

TITLE

Measuring the human movement: clinical and instrumental measures of coordination

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ABSTRACT

Sound movement is well coordinated: it is accurate, has proper speed (i.e. it can be fast or slow as needed) and is smooth. On the other hand, uncoordinated (i.e. ataxic) movement is out of the target, slow and fragmented (i.e. unsmooth). Among these three features, the fragmentation of movement is the hallmark of ataxia.

In ataxic movement, the typical bell-shaped velocity profile is disrupted by "dips", which are periods of deceleration followed by acceleration. The more profound the dips and the higher their number, the less smooth the movement appears. These dips can be so deep that the movement can have periods of zero-velocity, i.e. true arrest periods.

This lecture will describe and compare the main clinical and instrumental measures of movement coordination. These include clinical tests from the physical examination of the patient with ataxia, instrumental measures from optoelectronic systems, and recordings from inertial measurement units.

An emphasis will be given to the dimensionless jerk and the spectral arc length (SPARC) measure as instrumental measures of smoothness.

Lastly, smoothness measures will be reviewed in patients with nervous system disorders, such as stroke, cerebellar and basal ganglia disorders.

KEYWORDS (MeSH)

- Movement
- Upper extremity
- Ataxia
- Stroke
- Physical Examination