

Beyond the Battlefield:
Exploring Motion Tracking Technologies to Elevate
Regional Anesthesia Proficiency in Military Training

Lakshmi Sarvepalli, MD; John D Mitchell, MD; Vincent Baribeau, BS; Chris Clark, MD; Audrey R Tacderas, BS, and Carlos E. Guerra-Londono MD.

Department of Anesthesiology, Pain Management, & Perioperative Medicine. Henry Ford Health, Detroit, MI, USA.

Introduction:

- Motion analysis has been used to grade performance of surgical and ultrasound-guided procedures.¹ Its use in UGRA (Ultrasound Guided Regional Anesthesia) has been limited.
- This pilot study explores the feasibility of using motion tracking to discriminate UGRA proficiency between novice non-physician military medics and expert anesthesiologists.

Methods :

- IRB approval at Henry Ford Health (Detroit, MI). Participants gave informed consent for video and motion-tracking recordings during the course.
- Participants: 11 novice military medics and 4 experts
- Weeklong curriculum of point-of-care ultrasound techniques along with teaching/practice of 4 hours provided to novice military medics before data collection.
- Novice and expert data acquired on the same femoral block task trainer (Simulab Corp, Seattle WA) under identical conditions using protocolized start and stop points and a standard sequence of events for a single femoral nerve injection.
- A Viper electromagnetic motion tracker (Polhemus Ltd, Colcheter, VT) with sensors was attached to both the ultrasound probe and the dorsum of the participant’s dominant hand using Tegaderm.
- Sensors recorded the motion of the dominant (needle) hand and ultrasound probe in X, Y, and Z planes, as well as roll, pitch, and yaw at 240 frames per second.
- Primary endpoints for single injections: path length (cm), rotational sum (degrees), translational motions (number of distinct movements), and total time (seconds).
- Statistical analyses were performed in Stata/SE18.3 (StataCorp, College Station, TX), Two-tailed t-tests with unequal variance was performed.

Motion tracking can discriminate
UGRA proficiency between
novice non-physicians and expert
anesthesiologists.

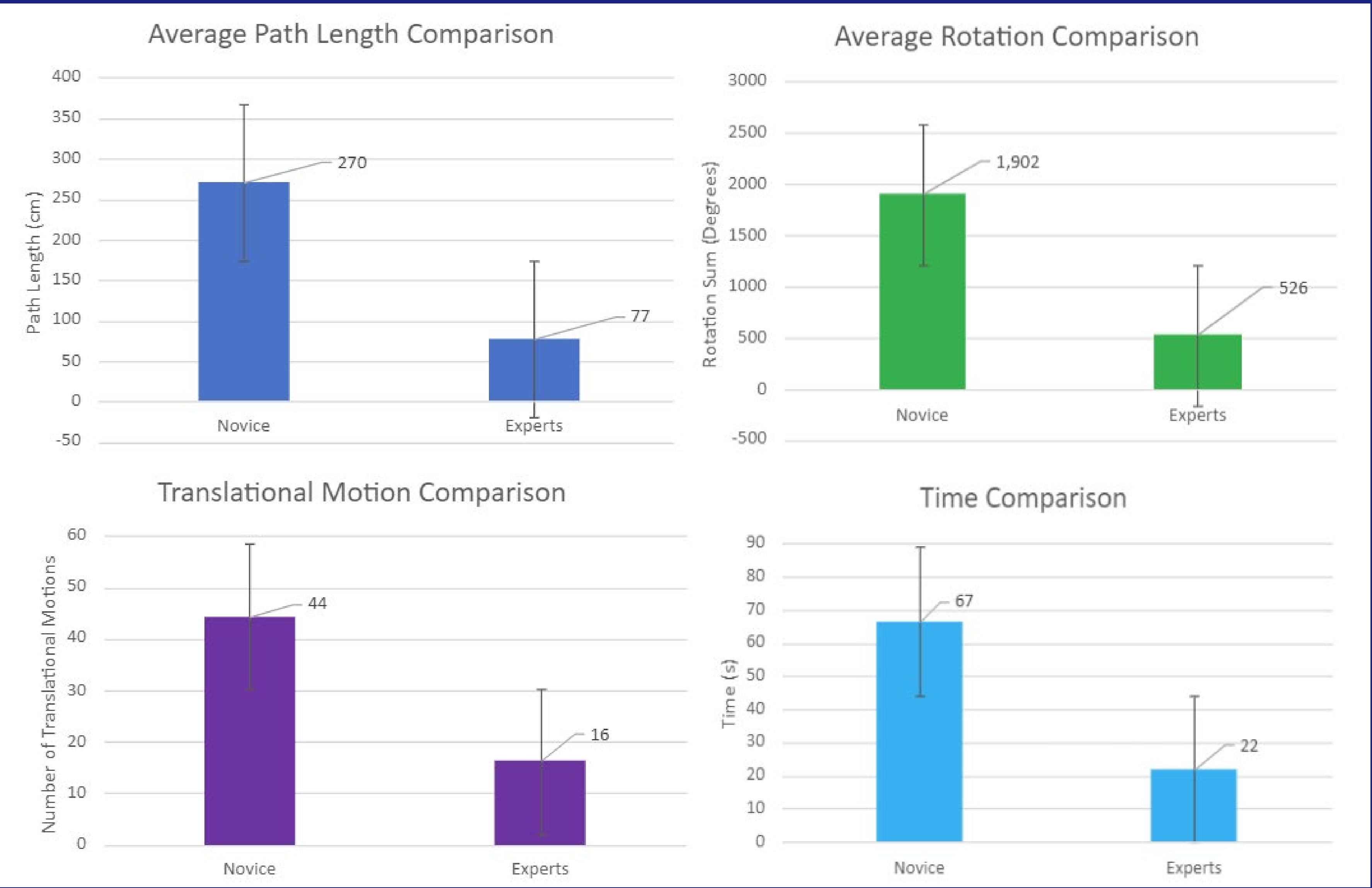


Figure 1: Motion metrics comparison Novice vs Experts Dominant Hand



Discussion:

- The results of this study showed significant differences in all four metrics between novices and experts.
- Greater Path length and Translational motion = Large indeliberate movements
- Large differences in Rotational Sum = Difficulty maintaining visualization
- Future studies should expand the sample size , evaluate the learning curves of trainees over a greater period.

References:

1. Weinstein JL, Ali H, Sarwar A, et al. Evaluation of Technical Performance of Ultrasound-Guided Procedures through Hand Motion Analysis: An Exploration of Motion Metrics. *J Vasc Interv Radiol.* Aug 2023;34(8):1337-1344. doi:10.1016/j.jvir.2023.05.015

2. Corvetto MA, Fuentes C, Araneda A, et al. Validation of the imperial college surgical assessment device for spinal anesthesia. *BMC Anesthesiol.* Sep 29 2017;17(1):131. doi:10.1186/s12871-017-0422-3

3. Chin KJ, Tse C, Chan V, Tan JS, Lupu CM, Hayter M. Hand motion analysis using the imperial college surgical assessment device: validation of a novel and objective performance measure in ultrasound-guided peripheral nerve blockade. *Reg Anesth Pain Med.* May-Jun 2011;36(3):213-9. doi:10.1097/AAP.0b013e31820d4305





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