Transforming Gait Research

Advancing a Worldwide Research Network and Biomechanical Database

Sean Osis, BKin, MSc, CAP
Reed Ferber

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Maximize Clinical Impact of Gait Analysis

Multi-Site Research System

- Apps
- Hardware
- Database
- Methods
- Materials
- Analytics

15 Research Partners
70 Clinic Partners
Standardized Tools
Grassroots Clinical Gait Analysis
Databases, Research and
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Problems you can solve

Subjects you have
Problems Database has Solved

1) Quality Control of Data

2) Understanding Selection Bias

3) Predicting Response to Rehabilitation
Reliability is a key challenge

Variance in Marker Placement

- Della Croce et al., 1999
- Gorton et al., 2009
- McGinley et al., 2009
- Szczerbik et al., 2011
- Wilken et al., 2012

Mitigate Placement Error?
1) Quality Control of Data

Single Expert Tester ($n = 345$)

Osis et al., PLoS One, 2016
1) Feedback Reduces Error

Ferber et al., ISB 2015
Osis et al., Gait Pos, in review
2) Understanding Selection Bias

Matching Affects **Comparisons**
- Grau et al., 2008

**Multiple** Patterns Exist
- Mezghani *et al.*, 2013
- Simonsen *et al.*, 2012
- Vardaxis *et al.*, 1998
- Hoerzer *et al.*, 2015

Selection of **Controls**?
2) Subject Sample Matters

Peak Knee Abduction Angle (degrees)

-2 -1 -0 0 1 2 3

Knee Abduction

Cluster 1
Cluster 2

-2.5 -2 -1.5 -1 -0.5 0 0.5 1

Knee Adduction

Cluster 1
Cluster 2

Cluster 1 Controls
Cluster 2 Controls
All Controls

Runners with PFP
n = 56

Cluster 1 Controls
n = 36

Cluster 2 Controls
n = 85

All Controls
n = 121

Phinyomark et al., J Biomech, 2015
3) Predicting Rehab Success

Variable OA Treatment **Outcomes**

- Fransen *et al.*, 2010
- Jansen *et al.*, 2011
- Abbott *et al.*, 2013
- Karsdal *et al.*, 2014

**Match** Patient with Treatment?
3) Predicting Rehab Success

Kobsar et al., PLoS One, 2015
3) Responders and Non-Responders

CV Accuracy 85.4%

Patient Groups Persist

Pre-Emptive Recognition

Kobsar et al., PLoS One, 2015
Database is a unique and powerful approach

Depends on strong collaboration

We encourage others to share and join our efforts

Reed Ferber: rferber@ucalgary.ca
Sean Osis: stosis@ucalgary.ca
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