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WHY PARENTAL EDUCATION IS NEEDED IN A PAEDIATRIC CHRONIC PAIN CLINIC

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BACKGROUND AND AIMS

Parental variables have been found to impact on management of children's chronic pain conditions¹⁻⁴. The purposes of this study were to 1) evaluate the characteristics of our paediatric chronic pain patients, including pain, function and psychosocial features, 2) investigate the extent to which parental variables were associated with functional disability and poor pain outcomes in the children and adolescents. A qualitative study was also conducted identifying parents' understanding of their child's condition, with a view to ensuring parent education content is comprehensive, relevant and beneficial.

METHOD

Patients aged 7-18 years, with pain for at least 2-3 months attending Sydney Children's Hospital's multidisciplinary chronic pain clinic were included in this study. Forty eligible children (mean age 13.4 years, females 72.5%) and their parents completed a set of questionnaires about pain intensity and frequency, functional disability, sleep behaviour, school absence, social and school functioning, depression, social consequences of pain, pain catastrophising and family stress. Parents were requested to evaluate their own pain catastrophising, partner-relationship and financial stress, and their responses to their child's symptoms.

Twenty-one parents were given a qualitative questionnaire. Topics included: understanding the child's pain condition; child's social and educational development; child's stress levels and emotional adjustment; overall family functioning; parent stress and emotional adjustment; and expectations regarding management.

RESULTS

There were moderate associations between parental and child variables. In particular, parental pain catastrophising was correlated with, and implied potential for negative influence on, the child's pain intensity ($r=0.36$, $P<0.05$), functional capacity ($r=0.53$, $P<0.001$), social functioning ($r=0.46$, $P<0.01$), tiredness ($r=0.42$, $P<0.01$) and pain catastrophising ($r=0.47$, $P<0.01$).

Although many parents had some understanding of chronic pain, most parents' knowledge was concerningly limited. The parent education content, influenced by these findings, specifically targeted increasing understanding and knowledge about chronic pain including their child's chronic pain, and the influence of parental beliefs, emotions and behaviours.

CONCLUSION

These data indicate that parental responses are associated with children's pain-related difficulty in coping and functioning across several domains. While an observational cross-sectional study cannot establish causal directions, it is reasonable to conclude that comprehensive, relevant and evidence-based parental education should be an essential component of the management of chronic pain disorders in children and adolescents.

REFERENCES

1. Walker, L.S., *et al.* Pain. 122, 43-52, 2006.
2. Claar, R.L., Simons, L.E., Logan, D.E. Pain, 138, 172-179, 2008.
3. Robins, P.M., Smith, S.M., Glutting, J.J., Bishop, C.T. J Pediatr Psychology, 30, 397-408, 2005.
4. Allen K. D., Shriver, M. D. Behav Ther, 29, 477-490, 1998.

ENHANCING PROCEDURAL EXPERIENCES FOR CHILDREN, PARENTS, AND STAFF AT THE SYDNEY CHILDREN'S HOSPITAL (SCH).

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BACKGROUND AND AIMS

This presentation is a summary of a hospital-wide project involving 257 Sydney Children's Hospital (SCH) clinical staff. Aims of the project were to:

- identify staff perceptions, attitudes, beliefs and values about current procedural pain and distress management
- assess staff satisfaction levels and confidence in utilising various pharmacological and non-pharmacological approaches to pain and distress management for procedures
- identify potential barriers to quality care and
- identify areas for improvement.

METHOD

All SCH staff involved with children having procedures were invited to participate in:

1. A short online/hard-copy survey – developed using Survey Monkey™
2. One of three 1-hour focus groups facilitated by two staff members.

Data were collected over a four-week period. Qualitative data were analysed using a thematic process. Qualitative data were analysed using Chi Square tests and graphically displayed.

Staff (N=257) completed the survey. A further 27 staff members attended the focus groups. Through both quantitative and qualitative methods, a 'snap shot' of current procedure management was developed, encompassing staff perspectives, attitudes and beliefs. Satisfaction with the current management of procedures in children at the SCH was also gauged.

RESULTS

Quantitative results confirmed a desire by staff for more education and training in pharmacological and non-pharmacological strategies. Forty-three percent (43.3%) of participants reported they had received no or not enough education and training in the use of pharmacological strategies. In addition, 65.3% indicated it was important or very important to receive more. Nearly half (48.7%) of

participants reported feeling concern/distress from children's responses to procedures, with a quarter (24.2%) of participants feeling this often or always. Education and training was correlated with staff perception of competence in managing children's pain and distress ($p < 0.001$) and with staff use of pharmacological strategies ($r = 0.02$, $p = 0.05$).

Priority to receive more education and training in sedation was positively correlated with staff finding performing/assisting with procedures on children stressful/distressing ($p = 0.006$).

There was a positive relationship between staff concern/distress with performing/assisting with procedures on children ($p = 0.001$), and concern/distress with children's and parents responses to procedures ($p = 0.001$).

Major themes from focus groups confirmed current practice was not optimal in procedure planning, preparation of child and family, time constraints, resources, the variability in approaches between areas.

CONCLUSION

This quality improvement project yielding strong, significant results, has initiated staff reflection in this challenging area of pain management and raised awareness of the need for improvement in accordance with international best practice. There is clear need for further education and leadership to improve procedural experiences of patients, parents and staff. These results have led to the development of strategies for hospital-wide improvements.

REFERENCES

Dowden, S., McCarthy, M. & Chalkiadis, G. Pain Research Management, 13(4), 321-326, 2008.

The Royal Australasian College of Physicians, Guideline Statement: Management of Procedure-related Pain in Children and Adolescents, 2005.

YUCK: THE INFLUENCE OF DISGUST ON THE VENIPUNCTURE EXPERIENCE IN ADOLESCENTS AND ADULTS

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BACKGROUND AND AIMS

In our previous study involving children aged 3-9 years undergoing blood collection via venipuncture or finger prick, we found evidence that self-reported disgust was a unique predictor for self-reported pain intensity, while anxiety/fear was also confirmed as significantly associated (potential predictor) with self-reported pain and observed pain-related distress. In children, we had applied a Color Analog Scale (CAS) for disgust with the upper anchor "very much yuck". "Yuck" was considered an age appropriate word for disgust. Although the CAS has been validated for children as young as five in pain contexts, we were not able to validate the derived yuck scale in children in this study. Thus, the first objective of the present study in adolescents and adults was to validate the CAS-Yuck scale. The entire study was replicated, albeit with some necessary modifications, in adolescents and adults.

METHOD

This was a cross sectional observational study in which we recruited a convenience sample of consenting adults and adolescents undergoing venipuncture. Ethics approval was obtained from the HREC of the South East Sydney Illawarra Area Health Service. Data were collected on disgust propensity (Disgust Scale-Revised, DS-R), pain-catastrophising (Pain Catastrophising Scale) and state anxiety (STAIS) of participants and of the parents of adolescents. The investigator measured participants' pain-related distress (FLACC) during the venipuncture. Following the procedure, participants reported their state anxiety, pain (CAS-Pain) and disgust levels (CAS-Yuck) in relation to the needle experience. Using SPSS, the analysis included univariate and multivariate tests of association.

RESULTS

Adults (N=50) and adolescents aged 13-18 (N=46) were relatively homogeneous, with significant between-group differences emerging only for pain-catastrophising, which was higher amongst adolescents. The results which follow are for the combined sample, except for those analyses involving the parents. Significant positive correlations were detected between CAS-Yuck and the DS-R ($r=0.38$, $p<0.01$), even when controlling for anxiety and age. Self-reported disgust, anxiety and pain-catastrophising were correlated with self-reported pain and with observable pain-related distress. In multivariate analyses, disgust uniquely predicted self-reported pain ($\beta=0.39$, $p<0.001$) but was not a significant predictor of observed distress when controlling for anxiety, pain-catastrophising and age. However, anxiety uniquely predicted self-reported pain ($\beta=0.35$, $p<0.001$) and observed distress ($\beta=0.36$, $p<0.001$). Self-reported disgust was a stronger correlate and potential predictor of pain intensity than anxiety. Parental and adolescent child state anxiety ($r=0.42$, $p<0.01$) and disgust propensity ($r=0.47$, $p<0.01$) were positively correlated.

CONCLUSION

The use of the CAS-Yuck Scale was validated in adults and adolescents. Self-reported disgust was the strongest correlate and potential predictor of self-reported pain intensity, while anxiety/fear was a significant predictor of self-reported pain and observed pain-related distress. Parental and adolescent disgust levels were correlated, providing insight into the developmental acquisition of disgust.

GROWING PAINS AND PERIODIC LIMB MOVEMENTS OF SLEEP IN CHILDREN: A RETROSPECTIVE OBSERVATIONAL STUDY

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BACKGROUND AND AIMS

Growing pains (GP) is a common functional pain syndrome of early childhood. Recent twin studies have found that GP is genetically influenced, and is associated with restless legs syndrome (RLS) in individuals and families, suggesting that it might share genetic determinants with RLS (Champion et al., 2010). Other points of similarity between GP and RLS include anatomical and temporal patterns of sensory symptoms, similarly disordered somatosensory processing, and the absence of somatic pathology. Given these commonalities, we hypothesized that GP would be associated with periodic limb movements in sleep (PLMS). A key feature of RLS is its important association with PLMS (Stefansson et al, 2007), although PLMS is not specific for RLS. RLS is uncommon and more difficult to diagnose in children than in adults, and estimates of the frequency of association with PLMS have been highly variable. The objective of this study was to investigate the association between GP and PLMS in children who have undergone polysomnography (PSG) for diverse reasons such as suspected obstructive sleep apnoea.

METHOD

Records of all 903 children who underwent PSG at the Sydney Children's Hospital, Randwick, NSW Australia between January 2009 and May 2010 were retrospectively reviewed. Only children aged between 3 and 16 years, seen by a single sleep physician and without neuro-muscular or neuro-developmental disorders were included in the analysis (n = 230). Data for age, sex, indication for PSG, parental report of GP, PLMS index (number of PLMS per hour of sleep), and other sleep parameters was retrieved. GP was diagnosed by the senior pediatric sleep medicine physician in the pre-PSG consultation, based on commonly applied criteria derived from Peterson (1986). Restlessness was also recorded pre-PSG, but diagnostic criteria for RLS had not been applied. PLMS were scored if there were four or more consecutive leg movements spaced 5s to 90s apart, each lasting 0.5s to 5s in duration and being at least 25% of the calibrated magnitude. Movements following arousals due to respiratory events were not scored. A case control study design was adopted in which PLMS and other sleep parameters in children with GP were compared to those without GP using odds ratios and logistic regression analysis.

RESULTS

GP was reported in 43 of the 230 subjects*, of which 25.6% had PLMS index >5 per hour (95% CI 12.6% to 38.6%). This was significantly higher than the percentage of subjects without GP having PLMS index >5 per hour which was 10.2% (95% CI 5.8% to 14.5%) ($p = 0.014$). The odds ratio for the association between GP and PLMS was 3.04 (95% CI – 1.32 to 6.99). A PLMS index >5 per hour was objectively measured in 30 of the 230 subjects, giving a prevalence of 13%. RLS was not likely to be a significant confounder because of its relative rarity in children. We controlled for other potential confounders in the analysis. (Is this true?)

* Man Wai, you should list or otherwise give some indication of the main reasons for the sleep studies.

CONCLUSION

These results suggest a significant relationship between GP and PLMS, in which children with GP were found to have been 3 times as likely to have a PLMS index >5 per hour of sleep than children without PLMS. The only other study in which PLMS was measured in children with GP did not find this association, however this may have been a result of a small sample size ($n = 10$) and the children also having RLS (Rajaram et al, 2004). The prevalence of PLMS in the total subjects is comparable to that found in the literature. Unfortunately, it was not possible to corroborate the prevalence of PLMS in children with RLS in this study as only 1 child had been diagnosed. Despite these limitations, and limitations generally of retrospective observational studies, the results, together with our twin data and the clinical similarities, suggest that GP may lie on the phenotypic spectrum of RLS.

GROWING PAINS AND RESTLESS LEGS SYNDROME: CASE-CONTROL STUDY OF THEIR ASSOCIATION IN PREGNANT WOMEN

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BACKGROUND AND AIMS

In concurrent studies in collaboration with the Australian Twin Registry, we have shown that growing pains (GP) is genetically influenced and might share genetic determinants with restless legs syndrome (RLS). We aimed to test the hypothesis that adults with RLS would frequently have a childhood history of GP. Women in the third trimester of pregnancy were chosen because they are known to have a relatively high prevalence of RLS. A case-control design was applied as the initial test of the hypothesis.

METHOD

Ethics approval was obtained from the HREC of the South East Sydney Illawarra Area Health Service. Women in the third trimester of singleton pregnancy were invited to participate through a public sector antenatal clinic at the Royal Hospital for Women. Questionnaires included an 11-item retrospective screen for GP based on widely accepted criteria of Peterson and one for RLS based on the diagnostic criteria of the International RLS Study Group. Additional questions were asked of all participants regarding family history, sleep disturbance, known risk factors for RLS and other potential confounders. The primary analysis was a comparison of the frequency with which cases (pregnant women with RLS) reported a childhood history of GP relative to controls (pregnant women without RLS). Other differences between cases and controls were also analysed using chi-square tests, Fisher`s exact test, odds ratios and positive predictive values (PPV).

RESULTS

Of the 234 women approached, 211 consented to participate and complete the questionnaires. Forty-seven women (22.5%) fulfilled diagnostic criteria for RLS. The remaining 164 served as the control group. There were no significant differences between cases and controls in terms of average age, Hb, the estimated fetal age and number of births. Of the 47 women with RLS, only 12 (25.5%) self-reported having RLS. A total of 17% of women with RLS met criteria for previous GP, compared with 6.7% of those without RLS ($P = 0.042$). The PPV of past GP history for RLS was 42.1%. The PPV of family history of GP for RLS

was 7.1% and that of family history of RLS was 46.7%. The odds ratio for GP as a risk factor for RLS decreased from 3.8 to 2.9 when anaemia was controlled for and thus anaemia was a confounder. A positive family history of RLS was reported in significantly more cases (15.2%) than controls (4.9%; $P = 0.025$). RLS cases had a significantly greater family history of GP (14.9%) than controls (4.9%; $P = 0.018$).

CONCLUSION

GP in childhood is probably a risk factor for adult RLS, at least in pregnant women. RLS in pregnancy is predicted also by family history of RLS and of GP. The data are consistent with our hypothesis that GP might share genetic determinants with RLS.

ASSOCIATIONS BETWEEN CHRONIC PAIN DISORDERS IN ADOLESCENTS AND HISTORY OF FUNCTIONAL PAIN SYNDROMES: A CASE-CONTROL STUDY

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BACKGROUND AND AIMS

Functional Pain Syndromes (FPS), including growing pains (GP), recurrent abdominal pain (RAP), and non-migraine headaches, are prevalent and co-morbid in early childhood, while migraine is more frequent in adolescents than in younger children. However, relationships between childhood FPS and chronic pain in adolescence have not been adequately examined.

This study was designed to test the hypothesis that a history of FPS will be found more often in adolescents suffering from chronic pain than in their pain-free peers.

METHOD

Our case-control study involved 101 adolescents aged 10 to 18 years. Cases (N=46, median age 14, 65.2% female) were adolescents who were patients of the Chronic Pain Clinic with diverse chronic pain disorders. The controls consisted of 55 adolescents (median age 16, 63.6% female) who did not have chronic pain, recruited by our Schools Liaison Officer.

Case and control participants filled out questionnaires covering demographic data and known and potential risk factors for chronic pain. The diagnoses of cases were determined by self-report and chart review. To minimise inadequate or biased recall, parents were asked to report and confirm early childhood history and risk factors in their children. Questions were included to assess various FPS, as well as restless legs syndrome (RLS). A validated questionnaire screened for a history of GP.

X²-tests and odds ratios were used to test the associations between chronic pain in adolescence and the lifetime prevalence of FPS. Cases in which the primary diagnosis was an extension of a FPS, *e.g.* migraine preceding chronic headache, were not included in the analysis. Multiple regression will be applied to control for other associations with chronic pain as confounders.

RESULTS

Migraine, headache, RAP and RLS were reported significantly more frequently in cases than controls, as tabulated. The results for GP were not significant, probably reflecting the relatively small sample size.

FPS in cases and controls

	Migraine	Headache	RAP	GP	RLS
Cases (N=46)	12 (26.1%)	14 (30.4%)	11 (23.9%)	9 (19.6%)	10 (21.7%)
Controls (N=55)	2 (3.6%)	1 (1.8%)	3 (5.5%)	3 (5.5%)	3 (5.5%)
Odds Ratio	9.35	23.63	5.45	4.22	4.82
X², P-value	8.8, <i>P</i> =0.003	14.0, <i>P</i> <0.001	5.7, <i>P</i> =0.017	3.5, <i>P</i> =0.06	4.5, <i>P</i> =0.014

Other statistically significant associations with chronic pain included anxiety, depression, fatigue, adversity, injury, low iron and low vitamin D.

CONCLUSION

When comparing controls to the sample of adolescents, the results indicate a significant association between chronic pain disorders and FPS, particularly regarding migraine, non-migraine headaches, and RAP. An association with RLS was also shown, but with this sample size GP association did not reach statistical significance.

Future research should include designs to determine the trajectory and inter-relationships between childhood FPS and testing them as independent risk factors for chronic pain in adolescents and adults.

We acknowledge with appreciation the advice of George Chalkiadis and Carl von Baeyer.

MIGRAINE, RESTLESS LEGS SYNDROME AND FUNCTIONAL PAIN SYNDROMES: A TWIN FAMILY CASE CONTROL STUDY.

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BACKGROUND AND AIMS

Of the functional pain syndromes (FPS) of childhood, growing pains (GP) and migraine are the conditions most strongly genetically influenced. Restless legs syndrome (RLS) is associated with migraine, and our recent studies have shown an association also with GP. The current study, applying a twin family case control design, aimed to explore the genetic influences in migraine and to test hypotheses that migraine is associated with RLS and with other FPS of childhood.

METHOD

A cross-sectional survey of 1800 twin families (twins aged 3 – 18 years, siblings and parents) examining associations between the common FPS of childhood (particularly focusing on GP, RLS and migraine/headache criteria) was mailed out through the Australian Twin Registry, yielding 438 evaluable responses. This study involves an analysis of the 345 control twin families (neither twin with GP) for the companion study which was a case-control study of twins with GP and their FPS associations.

Comparing families with at least one twin with migraine as cases and families with neither twin having migraine as controls, X^2 tests, odds ratios and descriptive statistics were applied to investigate prevalence rates and associations between migraine, RLS and other FPS. Concordance rates and ratios were calculated to assess heritability.

RESULTS

There were 24 twin families with at least one twin fulfilling criteria for migraine. Of the 13 monozygous (MZ) twin pairs with at least one twin having migraine, 3 were concordant (0.38 casewise concordance, 0.23 pairwise concordance). Of the 11 dizygous (DZ) twin pairs with at least one twin having migraine, 2 were concordant (0.31 casewise concordance, 0.18 pairwise concordance). The difference between MZ/DZ concordance was not significant.

There were 31 twin individuals with migraine, 5 (17.2%) who also had RLS, as opposed to 30 of the 659 (4.7%) twin individuals without migraine having RLS ($X^2=6.49$, $P=0.01$; OR=4.2, 95% CI=1.5-11.9). Significant results were also found for the association between migraine and both recurrent abdominal pain (RAP) and chronic pain including widespread pain (CP). There were 7 (23.3%) migraine cases that reported having RAP and 63 (9.6%) migraine-free controls with RAP ($X^2=4.5$, $P<0.001$; OR=5.8, 95% CI=2.2-15.3). CP was reported in 6 (20%) cases and in 27 (4.1%) controls ($X^2=16.9$, $p<0.0001$; OR=6.5, 95% CI=2.6-16.5). No significant contrasts were found when comparing the prevalence of FPS in the families of twin individuals with and without migraine.

CONCLUSION

Our results for the concordance rates of migraine in MZ and DZ twins did not add to the evidence that migraine is genetically influenced, probably influenced by the relatively small sample size. Migraine was associated with RLS, RAP and CP in twin individuals aged 3-12 years in this case-control study, consistent with current concepts of the multiple associations between FPS.

Title:

Functional pain syndromes: new concepts, heritability, paediatric focus with adult implications

Abstract:

Concepts in common concerning the disparate functional pain syndromes (FPS) and the stimulus of recent publications¹⁻³ have created a growing interest in these highly prevalent disorders. The FPS are characterised by insignificant or undetectable somatic pathology, genetic influences, shared genetic determinants with anxiety/depression, disordered somatosensory processing (including central sensitisation of nociception), and comorbid inter-relationships. A previous limitation to research in this area was the tendency to end-organ focus, *e.g.* headaches in neurology, irritable bowel syndrome in gastroenterology. There has been no comprehensive modern review of these disorders in paediatrics. The Session will include systematic review, case-control studies, and twin family studies in association with Australian and Dutch twin registries. The illustrative paediatric topics will cover especially growing pains, restless legs syndrome, and migraine along with their comorbidities (FPS and anxiety/depression). The FPS of childhood and adolescence will be shown to have substantial implications for chronic pain experiences in adults.

Targets

Paediatric and adult pain physicians, nurses, psychologists, and other health professionals

Learning objectives

1. Epidemiology and comorbid inter-relationships of the FPS in children and adolescents
2. Current concepts of the nature, heritability, and psychological associations of these syndromes
3. The application of twin family study methods and their interpretations
4. Later life implications

References

1. Diatchenko L, Nackley AG *et al.* Idiopathic pain disorders - Pathways of vulnerability. *Pain* 2006; 123(3): 226-230.
2. Mayer E, and Bushnell M. Functional pain disorders: time for a paradigm shift? *Functional Pain Syndromes: presentation and pathophysiology.* Seattle, IASP Press 2009: 531-565.
3. Apkarian AV, Robinson JP. Low back pain. *Pain Clinical Updates (IASP)* 2010; 18(6): 1-6.

Biography

G David Champion MBBS, MD, FRACP, FFPMANZCA. Director, Pain Research, Department of Anaesthesia and Pain Medicine, Sydney Children's Hospital. One hundred and twenty publications, in recent years principally in paediatric pains.

Lannie Ligthart B.Sc, M.Sc, PhD. Postdoctoral fellow at Department of Biological Psychology, VU University, Amsterdam, the Netherlands. Eleven publications in peer-reviewed journals and book chapters. PhD project title: Genetics and comorbidities of migraine in Dutch twin families.

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