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Interventions for attentional disruption in pain:

cognition-general, mechanism-specific or exercise-based?

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1 Interventions for attentional disruption in pain:

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4 Keywords: cognition; attention; disruption; interventions; cognitive training

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

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

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20 How should we go about developing interventions to improve attention in people with
21 pain? One way is to use commercially available computerised cognitive training
22 programmes, as done by Baker et al [6]. Such intervention programmes are usually targeted
23 at older adults to prevent cognitive decline, and operate under the premise that practice on
24 tasks that load heavily on core cognitive domains leads to improvements on other everyday

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3 25 tasks that rely on these domains. This concept is often compared to how exercise improves
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28 Definitive statements pertaining to the efficacy of computerised cognitive training are
29 contentious and beyond the scope of this commentary. Generally, computerised cognitive
30 training is believed to be effective in improving function on the practised cognitive domains,
31 but efficacy varies by domain and improvements seldom transfer far beyond the practiced
32 domain or task [18; 23; 24]. The efficacy for improving attention in particular has been
33 contested [18] and it remains to be determined whether the effects that have been
34 reported represent improvements in attentional capacity, the acquisition of a new strategy,
35 or increased motivation. This has implications for applying computerised cognitive training
36 to improving chronic pain patients' attention: acquired strategies are highly context- or task-
37 dependent and unlikely to transfer to novel contexts.

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39 Aside from disputes pertaining to its efficacy, the approach of using computerised cognitive
40 training in chronic pain patients has the drawback that interventions tend to be very broad,
41 i.e. training a wide range of cognitive domains at the same time. This may produce small
42 positive effects, but the training will be time-consuming for users and difficult for them to
43 sustain over time. This may be an appropriate approach for programmes that aim to
44 improve or maintain cognitive function in general, as is the case in computerised cognitive
45 training. But when the aim is to reverse an effect caused by a specific trigger, such as pain,
46 many aspects of a catch-all intervention could be unnecessary.

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

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

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66 If the improvement or maintenance of cognitive function in general is indeed the goal,
67 rather than targeting a specific mechanism, a third approach would be to increase exercise
68 within the constraints of the patient's condition. Not only does exercise improve cognitive
69 function, it can also help prevent chronic diseases and improve mood [8; 15; 19; 25].

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

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

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86 Conflict of Interest Statement

87 The authors have no conflicts of interest.

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