

Letter to the Editor

Isokinetic Dynamometer - Role in sports rehabilitation

Dear Editor ,

Isokinetic dynamometry is a method of quantitative myometry that uses hydraulic or electro-magnetic instrument to impose constant velocity movement at preset angular velocities.

The basic parts of the isokinetic dynamometer are:

1. Force acceptance unit: Interface between the subject and the system.
2. Lever arm: converts the force signal into an electrical signal.
3. Load cell: provides the base for the force acceptance unit and about a fixed axis.
4. Hand assembly: houses the motor responsible for the motion of the lever arm.
5. Seat or plinth: positions the subject with independent vertical and horizontal alignment options.
6. Control unit: consists of personal computer and its associated peripheral equipment.
7. Specific attachments: for various applications of the anatomical joints.

It is employed exclusively for assessing the intensity of performance of voluntarily contracting muscles. Besides, the physiological and mechanical factors, psychological factors are also involved. Motivation and cooperation of the subject is essential during isokinetic testing. The other factor which influences the subject's result is the familiarity with how the machine works. Hence, the physiotherapist gives time for subjects for warm up before the test to get acquainted with the machine. The test often starts after performing several practice repetitions.

Isokinetic device is also used for patients to check the pre and postoperative surgery results of the range of motion and muscular strength. Apart from various



Fig:1- Isokinetic Dynamometer (Biodesx)

group of muscles acting on upper and lower limb joints the spinal extensor and abdominal muscles can also be assessed during isokinetic testing. The readings are generally distributed by a computer and may be either auditory or visual.

The subject's joint is aligned with the axis of rotation of the dynamometer, and the limb to be tested is attached to the lever arm of the isokinetic device. The subject is instructed to push as hard and as fast as possible against the lever arm; the dynamometer resists the motion as needed to maintain a constant preset velocity. The amount of resistance needed to counter the subjects force is recorded as a torque measure. If the subject exerts a maximal effort throughout the entire range of motion, then the resistance of the dynamometer is a quantitative assessment of muscle performance usually defined as "muscle strength".

If the subject is assessed for strength, a certain number of repetitions such as five, in slower angular velocities (30°, 60°) are performed. Conversely, if a subject is being tested for endurance,



the machine may be set for a specific period of time such as 10 minutes in faster angular velocities (180°, 210°).

Control (input)

Joint dependent-

- 1.ROM
- 2.Angular velocity
- 3.Subject/ patient positioning
- 4.Stabilization
- 5.Alignment of the axis of the dynamometer & the joint
- 6.Contraction mode

Joint independent-

- 1.**Damp setting** (low, mid, high) isometric pre activation (IPA)
- 2.**Feed back** –auditory, Visual.

Performance (output)

Moment (Torque)

- 1.Peak
 - 2.Angle based
 - 3.Angle of peak moment
 - 4.Average Contractural work, power, impulse.
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Table:1- Parameters in isokinetic dynamometer testing.

An isokinetic training routine is helpful for athletes and others overcoming injuries, as it often prevents re-injury of the muscle being worked. Isokinetic exercises are often done when an athlete is recovering from an injury because the state of the muscle will change over the course of training period.

Data acquisition and analysis have been improved by using computer systems interfaced to isokinetic dynamometers. Recently developed computer systems provide correction for gravitational and inertial errors, accurate computation of isokinetic parameters and real-time display of the torque output. Biodex, Cybex, Kin-Com, Orthotron are some of the isokinetic devices used extensively for the athletes for enhancing their performance and quick return to play after injuries with effective rehabilitation.

References

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