

GEOFFREY DAVID CHAMPION
MB, BS, MD, FRACP, FFPMANZCA
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CURRICULUM VITAE

Personal

Professional Address: St Vincent's Clinic
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Degrees and Specialist Qualifications: MB, BS 1962, University of Sydney
MD by published work 1998, University of NSW
The anti-rheumatic gold complexes, chemistry, cellular metabolism, pharmacology and therapeutics
Fellow, Royal Australasian College of Physicians 1972 (MRACP 1966)
FFPMANZCA, Fellow, Faculty Pain Medicine, Australian and New Zealand College of Anaesthetists.
Foundation Diplomate 1999

University of NSW: Conjoint Associate Professor
* St Vincent's Clinical School (retired Jan. 2008)
* School of Women's and Children's Health

Registration: Australian Department of Health
Registration, Consultant Physician 1971
NSW Medical Board Registration renewed November 2013.

Post-graduate University studies: 1970-1971: the one year course in biostatistics of the Department of Public Health, University of California at Los Angeles, California, USA

Personal grants and awards

- 1969 Commonwealth Travelling Fellowship awarded by The Australian Arthritis and Rheumatism Foundation in conjunction with a Geigy grant from the Arthritis and Rheumatism Council of Great Britain.
- 1971 Research Award, Southern Californian Rheumatism Society.
- 1971 Abbott Fellowship of the Royal Australasian College of Physicians for part-time research in the Medical Professorial Unit (Department of Immunology), St Vincent's Hospital, Sydney.
- 1972 Part-time Research Grant (for 1973), Royal Australasian College of Physicians.

1975 Part-time Research grant (Tweedle Fellowship), Royal College of physicians.

NB: Almost all personal research activities since 1975 have been self-funded except for sessional payments 2009-April 2012 from a Sydney Children's Hospital Foundation grant.

CURRENT HOSPITAL AND PROFESSIONAL APPOINTMENTS

St Vincent's Clinic, Consultant Physician in Rheumatology, Musculoskeletal Medicine and Pain Medicine, recently limited to medico-legal practice. Chairman, Department of Rheumatology (1991-1996). Retired from adult medical private practice January 2008.

Sydney Children's Hospital (formerly Prince of Wales Children's Hospital), Sydney. Honorary/Visiting Consultant Physician in Rheumatology (Paediatric) (1974-2013). , also Honorary/Visiting Physician in Pain Medicine (2008-2013).

Founder, Director, Pain Research Unit (1990-2012). Currently Honorary Associate, Pain Research Unit, Department of Anaesthesia and Pain Medicine, SCH. The Pain Research Unit from 2001 was incorporated into the Department of Anaesthesia and Pain Medicine.

Conjoint Associate Professor, UNSW School of Women's and Children's Health (2005).

Sydney Childrens' Hospital Pain Research Unit website:
www.sch.edu.au/departments/pain_research.

PREVIOUS HOSPITAL APPOINTMENTS

- 1962-64 Resident Medical Officer, The Royal North Shore Hospital of Sydney.
- 1964-67 Medical Resident, Repatriation General Hospital, Concord, NSW.
- 1967-69 Spurway Fellow in the Rheumatic Diseases, The Royal North Shore Hospital of Sydney.
- 1969-69 Clinical Superintendent, The Royal North Shore Hospital of Sydney.
- 1969-70 Research Fellow, Medical Research Council Rheumatism Unit, Canadian Red Cross Memorial Hospital, Taplow, England.
- 1970-71 Research Fellow, Division of Rheumatology, Department of Medicine, University of California at Los Angeles, USA.
- 1972-73 Clinical Fellow, Medical Professorial Unit, St Vincent's Hospital, Sydney.
- 1972-74 Honorary Rheumatologist, Ryde District Soldiers' Memorial Hospital, NSW.
- 1972-77 Visiting Physician, Repatriation General Hospital, Concord, NSW.

- 1973-2007 St Vincent's Hospital, Sydney, Honorary/Visiting Physician in Rheumatology.
Chairman, Department of Rheumatology (1973-1984). President, St Vincent's Society (1992).
Conjoint Associate Professor, UNSW St Vincent's Clinical School (2001-2008).
- 1973-2008 St Vincent's Private Hospital, Visiting Physician.
Member, Pharmaceutical Committee (1994-2008).
Member, Committee on Pain Management convened by Nursing Administration (1994).
- 1988-2008 St Luke's Hospital, Sydney. Visiting Physician (Rheumatology).
- 1990-1997 Visiting Physician (Rheumatology). The Scottish Hospital, Sydney.
- 1992-2008 The Mater Misericordiae Hospital, Sydney. Visiting Physician (Rheumatology).
- 2004-2008 Wolper Hospital Sydney. Visiting Physician (Rheumatology).

TEACHING

- Medical Undergraduate: University of NSW Part time Clinical Teacher (1974-2008). Part time Examiner (1974-1995). In recent years to the present supervision of UNSW students for BSc Med Honours and Independent Learning projects.
- Post-graduate Includes invited lectures 1971-2013 to Australian Rheumatology Association, Australian Medical Association, Australian Pain Society, Australian and New Zealand College of Anaesthetists, International Symposia on Paediatric Pain, World and Asia Pacific Rheumatology Congresses, World Pain Congresses, Teaching Hospitals, general practitioners, including General Practitioners' Conference, and physiotherapists.

MEDICAL AND SCIENTIFIC ORGANISATIONS

Membership, and offices held:

Australian Medical Association
Member

Royal Australasian College of Physicians

Member (1966), Fellow (1972)

Member, Written Examinations Committee (1973-1976)

Member, panel of reviewers, Continuing Education and Peer Review in

Internal Medicine (1985-1986)
 Representative on Code of Conduct Committee, Medicines Australia (2006-9)
 Continuing Professional Development current.

Australian Rheumatology Association (formerly Australian Rheumatism Association)
 Associate Member (1967-1970), Member (1971-)
 Chairman, NSW Branch (1978-1979)
 NSW Representative on Council (1976-1979)
 Member, Therapeutics Sub-Committee (1977-1987)

Arthritis Foundation of Australia (formerly Australian Arthritis and Rheumatism Foundation)
 Medical Director (1976-1978)
 Scientific Advisory Committee, Member (1978-1992), Medical Secretary (1978-1979)
 Representative, Medicines Australia Code of Conduct Committee (1989-2006)

Arthritis Foundation of Australia NSW (formerly Arthritis and Rheumatism Council)
 Member, Board of Directors (1974-1997)
 Member, Naomi Wing Society

Faculty of Pain Medicine, Australian and New Zealand College of Anaesthetists
 Fellow, Foundation Diplomate (1999-)

Australasian Faculty of Musculoskeletal Medicine
 Member (1999-2003)

The Garvan Institute of Medical Research
 Member, Arthritis and Inflammation Programme Advisory Committee, The Garvan Research Foundation (1999-2004)

Australasian Society of Clinical and Experimental Pharmacologists
 Member (1975-1995)

International Association for the Study of Pain (IASP)
 Member, Scientific Program Committee for World Pain Congress (1993-1996)
 Member, Special Interest Group on Pain in Rheumatic Disease (1997-2005),
 Musculoskeletal pain (2013-), genetics and Pain (2012-)
 Member, Special Interest Group on Pain in Childhood
 Councillor (1990-1994)
 Member, Scientific Program Committee, Third International Symposium on Paediatric Pain, Philadelphia (1994)
 Convenor, Chairman of Scientific Program Committee, Member Local Arrangements Committee, Sixth International Symposium on Paediatric Pain, (Sydney 2003)

American Pain Society
 Member (1998-)

The Australian Pain Society
Member (circa 1980_)

British Society for Rheumatology
Member (until 1993)
Member (Overseas) of former Heberden Society

American College of Rheumatology (formerly American Rheumatism Association)
Member (circa 1975-)

Medico-legal Society
Member (until 2010)

**CONSULTANCIES, EDITORIAL APPOINTMENTS AND OTHER AFFILIATIONS,
PAST AND CURRENT**

Medicines Australia (formerly Australian Pharmaceutical Manufacturers Association Inc.)
Member, Code of Conduct Committee (1989-2009), representing RACP

Australian Government Dept. of Health and Ageing Therapeutic Goods Administration
Medical Consultant for evaluation of marketing application of new drugs

National Association of Testing Authorities, Australia
Member, Panel of Assessors (1987-2000)

Work Cover, New South Wales
Assessor of Permanent Impairment

The New South Wales Drug Information Service (Centre)
Specialist Consultant, Rheumatology

Reviewer, several journals, principally in the field of Pain Medicine

Current Therapeutics & Associated Periodical Publications of Adis Press Australasia
Member, Honorary Editorial Board (1982-2003)

Update, The Journal of Postgraduate Medical Practice
Member, Honorary Editorial Board (1983-1990)

Paediatric Pain Letter
Editorial Board member (1996-2003)

Australasian Journal of Pain Management
Honorary Editorial Board Member (previous)

Australasian Journal of General Practice

Honorary Editorial Board Member (previous)

The Royal Australian College of General Practitioners
Family Medicine Programme (previous)
Consultant to Checkup Programme (previous)

The Sun-Herald
Medical Correspondent, co-writer “Sunday Surgery” (1988)

Searle Australia
Consultant (1994-1998)

Janssen-Cilag National Pain Advisory Board
Member (2001-2002)
Member Advisory Board (Durogesic) (2006-7)

Children’s Paracetamol Focus Group, GlaxoSmithKline
Member (2001)

Novartis Australasia
Member Pain Management Advisory Board (2011- 2013)

RESEARCH GRANT REVIEW APPOINTMENTS

National Health and Medical Research Council:
Member, Panel of Independent Assessors (1981-2012)

National Occupational Health and Safety Commission (Worksafe Australia)
Assessor, Research grants Scheme (1986-1988)

The Arthritis Society, Canada (1985-1989)

The Medical Research Council of New Zealand (1985-1989)

The Arthritis Foundation of Australia (1978-2012)

NATIONAL HEALTH AND MEDICAL RESEARCH COUNCIL GRANTS

1976-77 Graham GG, Champion GD. Salicylate metabolism and pharmacokinetics in rheumatoid arthritis. \$16,000.

1979-80 Champion GD, Graham GG. Clinical pharmacology of gold compounds. \$59,720.

1982 Champion GD, Day RO, Graham GG. Pharmacology of gold compounds. \$15,597.

1982 Champion GD, Reeve R. Concepts and measurement of pain in children. \$6,665.

- 1986-88 Zeigler J, Graham GG, Champion GD. Studies on the uptake and functional effects of gold complexes. \$85,997.
- 1990-92 Zeigler J, Graham GG, Champion GD. The activation of anti-rheumatic gold complexes by cyanide. \$89,171.
- 1997-98 Champion GD, Goodenough B, Zeigler J, Taplin JE. Pain in children: age-related effects on measures of intensity, unpleasantness and coping. \$127,950.

PRESENTATIONS AT SCIENTIFIC MEETINGS

In the past 3 years I have been author or co-author of approximately 30 presentations at national international conferences, particularly in paediatric pain medicine. A presentation at the International Pain Genetics Conference in Miami, February 2012, was awarded the best clinical presentation. The presentation to the ASM of the Faculty of Pain Medicine, ANZCA May 2013 was awarded the best free paper presentation. The papers accepted for presentation in March to June 2013 and for the ASM of the Australian Pain Society April 2014 are listed at the end of this document.

SUPERVISION OF STUDENT RESEARCH PROJECTS

See Current Research at the end of this document.

PUBLICATIONS

Publications of original research and clinical studies in refereed journals.

- 1 Champion GD, Robertson MR, Robinson RG. Rheumatoid pleurisy and pericarditis. *Ann Rheum Dis* 1968; 27:521-530.
- 2 Champion GD. Gouty tenosynovitis and the carpal tunnel syndrome. *Med J Aust* 1969; 1:1030-1032.
- 3 Webb J, Champion GD, Frecler AS, Robinson RG. Calcium pyrophosphate crystal synovitis with articular chondrocalcinosis ("pseudogout" syndrome). *Med J Aust* 1970; 1: 466-470.
- 4 Champion GD, Paulus HE, Mongan E, Okun R, Pearson CM, Sarkissian E. The effect of aspirin on serum indomethacin. *Clin Pharmacol Ther* 1972; 13:239-244.
- 5 Champion GD, Pearl MB, Webb J. Evaluation of a latex slide test ("RA Test") for synovial fluid rheumatoid factor testing. *Med J Aust* 1972; 2:1263-1265.
- 6 Anderson IA, Corrigan AB, Champion GD. Rheumatoid rib erosions. *Ann Rheum Dis* 1972; 31:16-21.
- 7 Emori HW, Champion GD, Bluestone R, Paulus HE. Simultaneous pharmacokinetics of indomethacin in serum and synovial fluid. *Ann Rheum Dis* 1973; 32:433-435.
- 8 Day RO, Paull PD, Champion GD, Graham GG. Evaluation of an enteric coated

- aspirin preparation. *Aust NZ J Med* 1976; 6:45-50.
- 9 Paull P, Day R, Graham G, Champion D. Single-dose evaluation of a new enteric coated aspirin preparation. *Med J Aust* 1976; 1:617-619.
 - 10 Champion GD, Day RO, Ray JE, Wade DN. The effect of non-steroidal anti-inflammatory drugs on adenosine triphosphate content and histamine release from rat peritoneal cell suspensions rich in mast cells. *Br J Pharmacol* 1976; 58:393-397.
 - 11 Graham GG, Champion GD. Correlation of plateau serum salicylate with rate of salicylate metabolism. *Clin Pharm Ther* 1976; 20:120-122.
 - 12 Emori HW, Paulus HE, Bluestone R, Champion GD, Pearson CM. Indomethacin serum concentrations in man. Effects of dosage, food, and antacid. *Ann Rheum Dis* 1976; 35:333-338.
 - 13 Graham GG, Champion GD, Day RO, Paull PD. Patterns of plasma concentrations and urinary excretion of salicylates in rheumatoid arthritis. *Clin Pharmacol Ther* 1977; 22:410-420.
 - 14 Graham GG, Champion GD, Day RO, Haski AL, Hills LJ, Paull PD. Salicylates in rheumatoid arthritis: pharmacokinetics and analgesic response. *Agents & Actions* 1977; suppl AASI:37-42.
 - 15 Champion GD, Day RO, Paull PD, Graham GG, Owen MS, Haski AL, Hills LJ. Clinical pharmacology and efficacy of benorylate in patients with rheumatoid arthritis. *Aust NZJ Med* 1978; 8:22-28.
 - 16 Graham GG, Champion GD, Haavisto TM, McNaught PJ. Gold binding to red blood cells. *Ann Rheum Dis* 1981; 40:210.
 - 17 Champion GD, Bieri D, Browne CD, Day RO, Graham GG, Haavisto TM, Sambrook PN, Vallance JB. Auranofin in rheumatoid arthritis. *J Rheumatol* 1982; 9(suppl 8):137-145.
 - 18 Sambrook PN, Browne CD, Champion GD, Day RO, Vallance JB, Warwick N. Terminations of treatment with gold sodium thiomalate in rheumatoid arthritis. *J Rheumatol* 1982; 9:932-934.
 - 19 Graham GG, Haavisto TM, McNaught PJ, Browne CD, Champion GD. The effect of smoking on the distribution of gold in blood. *J Rheumatol* 1982; 9:527-531.
 - 20 Lee EJD, Williams KM, Graham GG, Day RO, Champion GD. Liquid chromatographic determination and the plasma concentration profile of the optical isomers of ibuprofen in man. *J Pharm Sci* 1984; 73:1542-1544.
 - 21 McGirr EE, Browne CD, Champion GD, Day RO, Sambrook PN. Aurothioglucose in rheumatoid arthritis. Outcome of treatment in patients intolerant of sodium aurothiomalate. *Med J Aust* 1984; 141:349-351.
 - 22 Graham GG, Haavisto TM, Jones HM, Champion GD. The effect of cyanide on the uptake of gold by red blood cells. *Biochem Pharmacol* 1984; 33:1257-1262.
 - 23 Lee EJD, Williams KM, Day RO, Graham GG, Champion GD. Stereoselective disposition of ibuprofen enantiomers in man. *Br J Clin Pharmacol* 1985; 19:669-674. (218 citations. This paper has been deemed a Citation Classic by the British Journal of Pharmacology and reprinted with commentaries in a Special Issue of the Journal: Volume 58, Issue 7, December 2004, S759-767).
 - 24 Sambrook P, McGuigan L, Champion D, Edmonds J, Fleming A, Portek I. Clinical features and follow-up study of HLA B27 positive patients presenting with peripheral arthritis. *J Rheumatol* 1985; 12:526-528.
 - 25 Champion GD, Cornell J, Browne CD, Garrick R, Herbert TJ. Clinical

observations in patients with the syndrome “repetition strain injury”. *The Journal of Occupational Health and Safety, Aust & NZ* 1986; 2:107-113.

- 26 Sambrook PN, Champion GD, Browne CD, Cohen ML, Compton P, Day RO, de Jager J. Comparison of methotrexate with azathioprine or 6-mercaptopurine in refractory rheumatoid arthritis: a life-table analysis. *Br J Rheumatol* 1986; 25:372-375.
- 27 Sambrook PN, Eisman JA, Yeates MG, Pocock NA, Eberl S, Champion GD. Osteoporosis in rheumatoid arthritis: safety of low dose corticosteroids. *Ann Rheum Dis* 1986; 45:950-953.(153 citations, 2005).
- 28 Sambrook PN, Eisman JA, Yeates MG, Pocock NA, Eberl S, Champion GD. Determinants of axial bone loss in rheumatoid arthritis. *Arthritis Rheum* 1987; 30:721-728.(181 citations, 2005).
- 29 Champion GD, Saxon JA, Kossard S. The syndrome of palmar fibromatosis (fasciitis) and polyarthritis. *J Rheumatol* 1987; 14:1196-1198.
- 30 Sambrook PN, de Jager JP, Champion GD, Doust BD, McGirr EE, Kozlowski KS, Sillence DO. Synovial complications of spondylepiphyseal dysplasia of late onset. *Arthritis Rheum* 1988; 31:282-287.
- 31 Patapanian H, Graham S, Sambrook PN, Browne CD, Champion GD, Cohen ML, Day RO. The oncogenicity of chlorambucil in rheumatoid arthritis. *Br J Rheumatol* 1988; 27:44-47.
- 32 Champion GD, Cairns DR, Bieri D, Adena MA, Browne CD, Cohen ML, Day RO, Edmonds JP, Graham GG, de Jager J, Sambrook PN. Dose response studies and long term evaluation of auranofin in rheumatoid arthritis. *J Rheumatol* 1988; 15:28-34.
- 33 Ungerer JA, Horgan B, Chaitow J, Champion GD. Psychosocial functioning in children and young adults with juvenile arthritis. *Pediatrics* 1988; 81:195-202.
- 34 Day RO, Williams KM, Graham GG, Lee EJ, Knihinicki RD, Champion GD. Stereo-selective distribution of ibuprofen enantiomers in synovial fluid. *Clin Pharm Ther* 1988; 43:480-487
- 35 Sambrook PN, Eisman JA, Champion GD, Pocock NA. Sex hormone status and osteoporosis in postmenopausal women with rheumatoid arthritis. *Arthritis Rheum* 1988; 31:973-978.
- 36 Day RO, Harris G, Brown M, Graham GG, Champion GD. Interaction of salicylates and corticosteroids in man. *Br J Clin Pharmacol* 1988; 26:334-337.
- 37 Sambrook PN, Champion GD, Cohen ML, Eisman JA. Effects of low dose corticosteroids on bone mass in rheumatoid arthritis: a longitudinal study. *Ann Rheum Dis* 1989; 48:535-538.
- 38 Sambrook PN, Champion GD, Browne CD, Cairns D, Cohen ML, Day RO. Graham S, Handel M, Jaworski R, Kempler S, Wachter T. Corticosteroid injection for osteoarthritis of the knee: peripatellar compared to intra-articular route. *Clin Exp Rheumatol* 1989; 7:1-5.
- 39 Rudkowski R, Graham GG, Champion GD, Ziegler JB. The activation of gold complexes by cyanide produced by polymorphonuclear leukocytes. I The effects of aurocyanide on the oxidative burst of polymorphonuclear leukocytes. *Biochem Pharmacol* 1990; 39:1687-1695.
- 40 Bieri D, Reeve RA, Champion GD, Addicoat L, Ziegler JB. The faces pain scale for the self-assessment of the severity of pain experienced by children:

- development, initial validation and preliminary investigation for ratio scale properties. *Pain* 1990; 41:139-150. (658 citations. Also 581 citations of the derivative paper: Hicks CL, von Bayer CL, Spafford PA, von Korlaar I, Goodenough B. *The Faces Pain Scale – Revised: toward a common metric in pain measurement. Pain* 2001; 93:173-183).
- 41 Sambrook P, Champion GD. Reflex sympathetic dystrophy; characteristic changes in bone on CT scan. *J Rheumatol* 1990; 17:1425-1426.
 - 42 Rudkowski R, Graham GG, Ziegler JB, Champion GD. The effect of aurothiomalate on the oxidative burst of polymorphonuclear leukocytes varies with the quantity of drug in Myocrisin ampoules. *J Rheumatol* 1991; 18:666-671.
 - 43 Rudkowski R, Ziegler JB, Graham GG, Champion GD. Auranofin inhibits the activation pathways of polymorphonuclear leukocytes at multiple sites. *Biochem Pharmacol* 1991; 41:1921-1929.
 - 44 Cohen ML, Arroyo JF, Champion GD, Browne CD. In search of the pathogenesis of refractory cervicobrachial pain syndrome: a deconstruction of the RSI phenomenon. *Med J Aust* 1991; 156:432-436.
 - 45 Sambrook PN, Birmingham J, Champion GD, Freund J, Kelly P, Kempler S, Eisman J,. Osteoporosis in post-menopausal women with rheumatoid arthritis: effect of estrogens and androgens. *J Rheumatol* 1992; 19:357-361.
 - 46 Buchbinder R, Hall S, Sambrook PN, Champion GD, Harkness A, Lewis D, Littlejohn GO, Miller MH, Ryan PFJ. Methotrexate therapy in rheumatoid arthritis: a life table review of 587 patients treated in community practice. *Rheumatol* 1993; 20:629-644.
 - 47 Arts SE, Abu-Saad HH, Champion GD, Crawford MR, Fisher RJ, Juniper KH, Ziegler JB. Age-related response to lignocaine-prilocaine (EMLA) emulsion and effect of music distraction on the pain of intravenous cannulation. *Pediatrics* 1994; 93:797-801.
 - 48 Johnston R, Spence SH, Champion GD, Ziegler JB. Pain, affect, and cognition in children: 1. The influence of affective state on pain in children. Proceedings of the 7th World Congress on Pain. *Progress in Pain Research and Management*, Vol 2, ed. Gebhart GF, Hammond DL, Jensen TS. Seattle, IASP Press, 1994:869-875.
 - 49 Graham GG, Champion GD, Ziegler JB. The cellular metabolism and effects of gold complexes. *Third International Conference on Gold and Silver in Medicine 1994. Metal Based Drugs*. 1994; 1:395-404.
 - 50 Cohen ML, Sheather-Reid RB, Arroyo JF, Champion GD. Evidence for abnormal nociception in fibromyalgia and repetitive strain injury. *J Musculoskeletal Pain* 1995; 3:49-57.
 - 51 Spence SH, Sharpe L, Newton-John T, Champion D. Effect of EMG biofeedback compared to applied relaxation training with chronic, upper extremity cumulative trauma disorders. *Pain* 1995; 63:199-206.
 - 52 Goodenough B, Addicoat L, Champion GD, McInerney M, Young B, Juniper K, Ziegler JB. Pain in 4 to 6 year old children receiving intramuscular injections: a comparison of the Faces Pain Scale with other self-report and behavioural measures. *Clinical Journal of Pain* 1997; 13:60-73.
 - 53 Goodenough B, Kampel L, Champion GD, Nicholas MK, Laubreaux L, Ziegler JB, McInerney M. An investigation of the placebo effect and other factors in the report of pain severity during venipunctur in children. *Pain* 1997; 72:383-391.
 - 54 Goodenough B, Champion GD, Laubreaux L, Tabah L, Kampel L. Needle pain

severity in children: does the relationship between self-report and observed behaviour vary as a function of age? *Australian Journal of Psychology* 1998; 50:1-9.

- 55 Thomas T, Robinson C, Champion GD, McKell M, Pell M. Prediction and assessment of the severity of post-operative pain and of satisfaction with management. *Pain* 1998; 75:177-185.
- 56 Goodenough B, Thomas W, Champion GD, Perrott D, Taplin JE, von Baeyer CL, Ziegler JB. Unravelling age effects and sex differences in needle pain: ratings of sensory intensity and unpleasantness of venipuncture pain by children and their parents. *Pain* 1999; 80:179-190.
- 57 Goodenough B, van Dongen K, Brouwer N, Abu-Saad HH, Champion GD. A comparison of the Faces Pain Scale and the Facial Affective Scale for children's estimate of the intensity and unpleasantness of needle pain during blood sampling. *European Journal of Pain* 1999; 3:301-315.
- 58 Goodenough B, Perrott D, van Dongen K, Brouwer N, Champion GD. Children's response to vaccine fluid injection versus needle puncture pain during routine immunisation. *Ambulatory Child Health* 2000; 6:91-100.
- 59 Goodenough B, Perrott D, Champion GD, Thomas W. Painful pricks and prickle pains: is there a relationship between children's rating of venipuncture pain and parental assessments of usual reaction to other pains? *The Clinical Journal of pain* 2000; 16:135-143.
- 60 Spence SH, Sharpe L, Newton-John T, Champion D. An investigation of symptom-specific muscle hyperactivity in upper extremity cumulative trauma disorder. *The Clinical Journal of Pain* 2001; 17:119-128.
- 61 Balachandran C, McCluskey PJ, Champion GD, Halmagyi GM. Methotrexate-induced optic neuropathy. *Clinical and Experimental Ophthalmology* 2002; 30:440-441.
- 62 Perrott DA, Goodenough B, Champion GD. Children's ratings of the intensity and unpleasantness of post-operative pain using facial expression scales. *European Journal of Pain* 2004; 8:119-127.
- 63 Perrott DA, Piira T, Goodenough B, Champion GD. Efficacy and safety of acetaminophen vs ibuprofen for treating children's pain or fever: a meta-analysis. *Archives of Pediatrics and Adolescent Medicine* 2004; 158:521-526.
- 64 Piira T, Sugiura T, Champion GD, Donnelly N, Cole ASJ. The role of parental presence in the context of children's medical procedures: a systematic review. *Child: Care, Health & Development* 2005; 31:233-243.
- 65 Goodenough B, Piira T, von Baeyer CL, Chua K, Wu E, Trieu JDH, Champion GD. Comparing six self-report measures of pain intensity in children. *The Suffering Child* 2005; 8:19 June.
<http://www.usask.ca/childpain/research/6scales/6scales.pdf>
- 66 Sanghavi R, Aneman A, Parr M, M, Dunlop L, Champion D. Systemic capillary leak syndrome associated with compartment syndrome and rhabdomyolysis. *Anaesthesia and Intensive Care* 2006; 34:388-391.
- 67 Piira T, Champion GD, Bustos T, Donnelly N, Lui K. Factors associated with infant pain response following an immunization injection. *Early Human Development* 2007; 83:319-326.
- 68 Bustos T, Jaaniste T, Salmon K, Champion GD. Evaluation of a Brief Parent Intervention teaching coping-promoting behaviour for the infant immunization

- context: a randomised controlled trial. *Behav Modif.* 2008 Jul;32(4):450-67. doi: 10.1177/0145445507309031.
- 69 Englert H, Champion D, Wu JC, Giallussi J, McGrath M, Manolios N. Antitopoisomerase antibody positivity predates nailfold capillaroscopy abnormalities in scleroderma. Postulated classification of 'prescleroderma'. *Intern Med J.* 2011 Feb;41(2):197-9. doi: 10.1111/j.1445-5994.2010.02381.x.
- 70 Balendran J, Champion D, Jaaniste T, Welsh A. A common sleep disorder in pregnancy: restless legs syndrome and its predictors. *Aust N Z J Obstet Gynaecol.* 2011 Jun;51(3):262-4. doi: 10.1111/j.1479-828X.2011.01294.x. Epub 2011 Mar 16.
- 71 Pathirana S, Champion D, Jaaniste T, Yee A, Chapman C. Somatosensory test responses in children with growing pains. *J Pain Res.* 2011; 4: 393–400. Published online 2011 December 2. doi: 10.2147/JPR.S24875
- 72 Champion D, Pathirana S, Flynn C, Taylor A, Hopper JL, Berkovic SF, Jaaniste T, Qiu W. Growing pains: twin family study evidence for genetic susceptibility and a genetic relationship with restless legs syndrome. *Eur J Pain.* 2012 Oct;16(9):1224-31. doi: 10.1002/j.1532-2149.2012.00130.x. Epub 2012 Mar 13.
- 73 Coenders A, Chapman C, Jaaniste T, Qiu W, Anderson D, Glogauer M, Goodison-Farnsworth E, McCormick M, Champion D. In search of risk factors for chronic pain in adolescents: a case-control study of childhood and parental associations. *J Pain Res* 2014; Mar 27; 7: 175-183.
- 74 Wong MW, Williamson BD, Qiu W, Champion D, Teng A. Growing pains and periodic limb movements of sleep in children. *J Paed Child Health* 2014; 50 (6): 455-460.

Chapters in books

- 1 Day RO, Graham GG, Champion GD, Lee E. Clinically significant drug interactions with anti-rheumatic drugs. *Anti-Rheumatic Drugs.* W B Saunders Company Ltd (Praeger Publishers). 1982: 37-54.
- 2 Champion GD, Day RO, Graham GG. Drug interactions with non-steroidal anti-inflammatory drugs. In: Lewis AJ, Furst DE eds. *Non-steroidal Anti-inflammatory Drugs, Mechanisms and Clinical Use.* New York, Marcel Dekker Inc. 1987: 245-267.
- 3 The Arthritis Foundation (NSW). Edited and principally written by Champion GD. *The Australian Arthritis Handbook (NSW Edition).* Published by AFA (NSW) and Ciba-Geigy. 1988.
- 4 Day RO, Graham GG, Williams KM, Champion GD, de Jager J. Clinical pharmacology of non-steroidal and anti-inflammatory drugs. In: Orme MCLE ed. *Anti-rheumatic Drugs.* New York, Permagon Press Inc. 1990: 138-187.
- 5 Champion GD, Handel M. Variable disease and variable response to second line agents. In: Dixon J, Furst DE eds. *Second-line Agents in the Rheumatic Diseases.* New York. Marcel Dekker. 1991.
- 6 Champion GD. Unproven remedies, alternative and complementary medicine. In: Klippel JH, Dieppe PA eds. *Rheumatology.* St Louis, Mosby. 1994:(8)19.1-15.
- 7 Champion GD. Unproven remedies, alternative and complementary medicine. In: Klippel JH, Dieppe PA eds. *Rheumatology (Second Edition).* London, Mosby. 1997: 3.13; 1-12.

- 8 Champion GD, Goodenough B, von Baeyer CL, Thomas W. Self-report measures of pain in children. In: McGrath PJ, Finley GA eds. *Measurement of Pain in Infants and Children. Progress in Pain Research and Management*. Volume 10. IASP Press (International Association for the Study of Pain). 1998: 10;123-160
- 9 Goodenough B, von Baeyer CL, Champion GD. Facial expression and the self-report of pain in children. In: Katsikitis M (ed). *The Human Face: Measurement and Meaning*. The Netherlands, Kluwer Academic Publishers 2002 (copyright 2003): 189-214.
- 10 Crawford M, Lang T, Lao A, Champion D. Pain in Children and Adolescents. In: *Pain: The person, the Science, and the Clinical Interface*. Armati P and Chow R, eds. IP Communications Pty Ltd, Lane Cove, NSW. 2014 (in press).

Editorials and leading articles

- 1 Editorial Comments. Salicylate kinetics and dosage rationale. *Med J Aust* 1972; 2:696.
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APPENDIX

RESEARCH PROJECTS 2013

Co-supervision of UNSW medical students

Henry Vo: Measurement of self-report of pain in pre-school children. This is an international study, beginning with a systematic review accepted for publication at the International Symposium on Pediatric Pain, Stockholm June 2013, followed by an empirical study involving hospital patients in the recovery ward after surgery.

Kavita Ravendran: Independent Learning Project on the pain experience of children on return home after short-stay surgery (tonsillectomy), factors associated with adverse pain experience.

Nadiyah Jaffar: Independent Learning Project on the pain experience of children on return home after short-stay surgery (appendicectomy), factors associated with adverse pain experience.

Shi Wei Lim: Independent Learning Project on somatosensory testing in children with chronic pain.

Elisa Phipps: Independent Learning Project on the experience of siblings of children with chronic pain, a case-control study.

Presentations invited or accepted at conferences 2013 March-June:

Australian Pain Society ASM, Canberra, March 2013

- Annabel Barton¹, Cindy Chapman², David Champion^{1,2}, Avi Lemberg^{1,3}, Amy Chan¹, Tiina Jaaniste², John Hopper⁴ PAEDIATRIC RECURRENT ABDOMINAL PAIN: TWIN FAMILY CASE-CONTROL STUDY OF HERITABILITY AND ASSOCIATIONS
- Cindy Chapman¹, Rianne Kofman², David Champion^{1,3}, Tiina Jaaniste¹, Amy Chan³, Annabel Barton³, John Hopper⁴, Sam Berkovic⁴ PAEDIATRIC RESTLESS LEGS SYNDROME IS ASSOCIATED WITH MULTIPLE FUNCTIONAL PAIN SYNDROMES IN CHILDHOOD: A TWIN FAMILY CASE CONTROL STUDY.
- Amy Chan¹, Cindy Chapman^{1,2}, David Champion^{1,2}, Annabel Barton¹, Tiina Jaaniste^{1,2}, Paulo Ferreira³, Nicholas Henschke⁴, John Hopper⁵. A TWIN FAMILY CASE-CONTROL STUDY ON PAEDIATRIC NON-SPECIFIC LOW BACK PAIN: INVESTIGATING HERITABILITY AND

COMORBIDITIES.

- Nancy Jia², Tamara Lang¹, Tiina Jaaniste¹, David Anderson¹, Cindy Chapman¹, Doanna Png², David Champion^{1,2}. PARENTAL IMPACT ON CHILDREN WITH CHRONIC PAIN: HOW ARE PARENTAL BELIEFS REFLECTED BY PARENTAL BEHAVIOURS WITHIN A COGNITIVE BEHAVIOURAL FRAMEWORK?

- Faculty of Pain Medicine, Australian and New Zealand College of Anaesthetists ASM, Melbourne, May 2013
Champion D. Genetic influences and associations of common idiopathic/functional pain syndromes of childhood: evidence from twin family case-control studies.

Australian Rheumatology ASM, Perth, May 2013

- Champion D. The common pain disorders of childhood.
- Champion D, Chapman C, Jaaniste T, Chan A, Kofman R, Germs J, Hopper J. Twin family case-control study on adolescent non-specific low back pain: investigating heritability and comorbidities.

International Symposium on Pediatric Pain, Stockholm, June 2013:

- Henry Vo, Tiina Jaaniste, David Champion, Carl von Baeyer. SYSTEMATIC REVIEW OF SELF-REPORT MEASURES FOR PAIN IN PRE-SCHOOL CHILDREN.
- Champion D Chairman and presenter in Workshop on GENETICS AND ASSOCIATIONS OF PEDIATRIC NECK AND BACK PAIN.
- Rianne Kofman¹, Cindy Chapman², David Champion^{2,3}, Tiina Jaaniste², Janny Germs¹, Amy Chan³, Annabel Barton³, John Hopper⁴. ONE MONTH CURRENT PREVALENCE OF REGIONAL PAIN IN ADOLESCENTS: HERITABILITY AND RELATED COMORBIDITIES: A TWIN STUDY
- David Champion^{1,3}, Rianne Kofman², Cindy Chapman¹, Tiina Jaaniste¹, Carl L von Baeyer⁴, John Hopper⁵, Sam Berkovic⁵, Amy Chan³, Annabel Barton³. PAEDIATRIC RESTLESS PAEDIATRIC RESTLESS LEGS SYNDROME IS ASSOCIATED WITH MULTIPLE FUNCTIONAL PAIN SYNDROMES IN CHILDHOOD: A TWIN FAMILY CASE CONTROL STUDY
- Matthew Crawford¹, David Champion¹, Cindy Chapman¹, Penny Lee², Man Wai Wong², Tiina Jaaniste¹, John Hopper³, Sam Berkovic³ GROWING PAINS: GENETIC INFLUENCE AND ASSOCIATIONS INCLUDING RESTLESS LEGS SYNDROME
- David Champion¹, Cindy Chapman¹, Lannie Ligthart², Shamini Gunalan³, Tiina Jaaniste¹, Wen Qiu¹, John Hopper⁴, Sam Berkovic⁴, Ian Andrews¹ PAEDIATRIC MIGRAINE: TWIN FAMILY CASE-CONTROL STUDY OF HERITABILITY AND ASSOCIATIONS
- Annabel Barton¹, Cindy Chapman², David Champion^{1,2}, Avi Lemberg^{1,3}, Amy Chan¹, Tiina Jaaniste², John Hopper⁴ PAEDIATRIC RECURRENT ABDOMINAL PAIN: TWIN FAMILY CASE-CONTROL STUDY OF HERITABILITY AND ASSOCIATIONS

- Nancy Jia², Tamara Lang¹, Tiina Jaaniste¹, David Anderson¹, Cindy Chapman¹, Doanna Png², David Champion^{1,2} PARENTAL IMPACT ON CHILDREN WITH CHRONIC PAIN: THE SIGNIFICANCE OF PARENTAL BELIEFS AND BEHAVIOURS.

Presentations accepted for Australian Pain Society ASM April 2014

SOMATOSENSORY TESTING IN CHILDREN AND ADOLESCENTS WITH CHRONIC PAIN

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Background and Aims: Chronic somatic pain disorders in children and adolescents are infrequently associated with overt pathology, while evidence for disordered somatosensory processing and for psychosocial associations is prominent. Despite the extensive research examining somatosensory test (SST) responses in adults, much less work, particularly in clinical contexts, has been done with children. The aim of this study was to assess responses to somatic stimuli, innocuous in healthy children, derived from validated quantitative sensory testing (QST) methods and to investigate associations amongst SST measures, psychological measures (depression, anxiety, catastrophising) and pain outcomes (disability, pain intensity). The relative potential of psychological or SST measures in predicting pain outcomes was examined.

Methods: Following research ethics approval, 60 children and adolescents (5-18 years), consenting or assenting with parental consent, were recruited from the paediatric chronic pain clinic, Sydney Children's Hospital. SST involved comparing control site (CS) and pain site (PS) responses to diverse stimuli (static/dynamic touch, punctate pressure, vibration, cool, deep pressure) on the 0-10 Color Analog Scale with adapted anchors. Psychological questionnaires relating to depression and anxiety (Bath Adolescent Pain Questionnaire) as well as pain interference (Patient Reported Outcome Measurement Informative Systems Paediatric Pain Interference Scale) were administered. Regression analyses were performed to compare the relative statistical effects of SST and psychological measures on pain intensity and functioning.

Results: Responses at the PS were found to be more frequently hypersensitive than hyposensitive for all SST measures except vibration, for which the most frequent response was hyposensitive (all $p < 0.001$, dynamic touch $p = 0.002$). Vibration duration was also significantly shorter at the PS ($p < 0.001$). Persistent after-sensations at the PS were observed for dynamic stimuli, deep pressure and repetitive deep pressure although the frequency was lowest for deep pressure stimuli. There were different predictive patterns of SST and psychological factors on pain outcomes. Depression and pain catastrophising accounted for a significant amount of variance for functional disability, whereas the SSTs (deep pressure and vibration intensity) were not significant predictors. In contrast, when predicting self-reported worst pain intensity over the past day/night, variance was significantly accounted for by SST measures (predominantly deep pressure) but not psychological factors.

Conclusion: The neurobiological component or presence of altered central sensory processing is evident given the marked somatosensory abnormalities including presence of after-sensations seen in these paediatric chronic pain patients. Hence, in addition to the psychological and pathological factors, the neurobiological domain, as assessed by simple office/bedside measures acceptable to children, can be inferred to contribute significantly to the maintenance and intensity of chronic pain. These findings emphasise the clinical role of somatosensory testing, especially in the absence of pathology.

Restless legs syndrome (RLS) and its remarkable association with pain

Chair: Associate Professor David Champion, Department of Anaesthesia and Pain Medicine, Sydney Children's Hospital, NSW

Restless legs syndrome (RLS) has been emerging as a potentially important association of common pain disorders. There have been several independent studies showing strong associations with chronic widespread pain fulfilling criteria for fibromyalgia syndrome. The twin family case-control study conducted by Sydney Children's Hospital with the Australian Twin Registry has shown associations, some clearly genetic, between RLS and growing pains, migraine, recurrent abdominal pain, and low back pain. Recently Dr Stehlik et al from Sweden have conducted a large population study in adult women and have shown RLS to be associated with acute and chronic pain and that the prevalence of RLS increased with pain severity and duration and especially with greater anatomical distribution. These studies, considered collectively, are indicating a likely fundamental relationship between RLS and pain, especially but not limited to pain disorders without disease. The associations suggest potential genetic links and/or common pathogenesis such as dopaminergic mechanisms which might be amplified by iron or vitamin D deficiency.

Presenters:

Dr Arthur Teng, Department of Sleep Medicine, Sydney Children's Hospital, NSW

Miss Aneeka Bott, Department of Anaesthesia and Pain Medicine, Sydney Children's Hospital, NSW

Dr Romana Stehlik, Centre for Sleep and Vigilance Disorders, Sahlgrenska Academy, Gothenburg University, Sweden

ANXIOUS DEPRESSION: HERITABILITY AND ASSOCIATIONS WITH THE COMMON PAIN DISORDERS OF CHILDHOOD, RESTLESS LEGS SYNDROME AND IRON DEFICIENCY

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Background and Aims: Co-morbidity between chronic pain disorders and the genetically associated conditions anxiety and depression has been well established. Individuals with anxious depression (AD) have increased sensitivity to pain. There are genetic associations between AD and some individual pain disorders, such as migraine. Using a twin family case-control design, we sought to obtain further insights into the heritability of paediatric AD and evidence for association with the common pain disorders of childhood, restless legs syndrome (RLS) and iron deficiency (ID). RLS and ID have been found by this twin family study to be associated with the pain disorders.

Methods: In Phase 1, questionnaires were sent to 3,909 twin families (twins aged 3 to 18 years, parents and siblings) through the Australian Twin Registry to assess the heritability and associations of lifetime prevalence of the common pain disorders, ID and RLS. In Phase 2, twin families were mailed questionnaires regarding AD (a subscale of the ASEBA Behavioral Checklist). Casewise concordances were calculated for AD in monozygous (MZ) and dizygous (DZ) twin pairs and compared.

Descriptive statistics, χ^2 tests and odds ratios (OR) with 95% confidence intervals were used to investigate frequencies and associations. Structural equation modelling was employed to estimate genetic and environmental influences (ACE model) upon AD.

Results: There were 1,017 evaluable responses from twin families. Casewise concordance was 0.84 and 0.71 for MZ and DZ pairs respectively ($p < 0.001$). The estimated heritability of liability was 27%, common environmental influence 57%, and unique environmental influence 16%. When binary analysis was used, clinical AD was recorded for 107 twin individuals (5.3%), and the heritability estimate was (77%). Adjusting for age, AD in twin individuals was associated with RLS [OR 1.06 (1.02-1.10); $p = 0.003$], migraine [OR 1.11 (1.07-1.16); $p < 0.001$], recurrent abdominal pain (RAP) [OR 1.09 (1.06-1.13); $p < 0.001$] and chronic pain (CP) [OR 1.09 (1.04-1.14); $p < 0.001$], but not with growing pains, headache, low back pain and ID. AD in mothers was significantly associated with migraine, LBP and AD in their twin children (all $p < 0.05$), whilst AD in fathers was only associated with AD in their twin children ($p < 0.001$). There was an association between AD in the oldest sibling and AD in the twins ($p < 0.001$). Bidirectional relationship between AD and pain disorders will be tested by mediation analysis.

Conclusions: Childhood AD is associated with several of the pain disorders and RLS. Parental and sibling AD is associated with AD in twin children. AD is heritable, and might share genetic influence with these pain disorders.

PARENT-REPORTED IRON DEFICIENCY: HERITABILITY AND ASSOCIATIONS WITH COMMON PAIN DISORDERS OF CHILDHOOD

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Background and Aims: The life prevalence of self-reported iron deficiency (ID) in women approximates one third by the age of 50. Two studies have shown that iron stores are heritable. ID has a causal association with restless legs syndrome (RLS) which, in turn, we have found to be associated with the common pain disorders of childhood. ID has been reported in several animal studies to be associated with increased sensitivity to pain. Accordingly, we sought evidence using data from our twin family case-control study to determine whether ID is heritable and associated with these pain disorders.

Methods: Questionnaires were sent to 3,909 twin families (twins aged 3 to 18 years, parents and siblings) through the Australian Twin Registry to assess the heritability and association of lifetime prevalence of the pain disorders as well as ID and RLS. As ID was determined by parent-report, cases were omitted from analyses if there was doubt about doctor confirmation. Casewise concordance rates were calculated for ID in monozygous (MZ) and dizygous (DZ) twin pairs to evaluate heritability. Descriptive statistics, chi-square (X^2) tests and odds ratios (OR) with 95% confidence intervals were applied to examine frequencies and associations. Structural equation modelling was employed to investigate genetic and environmental influences (ACE

model) upon ID.

Results: There were 1,017 evaluable responses in which 87 twin families had at least one twin with a history of ID. Concordance rates were 21 of 48 for MZ twin pairs compared to eight of 39 for DZ twin pairs. Casewise concordance was 0.60 and 0.34 for MZ and DZ pairs respectively [$X^2=5.23$, $p=0.022$]. The genetic modelling estimate liability of heritability was 34%, common environmental influence 51%, and unique environmental influence 15%. Twin individuals with ID had significant age-adjusted associations with RLS [OR 4.03 (2.48-6.55); $p<0.001$], migraine [OR 2.20 (1.16-4.17); $p=0.016$], recurrent abdominal pain (RAP) [OR 2.30 (1.45-3.67); $p<0.001$], and chronic pain (CP) [OR 4.51 (2.58-7.90); $p<0.001$]. After adjustment for age, growing pains, low back pain and headache were not significantly associated with ID. ID in mothers (34.7%) was significantly associated with RLS, RAP, CP and ID in twin children. Paternal ID was infrequent, and had no significant associations with the disorders in twins.

Conclusions: The results supported the heritability of self-reported ID, which is consistent with previously reported heritability of iron stores. Childhood and maternal ID were associated not only with RLS, as expected, but also with several of the pain disorders. We have proposed an explanatory model involving iron and dopaminergic mechanisms in the central nervous system and hypothesise that ID has a causal influence on the vulnerability to these pain disorders.