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Cognitive dysfunction and pain: considerations for future research

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Persons with chronic pain frequently complain of cognitive problems that interfere with daily functioning. In a large survey of persons with fibromyalgia, forgetfulness and difficulties with concentration were rated as the 5th and 6th most intense symptoms, just below pain [2]. In a study of persons with chronic pain attending a multidisciplinary pain center, 62% endorsed moderate to severe problems in at least one cognitive domain [8]. In a review, Hart et al. indicated there is consistent evidence for disturbances in attentional capacity, processing speed, and psychomotor speed among persons with chronic pain [4]. The authors noted little is known regarding the variables that underlie the inverse relation between pain and cognitive function [4].

In this issue, Gatzounis and colleagues present a well-conceived study examining the impact of pain on task accuracy during resumption of the activity following interruption [3]. To add to previous literature showing that interruptions by pain disrupt task accuracy and speed, they compared painful to non-painful interruptions to examine whether there is anything *especially* disruptive about pain. The authors found that evoked pain did impair task accuracy, but to a similar degree as innocuous stimuli. Thus, there was no evidence that painful stimuli are especially disruptive in terms of resuming tasks relative to non-painful interruptions. This raises the possibility that clinical pain does not interfere with activity resumption more than other every-day disruptions. As clinical pain may force persons to stop what they are doing, or persons with pain may take breaks during activity as a strategy to manage pain, the findings suggest that painful interruptions should not result in significantly greater performance decrement compared to other task interruptions once the activity is resumed. Another notable finding is that only performance on the more complex task, the tracking of the task sequence, was affected by both types of disruption. This suggests that simple activities may not be subject to performance decrements as a result of interruptions by pain.

As the authors mention in the discussion, this issue has clinical relevance to the treatment of chronic pain. Activity pacing is a behavioral strategy that is commonly taught to persons to help avoid escalations in pain and/or pursue other valued goals by taking breaks during an activity [7]. Activity pacing is enacted clinically in a number of different ways, with breaks

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in activity based on time, task completion, or symptom severity. If pain interferes with task resumption, pacing contingencies that include persisting through pain prior to a break might be detrimental to subsequent task performance. As patients with pain are often reluctant to alter their activity patterns, difficulties with task resumption might heighten their unwillingness to adopt this pain management strategy. As task performance on the more difficult task declined after interruption by pain as well as a non-pain stimulus, task interruption during difficult tasks may have a cost, and may be something to consider in the clinical treatment of persons with chronic pain. Also related to clinical application, one should consider that the authors examined performance on a cognitive task in healthy individuals. In clinical populations, activity pacing is often used for activities that include a physical component (e.g. gardening, housework), as prolonged physical activity often results in pain exacerbation. The degree of disruption caused by pain in resuming physical tasks warrants further examination.

It is imperative that future research in this area should also consider examining these effects in chronic pain populations, as these persons may have unique features that make them more prone to experiencing cognitive difficulties and performance decrements. Persons with chronic pain typically experience multiple symptoms, including fatigue and affective distress, which hold the potential to have a collective or synergistic effect on cognitive functioning. For example, McCracken and Iverson [6] found that in persons attending a university pain clinic, depressive symptoms, the use of antidepressants, and pain-related anxiety demonstrated significant association with cognitive complaints when examining all factors simultaneously. Similarly, Roth et al. [8] found that in a mixed chronic pain sample, depression-negative affect, fatigue, depression-somatic/physical function, depression-negative self, pain catastrophizing, and female gender all showed significant associations with cognitive complaints and accounted for 52% of the variance in perceived cognitive dysfunction. Changes in brain morphology and connectivity have also been demonstrated in those with chronic pain. For example, a number of studies have demonstrated cerebral atrophy in the form of decreased gray matter [1; 9]. A common finding across studies is that age and pain duration often show an inverse relationship with cognitive function, suggesting that pain may age the brain faster. This idea is supported by findings that women with fibromyalgia show an accelerated loss of gray matter equivalent to nearly 10 times the rate of loss seen in those without fibromyalgia [5]. Such changes in persons with chronic pain may impair their ability to accurately resume tasks following an interruption.

For many people with chronic pain the experience of pain is constant or nearly constant. For those with consistent pain, pain may act as a constant interruption, the effects of which may be compounded by the addition of other internal (e.g., fatigue) and external interruptions on activity. It is not fully clear how the findings from the study presented by Gatzounis et al. [3] map onto the experience of those with constant pain; the implications of the study findings are more straightforward for those with intermittent pain separated by pain-free intervals.

In conclusion, the findings from the study presented by Gatzounis and colleagues [3] are novel and important in that they provide new evidence that in healthy individuals, painful interruptions interfere with accurate resumption of a complex task, but not more so than a non-painful interruption. Having chronic pain results in multiple vulnerabilities for

difficulties with completing cognitive tasks and chronic pain is not usually experienced as intermittent episodes of acute pain separated by no pain, as was modeled in the experiment. Thus, these findings warrant replication and extension to persons with chronic pain to fully understand how the findings relate to the knowledge and treatment of chronic pain.

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