



Common, Complex & Complicated? Chronic Pain in Children and Teenagers

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Learning Objectives

- Discuss pathophysiology explaining development of chronic pain in children
- Explore successful interdisciplinary rehabilitative and psychological treatment choices
- Appreciate very low importance of pharmacotherapy in treating chronic pain

Chronic Pain in Children

- "Pain lasting > 3 months": Adult WHO time definition completely arbitrary and commonly useless in pediatrics

- **Pain that extends beyond the expected period of healing**
- and **hence lacks the acute warning function of physiological nociception**

Turk DC, Chiklaji A. Pain terms and taxonomies of pain. In: Bonica JJ, Loeser JD, Chapman CR, Turk DC, Butler SH. Bonica's management of pain. Hagerstown, MD: Lippincott Williams & Wilkins; 2001; Treede RD, Rief W, Burke A, et al. A classification of chronic pain for ICD-11. Pain. Jun 2015; 156(6):1002-1007.

- Chronic Pain in children is the result of a dynamic integration of biological processes, psychological factors, and sociocultural factors considered within a developmental trajectory. Pediatric Chronic Pain Task Force 2012 American Pain Society

- Total costs to society for adolescents with moderate to severe chronic pain extrapolated to **\$19.5 billion annually in the United States.** Groenewald CB, Essner BS, Wright D, Fesinmeyer MD, Palermo TM. The economic costs of chronic pain among a cohort of treatment-seeking adolescents in the United States. J Pain. Sep 2014; 15(9):925-933.

Impact on Family

- Family Life
- Financial Burden (direct medical & indirect)
- Emotional

Systematic review (16 cross-sectional studies): Lewandowski AS, Palermo TM, Stinson J, Handley S, Chambers CT. Systematic review of family functioning in families of children and adolescents with chronic pain. The journal of pain 2010 Nov; 11(11):1027-38.

- Families of children with chronic pain generally have poorer family functioning
- Pain-related disability is more consistent related to family functioning than pain intensity



Fear of Pain

Beliefs patients hold how detrimental pain will be

- Plays a significant role in relation to functional disability and depressive symptoms in the context of pediatric chronic pain

Simons LE, Kaczynski KJ, Conroy C, Logan DE. Fear of pain in the context of intensive pain rehabilitation among children and adolescents with neuropathic pain: associations with treatment response. J Pain 2012 Dec; 13(12):1151-61.

- Appears to play both a facilitative and inhibitory role in relation to treatment response:
 - may hinder improvements in disability & depressive symptoms
 - declines are strongly associated with positive functional outcomes

- Adolescents with chronic pain less likely to believe benign interpretations of ambiguous bodily-threat information than controls; associated with more disability xHeathcote LC, Jacobs K, Eccleston C, Fox E, Lau JY. Biased interpretations of ambiguous bodily threat information in adolescents with chronic pain. Pain. 2017; 158(3):471-8.

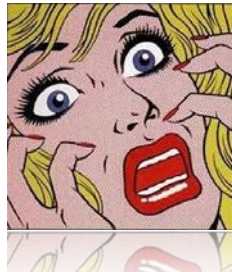


Fear and Disability

- **Meta-analysis: Robust, positive association between pain-related fear and disability** Zale, E.L., et al. The relation between pain-related fear and disability: a meta-analysis. J Pain, 2013. 14(10): p. 1019-30.
- Consistent with fear-avoidance model of chronic pain, findings suggest that pain-related fear may be important target for treatments intended to reduce pain-related disability
- **Perceived injustice associated with**
 - higher levels of pain intensity, catastrophizing, and functional disability, and with poorer emotional, social, and school functioning Miller MM, Scott EL, Trost Z, Hirsh AT. Perceived Injustice Is Associated With Pain and Functional Outcomes in Children and Adolescents With Chronic Pain: A Preliminary Examination. J Pain. 2016;17(11):1217-26.
 - greater pain, more severe depressive symptoms, and more pronounced disability Scott, W., et al. Anger differentially mediates the relationship between perceived injustice and chronic pain outcomes. Pain. 2013. 154(9): p. 1691-8.

Catastrophizing [“Awfulizing”]

- A set of negative emotional / cognitive processes such as magnification, rumination and pessimism about pain sensations and feelings of helplessness when in pain.
 - **Rumination:** Parent anxious preoccupation with pain
 - **Magnification:** Parent amplification of the significance of pain
- Significant link between child and parent catastrophizing Lynch-Jordan, A.M.; Kashikar-Zuck, S.; Szabova, A.; Goldschneider, K.R. The interplay of parent and adolescent catastrophizing and its impact on adolescents' pain, functioning, and pain behavior. Clin J Pain 2013. 29, 681-688.
- Kids have higher pain ratings, if either child or mother displays high pain catastrophizing Birnie, K.A., et al. Dyadic analysis of child and parent trait and state pain catastrophizing in the process of children's pain communication. Pain. 2016. 157(4): p. 938-48



Chronic Pain & Anxiety



- Children with chronic pain **suffer substantially more from anxiety and depression** compared to healthy children: Comorbidity 50-82% Hechler T. Altered interoception and its role for the co-occurrence of chronic primary pain and mental health problems in children. Pain. 2021;162(3):665-71 [LINK](#). Campo JV, Jansen-McWilliams L, Comer DM, Kelleher KJ. Somatization in pediatric primary care: association with psychopathology, functional impairment, and use of services. J Am Acad Child Adolesc Psychiatry. 1999;38(9):1093-101 [LINK](#). Liakopoulou-Kairis M, Aliferaki T, Protogora D, Korpa T, Kondyli K, Dimosthenous E, et al. Recurrent abdominal pain and headache—psychopathology, life events and family functioning. Eur Child Adolesc Psychiatry. 2002;11(3):115-22 [LINK](#).
- **Adolescent Chronic Pain (n=222)** Cohen LL, Vowles KE, Eccleston C. The impact of adolescent chronic pain on functioning: disentangling the complex role of anxiety. The journal of pain. 2010 Nov;11(11):1039-46.
 - Highly anxious adolescents were functioning poorly regardless of level of pain
 - At low anxiety: higher pain predicted greater disability

Mental Health & Pain

THE CHICKEN - OR - THE EGGEN EGG?



- Affective, anxiety, & behavior disorders early risk factors of chronic pain (rather than vice versa)

Tegethoff, M. et al., Comorbidity of Mental Disorders and Chronic Pain: Chronology of Onset in Adolescents of a National Representative Cohort. J Pain. 2015. 16(10): p. 1054-64.

- New musculoskeletal pain 10-17 year-olds (<1 month):

↑ depressive symptoms =
↑ pain-related disability and ↓
QoL 4 months later

Holley AL, Wilson AC, Palermo TM. Predictors of the transition from acute to persistent musculoskeletal pain in children and adolescents: a prospective study. Pain. 2017;158(5):794-801.

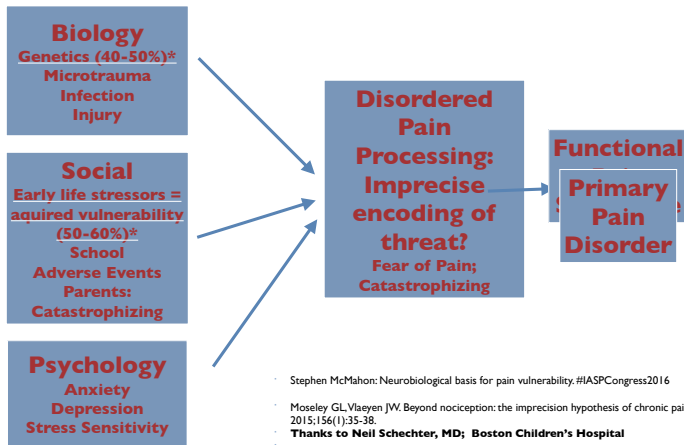
- National Longitudinal Study of Adolescent to Adult Health (n=14,790)**

Chronic pain in adolescence associated with higher rates of internalizing mental health disorders reported in adulthood

Noel, Melanie; Groenewald, Cornelius B.; Beals-Erickson, Sarah E.; Geber, J. Thomas; Palermo, Tonya M. Chronic pain in adolescence and internalizing mental health disorders: a nationally representative study. PAIN; June 2016. Vol. 157 - Issue 6: p. 1333-38

- anxiety disorders** (21.1% vs 12.4%)
- depressive disorders** (24.5% vs 14.1%)

Chronic Pain Pathophysiology



Chronic Pain Pathophysiology

- Many different chronic and recurrent pain syndromes, in both adult and pediatric populations, are now considered **manifestations of an underlying vulnerability rather than separate disorders**

von Baeyer CL, Champion GD. Commentary: Multiple pains as functional pain syndromes. Journal of pediatric psychology. [Comment]. 2011. 36(4):433-7.

- Considerable evidence, especially from twin studies, points to a role of **shared biological sensitivity**: "pain vulnerability", "pain sensitivity", or "central sensitivity syndrome"

(1) von Baeyer CL, Champion GD. Commentary: Multiple pains as functional pain syndromes. Journal of pediatric psychology. [Comment]. 2011 May;36(4):433-7. (2) Kindler LL, Bennett RM, Jones KD. Central sensitivity syndromes: mounting pathophysiologic evidence to link fibromyalgia with other common chronic pain disorders. Pain Manag Nurs. 2011 Mar;12(1):15-24. (3) Williams FM, Spector TD, MacGregor AJ. Pain reporting at different body sites is explained by a single underlying genetic factor. Rheumatology (Oxford). 2010 Sep;49(9):1753-5. (4) Mayer EA, Bushnell MC. Functional pain syndromes: presentation and pathophysiology. Seattle: IASP Press, 2009. (5) Burri A, et al. Chronic widespread pain: clinical comorbidities and psychological correlates. Pain. 2015. 156(8): p. 1458-64.



Thanks to Neil Schechter, MD; Boston Children's Hospital

Functional Primary Pain Disorder

- Chronic pain disorder that after appropriate medical assessment cannot be explained in terms of conventionally defined medical disease based on biochemical or structural abnormalities
- Associated with significant disruption of everyday life and often incapacitation
- Not typically responsive to conventional medical therapy but responsible for the consumption of enormous medical resources
- Often pejorative implication, i.e. pain is not organic and therefore not real or serious



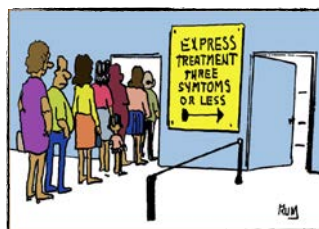
Schechter NL. Functional pain: time for a new name. JAMA pediatrics. Aug 2014;168(8):693-694.



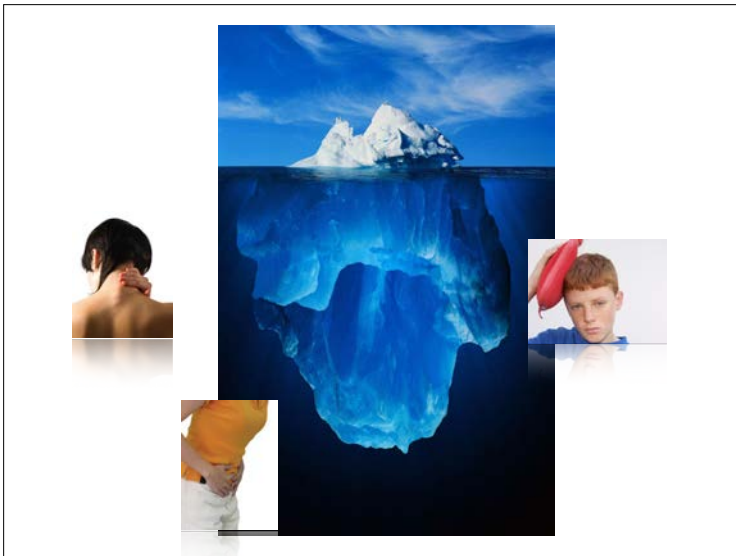
- Pejorative implication, i.e. pain is not "organic" and therefore not real or serious

Primary Pain Disorders

- Primary headaches
- Centrally mediated abdominal pain syndrome (2016)
- Widespread musculoskeletal pain ("fibromyalgia")
 - CRPS ?
- Majority of children experience pain at multiple sites



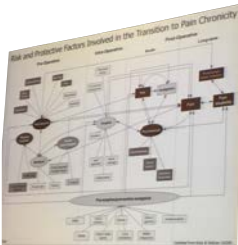
Thanks to Neil Schechter, MD;
Boston Children's Hospital





TRANSITION

from acute to chronic pain?



Joel Katz (ISPP 2015)

The diagram is a complex flowchart titled "Risk and Protective Factors Involved in the Transition to Pain Chronicity". It shows a progression from "Acute Pain" to "Chronic Pain" through various intermediate states and factors. Key elements include "Pain Catastrophizing", "Fear Avoidance", "Central Sensitization", "Neuroplasticity", "Cognitive Behavioral Factors", and "Social Support". It also lists "Risk Factors" and "Protective Factors" that influence the transition.

Chronic-on-acute Pain

- Approximately 5% of children and teenagers in general population have significant pain related dysfunction King S, Chambers CT, Huguet A, MacNevin RC, McGrath PJ, Parker L, et al. The epidemiology of chronic pain in children and adolescents revisited: a systematic review. Pain. 2011 Dec;152(12):2729-38.
- In USA: > 3.7 million children
 - USA - Age 0-17: 74.3 million children (2014): <http://www.childstats.gov/americaschildren/tables/pop1.asp>
- At least (!) 5 % of children with sickle cell disease, inflammatory bowel disease, rheumatoid arthritis, congenital heart disease, or cancer are expected to display chronic pain **in addition** to their underlying somatic pain episodes



Interdisciplinary Pain Clinic

Inter-disciplinary Pain Clinic



• **Pediatric Pain Screening Tool (PPST)** Simons, Laura E., et al. Pediatric Pain Screening Tool: rapid identification of risk in youth with pain complaints. Pain. 2015. 156(8): p. 1511-8.

Pediatric Pain Clinics 2022



1 Belgium 2 Germany 3 Hungary 4 Ireland 5 Israel 6 Netherlands 7 Switzerland

<http://childpain.org/index.php/resources/>

The Exit Interview

- **Pain is real!**
- Avoid diagnostic uncertainty: linked to higher youth catastrophic thinking about their pain Neville A, Jordan A, Pincus T, Nania C, Schulte FYeates KO, et al. Diagnostic uncertainty in pediatric chronic pain: nature, prevalence, and consequences. Pain Rep. 2020;5(6):e871.
- Expectation = Self-fulfilling prophecy
- **Expectations predict chronic pain treatment outcomes: superior clinical outcomes observed in individuals who expect high positive outcomes as result of treatment.** Cormier, S., et al., Expectations predict chronic pain treatment outcomes. Pain, 2016. 157(2): p. 329-38.



Exit Interview:

What is the Hard Work...and non-negotiable...?



Exit Interview:

What is the Hard Work...and non-negotiable...?

- **Physical Therapy**
 - Daily home exercise
- **Integrative Medicine**
 - Self-Hypnosis
 - Biofeedback
 - Progressive Muscle relaxation, etc.
 - Daily home exercise
 - Passive: Massage, Acupuncture

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- **Psychology** (...if missing school, anxiety, depression...)

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 - Self-Hypnosis
 - Biofeedback
 - Progressive Muscle relaxation
 - Daily home exercise
 - Passive: Massage, Acupuncture
- **Psychology** (...if missing school)
- **Normalize Life**
 - Sports/Exercise
 - Sleep-hygiene
 - Social: Having daily fun
 - School: Attending full-time (or school-re-entry plan)

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 - Social: Having daily fun
 - School: Attending full-time (or school-re-entry plan)
- **Family Coaching**
- **Medications...???**

Medications?



Opioids & Chronic Pain

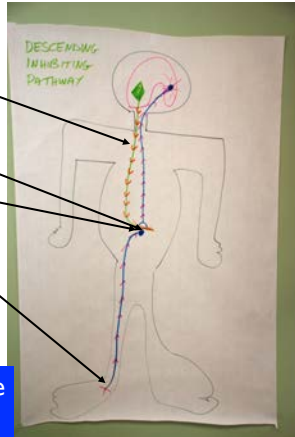
- **Lack of evidence** supporting long-term effectiveness
- Escalating **misuse** of prescription opioids including abuse and diversion
- **Symptoms of depression** associated with opioid use regardless of pain severity and physical functioning among patients with chronic pain. Goesling, J., et al., Symptoms of Depression Are Associated With Opioid Use Regardless of Pain Severity and Physical Functioning Among Treatment-Seeking Patients With Chronic Pain, J Pain, 2015, 16(9); p. 844-51.
- **Uncertainty about incidence of adverse drug events** Chapman CR, Lipschitz DL, Angst MS, Chou R, Diemco NC, Donaldson GW, et al. Opioid pharmacotherapy for chronic non-cancer pain in the United States: a research guideline for developing an evidence-base. J Pain. 2010 Sep;11(9):807-29. Elliot JA, HorroxE, Fibuch EE: The endocrine effects of long-term oral opioid therapy: A case report and review of the literature. J Opioid Manage 2011, 7(2): 145-54
 - endocrine dysfunction (androgen deficiency)
 - Immunosuppression & infectious disease
 - Opioid-induced hyperalgesia
 - Xerostomia
 - Overdose
 - Falls & fractures
 - Psychosocial complications

Opioids & Chronic Pain

- Updated Cochrane Review: **Effectiveness/safety** of long-term opioid therapy for lower back pain **remains unproven** Chaparro, L.E., et al., Opioids compared with placebo or other treatments for chronic low back pain: an update of the Cochrane Review Spine (Phila Pa 1976), 2014, 39(7); p. 556-63.
- Even after adjusting for substantial number of potential confounders, **opioids were associated with worse functioning** in back pain patients at 6-month follow-up Ashworth, J., et al., Opioid use among low back pain patients in primary care: Is opioid prescription associated with disability at 6-month follow-up? Pain, 2013, 154(7); p. 1038-44.
- Chronic lower back pain: **Increase in opioid use associated with increase in depression, and increase in depression associated with increase in opioid dose** Scherrer JF, Salas J, Lustman PJ, Burge S, Schneider FD, Residency Research Network of Texas: I. Change in opioid dose and change in depression in a longitudinal primary care patient cohort. Pain. Feb 2015;156(2):348-355.
- 109 patients with chronic pain over 7 years: **NO relation between opioid dose change and clinical pain score** Chen L, Vo T, Seefeld L, Malarick C, Houghton M, Ahmed S, et al. Lack of correlation between opioid dose adjustment and pain score change in a group of chronic pain

Exit Interview

1. Low-dose Amitriptyline (stimulates)
2. Gabapentin (inhibits)
3. Acetaminophen
4. Ibuprofen (Celecoxib?)
5. Lidocain 5% patch
6. Melatonin
7. Vitamin D ?
8. SSRI ?
9. Co-Q10, Fish-Oil/Omega 3000; Peppermint oil (coated)

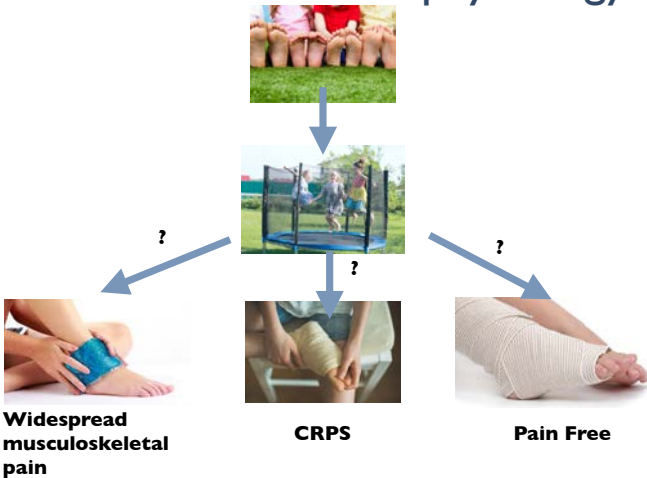


Opioids in absence of acute tissue injury not indicated!

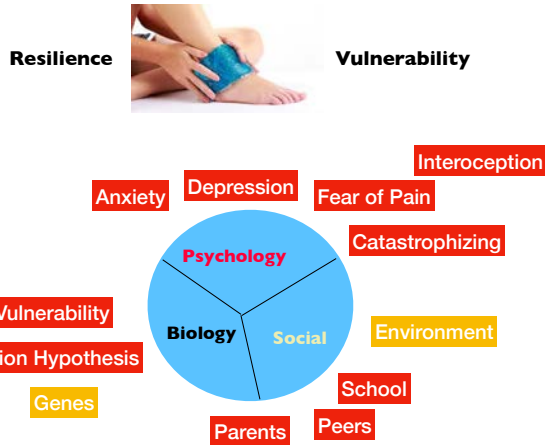


How did you become pain free?

Chronic Pain Pathophysiology



The Bio-Psycho-Social Model of Pain





Chronic Pain in Children and Adolescents: Diagnosis and Treatment of Primary Pain Disorders in Head, Abdomen, Muscles and Joints

Stefan J. Friedrichsdorf^{1,2,*}, James Giordano³, Kavita Desai Dakoaji¹, Andrew Warmuth¹, Cyndee Daughtry¹ and Craig A. Schulz^{1,4}

Abstract: Primary pain disorders (formerly “functional pain syndromes”) are common, under-diagnosed and under-treated in children and teenagers. This manuscript reviews key aspects which support understanding the development of pediatric chronic pain, points to the current pediatric chronic pain terminology, addresses effective treatment strategies, and discusses the evidence-based use of pharmacology. Common symptoms of an underlying pain vulnerability present in the three most common chronic pain disorders in pediatrics: primary headaches, centrally mediated abdominal pain syndromes, and/or chronic/recurrent musculoskeletal and joint pain. A significant number of children with repeated acute nociceptive pain episodes develop chronic pain in addition to or as a result of their underlying medical condition “chronic-on-acute pain.” We provide description of the structure and process of our interdisciplinary, rehabilitative pain clinic in Minneapolis, Minnesota, USA with accompanying data in the treatment of chronic pain symptoms that persist beyond the expected time of healing. An interdisciplinary approach combining (1) rehabilitation; (2) integrative medicine/active mind-body techniques; (3) psychology; and (4) normalizing daily school attendance, sports, social life and sleep will be presented. As a result of restored function, pain improves and commonly resolves. Opioids are not indicated for primary pain disorders, and other medications, with few exceptions, are usually not first-line therapy.

Friedrichsdorf SJ, Giordano J, Desai Dakoaji K, Warmuth A, Daughtry C, Schulz CA. Chronic Pain in Children and Adolescents: Diagnosis and Treatment of Primary Pain Disorders in Head, Abdomen, Muscles and Joints. *Children* (Basel). 2016;3(4). <https://pubmed.ncbi.nlm.nih.gov/27973405>

Conclusion

- Chronic pain usually not derived from peripheral nociceptive input (i.e. damage or inflammation)
- Many different chronic and recurrent pain syndromes now considered manifestations of underlying vulnerability rather than separate disorders
- Importance of rehabilitative, interdisciplinary team approach
- Opioids in absence of tissue injury or inflammation not indicated
- Patient expectation predict pain treatment outcomes



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Questions/Comments?

Thank you!



Save the Date



- 13th International Symposium on Pediatric Pain (ISPP) Auckland, New Zealand. March 24-27, 2022 <http://www.ispp2022.nz>
- 5th Maruzza International Congress on Pediatric Palliative Care May 25-28, 2022 plus 23rd "Become an EPEC-Pediatrics-Trainer" Conference. Rome, Italy. May 28-29, 2022 <https://www.childrenspalliativecarecongress.org/congress-2022>
- 24th "Become an EPEC-Pediatrics-Trainer" Conference. Education in Palliative and End-of-Life Care [EPEC]. (Hybrid in-person or virtual) San Francisco, July, 2022 EPEC.Pediatrics@UCSF.edu
- 13th Pediatric Pain Master Class (Hybrid in-person or virtual). San Francisco, Dec, 2022 Pediatric.PMC@ucsf.edu



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