



## Virtual Reality Therapy Alternative to Opioid Therapy for Pain

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1 **PRAHEALTHSCIENCES** 6/6/2018

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## 12-Month Financial Disclosures

• Alcobra	• Inspirion
• Bonti	• Insys
• Charleston Laboratories	• Kempharm
• Daiichi Sankyo	• Pain Therapeutics
• Depomed	• Shionogi
• Egalet	• Teva
• Indivior	• Trevi

Updated 4/4/2018

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## Objectives

- To understand how virtual reality can reduce chronic pain
- To understand the reason why virtual reality may be an effective treatment for chronic pain
- To understand how virtual reality would fit into a practice setting

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## Proprietary VR Chronic Pain Therapy

**VRNT** (VR Neuropsychological Therapy)

- is a VR-based **experiential learning system** (i.e., software)
- seeks to create **lasting reduction in chronic pain**
- by **correcting the maladaptive learning processes** which drive pain chronification

VRNT leverages

- immersive VR training
- self-distancing
- self-efficacy and
- fear extinction tools

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## VRNT: 1. Create Personalized Digital Copy of Pain Experience 2. Re-frame Pain Perception ("Heal" Pain)



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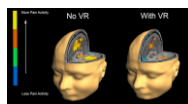
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## Historically VR for Pain meant Distraction Therapy

Scientific Basis of VR Distraction Therapy



### PROVEN POTENTIAL

#### 20 Years of Academic Research

- Clear unmet need for alternative pain therapy
- Immersive potential of VR identified early on
- Revenue model and lack of standards for scientific validation of games and unclear regulatory situation are still roadblocks for routine adoption
- Little evidence of lasting reduction in chronic pain

#### 120+ Research Papers

- Main focus on acute pain
- E.g., in hospital settings (burn victim rehabilitation) up to 50% pain reduction

#### 50+ Studies with **no-40 Patients**

- A.o., fMRI images show activity reduction in brain areas correlated to pain

Source: Beck et al., SMCN, volume 47(9), 2007; Hoffman et al., 2004

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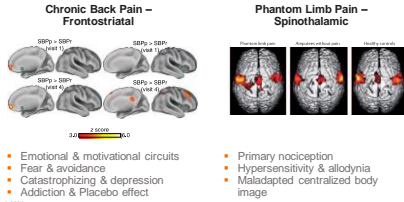
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## Chronic Pain Changes Brain

Growing body of neuroimaging research confirms  
 1. Chronic pain is mediated in different parts of brain, depending on pain type  
 2. Chronic pain is associated with maladaptive changes in those brain regions



Source: Galke et al. 2012; Flor et al. 2006

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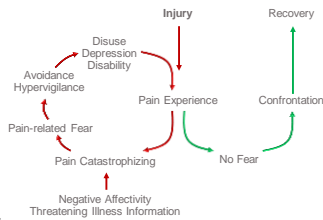
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## Maladaptive Implicit Learning Cycles Drive Chronification

Example: Fear-Avoidance Learning Cycle



Source: W.S. Vlaeyen, S.J. Limon et al. 2012

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## Mode of Action – VRNT Leverages Behavioral Therapy Tools

- Self-Efficacy**
  - Research: The inability to extinguish pain sustains maladaptive learning cycle
  - VRNT provides experiential "proof" it is possible to control and extinguish pain
- Fear Extinction (Exposure Tx)**
  - Fear-Avoidance Model: Patients who transition from acute to chronic pain do so because of negative affectivity to pain. This leads to cycle of catastrophizing, fear, avoidance, hypervigilance, disuse, depression and disability
  - VRNT provides "in vivo exposure" and helps patient disempower pain
- Self-Distancing / Imagery**
  - Research: Distancing from emotion related to a problem helps patients recalibrate pain affect
  - VRNT allows patient to experience pain without the emotional content

Source: Flor et al. 2012; Apkarian et al. 2011; Dehaene et al. 2014; Vlaeyen et al. 2012; Kross et al. 2017

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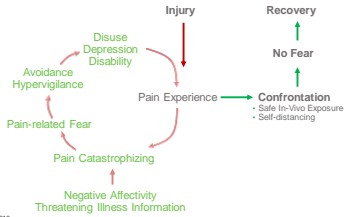
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## VRNT Seeks to Interrupt and Replace Maladaptive Learning Cycles

Example: Fear-Avoidance Learning Cycle



Source: J.W.S. Vlaeyen, S.J. Linton et al., 2012

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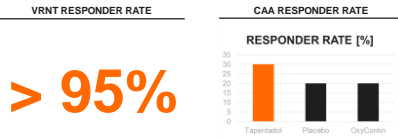
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## VRNT Product Performance

Encouraging Initial Qualitative Chronic Pain Patient Feedback



Source: Qualitative User Feedback initially after one demo session, with feedback chronic pain patients, Colson Review (2016)

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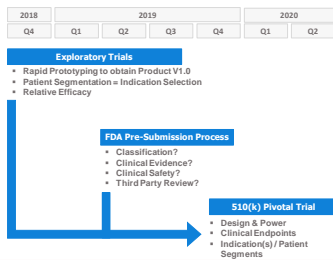
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## VRNT Regulatory Strategy - US




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## Thank You!

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