Developments to improve arthroscopic surgical skills training

Dimensionless Squared Jolt (DSJ) and Wider field of view arthroscope (150 degrees)

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I have no financial conflicts to disclose.
Purposes

(1) New parameter: Dimensionless Squared Jolt (DSJ)

Construct validity study: objectively measures arthroscopic skill

\[ \left( \int_{t_1}^{t_2} x''''(t)^2 \, dt \right) \ast \frac{D^3}{v_{mean}^2} \]
Purposes

(2) Using DSJ and traditional performance measures to

• investigate the difference wide scope (150-degrees) compared to the traditional scope (105-degrees)
Hypothesis

(1) DSJ is able to serve as an objective parameter for assessing arthroscopic surgical skill

(2) An arthroscope with wider FOV may aid arthroscopic performance as measured by motion analysis, time and DSJ
Materials and Methods

Construct Validity for DSJ

PILOT STUDY

12 Participants
- 6 Novices
- 6 Consultants

13 Novices
- Traditional scope
- Wide Scope
**PILOT STUDY – DSJ**

**CONSTRUCT VALIDITY**

**TRADITIONAL VS WIDE SCOPE**

All novices performed 3 times of standard arthroscopic tasks with traditional scope and wide scope.

- **Task #1**
  Touching the 5 points using grasper

- **Task #2**
  Inserting a suture anchor

- **Task #3**
  Pulling the sutures using grasper

**Shoulder dry model with 5 points marker**
## Pilot study – DSJ construct validity

**TABLE 1.** The Details of Each Participant’s parameter. Min acc = minimum acceleration; Avg. acc. = average acceleration; Nov = novice; Consult = consultant (consider changing to expert). * = denotes achieved significance.

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<th></th>
<th>Time taken (s)</th>
<th>Average acceleration (m/s²)</th>
<th>Maximum acceleration (m/s²)</th>
<th>No. of movements (&gt;10m/s²)</th>
<th>No. of movements (avg. acc.)</th>
<th>No. of movements (min. acc.)</th>
<th>Total path length (m)</th>
<th>Range of acceleration (m²/s²)</th>
<th>DSJ</th>
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*ONLY DSJ parameter shown significant difference*
Results
Wide vs Traditional scope

There was a significant difference between the wide-angle and traditional scope as measured by DSJ (P=.0008)

The other parameters did not demonstrate a difference.
CONCLUSIONS

1. Results shown the value of using DSJ in addition to motion analysis and task completion time as a method of objectively assessing arthroscopic performance.

2. Results shown its use in evaluating a new arthroscope, and conclude the wide-angled arthroscope has potential to improve arthroscopic performance.
CLINICAL IMPLICATIONS

1. DSJ is a valid parameter to assess arthroscopic surgical skills.


3. Wide-angled arthroscope provide a superior training tool than traditional arthroscope.
References

