The different dimensions of pain and cognitive difficulties following mTBI: a preliminary investigation

Mary-Jo Daher & Tisha J. Ornstein

Department of Psychology, Toronto Metropolitan University

Background

- Chronic pain (persisting ≥3 months) affects ~50% of people with mild traumatic brain injury (mTBI).[1,2]
- Pain is often operationalized through intensity alone, despite being a multidimensional experience with **sensory**, **cognitive** (e.g., catastrophizing), **functional** (e.g., disability), and **affective** (e.g., distress) components.[1,3,4,5]
- Pain appears to be linked to cognition, but whether specific pain dimensions differentially predict cognitive outcomes in mTBI remains unexamined.[1,6]

Question

How do distinct dimensions of pain relate to cognitive functioning in adults with chronic pain following mTBI?

Methods

Sample

- 56 adults referred for neuropsychological assessment after mTBI following a motor vehicle accident (data collection ongoing; target N = 121).
- 52% men; mean age 41.8 (range 22-66); median time since accident (TSA) 26 months (range 6-108).

Measures

- **Pain dimensions:**
  - ***Sensory***: Intensity (0-10) and pain locations (0-10 sites)
  - ***Cognitive***: Pain Catastrophizing Scale (PCS)
  - ***Functional***: Pain Disability Index (PDI)
  - ***Affective***: Hospital Anxiety and Depression Scale (HADS)
- **Cognition:** Processing speed, executive functioning, episodic memory, and attention/working memory. Domains assessed using composite z-scores.

Analyses

- Multiple linear regressions for each cognitive outcome, with pain dimensions tested both separately and together as predictors.
- Covariates include age, gender, education, TSA, prior mental health, pain medication use, substance use.

Multiple pain dimensions relate to executive functioning

Sensory, **cognitive**, and **functional** pain dimensions each related to executive functioning when examined separately.

When all pain dimensions were examined together, none stood out as a significant predictor. These pain experiences may share rather than independently contribute to executive functioning.

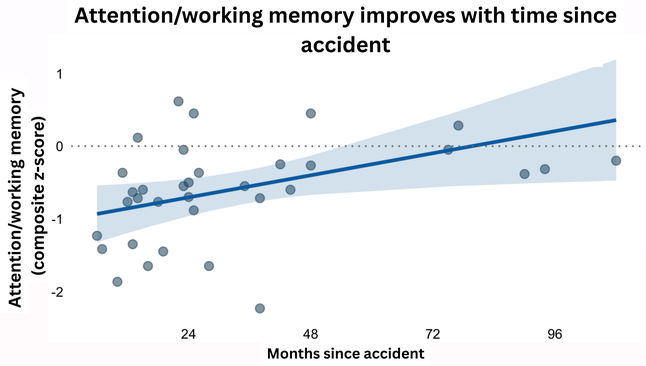
Pain dimensions	*β*	*p*	Model (tested separately)
Sensory (Intensity)	-0.34	.042	Adj R^2 = .27, p = .030
Cognitive (PCS)	-0.33	.041	Adj R^2 = .23, p = .034
Functional (PDI)	-0.37	.035	Adj R^2 = .23, p = .031

Model including all pain dimensions together: Adj R^2 = .19, p = .12.

Recovery trajectory drives attention & working memory

Greater recovery time was associated with better performance on attention and working memory tasks.

Attention and working memory performance was **not driven by pain.**

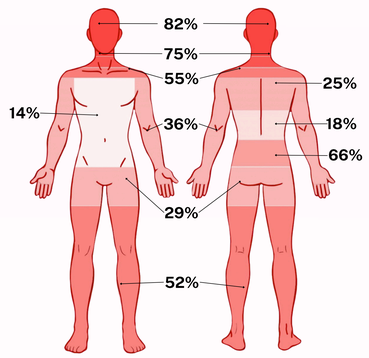


Time since accident predicted attention and working memory regardless of how pain dimensions were modelled:

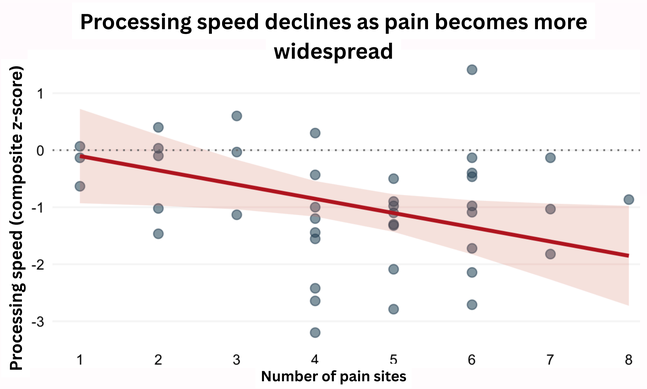
Pain dimensions	TSA *β*	Overall model
Tested separately	.38–.48*	Adj R^2 = .27-.32, all p < .05
Tested together	.46*	Adj R^2 = .26, p = .08

Note. *p < .05

Pain distribution uniquely predicts processing speed



50% reported intense pain (≥7/10)
77% reported widespread pain (4+ locations)



Individuals reporting pain across more body sites generally performed worse on processing speed tasks, **independent of their reported pain intensity.**

This effect held whether pain dimensions were modelled separately or together:

Pain dimensions	Distribution *β*	Overall model
Tested separately	-.43*	Adj R^2 = .22, p = .053
Tested together	-.46*	Adj R^2 = .19, p = .109

Note. *p < .05

No pain dimension predicted episodic memory

All models were non-significant. Prior mental health history emerged as a predictor in some analyses.

Implications and preliminary conclusions

- Different dimensions of pain relate to different cognitive abilities.
- Measuring pain by intensity alone may overlook clinically relevant patterns.
- A multidimensional view of pain may better identify cognitive risk.
- Replication in larger samples is needed.

References

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