Telehealth Part II: Telerehabilitation research and Australian perspective

INPTRA Webinar
Wednesday 25th Feb, 2015

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Co-Director: Telerehabilitation Research Unit
The University of Queensland, Brisbane. Australia
t.russell1@uq.edu.au
UQ Centre for Research Excellence in Telehealth

Chief Investigators

- Centre for Online Health
- Centre for Research in Geriatric Medicine
- Dermatology Research Centre
- Telerehabilitation Research Unit
- The Centre for Applied Health Economics
- UQ School of Business

Associate Investigators

- Health Economics, Griffith
- Technology & Paediatrics, UQ
- Education & Training, UQ
- Research Design & Aged care, UQ
- Nursing & Aged care, QUT
- Engineering & Health Informatics, UWS
- Workforce & Health System Design, HWA
- IT & Telehealth Strategy, Flinders
Telerehabilitation Research Unit
The University of Queensland

Directors:

Prof Deborah Theodoros

A/Prof Trevor Russell

- Established 2004
- 7 researchers across 4 disciplines (PT, SP, OT, AUD)
- 8 PhD students
- St Lucia Campus
- Primary focus on establishing the evidence base for telerehabilitation
Telerehabilitation Research Unit

Broad experience and research across 5 domains of telerehabilitation research

- Technical Efficacy
- Diagnostic Accuracy
- Societal Efficacy
- Therapeutic / outcome efficacy

Level 2

Research Article

Assessment and Diagnosis of Musculoskeletal Shoulder Disorders over the Internet

Leah Steele, Hannah Lade, Stephanie McKenzie, and Trevor G. Russell

RESEARCH ARTICLE

Telerehabilitation Mediated Physiotherapy Assessment of Ankle Disorders

Trevor G. Russell*, Robert Blumke, Bradley Richardson & Piers Truter

Division of Physiotherapy, School of Health Science, University of the Sunshine Coast

The Diagnostic Accuracy of Telerehabilitation for Nonarticular Lower-Limb Musculoskeletal Disorders

Validity and reliability of the assessment and diagnosis of musculoskeletal elbow disorders using telerehabilitation

Hannah Lade, Stephanie McKenzie, Leah Steele and Trevor G Russell
Musculoskeletal Diagnostic Accuracy

Telerehabilitation Study Participants

Aim:
Investigate the validity and reliability of telerehabilitation assessment of common musculoskeletal conditions

Participants:
- 103 participants (2009-2011)
- \( \bar{x} \) age = 27.4yrs (Range 18-63)
- Male 52%
- Musculoskeletal & Sports Injuries Clinic, Brisbane
Musculoskeletal Diagnostic Accuracy

Telerehabilitation Study Participants

- Shoulder, 28
- Elbow, 11
- Wrist/Hand, 17
- Non-Artic, 22
- Knee, 17
- Ankle, 16
- Wrist/Hand, 17
- Elbow, 11
- Non-Artic, 22
- Knee, 17
- Ankle, 16
Musculoskeletal Diagnostic Accuracy

Telerehabilitation Study Procedure

Procedure:

- Patient interview and physical assessment:
  - face-to-face
  - telerehabilitation system

- Order of Ax randomized
- Ax conducted sequentially
- Online patient Ax videorecorded
Musculoskeletal Diagnostic Accuracy

Telerehabilitation Study Procedure

Concurrent validity
Musculoskeletal Diagnostic Accuracy

Telerehabilitation Study Procedure

Intra-rater reliability

eHAB 1.1

eHAB 1.2

F2F
Musculoskeletal Diagnostic Accuracy

Telerehabilitation Study Procedure

Inter-rater reliability
Technologies

- Portable
- PC Based
- 3G/4G telecom
- Calibrated measurement tools
- Videorecordings / video demonstration

eHAB™
Multimedia Videoconferencing for rehabilitation consultations
eHAB
Accurate Measurement

http://www.neorehab.com
Profession specific assessment tools and media tools

Profession specific assessment tools

- Designed for easy clinical adoption
- Incorporates media critical to clinical application
- Valid and reliable
  - Physiotherapy
  - Speech Pathology
Musculoskeletal Diagnostic Accuracy

Telerehabilitation Study Methods

**Telerehabilitation Procedure:**

- Patient Interview
  - +/- standardised questionnaires

- Physical Examination
  - Observation
  - Palpation
  - Movement examination
  - Standardised Tests
  - Specific testing of muscular, neural, articular systems
Musculoskeletal Diagnostic Accuracy

Telerehabilitation Study Methods

**Telerehabilitation Procedure:**

- **Patient Interview**
  - +/- standardised questionnaires

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  - Palpation
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Musculoskeletal Diagnostic Accuracy

Telerehabilitation Study Methods

Telerehabilitation Procedure:

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• Physical Examination
  • Observation
  • Palpation
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  • Specific testing of muscular, neural, articular systems

Real-Time Demonstration
Self Palpation
Verbal Guidance
Vocabulary support
Musculoskeletal Diagnostic Accuracy

Telerehabilitation Study Methods

Telerehabilitation Procedure:

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Musculoskeletal Diagnostic Accuracy

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Musculoskeletal Diagnostic Accuracy

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Musculoskeletal Diagnostic Accuracy

Telerehabilitation Study Methods

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Musculoskeletal Diagnostic Accuracy

Telerehabilitation Study Methods

Outcome Measures

• Primary clinical diagnosis
  The patho-anatomical structure (e.g., supraspinatus tear), condition (e.g., adhesive capsulitis) or movement dysfunction (e.g., scapular dyskinesia)

• Systems diagnosis
  The anatomical system (muscle, bone, articular or neural) that contained the primary pathology

• Individual Outcome Measures

• Satisfaction Questionnaire
Pathoanatomical Diagnosis

<table>
<thead>
<tr>
<th></th>
<th>Shoulder</th>
<th>Elbow</th>
<th>Wrist/Hand</th>
<th>Non-Artic</th>
<th>Knee</th>
<th>Ankle</th>
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<tbody>
<tr>
<td>Validity</td>
<td>59.3</td>
<td>72.7</td>
<td>82.4</td>
<td>79</td>
<td>94</td>
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<tr>
<td>Inter-Rater</td>
<td>73.1</td>
<td>72.7</td>
<td>82.5</td>
<td>89</td>
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<tr>
<td>Intra-Rater</td>
<td>100</td>
<td>81.8</td>
<td>100</td>
<td>100</td>
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<td>100</td>
</tr>
</tbody>
</table>
Clinical Tests – Binary

Range of Motion
Special clinical tests
Pain response
Nerve ROM and sensibility
Strength
Joint Assessment
Limiting Factor

Shoulder
ELBOW
Wrist / Hand
Musculoskeletal Diagnostic Accuracy

Telerehabilitation Study Conclusions

- Diagnostic accuracy of telerehabilitation assessment is similar to face-to-face reliability studies (59-94% agreement)
- Remote assessment appears to have adequate concurrent validity
- High level of both inter and intra rater reliability
Telerehabilitation Research Unit

Broad experience and research across 5 domains of telerehabilitation research

- Technical Efficacy
- Diagnostic Accuracy
- Societal Efficacy
- Therapeutic / outcome efficacy

Internet-Based Outpatient Telerehabilitation for Patients Following Total Knee Arthroplasty: A Randomized Controlled Trial

Trevor G. Russell, Peter Buttrum, Richard Wootton and Gwendolen A. Jull

Methods

A randomized controlled trial

- Single-blinded, prospective, randomized controlled, non-inferiority trial
- Randomization
  - Traditional face-to-face 1:1 outpatient therapy
  - Telerehabilitation 1:1 therapy
- Intervention
  - Individualised 45 minute session / week. Comprehensive home program
  - Six (6) week program
Methods (continued)

A randomized controlled trial

- Sample size calculations for a non-inferiority trial were performed on the primary outcome measure (WOMAC)

- Participants
  - Unilateral Primary TKA
  - 34 Control
  - 31 Telerehabilitation
Outcome Measures

Functional Outcomes:
- The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC)
- The Patient Specific Functional Scale
- The Spitzer Quality of Life Uniscale
- The timed up-and-go test
- Pain intensity, using a visual-analogue scale

Physical Outcomes:
- Active and passive knee flexion angle and knee extension angle
- Quadriceps muscle strength
- Limb girth measurements to assess swelling in the knee
- Assessment of gait

Study Specific Outcomes:
- Patient satisfaction questionnaire
- Computer Literacy Questionnaire
- Home exercise diary
Telerehabilitation Intervention

Traditional Approaches

- Education ✓
- Goal Setting ✓
- Exercise +/- equipment ✓
- Motor retraining ✓
- Movement facilitation
- Functional restoration ✓
- Pain Management ✓
- Manual Therapy ✓
Results

Pre to post rehabilitation change – WOMAC (Primary Outcome)

<table>
<thead>
<tr>
<th>Outcome Measure</th>
<th>Control</th>
<th>Telerehab</th>
<th>* p = 0.04</th>
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<tbody>
<tr>
<td>W Pain</td>
<td>3.00</td>
<td>4.00</td>
<td></td>
</tr>
<tr>
<td>W Stiff</td>
<td>2.50</td>
<td>3.50</td>
<td></td>
</tr>
<tr>
<td>W Funct</td>
<td>2.00</td>
<td>3.00</td>
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<tr>
<td>W Global</td>
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Treatment method
- Control
- Telerehab
Results

Pre to post rehabilitation change – Physical Measures

Outcome Measure

<table>
<thead>
<tr>
<th>Treatment method</th>
<th>Control</th>
<th>Telerehab</th>
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<tbody>
<tr>
<td>AKF = Active knee flexion</td>
<td>![Graph showing differences in AKF]</td>
<td>![Graph showing differences in Telerehab]</td>
</tr>
<tr>
<td>PKF = Passive knee flexion</td>
<td>![Graph showing differences in PKF]</td>
<td>![Graph showing differences in Telerehab]</td>
</tr>
<tr>
<td>Ext = Knee extension</td>
<td>![Graph showing differences in Ext]</td>
<td>![Graph showing differences in Telerehab]</td>
</tr>
<tr>
<td>LG = Limb girth</td>
<td>![Graph showing differences in LG]</td>
<td>![Graph showing differences in Telerehab]</td>
</tr>
<tr>
<td>Strength</td>
<td>![Graph showing differences in Strength]</td>
<td>![Graph showing differences in Telerehab]</td>
</tr>
<tr>
<td>Gait</td>
<td>![Graph showing differences in Gait]</td>
<td>![Graph showing differences in Telerehab]</td>
</tr>
</tbody>
</table>

AKF = Active knee flexion
PKF = Passive knee flexion
Ext = Knee extension
LG = Limb girth
Results

Pre to post rehabilitation change – Functional Measures

<table>
<thead>
<tr>
<th>Outcome Measure</th>
<th>Control</th>
<th>Telerehab</th>
<th>p</th>
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<tbody>
<tr>
<td>PSFS</td>
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<tr>
<td>QOL</td>
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<tr>
<td>TUG</td>
<td></td>
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<td>*p = 0.04</td>
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<tr>
<td>VAS</td>
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</table>
Results

Satisfaction with telerehabilitation method

Perceived benefit

Contentment with method

Recommend to friends

Have this treatment again

Visual clarity

Audio clarity

Response (10 cm VAS)
Discussion

Major findings of the study

• Outpatient Telerehabilitation post TKA is feasible

• Telerehabilitation produced physical and functional results that were comparable (better in some measures) with those achieved through traditional face-to-face therapy

• A high level of satisfaction was reported for the telerehabilitation intervention

• The telerehabilitation intervention was successful despite participants having a very low level of computer skills and knowledge / interest.
Drivers for success

- Use available local resources
- Operate within a safety envelope
- Use principles of self management
- Capitalize on technology to facilitate advanced exercise interventions
- Capitalize on the access advantage
- Multidisciplinary teams
- Hybrid model can be effective
Telehealth in Australia

Queensland Statewide Telehealth Services

- >1000 sites
- All hospitals and most primary health care centres

- Mental Health
- Emergency Retrieval
- Diabetes
- Ear, Nose and Throat
- Heart Failure
- Geriatrics
- Intensive Care
- Ophthalmology
- Paediatrics
- Pharmacy
- Pre-Admission
- Rehabilitation
- Renal Services
- Offender Health
- Oncology

SP Clinic

AUD Clinic

OT Clinic

PT Clinic

9,000 consultations per annum
Telerehabilitation Clinic
- PT, OT, SP, AUD
- Student Led
- Education

AUD Clinic

PT Clinic

OT Clinic
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