RDoC matrix, impeding clinicians' ability to relate to RDoC-themed research studies.

So what can be done to mitigate this situation? Although in his paper Cuthbert repeatedly discusses the need for a "transition" from DSM/ICD to RDoC and provides concrete suggestions for how this may be done (e.g., incorporating "various combinations of RDoC constructs and DSM/ICD disorder categories in experiments"), according to Cuthbert such "transitional research designs are best regarded as temporary heuristics for a limited number of studies".

Rather than viewing the retention of elements of the DSM/ICD system as heuristics to be phased out as soon as possible, it should be a required part of any RDoC-oriented research project to provide linkages or crosswalks between the RDoC design and the DSM/ICD classifications. At a minimum, study populations used in RDoC-themed protocols should also be described in terms of DSM-5/ICD-11 diagnoses, if for no other reason than to provide a touchstone to the clinician for appreciating the types of subjects included in the study.

For example, according to Cuthbert, a "prototypical RDoC design... would include subjects with a wide range of normal-to-impaired functioning with respect to the dimensional constructs of interest". It would be relatively straightforward to diagnostically assess these subjects, not for the purposes of the experimental design but to characterize the study population in terms understandable by clinicians.

Only by explicitly building bridges between the DSM/ICD and RDoC worlds can the field continue to promote some level of communication and interaction between clinicians and researchers.

References

1. Robins E, Guze S. Establishment of diagnostic validity in psychiatric illness: its application to schizophrenia. Am J Psychiatry 1970;126:983-7.
2. Spitzer R, Williams J. Having a dream: a research strategy for DSM-IV. Arch Gen Psychiatry 1988;46:959-60.
3. Charney D, Barlow D, Botteron K et al. Neuroscience research agenda to guide development of a pathophysiologically based classification system. In: Kupfer D, First M, Regier D (eds). A research agenda for DSM-V. Washington: American Psycihiatric Association, 2002:31-84.
4. Hyman S. Mental illnesses: genetically complex disorders of neural circuitry and neural communication. Neuron 2000;28:321-3.
5. Hyman SE. The diagnosis of mental disorders: the problem of reification. Annu Rev Clin Psychol 2010;27:155-79.
6. Cuthbert BN. The RDoC framework: facilitating transition from ICD/DSM to dimensional approaches that integrate neuroscience and psychopathology. World Psychiatry 2014;13:28-35.

DOI 10.1002/wps.20107

RDoC+: taking translation seriously

Kenneth W.M. Fulford
University of Oxford, Oxford, UK

Cuthbert's paper gives a helpfully detailed introduction to the RDoC framework for assimilating neuroscientific findings, aimed, ultimately, at more effective translation of research into practice (1). In this commentary, I take a step back from the details to look at RDoC's underpinning theory and at the implications of that theory for RDoC's translational aims.

The theory underpinning RDoC is that mental disorders are analogous to disorders in other areas of medicine such as cardiology. Cuthbert, for example, compares RDoC's dimensions with (the also dimensional) hypertension (1). Insel, too, draws on the analogy at several points in his blog introducing RDoC as Director of the National Institute of Mental Health (NIMH). "Imagine – he writes, referring specifically to DSM's failure to translate research into practice – deciding that EKGs were not useful because many patients with chest pain did not have EKG changes" (2).

The implication, then, is that, in focussing on pathological mechanisms, RDoC takes the analogy with medicine more seriously than DSM. The concern, though, is that by the same token RDoC is at risk of neglecting the symptom side of the theory. Medicine is of course concerned equally with symptoms and with underlying mechanisms. Neglecting *either* side of the theory, therefore, neglecting either symptoms or mechanisms, could prove equally fatal to effective translation of research into practice.

To be clear, the concern here is not that symptoms (broadly construed) are actually excluded from RDoC. True, the particular symptoms on which DSM is based are not in RDoC (1). But "observable behavior" was included in NIMH's original strategic brief; symptoms are covered in RDoC itself (respectively by "self reports" and "behavior"); psychopathology is flagged in the title of Cuthbert's commentary; and, as Cuthbert indicates (1), "impairments that patients experience in their lives" were important in the development of the RDoC framework. So, the concern is not that symptoms are excluded but rather that, compared with mechanisms, RDoC is at risk of not taking them seriously enough.

Thus, Cuthbert's examples – reward, threat and memory (1) – although certainly showing the value of more precise understanding of symptoms as well as of brain mechanisms, all regard relatively straightforward aspects of subjectivity compared with the subtleties of such staples of mental disorder as belief, perception, volition and emotion. Insel, similarly, in his reference to EKGs, writes as though heart disease were diagnosed clinically by chest pain as such, whereas it is specifically *anginal* pain that is diagnostic of heart disease,

which, indeed, may not be in the chest at all but in the throat or left arm. Again, Cuthbert is well aware of the complexities of subjectivity. The concern is that, compared with mechanisms, these complexities fail to make it into RDoC's headlines. The relevant units of analysis, indeed, "self reports" and "behavior" – if the lists of instruments given in NIMH's domain workshop reports are any guide – rely heavily on questionnaires and rating scales no different in principle from those on which the DSM itself was originally constructed. So, with nothing essentially new on the symptom side of RDoC, there is a clear risk that it too, like the DSM, will fail to support effective translation of research into practice (3).

That said, Cuthbert emphasizes that RDoC is an inclusive, not exclusive framework. It will be measured, he says, "by the number of research programs that. . . outstrip the RDoC matrix to move in entirely new directions" (1). Scientifically, this promissory note towards an RDoC+, as it might be called, is perhaps the most important statement in Cuthbert's article. Progress in science, as the philosopher of science Karl Popper pointed out (4), depends on bringing together imaginative conjectures with the disciplines of trial by experiment. Social science research has identified similar conditions for creativity (5). It is just this vital combination of imagination and experiment that an open and inclusive RDoC of the kind Cuthbert anticipates will support.

If RDoC fails to deliver on this promissory note, it will not be for lack of resources. There is a veritable raft of new sciences of the mind that could be added to the neuroscience-focussed RDoC to give a symptom-enriched RDoC+. Prominent among these new sciences of the mind, in this centenary year of Karl Jaspers' *General Psychopathology*, is the continuing importance of phenomenology (6). Cuthbert is right to dismiss the merely "descriptive phenomenology" (1) of the DSM. But there are other more clinically realistic phenomenologies available for an RDoC+. Among these, "naturalized phenomenology" (7) connects philosophical phenomenology seamlessly with all the resources of cognitive science, which, in turn, as Cuthbert and others involved in planning RDoC were clearly aware (ref. 9 in 1), provides a natural bridge to the neurosciences (8). These resources, furthermore, together support computational approaches to psychopathology (9) that are directly conformable to the dimensional structure of the RDoC framework and the "precision medicine" (1) it is intended to foster.

In his book *The First Three Minutes*, the Nobel-laureate theoretical physicist Stephen Weinberg warned that in science "our mistake is not that we take our theories too seriously but that we do not take them seriously enough" (10). In rebalancing symptoms with mechanisms, RDoC takes the analogy between mental disorders and disorders in other areas of medicine such as cardiology more seriously than DSM. Taking the analogy seriously enough for successful translation of research into practice means adding to RDoC the resources of the new sciences of the mind.

References

1. Cuthbert BN. The RDoC framework: facilitating transition from ICD/DSM to dimensional approaches that integrate neuroscience and psychopathology. World Psychiatry 2014;13:28-35.
2. Insel TR. Transforming diagnosis. www.nimh.nih.gov.
3. Fulford KWM. From RDC to RDoC: a history of the future? http://blog.oup. com.
4. Popper K. Conjectures and refutations: the growth of scientific knowledge. London: Routledge, 2004.
5. Fulford KWM, Davies M, Gipps R et al. The next hundred years: watching our Ps and Q. In: Fulford KWM, Davies M, Gipps R et al (eds). The Oxford handbook of philosophy and psychiatry. Oxford: Oxford University Press, 2013:1-11.
6. Maj M. Introduction: the relevance of Karl Jaspers' General Psychopathology to current psychiatric debate. In: Stanghellini G, Fuchs T (eds). One century of Karl Jaspers' General Psychopathology. Oxford: Oxford University Press, 2013:xxiv-viii.
7. Zahavi D. Naturalized phenomenology. In: Schmicking D, Gallagher S (eds). Handbook of phenomenology and cognitive science. Dordrecht: Springer, 2010:2-19.
8. Broome M, Bortolotti L (eds). Psychiatry as cognitive neuroscience: philosophical perspectives. Oxford: Oxford University Press, 2009.
9. Fulford KWM, Broome M. Computational psychopathology: do it now! http://blog.oup.com.
10. Weinberg S. The first three minutes: a modern view of the origin of the universe. New York: Basic Books, 1977.

DOI 10.1002/wps.20106