraint. The observer is now faced with three

dimensional dynamic intricacies in multitudes of limb movements; details of which, are almost inaccessible to human visual capabilities .

Although, the simple measurement of time taken to provide an overall assessment of performance is very effective in obtaining a portray of athletic current status, it by no means provides an indication of where the neuromuscular weaknesses lay. This measurement of time, cannot contribute to designing a personal agility development program as it provides no information on neuromuscular characteristics and thus leaves room only for generalized team exercise routines.

Recent advances on agility, have taken other routes. A number of scientists are focusing on cognitive issues whereas another group is focusing on re-defining the concept of agility from a biomechanical point of view. Here, the dynamics of movements are considered at length. The starting point however, has been to re-evaluate the nature of motion. An agility drill consists of different segments such as sprints, which could be

represented by changes in velocity, and change of direction (COD), which could be presented as the change of radius of curvature. Manoeuvrability is of particular interest during the COD, which explains why many recent studies on agility are focusing on COD .

To study COD in agility, the dynamics of the change of direction zone should be addressed. This mode of thought, could take advantage of whole-body dynamic analysis approach to human movements in complex task--performance interactions. It is now possible to relate athletic agility performance to neuromuscular characteristics of the individual athlete by providing descriptions of control mechanisms involved.

Seemingly simple human movements such as walking gait, have been known to be chaotic. It is only recently that all studies on the subject are encouraged to take this phenomenon into considerations. This re-emphasizes the need for a whole-body dynamical approach to the analysis of human movements. The movement complexities however, could require alternative analysis techniques like non-linear dynamical analysis of the events during cyclic movements such as walking, jogging, running and sprinting. In all these types of Gait, continuous left and right steps during a gait cycle are accompanied by repetitive rotations of pelvis on the transverse plane which resembles rhythmic self-sustaining oscillator behavior. The implications are that it could be possible to adopt limit cycle modeling in describing whole body dynamics in different agility zones.

The nature of the task, on the other hand, could involve numerous changes of direction as in agility tests such Illinois.

It is argued that the nonlinear dynamic behavior of the neuromuscular system, in segmental coordination and control, needs to be better understood. It is shown that the mechanisms controlling performance in different phases of COD zone portray significant influence on the agility drill performance. It is this understanding that could be used to develop individualized agility development programs, unlike current states of training where limited individualizations are encountered in agility training.