

# ISOKINETIC TESTING AND DATA INTERPRETATION

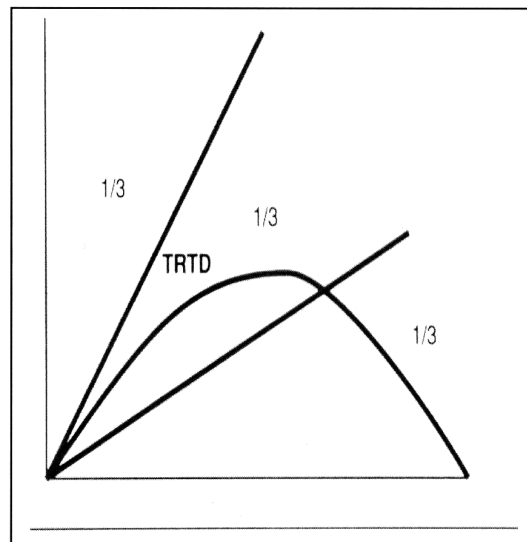
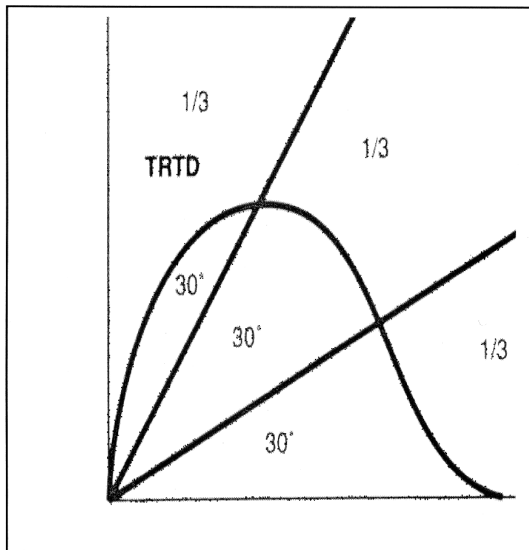
## curve analysis

There is correlation between the shape of the torque curve and the patient's symptoms (Davies). However, keep in mind that curves should have a consistent variation to them and pathology should not be based on one curve or curves alone. They should be used in conjunction with other clinical findings. The 4 areas of a curve used in analysis are as follows:

- **Four Regions of Curve**
  1. Time Rate of Tension Development
  2. Torque Obtainment
  3. Force Decay Rate
  4. Reciprocal Innervation Time

### **TIME RATE OF TORQUE DEVELOPMENT (TRTD)**

This is also known as Time Rate of Tension Development. It is the upward slope of the torque curve and indicates how quickly torque is developed during a muscle contraction. If the X and Y-axis are divided into 30° segments, the TRTD portion of the curve should be within the 60°-90° portion. A prolonged TRTD indicates a problem developing force quickly.



- TRTD can be examined relative to:

Peak Torque: Measured from start of muscle contraction to the highest point on the torque curve

Predetermined Torque Value

Predetermined Time: Torque at .20 sec., for example

Specific Point W/I ROM: Torque at 30°, for example.

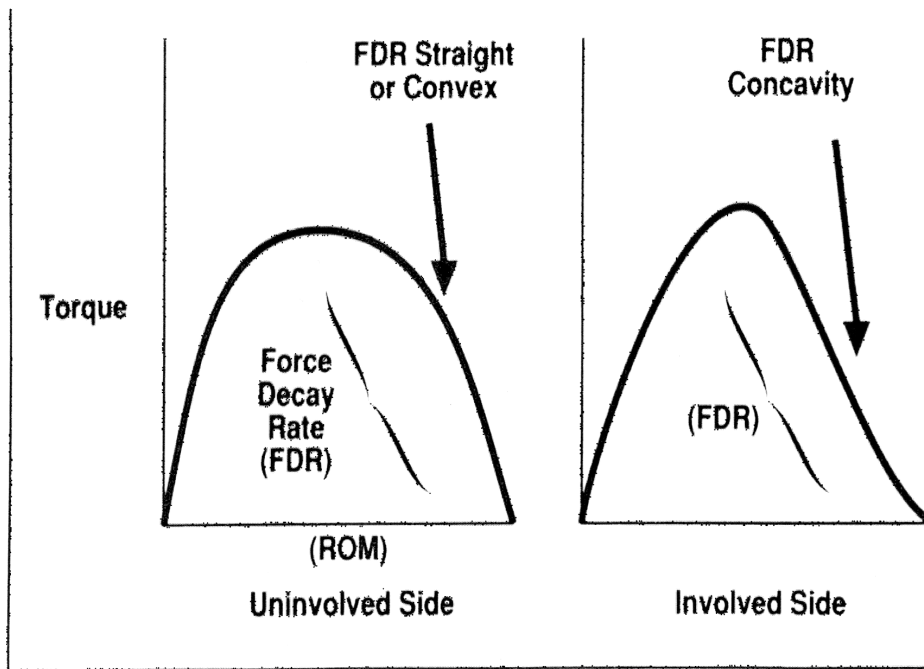
## **TORQUE OBTAINMENT**

- Values include:
  1. Peak Torque: Highest point on the curve
  2. Work: Total area under the curve

Pathologies that are indicative of poor Torque Obtainment exhibit problems maintaining torque, possibly associated with poor neuromuscular control, general weakness, or pain. Examples include, Chondromalasia Patella, and Musculotendinous strains.

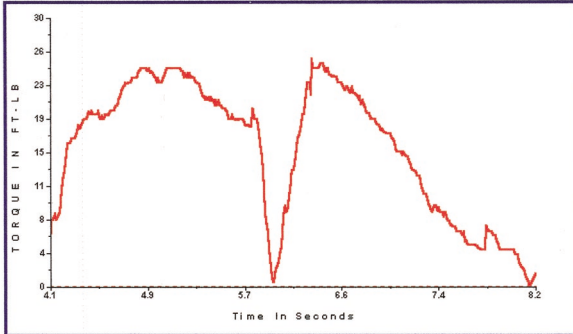
- Force Decay Rate (FDR)

The downward slope of the torque curve. This should be straight or convex and may be indicative of difficulty maintaining original "producing and maintaining" force at the end ROM. For example, a clinician sees concavity w/ ACL deficient knees between 20°-30°, commonly seen during a Pivot Shift test.



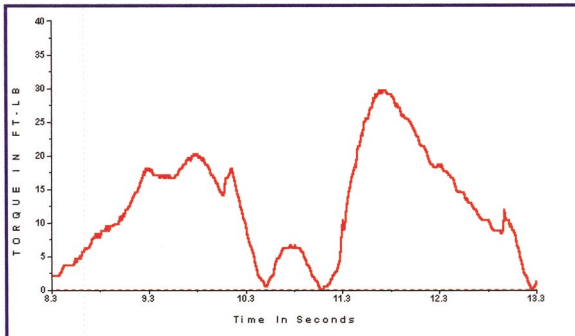
- Reciprocal Innervation Time (RIT)

Time interval between the end of the agonist contraction & the beginning antagonist contraction. RIT should have a "V" shaped appearance (Figure 1). A prolonged RIT will appear as a "U." (Figure 2)



**Protocol:** Isokinetic Unilateral      **Description:** manual  
**Joint:** Knee      **Pattern:** Extension/Flexion  
**Set Description:** Speed 60/60      **Side:** RIGHT  
**Comments:**

Figure 1. Normal Reciprocal Innervation Time



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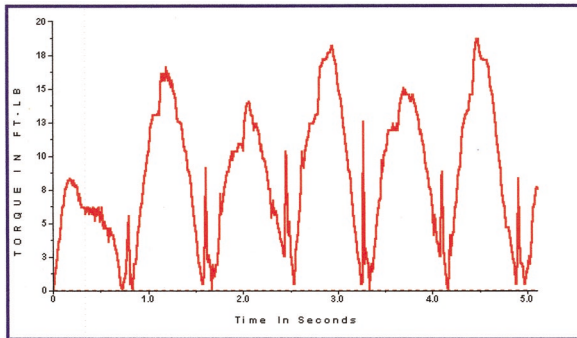
Figure 2. Poor RIT

Figure 1 shows a "normal" RIT, while Figure 2 shows a delay in RIT. This delay may be due to a decreased time of recruitment for motor units at the neuromuscular level. By working in smaller ROMs and at higher speeds, this can be rehabilitated provided there are no disruptions at the neuromuscular level. RIT is important during function, as a poor RIT means that a patient may have difficulty generating power. The ability to generate power is crucial to injury prevention. For example, the hamstrings protect the ACL during movements that require quick change of directions or stop and start movements.

### **WINDOWED VS. ALL DATA**

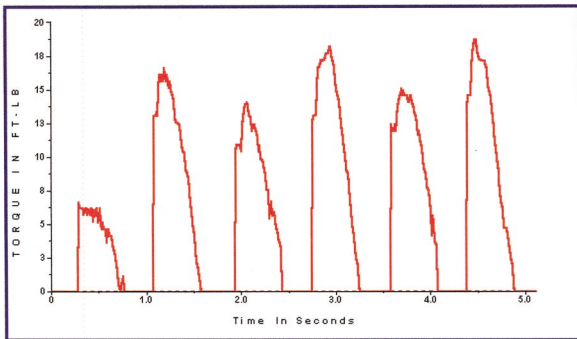
- All Data = records all data points
- Windowed = any data below 70% of set velocity is not computed
- Eliminates torque generated prior to isokinetic speed
- Takes out end spikes from deceleration

The difference between Windowed Data and All Data is that All Data shows all the data points and Windowed Data will show only data which has reached a preset percentage of Isokinetic Speed. The Biodex software allows you to set a predetermined percentage of isokinetic speed to display. The default value is 70%, this means that anything under 70% of isokinetic speed will be eliminated when viewing windowed data. Windowing the data is advantageous to eliminate artifact spiking which may occur at higher Isokinetic Speeds as the attachment decelerates into the end ROM stop. This can be seen as spikes towards the end ROM. (figure 3) When the data is Windowed the curve is displayed as the patient's effort at the speed they are working at. Windowed data shows the patient's actual effort.



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**Set Description:** Speed 180/180      **Side:** RIGHT  
**Comments:**

Figure 3. All Data



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**Set Description:** Speed 180/180      **Side:** RIGHT  
**Comments:**

Figure 4. Windowed Data