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Title: Diagnosis and Classification of Anteromedial Bundle Injury In Anterior Cruciate Ligament Injuries with a Digital Application

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Disclosures:

- The authors confirm that the data supporting the information in this study is available from the corresponding author upon request.
- The authors certify that each of the authors listed in this study contributed equally to the authorship of the present manuscript.
- Authors deny financial relationships with commercial interests.



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Background



PIVOT-SHIFT METER

- The knee is continually exposed to stressful forces and is prone to ligamentous injuries.
- In the anterior cruciate ligament injury, the anteromedial bundle is the most common affected.
- Evaluation and diagnosis can be performed by traditional and innovative methods.
- Previously we presented the Pivot Shift app to diagnose and classify posterolateral bundle injury.



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Hypothesis

- Staging the translational instability of the knee can be performed seeking reduction of interpersonal variance.
- An application for mobile phones has been developed using the gyroscopes and accelerometers built into a mobile phone.



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Materials and Methods

- Biomedical engineers from the ORMEDS company designed a phone app and installed it on smartphones.
- 220 measurements were performed in young, healthy men and women.
- The data measurements produced by the application were analyzed with an intraclass correlation coefficient.
- Data was tested and compared using the time of the maneuver and the amplitude of the maximum speed.
- The results of this test were compared with the KT-1000 arthrometer results.



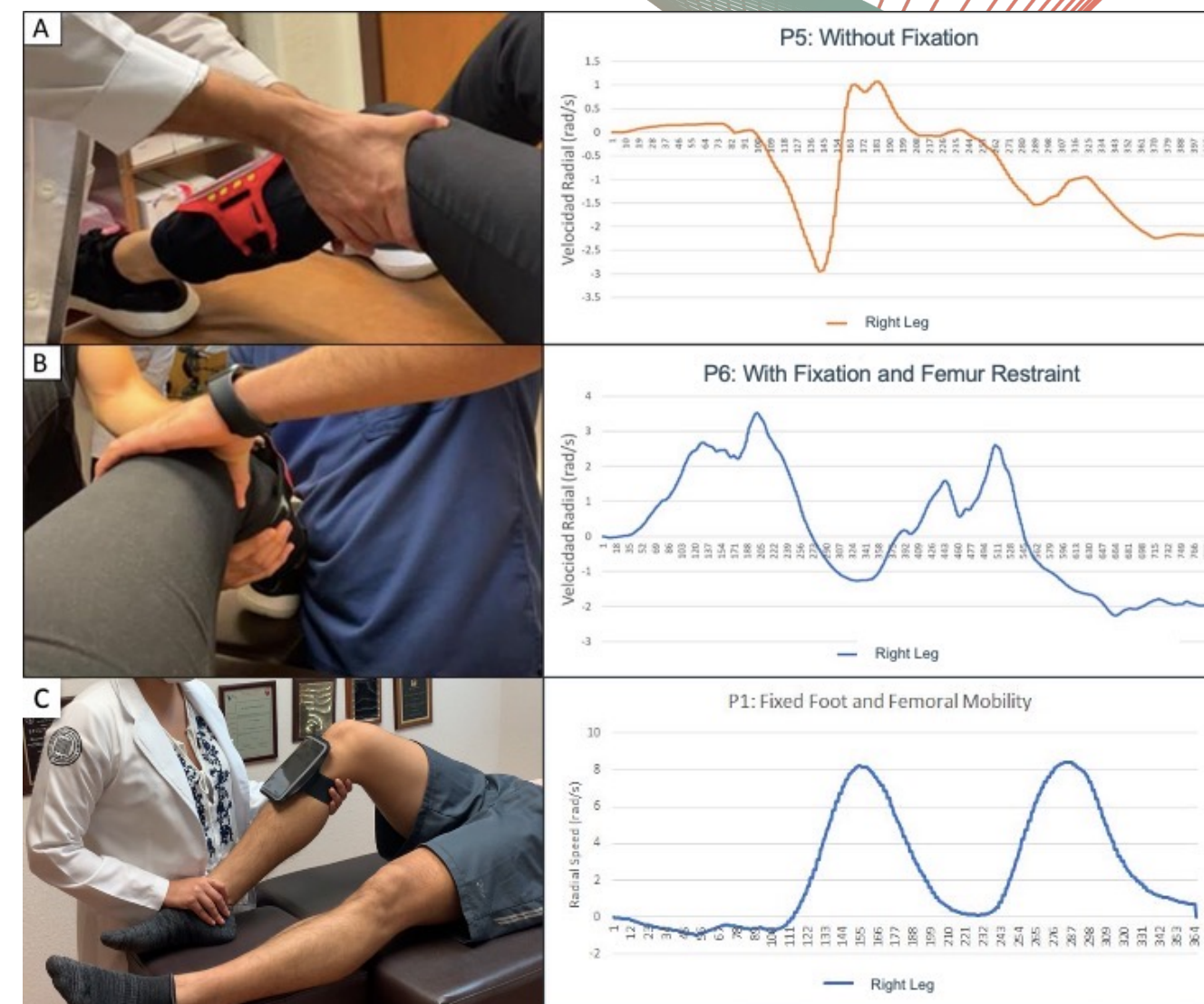
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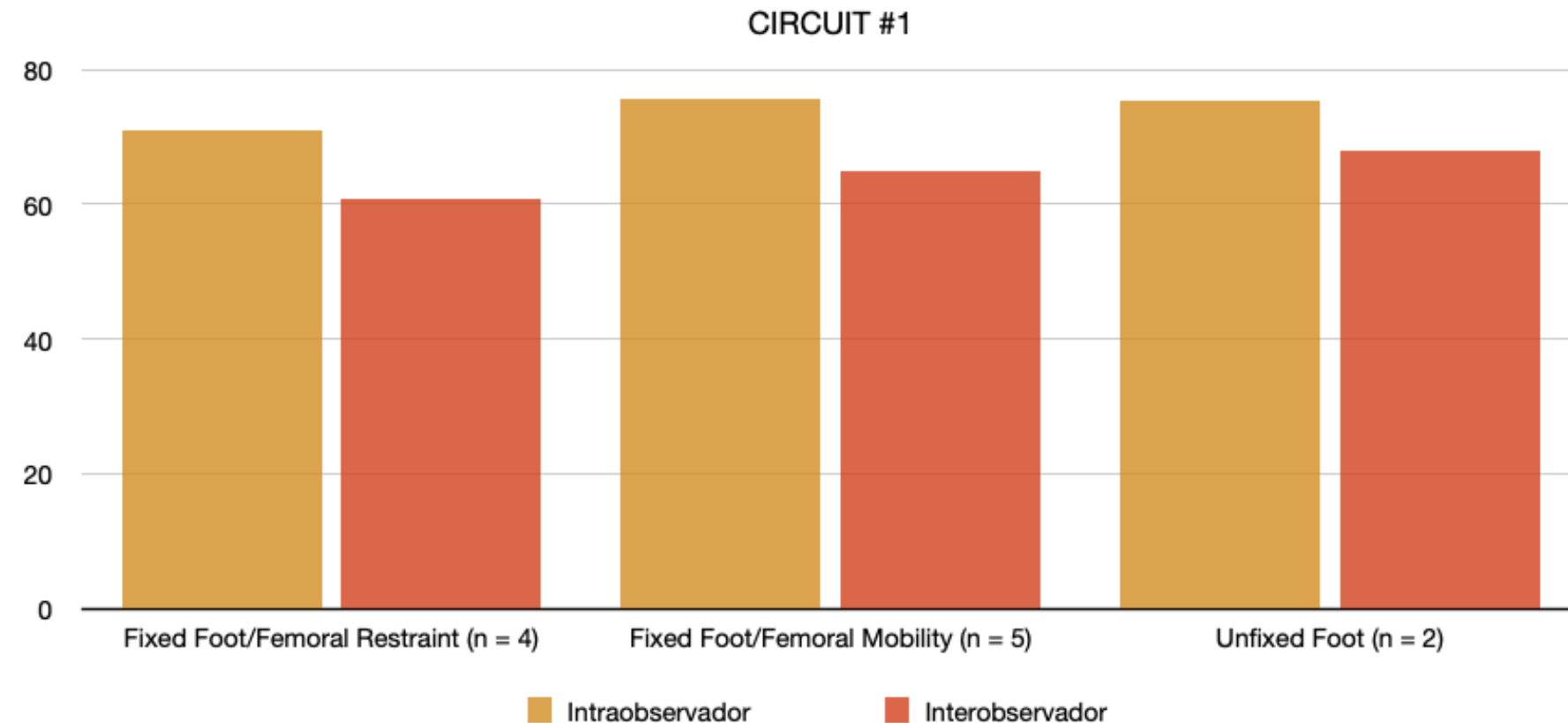
Results

- Two test circuits were carried out with 11 evaluators and 20 tests each.
- Subject positioning was fixed at a flexion angle of 30° on the horizontal axis. The first circuit had a free execution style of maneuver, and 2 styles were identified: fixed foot and without a fixed foot. Two subgroups, one with femoral mobility and the other with femoral restraint, existed within the group in which the foot was fixed.
- In the second circuit a randomization was performed, separating the evaluators into two groups of 5 at random and a control evaluator ("femoral restraint" group and "femoral mobility" group), seeking comparison.



AVERAGE ICC

- The essential factors for the best result of the application were classified.
- Intraclass correlation coefficient (ICC) analysis verified variability, with intra- and interobserver relationships of less than 70%.



	Intraobserver	Interobserver
Fixed Foot/Femoral Restraint (n = 4)	70.92	60.95
Fixed Foot/Femoral Mobility (n = 5)	75.52	65.06
Unfixed Foot (n = 2)	75.40	68.05

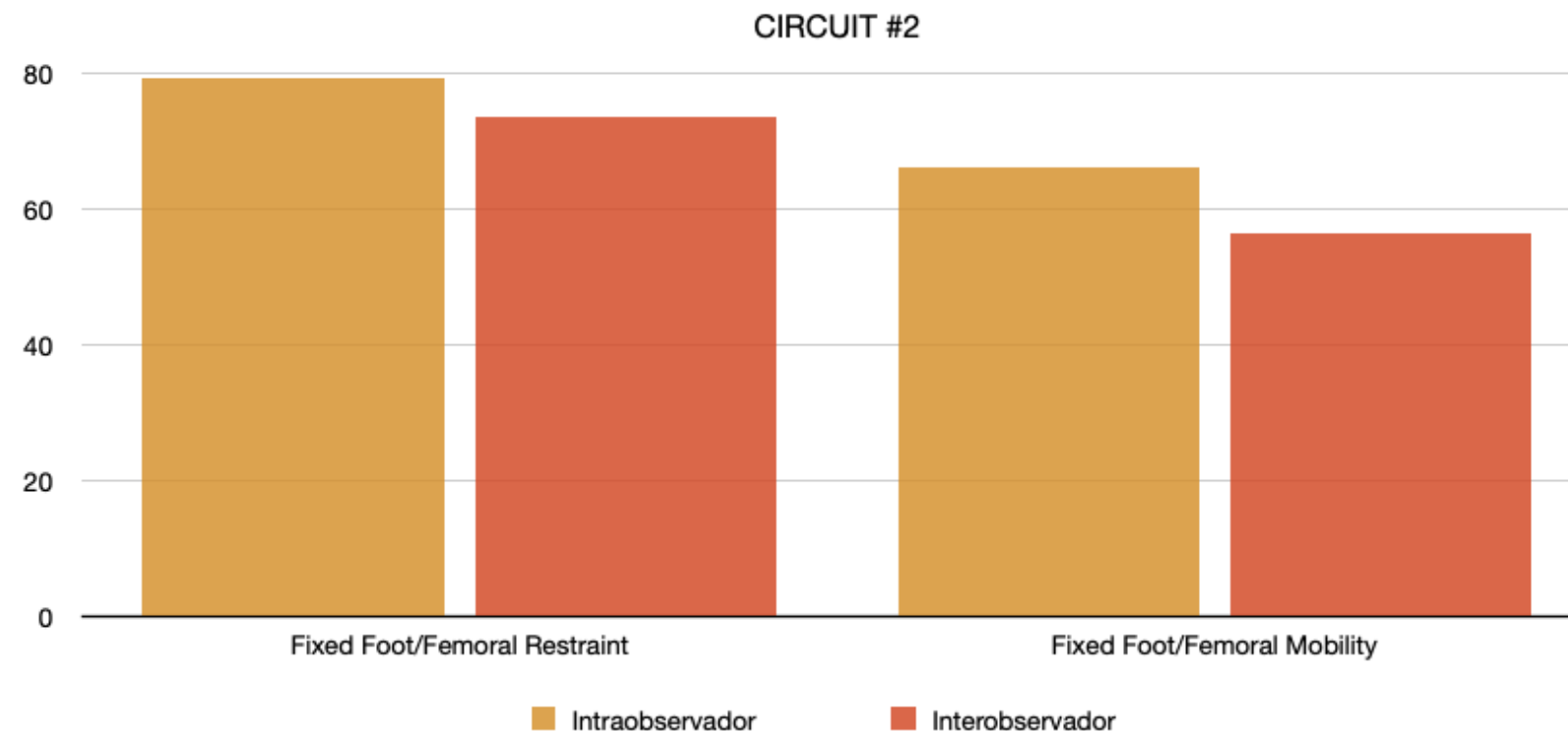


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- During the second circuit the same mathematical analysis was performed.
- Higher results were obtained between intra and interobserver samples per evaluator and per evaluation group.
- ICC reached 80% in several evaluators, demonstrating the need to standardize the maneuver for best results.



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	Intraobserver	Interobserver
Fixed Foot/Femoral Restraint	79.42	73.57
Fixed Foot/Femoral Mobility	66.20	56.40

Conclusions

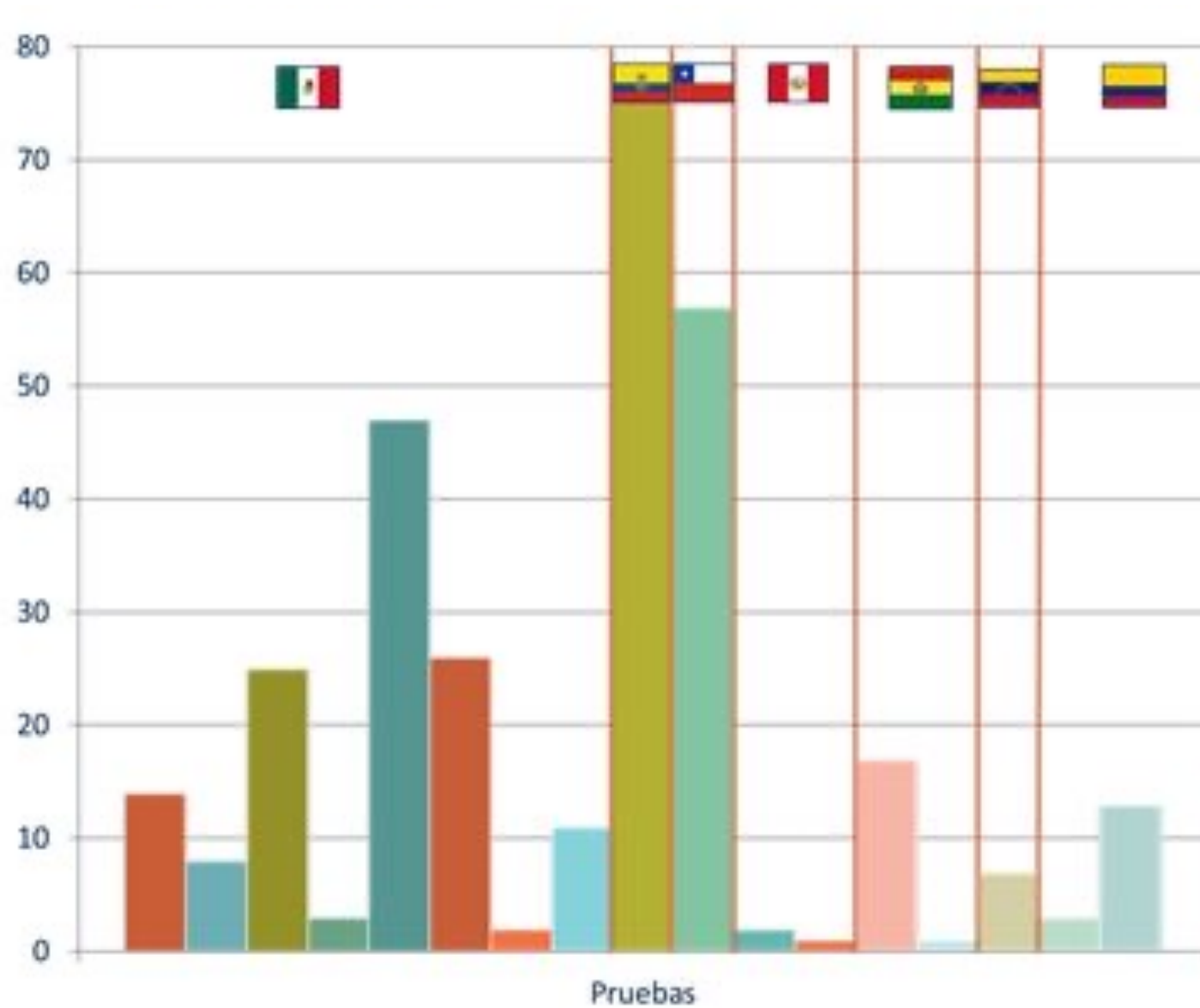
- Digital arthrometry seems to be the path toward the development of precise and objective evaluation methods for translational instability, with all the advantages that an early diagnosis and classification before any surgical treatment can offer.



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