

Spinal pain research

Associate Professor Peter O'Sullivan is a Specialist Musculoskeletal Physiotherapist who balances his time working clinically and at Curtin University of Technology. Here, he provides an overview of research in the area of spinal pain.

Clinical practice presents a rich environment for understanding disabling spinal pain: listening to the stories of people with pain, observing their behaviours, learning to understand the mechanisms that underlie their disorder and developing innovative management strategies enabling them to manage their disorders. It represents hypothesis testing on a case series basis, where ineffective treatments can be challenged and successful treatments can be developed. Observations made in the clinic can then be investigated and hypotheses tested under stricter research conditions. The findings of research in turn challenge beliefs and with it clinical practice.

This has led, over the past 10 years, to previously held simplistic biomechanical models of spinal pain and stability being challenged—with the development of more complex multidimensional models being adopted that better represent the pain disorders that we see. Also, a realisation that rigidly adhered to treatment, exercise and management models that have failed our patients with disabling spinal pain need to be questioned. New approaches to management need to be developed from an understanding of the mechanisms that underlie spinal pain disorders. Consequently, my practice of physiotherapy has dramatically changed over recent years; it is more multidimensional in focus, employs strong cognitive dimensions, it is more targeted and equips people to recover function by confronting commonly held maladaptive pain, movement and lifestyle behaviours.

I have also been privileged to have had outstanding mentors and colleagues

as both expert clinicians and researchers along the way. People such as Bob Elvey, Lance Twomey and Leon Straker—each highly skilled in their area, clear communicators and yet humble and respectful of others—have encouraged a quest for knowledge, reasoning, team-building and excellence.

Over the past 10 years at Curtin University, I have been privileged to be part of a wonderful collaboration of skilled researchers which has led to a research group that is focused, multiskilled, respectful, good humoured and highly productive. I have been able to bring clinical insights to the group, but without the expert skills of researchers such as Professor

Leon Straker (research management and design), Dr Anne Smith (biostatistics), Associate Professor Angus Burnett and Dr Amity Campbell (biomechanics), as well as our local, national and international collaborators and a team of outstanding research students, this work could not have progressed.

Our group has five primary areas of research focus.



snapshot

1. Understanding the development of disabling spinal pain

Our work in adolescent spinal pain has allowed us to investigate spinal pain at its inception and track it towards adulthood. The Raine study cohort based at the Institute of Child Health Research in WA represents a unique longitudinal study with a series of research teams that collaborate to investigate child development, the origin of disease processes and common disorders such as non-specific spinal pain from a multidimensional perspective. This collaboration has led to a new understanding of adolescent spinal pain and its multidimensional nature.

This work truly challenges any simplistic model for understanding the development of spinal pain. For example, recent early life trajectories of mental health behaviours are highly predictive of a small subgroup of adolescents with back and neck pain and other comorbidities. This work also allows us to investigate genetic/environmental interactions associated with the development of disabling spinal pain—an exciting new development in understanding disabling spinal pain.

Dr Tim Mitchell's doctoral research in student nurses also highlights the multidimensional nature of back pain in this high-risk group with physical, lifestyle and psychosocial factors predicting increased risk for back pain across a year.

Ivan Lin's doctoral research has investigated the experience of disabling back pain in Aboriginal people. This work underpins the importance of back pain beliefs and communication skills in our role as healthcare providers in preventing the vicious cycle of pain

and disability. Too often as physiotherapists we think that it is what we do and not what we say that makes the difference for our patients. His work challenges this belief.

With Associate Professor Burnett, Dr Tan and a group of masters students, we investigated the role that culture has on back pain beliefs in health professionals. This project highlighted the influence that cultururation has on back pain beliefs, pain perception and pain behaviour (disability).

2. Classification of chronic low back pain disorders

It has been a primary focus of our research group to investigate the presence of identifiable subgroups in chronic low back pain (CLBP) populations. This work largely developed from my clinical observations of patients with non-specific (NS) CLBP, noting that different pain patterns and behaviours are associated with their disorders. Many of these disorders share similar presentations, allowing them to be subgrouped. More importantly, these patients appear to respond to highly targeted intervention approaches directed at their cognitive and behavioural impairments.

Dr Wim Dankaerts conducted a study as part of his doctoral research, demonstrating that clinicians trained in this system could reliably identify these patients. This work has been extended to investigate a broad group of NS-CLBP patients by Kjartan Fersum at Bergen University, Norway.

Wim also conducted a series of studies identifying that these subgroups were clearly different in their spinal postures, movement patterns and motor control behaviours. This

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work challenges commonly held beliefs that NS-CLBP is associated with a loss of spinal stabilising muscle function, with the finding that some NS-CLBP patients present with increased co-contraction of the spinal stabilising muscles and a key feature of their presentation was their inability to relax them. Furthermore, these patients adopt pain-provocative postures, potentially maintaining their disorder.

Roz Astfalk has conducted similar doctoral research in an adolescent NS-CLBP population, identifying that subgroups similar to those identified in adults by Wim also exist in adolescents. A novel aspect of her findings was that the subgroups could be identified based on kinematic data of spinal posture and movement—but not clearly on the basis of EMG changes. The adolescents did not present with the clear patterns of motor activity observed in adults with and without LBP, potentially highlighting the plasticity of the neuromuscular system at this critical stage of their development.

3. Classification of pelvic girdle pain disorders

There has been a resurgence of clinical focus in recent years regarding the sacroiliac (SI) joint as a source of pain, with the common belief that pain disorders relating to the pelvis represent a lack of stability of the pelvic joints. A focus of our research has been the active straight leg raise test that is positive in many chronic sacroiliac (SI) joint pain disorders. Darren Beales's innovative doctoral research investigated this in detail. His research challenges commonly held views of pelvic stability, demonstrating that pain-free subjects utilise complex unilateral trunk muscle co-contraction strategies to flex their leg, whereas people with SI joint pain co-contract their abdominal wall with the generation of IAP during the manoeuvre. These findings challenge common clinical approaches that reinforce bilateral co-contraction of the lower abdominal wall as a management approach for these disorders.

4. Low back pain in sporting populations

My collaboration with Associate Professor Angus Burnett has led to the investigation of another risk group for LBP—sporting populations. It is well known that cricket fast bowlers, rowers and cyclists all have a high prevalence of LBP and injury. A series of studies has been conducted investigating these groups.

Dr Craig Ranson's doctoral research investigated fast bowlers in cricket. In spite of identifying a high prevalence of disc and facet degeneration, bone stress reaction in the pars region, asymmetry of the spinal stabilising muscles and coupling of spinal movements beyond end of range in these bowlers, none of these factors was predictive of back injury and stress fractures, challenging commonly held beliefs regarding causes of back pain in this group.

Deb Perich's doctoral research has investigated adolescent female rowers and has identified that deficits in back and lower limb endurance are associated with LBP in rowers. Leo Ng's doctoral research furthermore has revealed that when rowers with back pain are on a rowing ergometer, they spend a greater

amount of time at the end range of lumbar spine flexion during their drive phase when compared to rowers without pain. This supports a flexion stress mechanism for LBP in this sport.

5. Management of back pain disorders

A series of trials has been conducted to investigate the management of different back pain populations. Deb Perich and Alison Thorpe have conducted trials testing the efficacy of specific exercise interventions that are directed at the back and lower limb muscles combined with training of spino-pelvic control in sitting and rowing-specific positions. The findings of their work support that these interventions have the capacity to prevent LBP in adolescent female rowers across a season, as well as reduce the pain and disability associated with LBP when present.

Kjartan Fersum is completing a RCT investigating classification-based management of NS-CLBP utilising a novel approach to management called 'cognitive functional therapy'. This approach to management has been developed over the past 10 years as a way to address both the cognitive behavioural and movement behavioural impairments associated with NS-CLBP. It is an individually targeted, classification-based intervention designed to change both maladaptive cognitive and physical behaviours.

This trial holds promise as a major step forward in the management of these disabling disorders and the results of the one-year follow-up were presented in Sydney at the MPA Conference in early October.

This is a small snapshot of some of our work at Curtin which has been greatly supported by our team of specialist physiotherapists at Bodylogic Physiotherapy.

I believe that this new knowledge highlights that as a profession, we need to be flexible and adaptive, moving beyond out-dated paradigms of 'back pain beliefs' and management practices that have clearly not delivered adequately for our patients. Developing and embracing new evidence-based innovative approaches to deal with these complex disorders will be our challenge.

Research collaborators

Post-doctoral fellows

Dr Anne Smith: School of Physiotherapy, Curtin University

Dr Amity Cambell: School of Physiotherapy, Curtin University

Dr Andrew Briggs: School of Physiotherapy, Curtin University

Western Australia

Professor Tony Wright, Dr Helen Slater: School of Physiotherapy, Curtin University

Dr Kendall: School of Nursing, Curtin University

Professor Pollock, Dr Clare Reeves: School of Psychology, Curtin University

Dr Tan: School of International Health, Curtin University

Associate Professor Burnett: School of Sports Science, Edith Cowan University

Professor Elliot: School of Human Movement, University of Western Australia

Dr Goodman: School of Medicine, University of Western Australia

Professor Palmer: WAIMR, University of Western Australia

Professor De Klerk: Telethon Institute of Child Health Research

Associate Professor Hands: School of Human Movement, Notre Dame University

Dr Mak: Combined Universities Centre for Rural Health, Bunbury

Mr Dillon: Orthopaedic Surgeon, RHP Hospital

Dr Finch: Pain Specialist, South Perth

National

Professor Buchbinder: Monash University, Victoria

International

Associate Professor Dankaerts: Health Sciences, Leuven University, Belgium

Associate Professor Skouen: Health Sciences, Bergen University, Norway

Dr Kvale: Health Sciences, Bergen University, Norway

Professor Linton: Pain Psychology, Orebro University, Sweden

Professor O'Sullivan: Health Sciences, Limerick University, Ireland

Professor Chen: Health Sciences, Fudan University, China