

PAIN INHIBITORY PROCESSES AND SLEEP DISRUPTIONS IN HEALTHY YOUNG ADULTS

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BACKGROUND & AIMS

Diffuse Noxious Inhibitory Control (DNIC) response/Conditioned Pain Modulation (CPM) is a clinical marker of impaired pain inhibitory processes in a range of chronic pain conditions¹. This study explored:

- Reliability and differences between two conditioning stimulus used to elicit DNIC responses; a standard experimental pain inducing stimuli compared to a potential ecologically valid stimuli.
- The influence of subjective poor sleep and sleep disruptions on DNIC responses.

METHODS

- Participants were 57 healthy young adults (mean age 19, 84% female, 51% white). 94.7% completed both baseline and follow-up assessments.

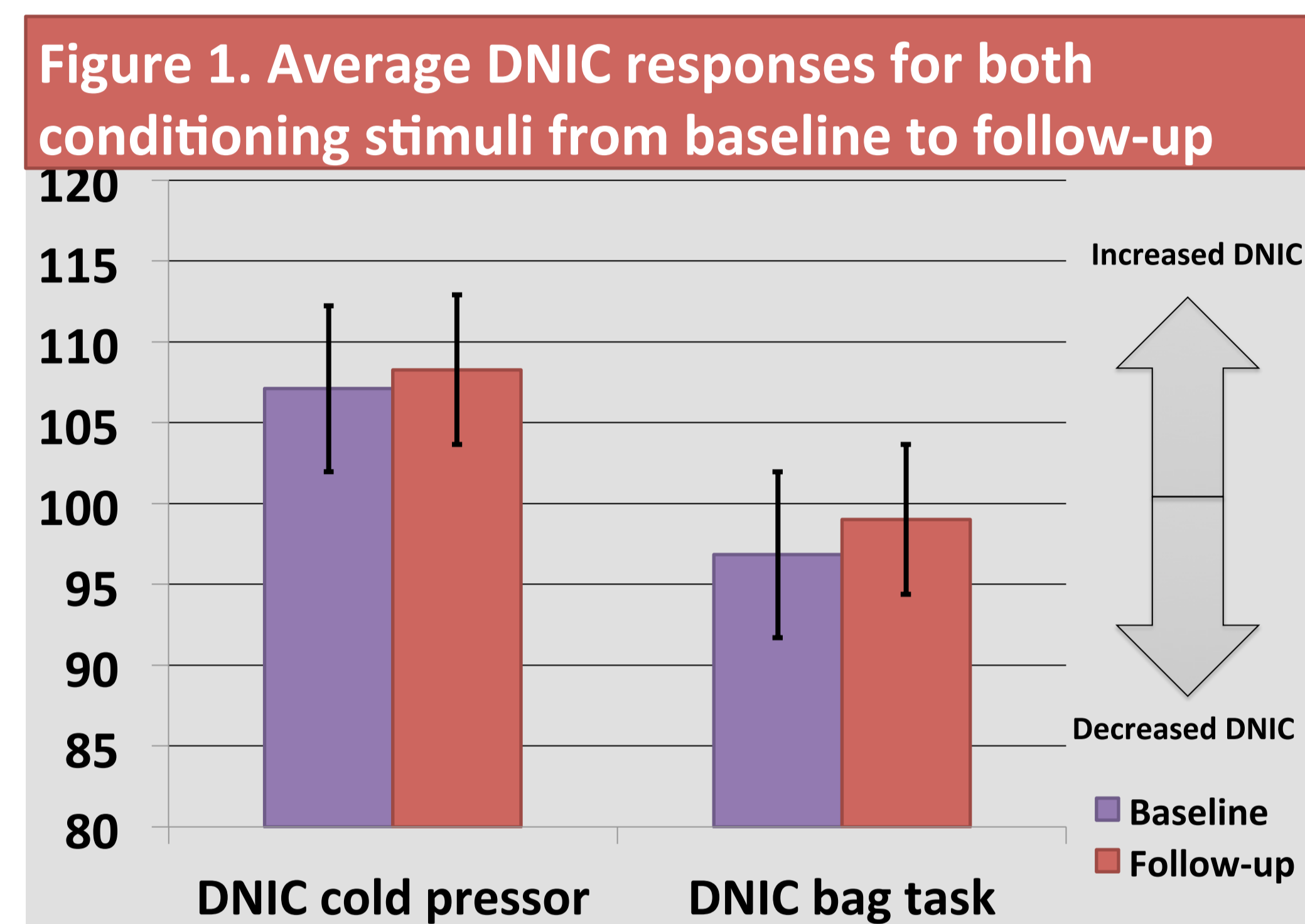


- **Quantitative Sensory Testing (QST) to assess DNIC response - Pressure Pain Threshold (PPTth)** assessed on the right forearm alongside two conditioning stimuli to induce pain on the contralateral side of the body:
 - **Cold Pressor Task**
 - **Bag Holding Task** [novel means of inducing musculoskeletal pain^{2,3}. Participants were asked to hold a 5kg(females) or 6kg(males) bag for 2 minutes].
- **DNIC** = %change in PPTth during conditioning stimulus relative to baseline PPTth.

RESULTS

DO THE DIFFERENT CONDITIONING STIMULI PRODUCE THE SAME RESPONSE?

Cold pressor task consistently activated the pain inhibitory pathway and showed significant DNIC response at both baseline and follow-up. The bag-task tended to show a reverse DNIC response (Fig. 1 & Table 1 below).



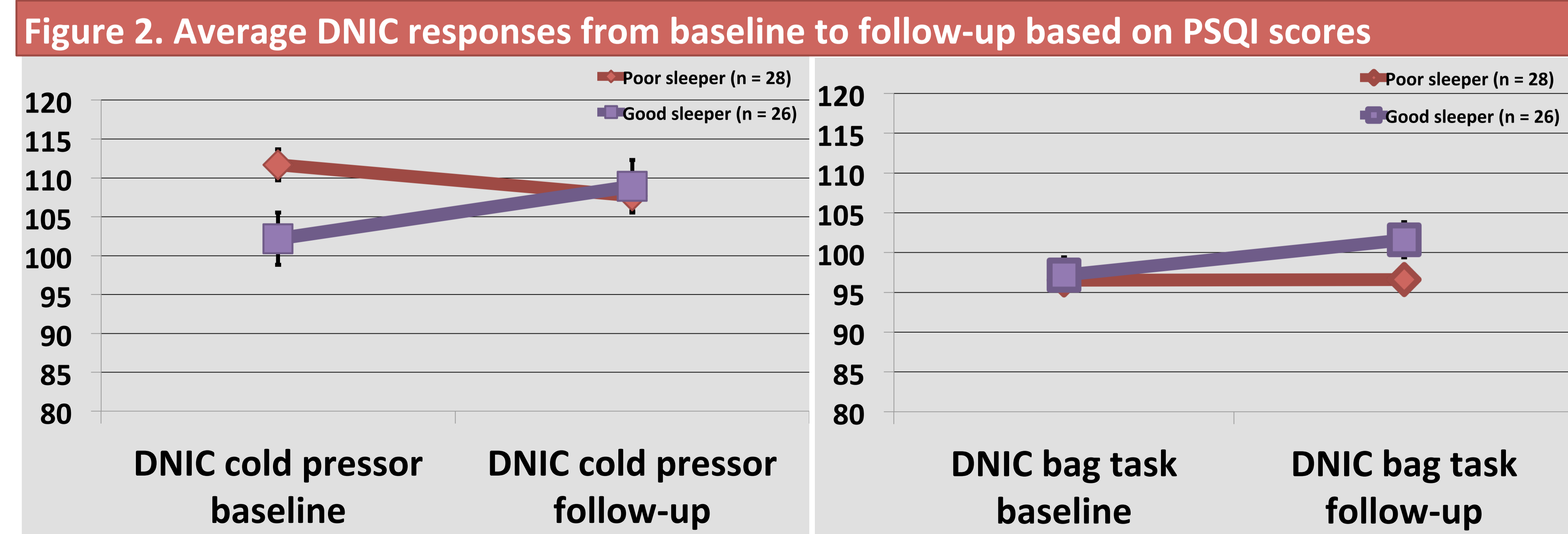
	Mean (SD)	t	df	Sig.
DNIC cold baseline	107.13 (13.66)	3.82	53	0.000
DNIC cold follow-up	108.28 (14.48)	4.20	53	0.000
DNIC bag baseline	96.84 (8.98)	-2.59	53	0.012
DNIC bag follow-up	99.02 (13.27)	-0.54	53	.59

DO THE TASKS ASSESSING DNIC RESPONSE SHOW RELIABILITY & STABILITY OVER 1 WEEK?

Significant **intraclass correlations (ICC)** between baseline and follow-up PPTths for both cold pressor (0.69) and bag task (0.78) stimuli. Significant ICC between baseline and follow-up DNIC scores for the bag-task (0.60) stimulus but not for the cold pressor task (0.33).

IS IMPAIRED DNIC RESPONSE ASSOCIATED WITH POOR SLEEP?

Based on PSQI scores, good sleepers (< 5) showed a significant rise in DNIC response from baseline to follow-up for both tasks. Poor sleepers (≥ 5) trend towards a decreased response was not significant (Fig. 2).



IS IMPAIRED DNIC RESPONSE ASSOCIATED WITH SLEEP DISRUPTIONS?

- Preliminary exploratory and descriptive analyses using week sleep diary averages.
- Of the 12 participants who showed impaired DNIC responses from baseline to follow-up for the cold pressor task, majority had either one or a multiple of sleep disturbances based on insomnia diagnostic sleep parameters:
 - Sleep Onset Latency (> 30 minutes)
 - Wake After Sleep Onset (>30 minutes)
 - Total Sleep Time (< 6 hours)
 - Sleep Efficiency (< 85%)

CONCLUSIONS

DNIC responses and intersession stability differed between the two conditioning stimuli used.

- Bag task may not have induced pain to elicit DNIC response in this sample of healthy participants. Experiments with chronic pain patients are required to assess its validity as a conditioning stimulus.

In this sample of healthy participants, few that showed impaired pain inhibitory responses also reported subjective sleep disruptions.

- Further studies needed to explore the specific temporal relationship between sleep disruptions and DNIC responses.

References

- 1 Pud et al. (2009) *Pain* 144, 16 – 19.
- 2 Tang et al. (2007) *Beh Res & Ther* 45, 2821 – 2835.
- 3 Vlaeyen et al. (1995) *Pain* 62, 363 – 372.

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