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Research Interests

• Health Psychology
  – Addictive behaviors and chronic health conditions

• Programmatic line of research:
  – Reciprocal interactions between acute/chronic pain and tobacco smoking
Pain and Smoking

• Tobacco smoking (CDC, 2010)
  – 21% of U.S. adults (46 M)
  – 443,000 U.S. deaths annually
  – $193 B annual health care costs/lost productivity

• Chronic (non-cancer) pain (IASP, 2008; IOM, 2011)
  – Critical national health problem
  – 25-43% of U.S. adults (up to 116 M)
  – $125-635 B annual health care costs/lost productivity
Smoking Among Persons w/ Pain

- **Epidemiological data** (e.g., Zvolensky et al., 2009)
  - 30-42% of persons who endorse past year chronic pain
    - After adjusting for sociodemographic, medical, and psychiatric features

- **Clinical data** (e.g., Hooten et al., 2011)
  - 49-68% of treatment-seeking pain patients
    - Greater with more severe pain/functional impairment
      - Smokers: greater pain/emotional distress and decreased activity
Pain and Smoking

- Both pain and smoking are highly prevalent, comorbid disorders

(Ditre et al., 2011; Psychological Bulletin)
Pain and Tobacco Smoking

• Highly prevalent comorbid conditions that:
  – Generate substantial challenges across multiple domains/disciplines (e.g., psychology, medicine, public health)
  – Engender significant burdens upon patients/systems
  – Attracted the attention of researchers and clinicians within the medical and behavioral sciences
Research on Pain and Smoking

Published Studies

PsycINFO  PubMed

(Ditre et al., 2011; Psychological Bulletin)
Two Directions of Inquiry

- **Effects of Smoking on Pain**
  - Tobacco smoking identified as a causal factor in the onset and progression of chronic pain
  - Smokers report more severe pain and require more analgesic medication than do nonsmokers
  - Nicotine has short acting pain-inhibitory effects

(Ditre et al., 2011; *Psychological Bulletin* - Ditre et al., 2011; *Pain* - Ditre et al., *under review*)
Two Directions of Inquiry

• **Effects of Pain on Smoking**
  – Pain increases desire and motivation to smoke
  – Pain patients report smoking to cope with pain
  – Pain associated with greater difficulty quitting
  – Pain may precipitate relapse to smoking

(Ditre et al., 2008; Journal of Abnormal Psychology - Ditre et al., 2010; Journal of Abnormal Psychology - Ditre et al., under review)
Effects of Pain on Smoking

- Effects of Pain Induction on Smoking

(Ditre & Brandon, 2008; Journal of Abnormal Psychology)
Effects of Pain on Smoking

- **Effects of Pain Induction on Smoking**
  - Pain increases desire and motivation to smoke

  ![Graph showing Urge to Smoke (0 – 60) and Latency to Smoke (in seconds)]

  **Urge to Smoke (0 – 60)**
  \[ F(4, 124) = 18.75, p < .001, f = .39 \]

  **Latency to Smoke (in seconds)**
  \[ F(4, 115) = 4.60, p = .03, f = .20 \]

(Ditre & Brandon, 2008; *Journal of Abnormal Psychology*)
Effects of Pain on Smoking

- Effects of Expectancies and Coping on Pain-Induced Motivation to Smoke

(Ditre et al., 2010; Journal of Abnormal Psychology)
Effects of Pain on Smoking

- Effects of Expectancies and Coping on Pain-Induced Motivation to Smoke

Urge to Smoke (0 – 60) $F(1,124) = 6.39$, $p = .01$, $f = .20$

(Ditre et al., 2010; Journal of Abnormal Psychology)
Pain as a Motivator of Smoking

- Pain may serve as a powerful reinforcer in the maintenance of tobacco smoking and nicotine dependence.

- In the absence of more adaptive coping responses, persons with chronic pain may learn to rely on smoking to manage noxious internal states.
Integrative Reciprocal Model

- Research findings integrated to present a reciprocal model of pain and smoking
  - Hypothesized to interact in the manner of a positive feedback loop, resulting in greater pain, increased smoking, and the maintenance of both chronic pain and tobacco addiction

(Ditre et al., 2011; Psychological Bulletin)
Integrative Reciprocal Model

- Four-stage model of pain processing (Riley & Price, 2004)

- **PAIN EXPERIENCE**
  - intensity appraisal
  - persistence/recurrence

- **IMMEDIATE AFFECTIVE RESPONSE**
  - unpleasantness, distress
  - physiological arousal

- **EXTENDED PAIN AFFECT**
  - pain-related suffering
  - e.g., depression, anxiety

- **TOBACCO SMOKING**
  - behavioral pain response
  - efforts to cope with pain

(Ditre et al., 2011; *Psychological Bulletin*)
Integrative Reciprocal Model

**PAIN EXPERIENCE**
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**SMOKING-RELATED OUTCOME EXPECTANCIES**
- for pain coping
- for affect regulation

**NEGATIVE/POSITIVE REINFORCEMENT**
- self-medication
- conditioning of pain as an interoceptive cue

**NEUROBIOLOGICAL PROCESSES**
- activation of dopamine reward system and neural stress system

**OTHER PAIN-RELATED FACTORS**
- pain-coping outcomes
- catastrophizing
- opioid use/misuse

**PSYCHOSOCIAL FACTORS**
- sociodemographic
- comorbid medical and psychiatric conditions

**RISK FACTOR INTERACTIONS**
- systemic inflammation
- gene expression
- basal metabolic rate
- opioid pharmacology

**TISSUE DAMAGE**
- cell/vascular damage
- alterations of bone microarchitecture
- carboxy-hemoglobin-induced anoxia

**NEUROLOGICAL PAIN PROCESSING**
- nAChR activity
- endogenous opioid system activity
- HPA axis activity

**OTHER EFFECTS ON PAIN PROCESSING**
- cardiovascular actions
- attentional narrowing
- nicotine withdrawal

(Ditre et al., 2011; Psychological Bulletin)
Current and Future Research

• Epidemiological analyses of pain and smoking
  – (e.g., targeted surveys, measure development)

• Laboratory-based research studies
  – (e.g., abstinence-induced hyperalgesia - R21)

• Naturalistic assessment of pain and smoking
  – (e.g., ecological momentary assessment)

• Develop and refine tailored interventions
  – (e.g., randomized clinical trials)
• Effects of Smoking Abstinence on Pain Reactivity: A Human Experimental Model
  – There is reason to believe that abstaining from smoking may increase pain reactivity during the early stages of a quit attempt
  • Possibly as a function of nicotine withdrawal severity
NIH/NIDA R21

• Method
  – $N = 198$ smokers (> 15 cpd)
  – Baseline session
    • Randomized to 1 of 3 experimental conditions
      – Abstain from smoking for 24 hours
      – Abstain from smoking for 2 hours
      – Continue to smoke as usual
  – Experimental pain induction session
    • Apply topical capsaicin solution
      – DV: Self-reported and physiological pain reactivity
NIH/NIDA R21

• Capsaicin pain model
  • Derived from chili peppers (vanilloid receptor agonist)
  • Long lasting pain stimulus that approximates key features of neuropathic and inflammatory clinical pain
  • Permits tests of spontaneous pain, primary and secondary hyperalgesia, and areas of flare
    – May provide insight into neural mechanisms of action
CIH – Pain/Smoking Studies

• Development of CME/CEU educational program on pain and smoking for VA Healthcare Professionals

• Development of integrated brief pain/smoking intervention to increase motivation to quit among persons in pain
  – Study1: Sample = pain; IV = pain/smoking info (yes/no); DV = motivation, referral follow-up, outcomes
  – Study2: Obtaining feedback from behavioral health providers on integrated brief pain/smoking intervention
Primary care providers’ and patients’ perceptions/knowledge of potential relations between pain and smoking

- Identify barriers to implementation of integrated brief pain/smoking intervention
- Overcome barriers to implementation
- Provide integrated brief pain/smoking intervention
- Provide standardized note to document implementation
- Measure patient outcomes (patient perceptions of information; smoking-related; satisfaction with provider)
CIH – Other Studies

• Smoking
  – Daily fluctuations of [PTSD] and smoking (behavior, motivation/readiness to quit)
  – Relations among interpersonal stress, affect regulation, and smoking relapse

• Pain/Alcohol
  – Daily fluctuations of pain (severity/interference), mood, and alcohol use
CIH – Chronic Pain

• Pain is one of the most common complaints made by patients to primary care providers in the VA healthcare system (>50%)

• In a study of 1,800 OEF/OIF Veterans, 46.5% reported some pain, with 59% of those exceeding the VA clinical threshold of ≥ 4/10 (Gironda et al., 2006)
CIH – Chronic Pain

• Cognitive-behavioral approach to chronic pain
  • Clinical effectiveness has been demonstrated in several hundred studies with a wide range of pain syndromes
  • The integration of psychological interventions with conventional medical methods in the treatment of chronic pain is essential
  • Many pain patients have difficulty accepting that the primary treatment goal is improved functionality rather than pain relief
CIH – Chronic Pain

• Six phases of cognitive-behavioral treatment
  1. Assessment (ongoing)
  2. Reconceptualization
     » View symptoms as circumscribed and addressable rather than vague and overwhelming
     » Preparation for future intervention (minimize resistance and non-adherence)
  3. Skills acquisition and consolidation
     » Coping skills training, change maladaptive interpretations
  4. Rehearsal and application
  5. Maintenance and generalization
  6. Follow-up
CIH – Chronic Pain

• Integrated Treatment for Chronic Pain and comorbid/co-occurring disorders
  • 30-54% of pain patients have comorbid depression (Banks & Kerns, 1996)
  • 24-67% of patients with substance use disorders have chronic pain (Otis & Pincus, 2008)

– Integrated Treatment for Chronic Pain and PTSD

» John D. Otis, Terence M. Keane, Robert D. Kerns, Department of Veterans Affairs (VA) Boston Healthcare System, Boston, MA; VA Connecticut Healthcare System
Thank you