Queensland cerebral palsy & rehabilitation research centre

The University Of Queensland AUSTRALIA

NEW Postgraduate Opportunities for 2017-2018

Queensland Cerebral Palsy Research and Rehabilitation Centre
NHMRC CRE: Australasian Cerebral Palsy Clinical Trials Network
At Child Health Research Centre, The University of Queensland

Website: https://qcprrc.centre.uq.edu.au
Australasian Cerebral Palsy Clinical Trials Network (AusCP-CTN)
Centre for Research Excellence (CRE)
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Our Research Team
The Queensland Cerebral Palsy and Rehabilitation Research Centre (QCPRRC) is an internationally recognised multidisciplinary research centre based at the Child Health Research Centre, next to the Lady Cilento Children's Hospital in the Faculty of Medicine at The University of Queensland. The Centre has an impressive funding track record of national and international grants with National Health and Medical Research Council funded clinical trials (12 projects, 7 Fellowships, 4 Early Career Fellowships), two program grants from Queensland Government Smart Futures Co-investment and the Merchant Charitable Foundation, and support from Foundations including the Research Foundation of the Cerebral Palsy Alliance and Cerebral Palsy International.

In 2017, a team of investigators from QCPRRC (Prof's Boyd, Colditz, Rose, Ziviani and Dr's Sakzewski, Barber, Whittingham and interstate colleagues) were awarded an **NHMRC Centre for Research Excellence to lead an Australasian Cerebral Palsy Clinical Trials Network** from 2017-2021. The Australasian CP Clinical Trials Network will uplift earlier detection of CP across Australasia, fast track children to multisite randomised clinical trials of new neuroprotectants and develop and test new rehabilitation and clinical trials. Knowledge translation studies will ensure effective transfer to enhanced clinical practice. The CRE will overcome known barriers to implementation by developing Clinical Care Pathways and International Clinical Practice Guidelines, guided by a consumer network. The changes in outcomes of children with CP due to the new clinical trials will be tested in Australian Cerebral Palsy Register (ACPR). This Australasian CP Clinical Trials Network brings together international leaders in neuroprotection, epidemiology, neuroscience, early detection, rehabilitation and e-rehabilitation with a track record of >40 randomised clinical trials of interventions and best practice implementation studies. The CRE will progress the work of the CRE Themes of (i) Preclinical trials; (ii) Early detection and Neuroscience; (iii) Clinical Trials; (iv) Knowledge Translation, Implementation and (v) Engagement and Health Policy.

The team have also been awarded an Advance QLD Innovation Partnership program (2017-2019) to set up a state-wide **QLD Early Detection and Early Intervention (QEDIN) Network** for Medical and Allied Health clinicians to screen infants to determine if they are at high risk of cerebral palsy (CP) and to fast track them to new clinical trials of early interventions including Rehabilitation Early for Congenital Hemiplegia (REACH) and Goal Directed Active motor training with Environmental Enrichment (GAME) and a Parenting program incorporating Acceptance and Commitment therapy (PACT). The $1.5M program will through use of the "Baby Moves app", state-wide training on the General Movements (GMs) and the Hammersmith Infant Neurological Examination (HINE) will develop clinical and radiological biomarkers for earlier detection of risk of CP in infants born preterm and in high risk, term-born infants.

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State of the art very early brain imaging using the two MRI compatible incubators at Lady Cilento Children's Hospital and the Royal Brisbane Women's Hospital, with clinical biomarkers will improve the early detection of CP from the current delayed detection of on-average 19 months of age. Innovative digital solutions for screening and cloud based radiological reporting will be developed with the Australian e-Health Research Centre at CSIRO, and implemented using the Queensland Health Telehealth network with the UQ Centre for Online Health. The impact on families' quality of life, costs and consequences of earlier detection and health outcomes will be monitored with the Health Economics Unit at Griffith University.

The QCPRRC team have a very strong track record of successful post graduate students achieving NHMRC funded scholarships (6), national APA scholarships (10), UQ PhD scholarships (3) and top up scholarships (Lions, Advance QLD). Our PhD students have published between 4-9 publications during their PhD and have achieved numerous international travel scholarships (to USA) and prestigious international awards (Best paper at the American and the Australian Academies of Cerebral Palsy and Developmental Medicine). Our honours students in Medicine and Physiotherapy have consistently achieved 1st class honours and 1-2 publications. Our post-doctoral fellows have achieved competitive national scholarships (5 Early Career Researcher scholarships and two Career Development awards from the NHMRC).

Our mission is to advance the health of infants, children with cerebral palsy, acquired brain Injury and related disabilities, supporting them and their families across their lifespan. We are closely linked with clinical services provided at the **Lady Cilento Children's Hospital**, providing research leadership to the Queensland Paediatric Rehabilitation Service (QPRS) and the Queensland Children's Gait Laboratory (QCGL). The QCPPRC has close collaborations with the UQ Perinatal Research Centre, UQ Children's Nutrition Research Centre, Advanced Magnetic Resonance Imaging group in CSIRO, Centre for Online Health, School of Human Movement Science, School of Health and Rehabilitation sciences, School of Psychology among other national (CP Alliance) and international collaborations (University of Pisa).

The **QCPRRC has research themes** reflecting the key areas of need for investigation in infants, children and Youth with cerebral palsy and acquired brain injury including:

1. *Neurorehabilitation* and the impact on motor, executive function and musculoskeletal outcomes.
2. *Neuroscience*: nature of the brain structure relationships and measures of neuroplasticity.
3. *Early detection of CP:* To develop early biomarkers of CP and fast track families to early interventions.
4. *Novel therapies*: including the potential of neuroprotection strategies.
5. *Longitudinal outcomes*: Growth, nutrition, physical fitness and activity and cognitive outcomes.
6. *Interventions* to enhance child and family quality of life.
7. *Translational research*: Implementation of evidence based interventions to clinical practice.

PhD, MPhil and Honours Opportunities at QCPRRC

All PhD opportunities involve supervision from a supportive team of experts in the field and the opportunity to be part of a multidisciplinary research team. Potential PhD students select topics imbedded in current clinical trials and population based cohort studies. They are closely supported by senior staff and postdoctoral fellows, and have the opportunity for practical clinical data collection, clinical experience linked to the relevant studies or a program of being embedded in clinical teams in our state-wide service from the Queensland Paediatric Rehabilitation Service or other disciplines at Child health Queensland. All postgraduate students have the opportunity be involved in our annual training course on systematic reviews and meta-analysis (8 sessions), which will assist them in developing skills for their literature search and systematic review of the literature or the psychometric properties of measures that they will use.

Available PhD Projects

Very early detection and intervention studies for infants at risk of cerebral palsy

Opportunities exist for PhD students (medical, neuroscience, physiotherapy, occupational therapy, and psychology) to be involved in studies of very early detection (PREBO- Preterm Brain Outcomes trial, NEMO-Neonatal Encephalopathy Motor Outcomes) and very early interventions for infants at high risk of CP. These projects involve the Queensland Cerebral Palsy Rehabilitation Research Centre, Perinatal research centre at UQ Centre for Clinical Research, Royal Brisbane and Women's Hospital, Mater Mothers Hospital, and Australian e-Health Research Centre, CSIRO. Research methods include use of General Movements Assessments (GMA) trained by our international partners at the University of Pisa, The Hammersmith infant neurological assessment (HINE); Advanced Brain Imaging to study the effects of early brain injury on motor and behavioural development. Novel very early neurorehabilitation models designed to optimise neuroplasticity are being developed ready for testing of efficacy in randomised controlled trials in (i) Infants with early assymetric brain injury (REACH); (ii) parenting Acceptance and commitment Therapy (PACT) and (iii) goal directed active motor training and environmental enrichment (GAME).

Student Opportunities:

1. Measurement and quantification of asymmetries of upper limb and gross motor abilities (using Wearable sensors) in the Rehabilitation EArly for Upper Limb therapy in Congenital Hemiplegia **(REACH** https://qcprrc.centre.uq.edu.au/reach) and goal directed active motor training and environmental enrichment (GAME) trial for an OT/PT PhD.
2. Very Early Detection of Cerebral Palsy using General Movements/ HINE and biomarkers of brain development in infants at risk of cerebral palsy (Current PREMO trial Prediction of Preterm Motor Outcome will be supplemented with a similar trial of early detection of Cerebral palsy in High risk Term Born infants NEMO Trial (Neonatal Encephalopathy Motor Outcomes) for a PT/OT or medical PhD.
3. EARLY Parenting Acceptance and Commitment Therapy for families of infants diagnosed early as at risk of CP (EARLY PACT, with Dr Koa Whittingham).
4. Relationship between advanced brain structure and function school age children with cerebral palsy including diffusion imaging, quantitative brain structure classification, functional Connectivity (FC) and specific motor, sensory and executive functions

Supervisory Team

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LEAP-CP Learning through everyday Activities for children with CP through Parent to PARENT Training

Dr Katherine Benfer has been awarded the QEII jubilee Fellowship to conduct an RCT in Kolkata India of a novel parent to parent training randomised trial of goal directed, active motor training with environmental enrichment for children identified to be at high risk of CP aged between 3-9 months. This study continues in India during 2017-2018 and then will be developed an RCT of LEAP-CP for indigenous children at high risk of CP in Northern Australia (based in Cairns).

Student Opportunities:

1. Measurement and quantification of asymmetries of upper limb and gross motor abilities (using Wearable sensors) in LEAP-CP for an OT/PT PhD.
2. Very Early Detection of Cerebral Palsy using General Movements/ HINE as biomarkers of early development in infants at risk of cerebral palsy in a low/middle income country (LEAP-CP India) and in a population of indigenous children in Northern Australia (LEAP-CP Australia) for a Medical, PT/OT PhD.
3. Tailoring of EARLY Parenting Acceptance and Commitment Therapy for families of infants diagnosed early as at risk of CP (EARLY PACT, with Dr Koa Whittingham) to implement in India (LEAP-CP India and LEAP-CP Australia).

Supervisory Team

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Neuroimaging projects with the Australian e-Health Research Centre (CSIRO) and UQ

One exciting area of research currently underway at the QCPRRC is the use of advanced neuroimaging technology to measure brain injury and neuroplasticity in newborn babies at high risk of abnormal neurodevelopment and in children with cerebral palsy. There is a new state-of-the-art Herston Imaging Research Facility (HIRF) located at Herston dedicated to clinical imaging research.

PhD Opportunities

1. Integrating functional MRI (fMRI) with diffusion MRI and tractography to measure brain plasticity using advanced connectivity analyses in preterm and term-born babies, infants at risk and children with cerebral palsy.
2. Develop a novel, automated brain classification program for cerebral palsy based on structural and connectivity MRI information.

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PREDICT

Implementation of comprehensive surveillance to PREDICT outcomes for children with CP

CIs: Roslyn N Boyd, Peter Davies, Jenny Ziviani, Stephen Rose; Stewart Trost, Rob Ware, Lee Barber, Koa Whittingham, Kristie Bell, Leanne Sakzewski.

Prospective population based study of school aged children with cerebral palsy

The **Predict CP study** will investigate the relationship between brain structure (at 3T), body composition, dietary intake, oropharyngeal swallowing, habitual physical activity, musculoskeletal development, and muscle performance on gross motor function, cognition, executive function, communication, participation, QOL and health resource use costs in an population based cohort of 245 children with CP at 8-9 years. Earlier preschool age (2-5 years) data from two longitudinal NHMRC cohorts will be combined to build prediction models of outcome to inform parents and health care providers (Disability Care, Australia).

The PREDICT offers a range of opportunities suitable for new graduates as well as experienced clinicians. Opportunities exist for candidates with a range of backgrounds including medicine, allied health (physiotherapy, occupational therapy, speech pathology, nutrition and dietetics and psychology), exercise science and/or health economists to undertake a PhD.

Physiotherapy PhD Opportunities: (with Prof Boyd, Dr Barber)

1. Relationship between muscle mechanics of the lower limb muscles (3DUS), functional capacity, performance, habitual physical activity, sedentary behaviour and health outcomes in a representative population of school age children with CP.
2. Impact of Interventions (BoNt-A, Orthopaedic surgery) on these relationships.
3. Relationship between physical capacity, performance on participation and identification of barriers to participation.

OT student opportunities: (with Dr Sakzewski, Prof Boyd)

1. Relationship between bilateral hand function, self-care and cognition in children with bilateral UL impairment and pilot an intervention to improve UL motor outcomes.

Speech Pathologist/Dietician PhD opportunities: (with Dr Kristie Bell, Dr Katherine Benfer)

Feeding and swallowing problems are common in children with CP, often adversely affecting growth and nutrition, and may cause children to require tube feeding to meet their nutrition and hydration needs. Little is known about the prevalence of feeding and swallowing problems in children with milder motor impairments or, at which severity level of oral-motor/swallowing dysfunction starts to affect a child's ability to meet their nutritional requirements orally.

Dietician, Human Movement Scientist, Physiotherapist (with Dr Kristie Bell, Dr Katherine Benfer)

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https://qcprrc.centre.uq.edu.au/predict-cp-0

Participate CP: Optimising participation in physically active leisure activities for children with cerebral palsy: A randomised controlled trial.
CIs: L Sakzewski, C Elliott (WA), R Boyd, J Ziviani, I Novak (NSW), S Trost (QLD), A Majnemer (Canada).
Aims: To evaluate the effects of a novel individualised, goal directed, intervention incorporating motivational interviewing for behaviour change, ParticiPAte CP versus usual care on habitual physical activity immediately post intervention. Secondary outcomes will be perceived performance of and satisfaction with individually defined physically active leisure participation goals, participation frequency and involvement, environmental supportiveness and quality of life immediately post intervention and retention at 6 months. **Design:** Randomised, wait-list controlled trial of Participate-CP in 100 children with CP (aged 8-12 yrs). **Intervention:** ParticiPAte CP is a targeted intervention underpinned by Self Determination Theory and using communication techniques of motivational interviewing. It is individualised and specifically tailored to the participation related goals and preferences of children and their family.

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HABIT-ILE: A randomised trial of Hand Arm Bimanual Intensive Training Including Lower Extremity training for children with bilateral cerebral palsy.
CIs: L Sakzewski, R Boyd, Y Bleyenheuft (Belgium), I Novak (NSW), C Elliott (WA), C Morgan (NSW), N Dowson, K Pannek.
Aims: To evaluate the effects of HABIT-ILE versus usual care on manual ability and gross motor function immediately post intervention. Secondary outcomes will be neuroplasticity changes in brain structural integrity plus functional and structural connectivity. Other secondary outcomes include walking endurance, self-care, mobility, and performance of and satisfaction with individualized goals immediately post intervention and retention at 26 weeks after the intervention. **Design:** Randomised, wait-list controlled trial of HABIT-ILE in 126 children with bilateral CP (aged 6-16 yrs; GMFCS II-IV). **Intervention:** HABIT-ILE is a motor learning approach simultaneously addressing coordination of the upper and lower limbs delivered using a “day camp” model, with 10-12 children in each group.

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CP Muscle Research: Quantifying the effect of intramuscular Botulinum toxin A therapy on calf muscle spasticity, structure and function in children with cerebral palsy

The Project: An opportunity exists for a high calibre higher degree research student to pursue a research career in paediatrics with a focus on the clinical measurement and management of lower limb spasticity in children aged 5-12 years of age with cerebral palsy. The project is a collaboration between researchers from the Queensland Cerebral Palsy and Rehabilitation Research Centre (QCPRRC) and clinicians from the Queensland Paediatric Rehabilitation Service (QPRS) and will integrate directly into the Botulinum toxin clinic, Lady Cilento Children's Hospital. The project would ideally suit a physiotherapist or exercise physiologist with experience in paediatrics and/or biomechanics.

The research will primarily focus on developing and validating a new, instrumented device to quantify muscle spasticity in a clinical setting and evaluate the efficacy of intramuscular Botulinum toxin A (BoNT-A). The project will also quantify the effects of intramuscular Botulinum toxin-A on muscle structure and

function using quantitative Portable Spasticity Assessment Device (PSAD), ultrasound, and physical function and performance using validated clinical assessments.

The Portable Spasticity Assessment Device (PSAD) is an instrumented spasticity measurement tool developed by research from The University of Copenhagen that enables objective measurement of static and dynamic causes of increased muscle stiffness in a clinical setting. Because the PSAD is used in conjunction with standard clinical assessments of range of motion it represents an innovative, efficient and clinically viable alternative to existing assessments for evaluating indications and efficacy of BoNT-A therapy. Combined with tools that objectively measure muscle morphology and quality (3DUS) and walking quality using 2D video analysis, the PSAD will provide a comprehensive clinical toolbox to evaluate the efficacy of BoNT-A therapy in children with CP.

Research Aims: In a prospective pre-post cohort study of young children with CP receiving a single intramuscular BoNT-A treatment to the calf muscle, this study aims to:

1. Evaluate the in calf muscle stiffness and spasticity using the PSAD.
2. Evaluate the responsiveness and predictive ability of the PSAD compared to the Modified Tardieu Scale and Modified Ashworth Scale.
3. Evaluate the relationship between short-medium changes in calf muscle stiffness, spasticity, size and quality, walking quality and functional ability.

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Other PhD projects in the NHMRC CRE: Australasian Cerebral Palsy Clinical Trials network

In our NHMRC CRE there will be five top up PhD stipends at $5,181.80 per annum for 3 years (total **$15,545.40)**, aimed at assisting and enticing clinician researchers to undertake a higher research degree. This will provide additional support to the researcher while the majority of funding will need to be obtained from competitive higher degree stipends. The scope of this research will be decided by the Advisory Board, the CRE management and the Research Steering Committee.

These stipends will be for new research related to the following topics areas identified as priorities in the CRE:

1. **PREMMO-PLUS**: very early intervention for infants born Preterm.
2. **NEMO:** Neonatal Motor Encephalopathy Outcomes for early identification of Cerebral Palsy in infants born at Term.
3. **Helping NEMO:** early intervention for infants born at term with CP study
4. **Knowledge Translation:** implementation of early intervention for infants with CP study
5. **VISIBLE:** Vision intervention for severely impaired babies: learning & enrichment.
6. **Translation of Research into Practice (TRIP) fellowship: Translating Research into Practice to implement functional therapy interventions for children with CP:** Two 0.5 FTE positions are funded by the University of Queensland, ($62,500 pa) to co-support a TRIP fellow (0.5FTE) for 2 years.