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Mechanisms, Mechanisms, Mechanisms: It Really Does All Boil Down to Mechanisms

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Results from randomized controlled trials (RCT) suggest that Cognitive Behavioral Therapy (CBT), Mindfulness-Based Stress Reduction (MBSR), and Acceptance and Commitment Therapy (ACT) produce at least modest gains in primary outcomes for people with chronic pain, although fewer RCTs for MBSR and ACT have been published at present than for CBT [8,9,11,12,22,28]. “Do these treatments work?” The answer is a provisional “yes.” Another vital question – “How do these treatments work?” – was largely neglected until recently. Most treatment mechanism research has proceeded on a “specificity assumption” that, for instance, CBT generates improvements in pain and function primarily via changes in maladaptive pain-related cognitions (e.g., pain catastrophizing). Evidence shows that CBT-based treatments produce significant pre- to post-treatment changes in such cognitions, and these changes are correlated with pre to post changes in outcomes [3,10,17,18,19]. Findings also show similar mechanism effects for changes in mindfulness during MBSR [14], and changes in cognitive flexibility and pain reactivity during ACT [23,24,25,27]. Further, studies using cross-lagged analyses suggest that early-treatment changes in mechanisms predict late-treatment changes in outcomes [4,5,6].

Methods of these studies were limited, however, because they examined only one kind of mechanism during only one kind of treatment. They could not show whether other mechanisms not specific to the target treatment were also at work, whether observed mechanism effects were proxy effects for actual mechanisms, or whether specific mechanism effects were tied to a single treatment. Other studies extended this research and examined the role of single mechanisms but across different treatments. Smeets and colleagues conducted secondary analyses of an RCT comparing CBT, physical exercise, and CBT plus exercise [16]. Results showed that pre- to post-treatment changes in pain catastrophizing did not differ significantly between treatments, and changes in pain catastrophizing predicted pre to post changes in outcomes comparably across them. Similar results were found for pain catastrophizing in a trial of CBT versus pain education [7]. Such results call into question whether pain catastrophizing change is a mechanism specific to

CBT, but also suggest that pain catastrophizing change is an important but pervasive mechanism elicited by different treatments, even those not using deliberate cognitive change techniques. These studies, however, examined only a single mechanism.

Turner and colleagues [20] conducted secondary analyses of a large RCT [8] comparing MBSR, CBT and usual care for people with chronic low back pain. They examined whether mindfulness and pain acceptance – hypothesized to be mechanisms specific to MBSR -- would increase more in MBSR than in CBT, and whether pain catastrophizing and pain self-efficacy – hypothesized to be mechanisms specific to CBT -- would change more in CBT than in MBSR. Only two of nine comparisons between MBSR and CBT of pre to post mechanism changes were significant, and in directions opposite of hypotheses. Namely, pain catastrophizing decreased more in MBSR than in CBT, and one aspect of mindfulness increased more in CBT than in MBSR. Turner and colleagues did not report analyses of change scores, but other investigators have. Vowles and colleagues [26] showed significant changes from pre- to post-treatment in measures of both acceptance and pain catastrophizing during a CBT-based program; changes that correlated similarly with pre to post outcome changes. Acceptance and pain catastrophizing change scores were also correlated significantly. These findings were replicated in studies of CBT-based multidisciplinary chronic pain programs [1,2]. Together, findings do not support the conceptualization that different treatments produce outcomes primarily along distinct pathways specific to certain interventions, but instead raise the possibility that different treatments achieve gains through shared underlying mechanisms. CBT, MBSR, and ACT theories describe different principles by which people with chronic pain can aggravate or improve their experience, but extant data suggest that their theoretical distinctions may contribute little to actual outcomes, whereas their commonalities contribute much.

This phenomenon intersects with another phenomenon: different treatments produce largely similar outcomes [13,22]. A case in point is findings from the parent study of Turner and colleagues, which revealed no meaningful differences on primary outcomes between MBSR and CBT [8]. Indeed, the Cherkin and Turner studies illuminate the crossroads I believe the psychosocial chronic pain treatment field has reached: different treatments produce similar outcomes and may do so via similar mechanisms.

However, we still do not know precisely what those shared mechanisms are, or how they are most effectively stimulated. Thus, we may profit from shifting the bulk of research attention away from the 10% of the tip of the therapeutic iceberg (i.e., developing new treatments based on new theories), and focus more on the 90% of the hidden iceberg that carries most of the mass (i.e., shared mechanisms). Profit us how? By doing so, we may be able to improve the effectiveness of psychosocial pain treatments. Rather than joining in what appears to be a continuous reinvention of the wheel by comparing new treatments to control groups, we may need to realign conventional RCT science to facilitate the hunt for critical mechanism factors that make all treatments work. One of many alternative research strategies that could be pursued would take advantage of already existing efficacious treatments. We could identify key therapeutic mechanisms within these treatments by launching comprehensive and well-powered studies that incorporate multiple psychosocial chronic pain treatments and multiple mechanisms – à la Turner and colleagues -- to compare

and contrast mechanism effects on outcomes, to assess timing of mechanism changes during treatment, and, importantly, to determine which techniques best engender mechanism changes. Indeed, some form of behavioral activation – physical exercise [16]; stretching [15] – may represent particularly potent techniques to achieve not only behavioral changes, but what may emerge as crucial cognitive changes (i.e., increased self-efficacy). Once critical mechanisms are identified, we can devote energy to improving techniques and processes that fully engage and maximize the impact of these factors, when to engage them during treatment, and which combinations of mechanisms should be engaged for maximum benefit. To increase effectiveness of psychosocial chronic pain treatments, we may need to take such a “nuts and bolts” or “bottom-up” approach to get our hands on what actually drives the benefits we want.

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