Do Fear of Movement and Negative Cognitions After Trauma Lead to Activity Avoidance, Depression, and Chronic Posttraumatic Pain Development? Testing the Fear-Avoidance Model Using a Large Prospective Cohort

Lane S[1], Bollen KA[2,3], **Mintz A[4,5]**, Kurz M[6], Hendry P[7], Pearson C[8], Velilla MA[9], Lewandowski C[10], Datner E[11], Domeier R[12], McLean S[4,5,13]

[1]Department of Psychology, University of North Carolina, Chapel Hill, NC; [2]Department of Psychology and Neuroscience, University of North Carolina, Chapel Hill, NC; [3]Department of Sociology, University of North Carolina, Chapel Hill, NC; [4]Institute for Trauma Recovery; [5]Department of Anesthesiology, University of North Carolina, Chapel Hill, NC; [6]Department of Emergency Medicine, University of Alabama Hospital at Birmingham, Birmingham, AL; [7]Department of Emergency Medicine, Shands, Jacksonville, FL; [8]Department of Emergency Medicine, Detroit Receiving Hospital, Detroit, MI; [9]Department of Emergency Medicine, Sinai-Grace Hospital, Detroit, MI; [10]Department of Emergency Medicine, Henry Ford Hospital, Detroit, MI; [11]Department of Emergency Medicine Einstein Medical Center, Philadelphia, PA; [12]Department of Emergency Medicine, Saint Joseph Mercy Health System, Ann Arbor, MI; [13]Department of Emergency Medicine, University of North Carolina, Chapel Hill, NC

Introduction

- The most common model of chronic pain development posits that fear of movement and negative cognitions in the early aftermath of injury lead to depression and activity avoidance, which in turn cause chronic pain.
- However, this decades-old "Fear-Avoidance" model (FAM) focuses on a simple view of pain development (inactivity leads to pain) that is not informed by more recent discoveries regarding the neurobiology of pain and psychological sequelae of trauma.
- In this study, we sought to obtain a high-quality, large-scale, prospective cohort of trauma survivors to test the fear-avoidance model using structural equation modeling (SEM).

Methods

- African Americans presenting to the emergency department (ED) within 24 hours after experiencing a motor vehicle collision (MVC) were enrolled from 16 sites (Figure 1).
- Study participants completed an initial ED assessment and follow-up web-based/phone assessments at 6 weeks and 6 months.
- ED evaluation included assessment of pain severity (0-10 NRS), pain catastrophizing (PCS)[1], and fear of movement (TSK, FABQ)[2,3].
- Six-week evaluation included assessment of depressive symptoms (CES-D)[4] and pain interference (BPI and SF-12)[5,6].
- Six-month evaluation included assessment of chronic pain outcomes (0-10 NRS).
- SEM was used to determine whether FAM provided a good fit to the data and to evaluate hypothesized FAM relationships.[7]

References

1. Sullivan, M. J., Bishop, S. R., & Pivik, J. (1995). The pain catastrophizing scale: development and validation. *Psychological Assessment, 7*(4), 524.
2. Miller, R. P., Kori, S. H., & Todd, D. D. (1991). The Tampa Scale: a Measure of Kinesiophobia. The Clinical *Journal of Pain, 7*(1), 51.
3. Waddell, G., Newton, M., Henderson, I., Somerville, D., & Main, C. J. (1993). A Fear-Avoidance Beliefs Questionnaire (FABQ) and the role of fear-avoidance beliefs in chronic low back pain and disability. *Pain*, *52*(2), 157-168.
4. Radloff, L. S. (1977). The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement*, *1*(3), 385-401.
5. Cleeland, C. S. (1989). Measurement of pain by subjective report. *Advances in Pain Research and Therapy*, *12*, 391-403.
6. Ware, J. E., Keller, S. D., & Kosinski, M. (1998). *SF-12: How to score the SF-12 physical and mental health summary scales*. Health Institute, New England Medical Center.
7. Muthén, L.K. and Muthén, B.O. (1998-2015). Mplus User's Guide. Seventh Edition. Los Angeles, CA: Muthén & Muthén.

Table 1: Descriptive statistics of African-Americans presenting to the Emergency Department following an MVC (n = 907)

Characteristic	Mean (SD)
Acute Pain (0-10 NRS)	7.4 (2.2)
Pain Catastrophizing, ED (0-4)	1.0 (0.4)
Fear of movement, ED (0-4.4)	2.7 (0.6)
Age	35.1 (12.7)
	N (%)
Female	565 (62%)
High school education or less	364 (40%)

Figure 1: Sixteen ED Recruiting Sites and Coordinating Site (UNC)

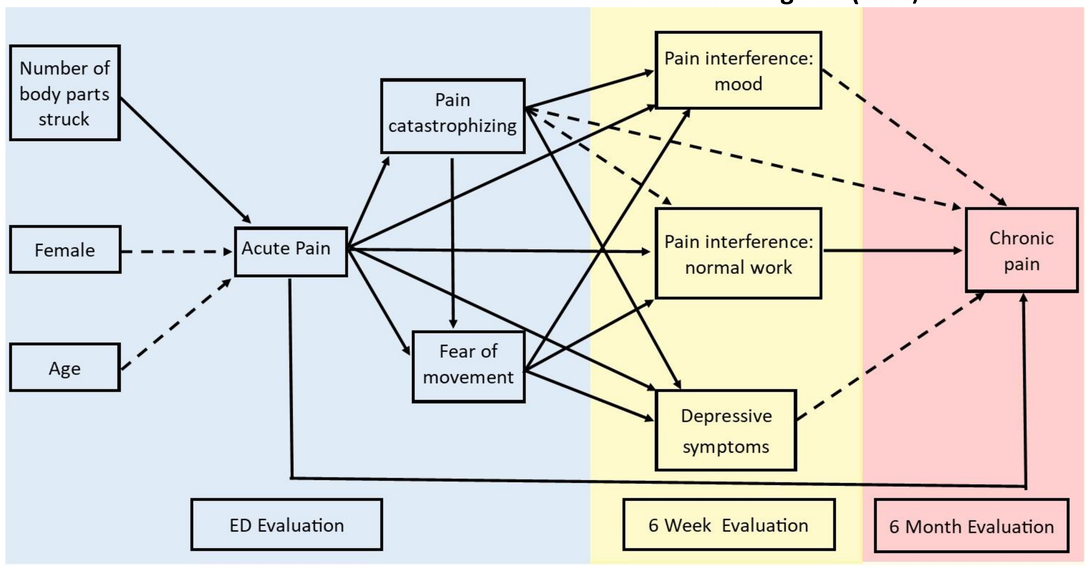

Figure 2: Path diagram representing final model. Solid lines represent significant relationships. Dashed lines represent non-significant relationships.

Table 2: Strength of association and statistical significance of proposed relationships within the classical fear-avoidance model (FAM) of chronic pain development after trauma.

	Unstandardized Estimate	Standardized Estimate	Std. Error	p	R^2
Acute pain					
Number of body parts struck	.295	.252	.071	<.001	.07
Female	.183	.051	.195	.349	
Age	-.001	-.005	.008	.928	
Depressive symptoms					
Acute pain	.077	.156	.022	<.001	.33
Fear of movement	.415	.360	.055	<.001	
Catastrophizing	.309	.257	.056	<.001	
Chronic pain					
Acute pain	.308	.226	.059	<.001	.37
Catastrophizing	.280	.084	.151	.064	
Pain interference: normal work	.413	.471	.145	.004	
Pain interference: mood	-.014	-.017	.148	.924	
Depressive symptoms	-0.060	-.022	.209	.775	

Results

- 907 African-American participants who presented to the ED after experiencing an MVC were enrolled.
- Characteristics of study participants are shown in Table 1.
- Most participants were women greater than 30 years of age with at least a high school education.
- Acute severe pain was common (mean 7.4) among participants at the time of ED evaluation.
- 798/907 (88%) of participants completed the six week follow-up assessment and 786/907 (87%) of participants completed the six month follow-up assessment.
- Acute pain, pain catastrophizing, pain interference, and depressive symptoms were all included in the FAM SEM, but only acute pain (β= .308, <.001) and pain interference with normal work (β= .413, p<.004) influenced the transition from acute to chronic pain.
- Acute pain severity, fear of movement, and pain catastrophizing all influenced the development of post-traumatic depressive symptoms.
- However, post-traumatic depressive symptoms was an outcome distinct from chronic pain.
- Negative cognitions (pain catastrophizing) in the aftermath of an MVC predicted depressive symptoms, but not pain.

Conclusions

- The concept that negative cognitions and activity avoidance after trauma cause chronic post-traumatic pain was not supported by the data.
- New models of the pathogenesis of post-traumatic pain and psychological sequelae are needed to better understand the relationships between acute pain, negative cognitions, depressive symptoms, and the development of chronic pain.

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