

## The basic science/clinical science interface and treatment development

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### **Abstract:**

Psychological constructs often are incorporated into treatments before they are investigated systematically from a basic-science perspective. We discuss the potential costs of such a sequence of events and the potential benefits of closer working ties between basic and clinical scientists, and we consider how applying basic knowledge of cognitive processes could enhance our understanding of psychotherapy outcome and mechanisms of action. We call upon clinical and basic scientists to engage in a more “mindful” enterprise of translational research.

**Keywords:** basic science | clinical science | translational research | cognition | psychotherapy

### **Article:**

Publication of the article by Bishop, Lau, Shapiro, Carlson, and Anderson (this issue) proposing an operational definition of *mindfulness* provides an opportunity to observe how basic behavioral science and clinical science influence—or fail to influence—each other. The concept of mindfulness has been incorporated into psychological treatments despite the absence of a robust scientific understanding of the phenomenon itself. Along with the proposed operational definition, Bishop and colleagues present a thoughtful analysis of the nature of mindfulness and preliminary hypotheses regarding how the underlying psychological processes, the skills themselves, and the consequences of skill acquisition might be measured. The article represents a potentially important milestone for psychotherapy research, but it also illustrates a frequent paradox of psychotherapy research: pursuing the basic science *after* a treatment or technique has been disseminated.

In this commentary, we discuss some potential costs of this clinic-first scenario as well as the potential benefits of a more deliberate translational strategy. We then illustrate how basic and clinical science might work more synergistically by considering the challenges facing researchers who study possible mechanisms of action underlying therapeutic interventions.

There are numerous examples of psychological treatment strategies or techniques becoming popularized before the underlying principle or phenomenon is understood (Moras, 2002; Salkovskis, 2002). We believe that such examples outnumber cases in which strategies or techniques emerged or “crossed over” from basic science. For instance, both cognitive therapy (CT; Beck, Rush, Shaw, & Emery, 1979) and interpersonal therapy (IPT; Klerman, Weissman, Rounsaville, & Chevron, 1984) were designed and implemented as interventions for depression in the absence of a clear empirical basis in behavioral science. It was *after* those treatments became established that a corpus of basic research examining the psychological phenomena underlying each treatment emerged (particularly for CT). Mindfulness is the latest example of this trend for intervention development to precede basic science. We believe it is important to identify the potential *costs* of incorporating constructs that lack a basic-science foundation into treatments as well as the potential *benefits* of a more deliberate, mindful strategy in which basic research either precedes or accompanies clinical application of new constructs.

## **THE POTENTIAL COSTS OF PROCEEDING WITHOUT BASIC SCIENCE**

The field of psychotherapy research has progressed beyond the question of whether psychosocial interventions can be effective to grapple with more complex questions such as what makes a particular intervention work (Beutler, Moleiro, & Talebi, 2002). In particular, both researchers and clinicians seek to determine which intervention(s) will be most effective for a particular individual with specific problems (Beutler & Harwood, 2000). However, without a thorough understanding of the interventions that therapists might use, it will not be possible to predict with appropriate accuracy and reliability which would be best for a given patient. There are critical questions about a given clinical technique or intervention approach that cannot be answered without basic science data. Is it really what we think it is (construct validity)? How can it be measured? What individual difference and/or situational variables predict its onset, maintenance, and disappearance? Under what circumstances is it most, or least, effective?

But given the long history of mindfulness-based techniques, wouldn't it be unrealistic to expect clinicians to forego their use until psychologists had determined exactly what mindfulness was? Our reply is as follows. It would indeed be unrealistic and unwise for clinicians not to consider using mindfulness techniques *as long as their clinical practice was scientifically grounded*—that is, as long as clinicians recognized their work as *applied behavioral science* and understood the distinction between empirically supported aspects of psychotherapy (techniques as well as relationships) and not-well-understood interventions (McFall, 2000). A scientifically grounded approach to psychotherapy would encourage clinicians both to return to the basic science literature for ways to conceptualize the techniques they seek to use, and to contribute to the development of basic knowledge as they learn about concepts of interest through their clinical practice.

## **THE POTENTIAL BENEFITS OF TRANSLATIONAL APPROACHES**

A recent National Institute of Mental Health (NIMH; 1999) task force report observed that interventions in mental health seldom incorporate knowledge and methods developed from basic behavioral science. The report noted that “behavioral science offers critical insights into the

nature of mental illness and mental health, and the processes and interventions that can prevent illness or lead from disorder to remission, recovery, and rehabilitation” (p. 13). Although collaborations between basic and clinical scientists remain infrequent, the benefits of such collaborations are clear. We briefly note just three:

Availability of data regarding phenomena of interest: The likelihood that an important phenomenon or treatment process already has been observed (at least in analog form) and described systematically is great (Strauman, 1995).

Measurement techniques: The likelihood that an instrument or method already exists that can provide reliable assessment of the phenomenon or process of interest also is great.

Theoretical basis for hypotheses regarding mechanisms of action: Conceptual models of the phenomenon of interest provide a logically and empirically sound basis for developing hypotheses about how, and under what circumstances, an intervention might work.

## **BASIC SCIENCE AND CLINICAL SCIENCE IN PARTNERSHIP: STUDYING COGNITIVE CHANGE IN PSYCHOTHERAPY**

The benefits of a translational approach warrant further discussion. Consider how techniques such as mindfulness relate to basic knowledge regarding cognition and cognitive change, and how a focus on developing treatment interventions provides the opportunity to move toward a merging of basic science and clinical science. Psychotherapy research has become increasingly focused on determining mechanisms of action (Persons & Miranda, 1995) and how those mechanisms relate to recovery and relapse prevention. The mindfulness article draws attention to one potentially important factor concerning underlying mechanisms: the concept of skill acquisition (particularly cognitive or metacognitive skills) and its role in therapeutic change.

Bishop et al. proposed that mindfulness is best conceptualized as a skill acquired through instruction and practice. This conceptualization can provide a foundation for exploring basic questions about treatment-related change. For example, one might ask whether the cognitive processes underlying mindfulness, taught in the context of affect management, are fundamentally different from cognitive processes involved in affect management in nonpatient controls who have not been taught mindfulness. Skill-based change may involve the engagement (or even formation) of entirely new cognitive systems not seen in nonpatient controls or in patients treated with other approaches (e.g., pharmacotherapy). There is growing evidence that the cognitive changes that take place during therapy are associated with changes in basic neurobiology, such as in synaptic plasticity (see Liggan & Kay, 1999, for a review).

Integrating basic research on information processing and the neural underpinnings of cognition with clinical research on psychopathology and processes of change has much to offer. One such potential contribution is with regard to measurement of cognitive change in therapy. Clinical researchers often rely on self-report instruments with high face validity (e.g., the Automatic Thoughts Questionnaire [Hollon & Kendall, 1980] used to assess changes in negative thinking). However, such instruments cannot measure underlying cognitive processes. Without more specific, targeted measures, the distinction proposed by Bishop et al. between the cognitive

processes underlying mindfulness and the *products* of those processes is unlikely to be clinically or scientifically meaningful. There are many possible information processing “pathways” leading to the same skill-acquisition outcome.

Assuming that symptomatic improvement is correlated with skill acquisition, how can we be sure that the improvement observed has resulted from that skill? Changes in end-product measures alone may suggest that a shift in underlying cognitive organization has taken place, but the specific nature of the underlying change will remain elusive. However, by developing and testing hypotheses about the basic processes likely to be modified by skill acquisition (e.g., episodic memory), the neurobiological correlates of those processes, or both, the possibility of a significant advancement of both basic and clinical science increases.

It is here that psychotherapy researchers are most likely to benefit from integrating concepts and measures from behavioral science. Research in basic and social cognition offers a range of methods to investigate how information processing influences mood and motivation. Technological advances such as functional neuro-imaging may allow researchers to learn more about the cognitive and neurobiological processes associated with psychopathology and how treatment influences them. Conversely, the challenge of extending basic-science theories and methods to study rich, complex phenomena such as mindfulness is just as likely to benefit our fundamental understanding of cognition.

How can we study therapy-related skill acquisition and cognitive change in a more meaningful and informative way? Bishop et al. remind us that we must first operationalize the therapeutic strategies hypothesized to be “active ingredients” in the change process, which itself is a major challenge in light of the ambiguities surrounding studies of putative therapeutic mechanisms of action (Messer & Wampold, 2002). But in order to establish clear causal links between interventions and outcomes, operationalizations of intervention techniques must be rooted in a solid theoretical and empirical foundation. Interventions that lack such a foundation (e.g., EMDR; for a critique, see Lohr, Lilienfeld, Tolin, & Herbert, 1999) force clinical researchers to work backwards and, in the absence of any guiding theory, generate posthoc speculations regarding possible active components. Unfortunately, such work often takes place long after the intervention has been popularized and the opportunity for high-impact translational research has been lost.

Once putative “active ingredients” have been identified and operationalized, how can it be determined whether changes in psychological processes of interest have occurred? It is not possible to rely on self-reports of changes in cognitive or metacognitive processes that may or may not be accessible for conscious evaluation. This apparent obstacle actually represents an important opportunity for the field, because it forces us to conceptualize change processes in basic-science terms. Cognitive psychology and cognitive neuroscience offer a plethora of useful data and theory regarding learning, memory, information processing, and neural systems. In this regard, we appreciate the suggestions offered by Bishop et al. regarding *how* mindfulness and related skill acquisition might be assessed, using experimental tasks that tap into basic cognitive processes (e.g., the emotional Stroop task).

Finally, the translational approach is applicable not only to treatment *development* but also to studies of treatment *process* and *outcome*. Outcome research could examine both whether therapy-based skill acquisition leads to changes in fundamental cognitive processes and whether such changes moderate clinical improvement. Although the question of symptom relief is undoubtedly an important one, questions regarding how and why a treatment works ultimately will be more valuable in improving efficacy, predicting outcome, and preventing relapse.

In summary, the article by Bishop et al. is a welcome effort to link clinical intervention more thoroughly with basic science, albeit after the popularization of mindful-ness-based techniques. We urge clinical investigators to take a mindfully translational approach in which clinical scientists develop and validate interventions by linking them with basic behavioral science.

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