

Fibromyalgia In Young People

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BUSKILA D

Pediatric Fibromyalgia Management And Outcome Of Pediatric Fibromyalgia

Fibromyalgia is an idiopathic chronic pain syndrome defined by widespread non-articular musculoskeletal pain and generalized tender points. The syndrome is associated with a constellation of symptoms, including fatigue, non-refreshing sleep, irritable bowel, and more. Central nervous system sensitization is a major pathophysiologic aspect of fibromyalgia; in addition, various external stimuli such as trauma and stress may contribute to development of the syndrome. Fibromyalgia is most common in mid-life, but may be seen at any age. This article reviews the epidemiology, clinical characteristics, etiology, management, and outcome of pediatric fibromyalgia.

Rheum Dis Clin North Am. 2009 May;35(2):253-61. doi: 10.1016/j.rdc.2009.06.001.

ERASO RM, BRADFORD NJ, FONTENOT CN, ESPINOZA LR, GEDALIA A

Fibromyalgia Syndrome In Young Children: Onset At Age 10 Years And Younger

OBJECTIVE: To report our experience of fibromyalgia syndrome (FMS) in young children with onset at age 10 years and younger as compared to older children. **METHODS:** Clinical and laboratory data were reviewed in all patients that had been diagnosed with FMS between November 1994 and March 2003. Patients with onset above the of age 18 years, and patients with FMS and concomitant rheumatic diseases were excluded from this study. The study population included two groups: group "A", young children with onset at age 10 years and under and group "B", children with onset above 10 years old. A questionnaire was used at follow-up visits or by telephone interview to evaluate the outcome.

RESULTS: There were 148 children with the diagnosis of FMS (based on ACR criteria), of these 46 children in group A and 102 children in group B. The mean age at onset and mean age at diagnosis were 7.5 years and 10 years in group A, and 13.2 years and 14.5 years in B, respectively. The mean interval between the age of onset and the age at diagnosis was 32 months in group A, and 18 months in group B ($p= 0.007$). There was a predominance of female gender and Caucasian ethnicity in both groups. Diffuse aching was reported in all patients in both groups. Stiffness, subjective joint swelling, abdominal pain and initial presentation on wheelchair were found more frequently in group A, compared with group B

($p = 0.03, 0.001, 0.01, 0.03$ respectively). The mean count of tender points at diagnosis was higher in group A, compared with group B (15.3 vs. 14.2, $p = 0.004$). The differences of other clinical features and laboratory tests in both groups were not statistically significant. Thirty-six patients in group A (78%) and 83 in group B (81%) were available for one or more follow-up visits and/or telephone interview. The mean follow-up period was 14 months in group A, and 19 months in group B (p value = 0.3). There was no difference in the type of treatment or outcome in both groups. **CONCLUSION:** FMS in young children of 10 years old and younger is frequently under-recognized. As compared with the older group, stiffness, subjective joint swelling, abdominal pain, initial presentation on wheelchair and a higher mean count of tender points at diagnosis were significantly more common in the younger age group. However, the type of medications used and outcome were similar in both groups. Prospective studies with large patient population are needed to clarify these findings.

Clin Exp Rheumatol. 2007 Jul-Aug;25(4):639-44.

KASHIKAR-ZUCK S, KING C, TING TV, ARNOLD LM

Juvenile Fibromyalgia: Different From The Adult Chronic Pain Syndrome?

While a majority of research has focused on adult fibromyalgia (FM), recent evidence has provided insights into the presence and impact of FM in children and adolescents. Commonly referred as juvenile fibromyalgia (JFM), youths, particularly adolescent girls, present with persistent widespread pain and cardinal symptoms observed in adult FM. A majority of youth with JFM continue to experience symptoms into adulthood, which highlights the importance of early recognition and intervention. Some differences are observed between adult and juvenile-onset FM syndrome with regard to comorbidities (e.g., joint hypermobility is common in JFM). Psychological comorbidities are common but less severe in JFM. Compared to adult FM, approved pharmacological treatments for JFM are lacking, but non-pharmacologic approaches (e.g., cognitive-behavioral therapy and exercise) show promise. A number of conceptual issues still remain including (1) directly comparing similarities and differences in symptoms and (2) identifying shared and unique mechanisms underlying FM in adults and youths.

Curr Rheumatol Rep. 2016 Apr;18(4):19. doi: 10.1007/s11926-016-0569-9.

KASHIKAR-ZUCK S, CUNNINGHAM N, SIL S, BROMBERG MH, LYNCH-JORDAN AM, STROTMAN D, PEUGH J, NOLL J, TING TV, POWERS SW, LOVELL DJ, ARNOLD LM

Long-Term Outcomes Of Adolescents With Juvenile-Onset Fibromyalgia In Early Adulthood

OBJECTIVE: This prospective longitudinal study examined the long-term physical and psychosocial outcomes of adolescents with juvenile-onset fibromyalgia (JFM), compared with healthy control subjects, into early adulthood. **METHODS:** Adolescent patients with JFM initially seen at a pediatric rheumatology clinic ($n = 94$) and age- and gender-matched healthy control subjects ($n = 33$) completed online measures of demographic characteristics, pain, physical functioning, mood symptoms, and health care utilization at ~6 years' follow-up (mean age: 21 years). A standard in-person tender-point examination was conducted. **RESULTS:** Patients with JFM had significantly higher pain ($P < .001$), poorer physical function ($P < .001$), greater anxiety ($P < .001$) and depressive symptoms ($P < .001$), and more medical visits ($P < .001$) than control subjects. The majority (>80%) of JFM patients continued to experience fibromyalgia symptoms into early adulthood, and 51.1% of the JFM sample met American College of Rheumatology criteria for adult fibromyalgia at follow-up. Patients with JFM were more likely than control subjects to be married and less likely to obtain a college education. **CONCLUSIONS:**

Adolescent patients with JFM have a high likelihood of continued fibromyalgia symptoms into young adulthood. Those who met criteria for fibromyalgia in adulthood exhibited the highest levels of physical and emotional impairment. Emerging differences in educational attainment and marital status were also found in the JFM group. JFM is likely to be a long-term condition for many patients, and this study for the first time describes the wide-ranging impact of JFM on a variety of physical and psychosocial outcomes that seem to diverge from their same-age peers.

Pediatrics. 2014 Mar;133(3):e592-600. doi: 10.1542/peds.2013-2220. Epub 2014 Feb 24.

KASHIKAR-ZUCK S, TING TV

Juvenile Fibromyalgia: Current Status Of Research And Future Developments

Juvenile-onset fibromyalgia (JFM) is a poorly understood chronic pain condition most commonly affecting adolescent girls. The condition is characterized by widespread musculoskeletal pain and other associated symptoms, including fatigue, nonrestorative sleep, headaches, irritable bowel symptoms, dysautonomia and mood disorders such as anxiety and/or depression. In the past few years, there has been a greater focus on understanding JFM in adolescents. Research studies have provided insight into the clinical characteristics of this condition and its effect on both short-term and long-term psychosocial and physical functioning. The importance of early and effective intervention is being recognized, as research has shown that symptoms of JFM tend to persist and do not resolve over time as was previously believed. Efforts to improve treatments for JFM are underway, and new evidence strongly points to the potential benefits of cognitive-behavioral therapy on improving mood and daily functioning. Research into pharmacotherapy and other non-pharmacological options is in progress. Advancements in the understanding of adult fibromyalgia have paved the way for future studies on diagnosis, assessment and management of JFM. This Review focuses on our current knowledge of the condition, provides an update of the latest research advances, and highlights areas for further study.

Nat Rev Rheumatol. 2014 Feb;10(2):89-96. doi: 10.1038/nrrheum.2013.177.

Epub 2013 Nov 26.

KASHIKAR-ZUCK S, SIL S, LYNCH-JORDAN AM, TING TV, et al.

Changes In Pain Coping, Catastrophizing, And Coping Efficacy After Cognitive-Behavioral Therapy In Children And Adolescents With Juvenile Fibromyalgia

A recent randomized multisite clinical trial found that cognitive-behavioral therapy (CBT) was significantly more effective than fibromyalgia education (FE) in reducing functional disability in adolescents with juvenile fibromyalgia (JFM). The primary objective of this study was to examine the psychological processes of CBT effectiveness by evaluating changes in pain coping, catastrophizing, and coping efficacy and to test these changes as mediators of continued improvements in functional disability and depressive symptoms at 6-month follow-up. One hundred adolescents (11-18 years old) with JFM completed the clinical trial. Coping, catastrophizing, and coping efficacy (Pain Coping Questionnaire) and the outcomes of functional disability (Functional Disability Inventory) and depressive symptoms (Children's Depression Inventory) were measured at baseline, posttreatment, and 6-month follow-up. Participants in both conditions showed significant improvement in coping, catastrophizing, and efficacy by the end of the study, but significantly greater improvements were found immediately following treatment for those who received CBT. Treatment gains were maintained at follow-up. Baseline to posttreatment changes in coping, catastrophizing, and efficacy were not found to

mediate improvements in functional disability or depressive symptoms from posttreatment to follow-up. Future directions for understanding mechanisms of CBT effectiveness in adolescents with chronic pain are discussed. PERSPECTIVE: CBT led to significant improvements in pain coping, catastrophizing, and efficacy that were sustained over time in adolescents with juvenile fibromyalgia. Clinicians treating adolescents with JFM should focus on teaching a variety of adaptive coping strategies to help patients simultaneously regain functioning and improve mood.

J Pain. 2013 May; 14(5):492-501. doi: 10.1016/j.pain.2012.12.019.Epub 2013 Mar 26.

KASHIKAR-ZUCK S, TING TV, ARNOLD LM, BEAN J, POWERS SW, ET AL.

Cognitive Behavioral Therapy For The Treatment Of Juvenile Fibromyalgia: A Multisite, Single-Blind, Randomized, Controlled Clinical Trial

OBJECTIVE: Juvenile fibromyalgia syndrome (FMS) is a chronic musculoskeletal pain disorder in children and adolescents for which there are no evidence-based treatments. The objective of this multisite, single-blind, randomized clinical trial was to test whether cognitive-behavioral therapy (CBT) was superior to fibromyalgia (FM) education in reducing functional disability, pain, and symptoms of depression in juvenile FMS. METHODS: Participants were 114 adolescents (ages 11-18 years) with juvenile FMS. After receiving stable medications for 8 weeks, patients were randomized to either CBT or FM education and received 8 weekly individual sessions with a therapist and 2 booster sessions. Assessments were conducted at baseline, immediately following the 8-week treatment phase, and at 6-month followup. RESULTS: The majority of patients (87.7%) completed the trial per protocol. Intent-to-treat analyses showed that patients in both groups had significant reductions in functional disability, pain, and symptoms of depression at the end of the study, and CBT was significantly superior to FM education in reducing the primary outcome of functional disability (mean baseline to end-of-treatment difference between groups 5.39 [95% confidence interval 1.57, 9.22]). Reduction in symptoms of depression was clinically significant for both groups with mean scores in the range of normal/nondepressed by the end of the study. Reduction in pain was not clinically significant for either group (<30% decrease in pain). There were no study-related adverse events. CONCLUSION: In this controlled trial, CBT was found to be a safe and effective treatment for reducing functional disability and symptoms of depression in adolescents with juvenile FMS.

Arthritis Rheum. 2012 Jan;64(1):297-305. doi: 10.1002/art.30644.

KASHIKAR-ZUCK S, LYNCH AM, SLATER S, GRAHAM TB, SWAIN NF, NOLL RB

Family Factors, Emotional Functioning, And Functional Impairment In Juvenile Fibromyalgia Syndrome

OBJECTIVE: Family factors and emotional functioning can play an important role in the ability of adolescents with juvenile primary fibromyalgia syndrome (JPFS) to cope with their condition and function in their everyday lives. The primary objectives of this study were to determine 1) whether adolescents with JPFS and their caregivers differed from healthy age-matched comparison peers and their caregivers in terms of emotional distress and functional impairment; 2) whether there were any differences in the family environment of adolescents with JPFS compared with healthy comparison peers; and 3) which individual-, caregiver-, and family-level variables were associated with functional impairment in adolescents with JPFS. METHODS: Participants were 47 adolescents with JPFS recruited from a pediatric rheumatology clinic and 46 comparison peers without chronic illness matched for age,

sex, and race. Participants and their caregivers (all mothers) completed a battery of standardized measures administered in their homes. **RESULTS:** Adolescents with JPFS had greater internalizing and externalizing symptoms than healthy comparison peers. Mothers of adolescents with JPFS reported twice as many pain conditions and significantly greater depressive symptoms than mothers of comparison peers. The JPFS group also had poorer overall family functioning and more conflicted family relationships. In adolescents with JPFS, maternal pain history was associated with significantly higher functional impairment. **CONCLUSION:** Increased distress and chronic pain are evident in families of adolescents with JPFS, and family relationships are also impacted. Implications for child functional impairment and the need for inclusion of caregivers in treatment are discussed.

Arthritis Rheum. 2008 Oct 15;59(10):1392-8. doi: 10.1002/art.24099.

KEOGH E, ECCLESTON C.

Sex Differences In Adolescent Chronic Pain And Pain-Related Coping

Sex differences exist in pain and the strategies used to cope with pain. Although it has been proposed that such differences become apparent around puberty, somewhat surprisingly very little research has specifically investigated sex as a moderator of pain within adolescents. The primary aim of the current study was to investigate sex differences in pain and coping within a group of 46 male and 115 female adolescent chronic pain sufferers. All were aged between 11 and 19 years and had been referred to the Pain Management Unit at the Royal National Hospital for Rheumatic Diseases, United Kingdom. Patients completed a battery of measures including pain experiences and a pain coping questionnaire. No sex differences were found in pain chronicity, although males and females did differ in self-reported pain experiences (females reported higher pain). Sex differences were also found in coping behaviours. Females used more social support, positive statements and internalizing/catastrophizing, whereas males reported engaging in more behavioural distraction. Of these strategies internalizing/catastrophizing was found to mediate the relationship between sex and pain. This suggests that not only do sex differences exist in the pain experiences and pain-coping strategies of adolescents with chronic pain, but that internalizing/catastrophizing may be an important mechanism in understanding such differences. More research examining potential sex differences in children and adolescents is recommended.

Pain. 2006 Aug;123(3):275-84. Epub 2006 Apr 27.

KING CD, JASTROWSKI MANO KE, BARNETT KA, PFEIFFER M, TING TV, KASHIKAR-ZUCK S.

Pressure Pain Threshold and Anxiety in Adolescent Females With and Without Juvenile Fibromyalgia: A Pilot Study

OBJECTIVES: Reduced pain thresholds have been documented in adult fibromyalgia, but there are no quantitative studies of altered pain sensitivity in adolescents with juvenile fibromyalgia (JFM). The current study examined differences in pressure pain sensitivity between adolescent females with JFM and healthy controls. The relationship between levels of anxiety and pain were also examined. **METHODS:** A total of 34 JFM (15.4±1.4 y old) and 31 controls (14.5±1.3 y old) completed self-report measures of pain and anxiety. Pressure pain threshold was assessed (palm and forehead sites) with a hand-held algometer. Participants indicated the first sensation of pain and then rated the intensity of pain on a Numerical Rating Scale. **RESULTS:** Adolescents with JFM exhibited greater sensitivity to pressure pain compared with controls. While the difference between JFM and controls was only observed at the forehead, the intensity of pain produced by the pressure algometry at both sites was significantly higher

in the JFM participants compared with controls. Correlations between clinical pain and anxiety were significant for the JFM group only. No relationships were observed between anxiety and pressure pain for either group. **DISCUSSION:** This study is a first step toward investigating mechanisms of altered pain processing in adolescents with JFM. Adolescents with JFM were found to be more sensitive to pressure pain than their healthy peers, which suggests a propensity for sensitization of peripheral and/or central nociceptive information often reported in adult fibromyalgia, and which does not appear to be affected by anxiety.

Clin J Pain. 2017 Jul;33(7):620-626. doi: 10.1097/AJP.0000000000000444.

LOGAN DE, SIMONS LE, STEIN MJ, CHASTAIN L

School Impairment In Adolescents With Chronic Pain

The purpose of this study was to assess and describe school functioning among adolescents presenting for evaluation in a tertiary care pediatric chronic pain clinic. Adolescents (n = 220, aged 12-17) and their parents participated in the study, providing self-reported data on school attendance, school performance, and perceived academic competence. Participants' schools provided official attendance records, descriptions of accommodations implemented to address the student's pain problems in the school setting, and teacher ratings of academic competence. Results show that many adolescents with chronic pain miss a significant amount of school, experience a decline in grades, and perceive pain to interfere with their school success. Various indicators of school impairment are highly intercorrelated, suggesting that impairment or success in one domain is typically associated with similar patterns in other domains of school functioning. However, as a group, adolescents with pain are viewed by themselves and their teachers as academically competent. Strong correlations emerged between different reporters of school functioning indicators such as attendance, suggesting that reliance on parent or adolescent reporting may be sufficient when assessing these domains. Findings underscore the importance of broadly assessing school functioning in adolescents with chronic pain. **PERSPECTIVE:** This study extends our understanding of school functioning among adolescents with chronic pain. It highlights the need to assess both school attendance and performance in this population as well as how schools respond to pain problems. Devising summary indicators of school impairment can be useful in both clinical and research contexts.

J Pain. 2008 May;9(5):407-16. doi: 10.1016/j.jpain.2007.12.003. Epub 2008 Feb 6.

LOGAN DE, CATANESE SP, COAKLEY RM, SCHARFF L

Chronic Pain In The Classroom: Teachers' Attributions About The Causes Of Chronic Pain

BACKGROUND: School absenteeism and other impairments in school function are significant problems among children with chronic pain syndromes; yet, little is known about how chronic pain is perceived in the school setting. The purpose of this study was to examine teachers' attributions about the causes of chronic pain in adolescent students. **METHODS:** Classroom teachers (n = 260) read vignettes describing a hypothetical student with limb pain. They were presented with a list of possible physical and psychological causes for the pain and asked to identify the causes to which they attributed the pain. Vignettes varied by the presence or absence of (1) documented medical evidence for the pain and (2) communication from the medical team. Teachers also responded to questions assessing their responses to the student in terms of support for academic accommodations and sympathy for the student. **RESULTS:** Teachers tended to endorse a dualistic (ie, either physical or psychological) model for pain

rather than a biopsychosocial model. Documented medical evidence supporting the pain was the most influential factor affecting teachers' attributions about chronic pain. Teachers who attributed the pain to physical causes, either in isolation or in combination with psychological causes, responded more positively toward the student. **CONCLUSIONS:** Many teachers lack a biopsychosocial framework through which to understand chronic pain syndromes in students. How chronic pain is described to school personnel may affect how teachers understand the pain and respond to it.

J Sch Health. 2007 May;77(5):248-56.

LYNCH-JORDAN AM, SIL S, BROMBERG M, TING TV, KASHIKAR-ZUCK S

Cross-Sectional Study Of Young Adults Diagnosed With Juvenile Fibromyalgia: Social Support And Its Impact On Functioning And Mood

PURPOSE: Juvenile-onset fibromyalgia (JFM) affects physical, social, and emotional functioning. Little is known about how social support and social interactions are impacted in the transition to young adulthood for patients diagnosed with JFM. **METHODS:** Young adults (Mage = 21.6) diagnosed with JFM during adolescence (N = 94) and matched healthy controls (N = 33) completed measures of social network size and diversity, perceived social support, physical functioning, and depressive symptoms as part of a cross-sectional survey study. **RESULTS:** No difference in social network diversity was found, although JFM patients reported fewer total people within their social networks. JFM patients reported poorer emotional and tangible support and fewer positive social interactions than healthy controls. After controlling for condition and pain intensity, the level of perceived social support was a significant predictor of physical functioning and depressive symptoms, whereas social network size also contributed uniquely to physical functioning. **CONCLUSIONS:** Given the developmental importance of social support in adolescence and young adulthood, interventions should include methods of improving social support into fibromyalgia management.

J Adolesc Health. 2015 Nov;57(5):482-7. doi: 10.1016/j.jadohealth.2015.07.015. Epub 2015 Sep 12.

NELSON S, CUNNINGHAM N, PEUGH J, JAGPAL A, ARNOLD LM, LYNCH-JORDAN A, KASHIKAR-ZUCK S

Clinical Profiles Of Young Adults With Juvenile-Onset Fibromyalgia With And Without A History Of Trauma

OBJECTIVE: To examine the differential presentation(s) of psychological and health-related outcomes in young adults with juvenile-onset fibromyalgia (FM) with and without a history of trauma, compared to healthy controls. **METHODS:** In total, 110 participants (86 with juvenile-onset FM and 24 healthy controls, with a mean age of 23.4 years) completed a structured clinical interview to assess for trauma and psychological comorbidities, as well as self-report questionnaires on pain, physical functioning, and health care utilization. **RESULTS:** Of the juvenile-onset FM participants, 37% (n = 32) reported a history of trauma. Three group comparisons (i.e., juvenile-onset FM with trauma versus juvenile-onset FM with no trauma versus healthy controls) revealed that juvenile-onset FM participants significantly differed from healthy controls on all psychological and health-related outcomes. Further, although juvenile-onset FM participants with and without a history of trauma did not significantly differ on pain and physical functioning, juvenile-onset FM participants with a history of trauma were significantly more likely to have psychological comorbidities. **CONCLUSION:** This is the first controlled study to examine the differential outcomes between juvenile-onset FM participants with and without a history of trauma. Group comparisons between juvenile-onset FM participants and healthy controls were

consistent with previous research. Further, our findings indicate that juvenile-onset FM participants with a history of trauma experience greater psychological, but not physical, impairment than juvenile-onset FM participants without a history of trauma.

Arthritis Care Res (Hoboken). 2017 Nov;69(11):1636-1643. doi: 10.1002/acr.23192. Epub 2017 Sep 21.

NUTKIEWICZ M

Diagnosis Versus Dialogue: Oral Testimony And The Study Of Pediatric Pain

Through the perspectives of the children, this essay examines the communication between pediatric pain patients and their doctors. Based upon the oral history responses of thirty-two patients with chronic pain present for evaluation at the Pediatric Pain Clinic at UCLA, oral testimony was employed to uncover a wide range of topics related to a child's experience with pain such as family dynamics, how and when pain became a life-changing factor, coping strategies, and external sources that contribute to the child's understanding of pain. Most important, children were encouraged to explain what it was like to be in pain, not only to describe symptoms but also to share their dreams and hopes, their fears and uncertainties -- as well as the place of pain in their world.

Oral Hist Rev. 2008;35(1):11-21. doi: 10.1093/ohr/ohm002.

REID K, LANDER J, SCOTT S, DICK B

What Do The Parents Of Children Who Have Chronic Pain Expect From Their First Visit To A Pediatric Chronic Pain Clinic?

BACKGROUND: Chronic pain in childhood is increasingly recognized as a significant clinical problem. Best-practice management of pediatric chronic pain in a multidisciplinary pain clinic involves a variety of treatment modalities. It is important that parents of children treated in these settings understand the different treatment options available for their children. By involving parents more effectively, care providers may more efficiently address unmet treatment needs and improve tailoring of treatment programs aimed at increasing function, reducing pain-related disability and improving quality of life. **OBJECTIVES:** To explore the expectations held by parents for their first visit to a pediatric multidisciplinary pain clinic. **METHODS:** Fourteen parents completed a paper-based survey exploring their expectations immediately before their first visit to a multidisciplinary pediatric pain clinic in a tertiary care children's hospital. **RESULTS:** Responses from parents suggest a clear desire for information about the causes of their child's pain, treatment options available at the pain clinic, effective strategies to enhance children's ability to cope with pain, and the effects of pain on both body and mood. Most parents rated the various treatment options as important for their child. All parents indicated it was very important to have the pain team 'be there' for them. **CONCLUSIONS:** These findings indicate that parents want more information about chronic pain and treatment options. Pediatric chronic pain clinics have the ability to assist children with chronic pain and their families considerably by providing information about chronic pain and the various treatment options available to them.

Pain Res Manag. 2010 May-Jun;15(3):158-62.

RUSY LM, HARVEY SA, BESTE DJ

Pediatric Fibromyalgia And Dizziness: Evaluation Of Vestibular Function

Twelve children with fibromyalgia and complaints of chronic dizziness were evaluated with both clinical office maneuvers of vestibular function and laboratory tests composed of electronystagmography and sinusoidal harmonic acceleration rotary chair testing. All test results were normal for spontaneous nystagmus with or without visual fixation, oculocephalic reflex, dynamic visual acuity, head-shaking nystagmus, Quix test, and Dix-Hallpike maneuver. Electronystagmography test results were essentially normal for saccades, gaze, Dix-Hallpike, pendular tracking, and caloric evaluation. Rotary chair testing was normal in all 12 patients. These findings suggest that central (brainstem) and peripheral vestibular (inner ear) mechanisms do not account for the complaints of dizziness in the pediatric patient with fibromyalgia. The common musculoskeletal abnormalities of fibromyalgia may affect their proprioceptive orientation, therefore giving them a sense of imbalance.

J Dev Behav Pediatr. 1999 Aug;20(4):211-5.

SIL S, THOMAS S, DICESARE C, STROTMAN D, TING TV, MYER G, KASHIKAR-ZUCK S

Preliminary Evidence Of Altered Biomechanics In Adolescents With Juvenile Fibromyalgia

OBJECTIVE: Juvenile fibromyalgia (FM) is characterized by chronic musculoskeletal pain and marked reduction in physical activity. Despite recommendations for exercise to manage juvenile FM pain, exercise adherence is poor. Because of pain and activity avoidance, adolescents with juvenile FM are at risk for altered joint mechanics that may make them susceptible to increased pain and reduced tolerance for exercise. The primary aim of this study was to assess functional deficits in patients with juvenile FM compared to healthy controls using objective biomechanical assessment. **METHODS:** Female adolescent patients with juvenile FM (n = 17) and healthy controls (n = 14) completed biomechanical assessments, including gait analysis and tests of lower extremity strength (isokinetic knee extension/flexion and hip abduction) and functional performance (drop vertical jump test) along with self-reported measures of disability (Functional Disability Inventory), pain intensity, depressive symptoms (Children's Depression Inventory), and fear of movement (Tampa Scale of Kinesiophobia). **RESULTS:** Patients with juvenile FM demonstrated mild deficiencies in walking gait and functional performance (P < 0.05 for both) and significantly lower left knee extension and flexion strength (18-22% deficit) and bilateral hip abduction strength (34-38%) compared with healthy controls (P < 0.008 for all). Patients with juvenile FM reported significantly higher functional disability, pain intensity, depressive symptoms, and fear of movement relative to controls (P < 0.01 for all). **CONCLUSION:** This study showed that adolescents with juvenile FM exhibited objective alterations in biomechanics and self-reported fear of movement that may have reinforced their activity avoidance. Interventions for juvenile FM should include a focus on correcting functional deficits and instilling greater confidence in adolescents with juvenile FM to engage in exercise to improve functional outcomes.

Arthritis Care Res (Hoboken). 2015 Jan;67(1):102-11. doi: 10.1002/acr.22450.

SIL S, LYNCH-JORDAN A, TING TV, PEUGH J, NOLL J, KASHIKAR-ZUCK S

Influence Of Family Environment On Long-Term Psychosocial Functioning Of Adolescents With Juvenile Fibromyalgia

OBJECTIVE: Little is known about the impact of family environment on the long-term adjustment of patients with juvenile-onset fibromyalgia (JFM). Our objective was to evaluate whether family environment in early adolescence predicted later physical functioning and depressive symptoms of adolescents with JFM as they transitioned to early adulthood in the context of a controlled long-term followup study. **METHODS:** Participants consisted of 39 youth (mean age 18.7 years) with JFM and 38 healthy matched controls who completed web-based surveys about their health status (Short Form 36 health survey) and depressive symptoms (Beck Depression Inventory II) ~4 years after a home-based, in-person assessment of child and family functioning. During the initial assessment, parents of the participants (94% mothers) completed the Family Environment Scale and adolescents (mean age 14.8 years) completed self-report questionnaires about pain (visual analog scale) and depressive symptoms (Children's Depression Inventory). **RESULTS:** The results indicated that family environment during early adolescence significantly predicted greater depressive symptoms in early adulthood for both the JFM group and the healthy controls. In particular, a controlling family environment (use of rules to control the family and allowing little independence) during early adolescence was the driving factor in predicting poorer long-term emotional functioning for patients with JFM. Family environment did not significantly predict longer-term physical impairment for either group. **CONCLUSION:** Adolescents with JFM from controlling family environments are at an increased risk for poorer emotional functioning in early adulthood. Behavioral and family interventions should foster independent coping among adolescents with JFM and greater parenting flexibility to enhance successful long-term coping. *Arthritis Care Res (Hoboken)*. 2013 Jun;65(6):903-9. doi: 10.1002/acr.21921.

SIL S, KASHIKAR-ZUCK S

Understanding Why Cognitive-Behavioral Therapy Is An Effective Treatment For Adolescents With Juvenile Fibromyalgia

Recent studies have demonstrated that cognitive-behavioral therapy (CBT) is an effective treatment for children and adolescents with juvenile fibromyalgia. Unfortunately, the specific psychological changes that occur during treatment that explain why CBT works are not well understood. Historically, the increased use of specific coping strategies learned during CBT was thought to be the primary reason for why CBT was effective. However, evidence to support the notion that increases in adaptive coping directly lead to patient improvement is minimal. Instead, a growing number of studies in adults suggest that CBT results in more global changes of psychological perceptions of the pain itself (cognitive appraisals) and one's ability to manage the pain. This report discusses the role of coping and aspects of cognitive appraisal as potential psychological changes that explain CBT-related improvements for youths with juvenile fibromyalgia.

Int J Clin Rheumtol. 2013 Apr 1;8(2). doi: 10.2217/IJR.13.3.

SIMONS LE, LOGAN DE, CHASTAIN L, STEIN M

The Relation Of Social Functioning To School Impairment Among Adolescents With Chronic Pain

OBJECTIVES: To further our understanding of social functioning in children with chronic pain, and particularly how social functioning relates to school impairment in this population. **METHODS:** This study involved 126 adolescents (12 to 17 y) evaluated at a multidisciplinary pain clinic. Adolescents completed measures assessing social functioning, pain, physical limitations, somatic symptoms, and school impairment. **RESULTS:** Lower social functioning scores were significantly associated with pain, physical limitations, somatic symptoms, and school impairment. Social functioning mediated the relations between adolescents' pain experience (ie, pain, physical symptoms, physical limitations) and school impairment. **DISCUSSIONS:** These findings highlight the importance of assessing and addressing social functioning in youth with chronic pain. Future research targeting school impairment should include evaluating the potential role that peer difficulties may play.

Clin J Pain. 2010 Jan;26(1):16-22. doi: 10.1097/AJP.0b013e3181b511c2.

TAYAG-KIER CE, KEENAN GF, SCALZI LV, SCHULTZ B, ELLIOTT J, ZHAO RH, ARENS R

Sleep And Periodic Limb Movement In Sleep In Juvenile Fibromyalgia

OBJECTIVES: Fibromyalgia has been recently recognized in children and adolescents as juvenile fibromyalgia (JF). In adult fibromyalgia, subjective complaints of nonrestorative sleep and fatigue are supported by altered polysomnographic findings including a primary sleep disorder known as periodic limb movements in sleep (PLMS) in some subjects. Although poor sleep is a diagnostic criterion for JF, few reports in the literature have evaluated specific sleep disturbances. Our objectives were to evaluate in a controlled study the polysomnographic findings of children and adolescents with JF for alterations in sleep architecture as well as possible PLMS not previously noted in this age group. **METHODS:** Sixteen consecutive children and adolescents (15.0 +/- 2.6 years of age) diagnosed with JF underwent overnight polysomnography. Polysomnography was also performed on 14 controls (14.0 +/- 2.2 years of age) with no history of an underlying medical condition that could impact on sleep architecture. Respiratory variables, sleep stages, and limb movements were measured during sleep in all subjects. **RESULTS:** JF subjects differed significantly from controls in sleep architecture. JF subjects presented with prolonged sleep latency, shortened total sleep time, decreased sleep efficiency, and increased wakefulness during sleep. In addition, JF subjects exhibited excessive movement activity during sleep. Six of the JF subjects (38%) were noted to have an abnormally elevated PLMS index (>5/hour), indicating PLMS in these subjects. **CONCLUSION:** Our study demonstrated abnormalities in sleep architecture in children with JF. We also noted PLMS in a significant number of subjects. This has not been reported previously in children with this disorder. We recommend that children who are evaluated for JF undergo polysomnography including PLMS assessment. juvenile fibromyalgia; periodic limb movement in sleep; restless legs syndrome.

Pediatrics. 2000 Nov;106(5):E70.

TESHER MS

Juvenile Fibromyalgia: A Multidisciplinary Approach To Treatment

A 14-year-old boy presented with months of severe widespread musculoskeletal pain. He was profoundly fatigued and unable to attend school. Laboratory evaluation, including complete blood count, comprehensive metabolic panel, inflammatory markers, and thyroid function, was unrevealing. Physical examination was also normal except for multiple tender points. The patient was diagnosed with juvenile primary fibromyalgia syndrome and referred for multidisciplinary treatment including physical therapy, exercise, and counseling, and his daily functioning gradually improves. Juvenile fibromyalgia is a complex syndrome that often severely limits patients' activities and can impede normal adolescent development. Effective treatment requires an understanding of the biologic, psychologic, and social factors contributing to the perpetuation of chronic pain. The author reviews the diagnostic criteria, pathophysiology, and treatment of juvenile fibromyalgia. Medications, particularly antidepressants and anticonvulsants, can be useful adjuncts to therapy. However, multimodal pain management including intensive physical therapy, exercise, counseling, and sleep hygiene is most effective in treating fibromyalgia.

Pediatr Ann. 2015 Jun;44(6):e136-41. doi: 10.3928/00904481-20150611-08.

TING TV, HASHKES PJ, SCHIKLER K, DESAI AM, SPALDING S, KASHIKAR-ZUCK S

The Role Of Benign Joint Hypermobility In The Pain Experience In Juvenile Fibromyalgia: An Observational Study

BACKGROUND: Juvenile Fibromyalgia (JFM) is characterized by chronic widespread musculoskeletal pain and approximately 40% of children and adolescents with JFM also suffer from benign joint hypermobility (HM). It is not currently known if the presence of HM affects the pain experience of adolescents with JFM. The objective of this study was to examine whether there were any differences in self-reported pain intensity and physiologic pain sensitivity between JFM patients with and without joint HM. **METHODS:** One hundred thirty-one adolescent patients with JFM recruited from four pediatric rheumatology clinics completed a daily visual analogue scale (VAS) pain rating for one week and underwent a standardized 18-count tender point (TP) dolorimeter assessment. Medical records were reviewed for the presence of joint HM. Average pain VAS ratings, tender point count and tender point sensitivity were compared between JFM patients with and without hypermobility (HM+ and HM-). **RESULTS:** Nearly half (48%) the sample of JFM patients were found to be HM+. HM+ and HM- patients did not differ in their self-reported pain intensity. However, HM+ patients had significantly greater pain sensitivity, with lower TP thresholds ($p = 0.002$) and a greater number of painful TPs ($p = 0.003$) compared to HM- patients. **CONCLUSION:** The presence of HM among adolescent patients with JFM appears to be associated with enhanced physiologic pain sensitivity, but not self-report of clinical pain. Further examination of the mechanisms for increased pain sensitivity associated with HM, especially in adolescents with widespread pain conditions such as JFM is warranted.

Pediatr Rheumatol Online J. 2012 Jun 15;10(1):16. doi: 10.1186/1546-0096-10-16.

TRAN ST, THOMAS S, DICESARE C, PFEIFFER M, SIL S, TING TV, WILLIAMS SE, MYER GD, KASHIKAR-ZUCK S

A Pilot Study Of Biomechanical Assessment Before And After An Integrative Training Program For Adolescents With Juvenile Fibromyalgia

BACKGROUND: Adolescents with juvenile fibromyalgia (JFM) tend to be very sedentary and avoid participation in physical activity. A prior study suggested that JFM patients show altered biomechanics compared to healthy adolescents which may make them more prone to pain/injury during exercise. A new intervention combining well established cognitive behavioral therapy (CBT) techniques with specialized neuromuscular exercise -Fibromyalgia Integrative Training for Teens (FIT Teens) was developed and shown to be promising in improving functioning in adolescents with JFM. In contrast to traditional exercise programs such as aerobic or resistance training, neuromuscular training is a tailored approach which targets gait, posture, balance and movement mechanics which form the foundation for safe exercise participation with reduced risk for injury or pain (and hence more tolerable by JFM patients). The aim of this pilot feasibility study was to establish whether objective biomechanical assessment including sophisticated 3-D motion analysis would be useful in measuring improvements in strength, balance, gait, and functional performance after participation in the 8-week FIT Teens program. **METHODS:** Eleven female participants with JFM (ages 12-18 years) completed pre- and post-treatment assessments of biomechanics, including walking gait analysis, lower extremity strength assessment, functional performance, and dynamic postural stability. **RESULTS:** Descriptive data indicated that mechanics of walking gait and functional performance appeared to improve after treatment. Hip abduction strength and dynamic postural control also demonstrated improvements bilaterally. **CONCLUSIONS:** Overall, the results of this pilot study offer initial evidence for the utility of biomechanical assessment to objectively demonstrate observable changes in biomechanical performance after an integrated training intervention for youth with JFM. If replicated in larger controlled studies, findings would suggest that through the FIT Teens intervention, adolescents with JFM can progress towards normalized strength and biomechanics, which may enhance their ability to engage in physical exercise.

Pediatr Rheumatol Online J. 2016 Jul 22;14(1):43. doi: 10.1186/s12969-016-0103-7.

TSAO JC, MELDRUM M, KIM SC, JACOB MC, ZELTZER LK

Treatment Preferences For CAM In Children With Chronic Pain

CAM therapies have become increasingly popular in pediatric populations. Yet, little is known about children's preferences for CAM. This study examined treatment preferences in chronic pediatric pain patients offered a choice of CAM therapies for their pain. Participants were 129 children (94 girls) (mean age = 14.5 years +/- 2.4; range = 8-18 years) presenting at a multidisciplinary, tertiary clinic specializing in pediatric chronic pain. Bivariate and multivariate analyses were used to examine the relationships between CAM treatment preferences and patient's sociodemographic and clinical characteristics, as well as their self-reported level of functioning. Over 60% of patients elected to try at least one CAM approach for pain. The most popular CAM therapies were biofeedback, yoga and hypnosis; the least popular were art therapy and energy healing, with craniosacral, acupuncture and massage being intermediate. Patients with a diagnosis of fibromyalgia (80%) were the most likely to try

CAM versus those with other pain diagnoses. In multivariate analyses, pain duration emerged as a significant predictor of CAM preferences. For mind-based approaches (i.e. hypnosis, biofeedback and art therapy), pain duration and limitations in family activities were both significant predictors. When given a choice of CAM therapies, this sample of children with chronic pain, irrespective of pain diagnosis, preferred non-invasive approaches that enhanced relaxation and increased somatic control. Longer duration of pain and greater impairment in functioning, particularly during family activities increased the likelihood that such patients agreed to engage in CAM treatments, especially those that were categorized as mind-based modalities.

Evid Based Complement Alternat Med. 2007 Sep;4(3):367-74.

VERKAMP EK, FLOWERS SR, LYNCH-JORDAN AM, TAYLOR J, TING TV, KASHIKAR-ZUCK S
A Survey Of Conventional And Complementary Therapies Used By Youth With Juvenile-Onset Fibromyalgia

Little is known regarding treatment choices of youth diagnosed with juvenile-onset fibromyalgia (JFM) as they move into young adulthood. Additionally, there is little empirical evidence to guide youth with FM into appropriate treatment options, leading to a variety of therapies used to manage FM symptoms. The purpose of this descriptive study was to examine all therapies used by individuals with JFM as they entered young adulthood and the perceived effectiveness of these treatments. As part of a larger follow-up study, participants completed a web-based survey of all current and past treatments received for FM symptoms 2 years after their initial presentation and diagnosis at a pediatric rheumatology clinic. One hundred ten out of 118 eligible patients participated in the follow-up assessment as young adults (mean age 18.97 years; 93.6% female). A majority of participants reported use of conventional medications (e.g., antidepressants, anticonvulsants) and nondrug therapies (e.g., psychotherapy). Currently and within the past 2 years, antidepressant medications were the most commonly used to manage FM. Complementary treatments were used less often, with massage being the most popular choice. Although currently used treatments were reported as being effective, past treatments, especially medications, were viewed as being more variably effective. This is a potential reason why young adults with JFM might try more complementary and alternative approaches to managing their symptoms. More controlled studies are needed to investigate the effectiveness of these complementary methods to assist treatment providers in giving evidence-based treatment recommendations.

Pain Manag Nurs. 2013 Dec;14(4):e244-50. doi: 10.1016/j.pmn.2012.02.002. Epub 2012 Jun 19.

VON STÜLPNAGEL C, REILICH P, STRAUBE A, SCHÄFER J, BLASCHEK A, LEE SH, MÜLLER-FELBER W, HENSCHEL V, MANSMANN U, HEINEN F

Myofascial Trigger Points In Children With Tension-Type Headache: A New Diagnostic And Therapeutic Option

The goal of this pilot study was to evaluate the effect of a trigger point-specific physiotherapy on headache frequency, intensity, and duration in children with episodic or chronic tension-type headache. Patients were recruited from the special headache outpatient clinic. A total of 9 girls (mean age 13.1 years; range, 5-15 years) with the diagnosis of tension-type headache participated in the pilot study from May to September 2006 and received trigger point-specific physiotherapy twice a week by a trained physiotherapist. After an average number of 6.5 therapeutic sessions, the headache frequency had been

reduced by 67.7%, intensity by 74.3%, and duration by 77.3%. No side effects were noted during the treatment. These preliminary findings suggest a role for active trigger points in children with tension-type headache. Trigger point-specific physiotherapy seems to be an effective therapy in these children. Further prospective and controlled studies in a larger cohort are warranted.

J Child Neurol. 2009 Apr;24(4):406-9. doi: 10.1177/0883073808324540.

WILSON AC, SAMUELSON B, PALERMO TM

Obesity In Children And Adolescents With Chronic Pain: Associations With Pain And Activity Limitations

OBJECTIVES: Obesity is associated with functional disability in adults with chronic pain, but less is known about obesity among youth with chronic pain. The purpose of this study was to (1) identify the prevalence of overweight and obesity in children and adolescents receiving treatment for chronic pain, and (2) examine associations between Body Mass Index (BMI), pain intensity, and activity limitations in this population. **METHODS:** Data were obtained from records of 118 patients, ages 8 to 18, seen in a multidisciplinary pediatric pain clinic. Information about age, sex, pain problem, duration and severity, medical diagnoses, medications, height, and weight were collected from medical records and intake questionnaires. The CDC's pediatric BMI calculator was used to obtain percentile and category (underweight, healthy weight, overweight, obese). Children and parents completed the Child Activity Limitations Interview-21 (CALI-21), a self-report measure of activity limitations. **RESULTS:** A significantly higher rate of overweight and obesity was observed among youth with chronic pain compared with a normative sample. BMI percentile was predictive of concurrent limitations in vigorous activities, according to parent report. **DISCUSSION:** BMI percentile and weight status may contribute to activity limitations among children and adolescents with chronic pain. Weight status is an important factor to consider in the context of treatment of chronic pain and disability in children and adolescents.

Clin J Pain. 2010 Oct;26(8):705-11. doi: 10.1097/AJP.0b013e3181e601fa.

YUNUS MB, KHAN MA, RAWLINGS KK, GREEN JR, OLSON JM, SHAH S

Genetic Linkage Analysis Of Multicase Families With Fibromyalgia Syndrome

OBJECTIVE: Based on the reports of familial aggregation of fibromyalgia (FM) syndrome, we investigated its possible genetic linkage to HLA by studying multicase families. **METHODS:** Forty Caucasian multicase families with a diagnosis of FM (American College of Rheumatology criteria) in 2 or more first degree relatives were investigated. Eighty-five affected and 21 unaffected members of 41 sibships were studied. Depression symptomology was assessed by Zung Self-rating Depression Scale (SDS). HLA typing was performed for A, B, and DRB 1 alleles, and haplotypes were determined with no knowledge of the subject's diagnosis. We investigated genetic linkage to the HLA region by evaluating sibships in multicase families. **RESULTS:** Sibship analysis showed significant genetic linkage of FM to the HLA region ($p = 0.028$). Subgroup analysis was also performed for 17 families where the proband was also noted to have depression (with an SDS index value ≥ 60). We found that the presence of depression did not influence the observed results ($p = 0.22$). **CONCLUSION:** Our study of 40 multicase families confirms existence of a possible gene for FM that is linked with the HLA region. Our results should be regarded as preliminary and their independent confirmation by other studies is warranted.

J Rheumatol. 1999 Feb;26(2):408-12.

