Innovative practices for optimizing adult physical & psychological rehabilitation
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**METHODS**
As a recipient of the Dr Dorothy Sandars Churchill Fellowship, I visited leading international military & civilian centres for adult physical rehabilitation & attended the premier international clinical gait conference to inform the design, equipment of a state-of-art clinical rehabilitation facility in Brisbane.

**ACKNOWLEDGEMENTS**
1. Prof Alberto Esquenazi, Moss Rehabilitation Philadelphia, Einstein Healthcare Network
2. Dr Christopher Dearth & Captain Michelle Nordstrom, Walter Reed National Military Medical Hospital, Bethesda
3. Renee Keesen & Dr Floris Morang from MotekforceLink.com & Dr Maarten Prins from Militair Revalidatie Centrum Aardenburg, Netherlands
4. Prof Dr Michael Schütz, Charité Mitte, Berlin
5. Group Captain Dr Alex Bennett PhD & Russ Coppack PhD, MBE Defence Medical Rehabilitation Centre, Headley Court, Surrey

Many others are acknowledged in my report.

**INNOVATIONS**

**3-DIMENSIONAL MOTION CAPTURE**
- 3-Dimensional motion analysis is the gold-standard for paediatric physical rehabilitation in Australia to inform & monitor clinical practice for walking disorders; this is not so for patients post-adolescents who continue with or acquire walking dysfunction following trauma or developing a condition.

1. For inpatients, the use of robots by therapists was prevalent to support & guide patients in early therapy allowing the patient to “walk” in a symmetrical upright posture.

2. Once upper body control was restored, patients could be progressed to antigravity treadmills which gradually allowed full-weight bearing bilaterally.

3. 3D-motion capture systems in virtual reality (VR) settings, with force plate embedded treadmills (with 6 degrees of freedom), were observed which assessed walking, and provided physical therapy at increasing levels of challenge (tilting [fore/aft & side-side] & vertical [up & down]). The VRE were chosen by the patient. This enabled immediate visual feedback for patients & real-time 3D quantitative data for therapists providing treatment.

4. With the addition of visual information from the patient & special software, the same equipment was used for the treatment of Post-Traumatic Stress Disorder incorporating the technique of EMDR - eye movement desensitization & reprocessing.

**FINDINGS**

**KEY WORDS**
- Adult physical & psychological rehabilitation
- Virtual reality environment (VRE)
- 3-dimensional motion capture
- Kinetics
- Assessment & treatment of gait
- Military
- Civilian
- Trauma

**WHY?**
Australia faces significant challenges in healthcare due to success of medical developments e.g. trauma surgery, neurology, intensive care and the growing aging population. However, this success has not been matched by innovation in physical rehabilitation.

**AIM**
To investigate the expanded & enhanced use of 3-dimensional motion capture and other technology including robots & virtual reality environments in physical & psychological rehabilitation for substantial movement dysfunction - especially in walking.

**3-DIMENSIONAL MOTION ANALYSIS**
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