

1 Interventions for attentional disruption in pain:
2 cognition-general, mechanism-specific or exercise-based?

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9 In the current issue of PAIN, Baker et al. [6] report that a computerised cognitive training
10 programme was able to improve chronic pain patients' performance on a neurocognitive
11 assessment composite. Decades' worth of research has supported the hypothesis that pain
12 disrupts attention [3-5; 9-14; 17; 20; 21; 28], with the ultimate goal being to reverse this
13 effect in people with pain. As far as we are aware, this is the first study that attempts to do
14 so.

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16 Improving attention in people with chronic pain is a very worthwhile goal. Patients often
17 report that pain makes it difficult to think clearly [1; 2; 7; 14; 16], and disruption to attention
18 has the potential to impact on many, if not all, areas of life, such as work, study, socialising
19 and mood, to name a few. We are not always able to reduce patients' pain, so many people
20 must learn to live with their pain long-term. By improving their cognitive function, we may
21 be able to improve quality of life for people living with chronic pain.

22

23 How should we go about developing interventions to improve attention in people with
24 pain? One way is to use commercially available computerised cognitive training

25 programmes, as done by Baker et al [6]. Such intervention programmes are usually targeted
26 at older adults to prevent cognitive decline, and operate under the premise that practice on
27 tasks that load heavily on core cognitive domains leads to improvements on other everyday
28 tasks that rely on these domains. This concept is often compared to how exercise improves
29 physical fitness.

30

31 Definitive statements pertaining to the efficacy of computerised cognitive training are
32 contentious and beyond the scope of this commentary. Generally, computerised cognitive
33 training is believed to be effective in improving function on the practised cognitive domains,
34 but efficacy varies by domain and improvements seldom transfer far beyond the practiced
35 domain or task [18; 23; 24]. The efficacy for improving attention in particular has been
36 contested [18] and it remains to be determined whether the effects that have been
37 reported represent improvements in attentional capacity, the acquisition of a new strategy,
38 or increased motivation. This has implications for applying computerised cognitive training
39 to improving chronic pain patients' attention: acquired strategies are highly context- or task-
40 dependent and unlikely to transfer to novel contexts.

41

42 Aside from disputes pertaining to its efficacy, the approach of using computerised cognitive
43 training in chronic pain patients has the drawback that interventions tend to be very broad,
44 i.e. training a wide range of cognitive domains at the same time. This may produce small
45 positive effects, but the training will be time-consuming for users and difficult for them to
46 sustain over time. This may be an appropriate approach for programmes that aim to
47 improve or maintain cognitive function in general, as is the case in computerised cognitive

48 training. But when the aim is to reverse an effect caused by a specific trigger, such as pain,
49 many aspects of a catch-all intervention could be unnecessary.

50

51 Another approach to developing interventions for people with pain, and the one we wish to
52 advocate, would be to target the specific mechanisms of the effect of pain on attention. For
53 example, if pain and ongoing tasks are processed simultaneously (i.e. if pain acts as a
54 working memory load), then perhaps interventions should specifically target working
55 memory capacity. Alternatively, if attention is disrupted because our focus shifts frequently
56 from our ongoing tasks to our pain, then perhaps interventions should target attentional
57 control and inhibitory control. These are just two examples of possible mechanisms in the
58 cognitive domain: the mechanisms may instead be metacognitive, motivational [27], or
59 otherwise.

60

61 Unfortunately, we do not yet know enough about the mechanisms of the disruptive effect
62 of pain on attention, and what the individual differences may be, to develop such targeted
63 interventions. But if we could develop targeted interventions, the demand on patients' time
64 could be substantially reduced or spent more effectively, which could reduce the risk of
65 attrition over the course of programmes. If time demands are minimised and patients are
66 provided with strong theoretical reasons why an intervention will work, alongside evidence
67 that it does, they may be more motivated to stick with it for long enough to see results.

68

69 If the improvement or maintenance of cognitive function in general is indeed the goal,
70 rather than targeting a specific mechanism, a third approach would be to increase exercise

71 within the constraints of the patient's condition. Not only does exercise improve cognitive
72 function, it can also help prevent chronic diseases and improve mood [8; 15; 19; 25].

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74 The specific nature of interventions aside, we can only develop effective interventions if the
75 research they are based on and the studies testing their effectiveness are conducted in a
76 rigorous manner. Pre-registration of study protocols, methods, hypotheses, measures and
77 analyses is vital to ensure transparency and reproducibility of research. Furthermore, it aids
78 in the fight against publication bias and p-hacking. Sample size calculations, active control
79 groups, delayed post-tests and replication studies will also allow us to place trust in research
80 findings. [22; 26]

81

82 Baker et al. [6] have shown that there is potential for improving cognition in people with
83 chronic pain, which gives hope that as we develop and refine interventions, we will be able
84 to substantially improve the everyday lives of patients. However, in our view, we need to
85 fully understand the mechanisms of the effect of pain on attention before we can develop
86 interventions that will be as effective, time-effective, and cost-effective as we would like.

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89 Conflict of Interest Statement

90 The authors have no conflicts of interest.

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