

*In this issue we present an exchange of views arising from the DSM-IV diagnostic criteria for delusions. Anchoring the discussion is an article by Drs. Mujica-Parodi and Sackeim in which they examine the DSM-IV requirement that to be classified as a delusion, a belief must be discordant with beliefs ordinarily accepted by the patient's culture or subculture. They propose that an information-processing model would avoid what they regard as the relativism and ambiguity of this DSM-IV criterion. Drs. Cutting and Fabrega critique the model and reflect further on the diagnosis of delusions, and the authors reply.*

## Cultural Invariance and the Diagnosis of Delusions: Information Processing as a Neurobiologically Preferable Criterion

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Without question, the *Diagnostic and Statistical Manual of Mental Disorders*<sup>1</sup> functions as the bible of psychiatric diagnosis. DSM establishes the scope of psychopathology; it demarcates the boundary between the merely eccentric and the truly ill. Its power and influence cannot be underestimated, for how we choose to define an illness necessarily affects the nature of the very questions that we ask in furthering our knowledge about that illness.

DSM-IV classifies a belief as a delusion if and only if it contains four elements. These require that the ideation be

1. False.
2. Based on a faulty inference from reality (i.e., not simply false because of ignorance or wrong information).
3. Sustained in spite of clear evidence to the contrary.
4. Discordant with beliefs accepted by one's culture.

The negation of any one of these four elements is sufficient to rule out a diagnosis of delusional ideation. The first three conditions are intuitive; the last condition, we will argue below, is not at all obvious and makes evident some of our most fundamental assumptions regarding the nature of psychiatric illness. Thus, even if the condition of cultural nonconformity turns out to be neces-

sary—and we will make a case here that it is necessary—it is so for nontrivial reasons that deserve critical examination.

We first present below some of the problems raised by the “cultural condition.” We then offer a preliminary response to this critique within the standard framework of DSM and point out the shortcomings of this response. We next present a theory of delusions that is based on Johnson-Laird's experimental studies on what we call “conceptual model restriction” in normal cognition<sup>2,3</sup> and addresses the cultural condition from within the context of model restriction. Finally, we present some case examples to examine whether, in fact, model restriction is useful in diagnosing delusional ideation, particularly in cases that would be considered ambiguous by current DSM criteria.

### PROBLEMS WITH CULTURAL SUBJECTIVITY

The most striking feature of the cultural condition is that it is expressly relativistic. The only symptom of delusional ideation is the set of beliefs that the patient holds. However, a pattern of beliefs presented by one person may be evidence for mental illness, whereas the identical pattern of beliefs presented by another person within a different cultural context may not be evidence for mental illness. On a superficial level, this makes it hard to conceive of delusional ideation as a medical condition that is reducible to a physiological pathology. After all, a heart murmur is evidence of a heart abnormality whether it is diagnosed in New York or in Bangladesh.

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Although other facts about a patient may be relevant in deciding on a diagnosis in medicine (a prior myocardial infarction, for instance, in the case of the murmur), they are so only in the context of symptom underdetermination. Even if a particular symptom may be evidence for more than one underlying cause, the presence of that symptom presents insufficient information by itself to distinguish between possible causes.

The distinction between symptom underdetermination and symptom relativism is subtle but nonetheless real. The former concerns incomplete information about a pathology; the shift is therefore between diagnoses. The latter concerns not the nature of the diagnosis, but the nature of the actual pathology that underlies that diagnosis. In medicine, a one-to-one correlation between a pathology and its diagnosis is presumed to exist; in other words, one body's state should not, in principle, produce two different and mutually incompatible diagnoses. A person's neurobiological framework (i.e., actual pathology) presumably is not affected by whether that person's residence is in Bangladesh or New York. Therefore, a potential paradox in establishing delusions as a medical (versus, say, a sociological) disease emerges if the same person can be diagnosed correctly in different and mutually incompatible ways simply because of his or her social context.

The cultural condition can be defended from the problem of physiological irreducibility in two ways. First, one can argue that the heart murmur example misses the point by presenting a false analogy. What is relevant about diagnosing delusions in Bangladesh versus New York is that the systems of beliefs in which those delusions occur, their context, is different. A direct analogy to the heart murmur case, therefore, would require that the standard heart be different in New York and Bangladesh. If so, it might indeed be difficult (if not theoretically impossible) to characterize a heart in one location as diseased from the vantage point of the other location, since the standard for each is different. Even if one heart is intrinsically less efficient than the other, we would be hard pressed to label as "sick" a characteristic that is the norm. For example, we do not consider the basset hound, an animal of astonishingly inefficient design, to be a "diseased dog," but rather a separate breed.

A second response to the issue of physiological irreducibility is to suggest that the underlying problem, precisely that to which the delusions are physiologically reducible, causes one to believe in things that are not accepted by one's culture. The fourth condition in the DSM criteria (the cultural condition) is really only a consequence of the third condition (perseverance in the face of disconfirmation) if we make the probabilistic as-

sumption that typically the greater the number of people who endorse a factual belief, the greater the likelihood of its truth. Thus, the very fact that a belief's negation is endorsed by many people should count as "disconfirmation" for that belief. We shall elaborate on this view in a later section.

The second problem with the cultural condition, vagueness, is related to the first. In principle one cannot determine whether a belief conforms to a person's "culture or subculture" unless one can characterize the boundaries of that culture or subculture. Yet there is no precise method for distinguishing a subculture's ideology from a communally held delusional belief. While it is easy to define two categories of beliefs, those that are held by most of the members of a homogeneous culture and those that are held solely by one individual, the vast proportion of rationally unjustifiable beliefs fall in between the two. To name just a few interesting examples, consider *folie à deux*, millennial cults, national hysteria, and most, if not all, organized religions. If DSM can consider *folie à deux* as sharing a delusion, then why not a *folie à trois*? Or a *folie à trente*, for that matter? If DSM can consider families to share in delusions, then why not several families or entire groups of people who are genetically unrelated but who consider themselves to be family? For that matter, why should the number of people who share a symptom be theoretically relevant at all? The person with the heart murmur still has a heart murmur if his entire town does as well. Although, as we noted, a characteristic may very well not be classified as a disease if it is pervasive enough to be considered as occurring "by default" (as with the unfortunate basset hound), the characteristic obviously exists, independent of diagnosis.

On the other hand, if some objective measure of minimal functioning can indeed be defined ("working" versus "not working," for instance), then a characteristic can be classified in terms of whether it impedes or promotes functioning. We will argue here that such an objective measure exists in the case of belief formation. Just as we can plausibly define a "functional heart" as one that permits an organism to go out and perform the activities that are required to sustain that organism, we can plausibly define a "functional rational structure" as one that preserves truth-value enough of the time to allow the individual to 1) survive physically and 2) communicate socially—the two being usually linked.

These two desiderata, physical survival and social communication, are objective even though they admit to degree. Because they are objective criteria, we would expect them to fall outside of the domain of culture. It will be objected that social communication is itself social, of course, and thus might well vary according to

culture. Physical survival might also vary, for that matter, since the physical requirements of different cultures are different—consider a primitive agrarian culture versus one in which the majority of people sit in offices. Yet this is to miss the point. What we are looking at in the case of rational structure is something much more fundamental than the content of beliefs; it is the ability to think (regardless of particular content) in a manner that preserves truth-value. “Preservation of truth-value” may be defined as the ability in individuals to draw conclusions that are consistently true (i.e., that correspond with “reality” in the purely factual sense), from premises that are also true.

The connection between thinking in ways that preserve truth-value and our two desiderata of minimal functioning (physical survival and social communication) is commonsensical. Individuals who have true knowledge that they are in front of a hole are less likely to fall into it. Having true knowledge of the fact that winter will inevitably follow summer, one can plan ahead and stockpile food. By extension, a group of individuals who have true knowledge will have a shared frame of reference that will allow them to communicate. This point is less obvious because we can easily imagine a large group of people who have shared false knowledge that acts as a shared frame of reference, but this, as we shall argue later, is a special case. The relevant premise here is that one can be wrong in a very large number of ways, but one can be right in only one way. For example, if my telephone is black, then there is only one true statement about its color: My telephone is black. However, there are a very large number of statements about its color that are false: My telephone is white, My telephone is brown, My telephone is chartreuse, etc. Since the false statements are all equally wrong, we would not expect the choice of one to be favored over another. Therefore, the probability that more than one person would choose the same wrong statement is exceedingly small because the possibilities from among which one can choose are very large. The probability that each additional person would choose the same wrong statement is even smaller by far. We can imagine that if each person in a society had a different view about the color of the telephone (and a different view about everything else as well), the members of that society would find it impossible to communicate with one another. Therefore, mutual and consistent access to truth provides the most efficient manner of communicating.

Because “what is factually true” exists independently of the cultural vantage point from which one stands, access to that knowledge is not culturally relative. If there is a hole somewhere in Bangladesh, it is just as much a hole whether I am a native or a tourist. Knowl-

edge of its existence will prevent me from falling into it whether I am a native or a tourist. We will be able to discuss its dangers only if we all recognize it as a hole, and that recognition is independent of our cultural backgrounds. Far from being culturally relativistic, recognition of truth is perhaps the only thing that cuts across cultures and allows us to see each other as common creatures of rationality. Cultures may have different values, but presumably they do not have different formal systems of logic.

### PRAGMATIC MOTIVATIONS FOR CULTURAL SUBJECTIVITY

Perhaps this is too abstract. The likely implicit motivation for the manner in which delusions are defined in DSM is twofold: the need to identify pathology in the face of widespread nonrational or false beliefs (diseases being, by definition, low in prevalence), and an emphasis on functionality. The cultural condition presumably addresses both. Or does it?

Consider two cases. The first is a student who believes that he will perform well on his exams only if he is in possession of a certain “lucky” rabbit’s foot during these exams. Since he owns the rabbit’s foot, bringing it to his exams does not present a problem. He continues to hold this belief even though his performance on exams varies in direct correspondence to the amount of time that he spends studying in preparation for these exams and is uncorrelated to whether the rabbit’s foot is in his possession. Instances in which he has the rabbit’s foot and does well reinforce his belief, but instances in which he does well without the rabbit’s foot or does poorly with the rabbit’s foot are discounted as insignificant aberrations.

The second case concerns another student, who believes that she will perform well on her exams only if she sees nine parked red cars on the day that she takes her exam. This belief causes problems for the student, for she often spends hours before her exams running around trying to find the nine parked red cars and sometimes is unable to find them even after an exhaustive search. This student also continues to hold on to her belief in spite of the fact that her performance varies in direct correspondence directly to the amount of time that she spends studying in preparation for these exams and is uncorrelated to whether she has, in fact, found the nine parked cars. Again, instances in which she has found the nine parked cars and does well reinforce her belief, while instances in which she cannot find the nine parked cars but does well, or finds the nine parked cars

but does poorly, are perceived as insignificant aberrations.

Both students hold false beliefs in spite of evidence to the contrary. The first student's false belief is not uncommon, while the second student's belief is considered extremely odd. The first student's belief improves his level of functioning by providing an easily attainable (false) sense of security. The second student's belief impairs her level of functioning by making the object of (false) security beyond her control. So, is one case delusional and one not delusional because of considerations of cultural acceptance, or because of considerations of functionality? This is a misleading question, for it assumes that in only one case are the beliefs delusional. We will argue that by the criteria for model restriction given below, both students are delusional, but that one of the delusions is more common and socially acceptable precisely because it does not have a significant impact on functioning. Although considerations of functionality may determine who receives treatment on a purely practical basis, the underlying mechanism of immunity to contradictory evidence remains the same. Presumably the more immune one is to contradictory evidence, the more extreme one's delusions will be, and therefore the more likely they are to affect one's functioning and be culturally unacceptable. But to look solely at cultural acceptance and functioning is to mistake the symptom for the cause. We will look at cases of culturally shared rationally unjustifiable belief after a brief presentation of a model of delusions that is based on immunity to contradictory evidence ("model restriction") in the following section. We will then refine the formulation of the cultural condition in terms of that model.

#### A NEW DEFINITION OF DELUSIONAL IDEATION IN TERMS OF MODEL RESTRICTION

Johnson-Laird's experimental studies on the cognitive functioning of healthy individuals suggest that rather than starting from a few premises and deriving conclusions in a systematic deductive manner, most people take in information, form mental models (hypotheses) with respect to that information, then gradually amend ("restrict") their models by interaction with contradictory evidence.<sup>2,3</sup> Thus, if a little boy has an experience with a cat who scratches, he may form the hypothesis that all cats scratch and that the only animals that scratch are cats. Later experience with affectionate cats and surly hamsters may cause him to amend his model: some cats scratch and some do not; some hamsters scratch also. In this manner, our ideas are constantly affected by the increasing information to which we are

exposed. As the boy grows up, he presumably incorporates more fundamental principles into his rational structure that act as a filter on new experiences: just because one  $x$  does  $y$  doesn't mean that all  $x$  do  $y$ , for instance. These principles signal the likely presence of counterexamples to his original hypothesis to which he can be alert. Johnson-Laird's work has shown that simply being presented with counterexamples to one's theories is not sufficient to reasoning well; counterexamples must first be recognized for what they are.

Delusions may be viewed as the natural consequence of a failure to distinguish conceptual relevance: irrelevant information, in the form of disconnected experiences, is taken to be relevant in a manner that suggests false causal connections, whereas relevant information, in the form of counterexamples, is ignored. Interestingly, there is a substantial amount of evidence that individuals with schizophrenia have a similar problem in distinguishing between relevant and irrelevant sensory stimuli.<sup>4,5</sup> The classic case of sensory filtering is that of the "cocktail party phenomenon," in which one can focus on the conversation of one's partner amidst the loud drone of a hundred other conversations. It could be hypothesized that the tendency to view disparate and unconnected pieces of information as being all equally important, gathered within the context of a heightened sense of alarm, is responsible for the sort of conspiratorial delusions that are so common among paranoid patients. Garety<sup>6</sup> has suggested a model of belief formation that is similar.

The advantage of considering delusions within the context of model restriction is that it provides a coherent framework from which the first three DSM conditions often follow (falsity, faulty inference, immunity to contradictory evidence) and preserves the core of the fourth condition without the relativism and vagueness that characterize its current formulation. We would argue that the consequences of the cultural condition are intuitively maintained by making a distinction between beliefs that are arational and beliefs that are irrational. "Arational" beliefs are those that are held without rational justification, in the absence of information to support them. "Irrational" beliefs are those that are held in spite of evidence to the contrary; the problem here is not lack of information, but rather refusal to acknowledge it. The little boy who initially concludes that "all cats scratch and the only animals that scratch are cats" on the basis of his limited experience is not delusional in making this hypothesis. The world does not necessarily lay all of its relevant premises before us at once. He is only doing what all of us do regularly in the absence of full information. But the boy who grows up into a man and still maintains that "the only animals that scratch

are cats," in spite of experience with long-clawed surly hamsters, is delusional, by our definition. It may be a delusion that has little or no impact on his ability to function (in which case his delusion may never be diagnosed as such), or it may be totally incapacitating. It may be a delusion that is his alone, or it may be a delusion shared by a whole slew of cat-hating activists. But both of these judgments (as to functioning and social commonality) merely function as modifiers to the diagnosis—they do not define the diagnosis itself.

Because model restriction provides an objective set of criteria for diagnosis, it is independent of cultural setting. On the other hand, it also neatly excludes a whole region of arational belief that is largely culturally influenced. Common religious beliefs such as the "second coming," God, or heaven cannot be considered "delusional" because they admit of no counterexample: future events haven't yet occurred and thus cannot be contradicted, and nonphysical entities cannot be contradicted by physical evidence. Belief in the power of prayer, for instance, may be labeled as either arational or irrational, depending upon the ground rules that one uses to characterize possible responses to the prayer. Obviously, if the answer to a prayer must always be "yes," then any instance in which one prays for  $x$  and  $x$  does not occur must constitute a counterexample. Because it is often the case that people who pray do not receive what they prayed for, the possibility of having "no" as an answer to their prayers permits them to go on praying without having to face disconfirmatory evidence. Therefore, in evaluating an individual who is markedly religious (who fervently prays, for instance) for evidence of delusional ideation, it is necessary to determine whether or not the individual's maintenance of his or her religious beliefs requires ignoring empirical counterexamples to those beliefs (in this case, by answering the question, "is 'no' a possible answer to prayer?").

A potential difficulty is that many "bizarre" delusions (i.e., delusions defined by DSM as those whose content is not physically possible) would also seem to evade diagnosis on similar grounds. For the patient who considers himself to be an ambassador from Alpha Centauri, what counts as a relevant counterexample? And for the patient who believes that his thoughts are being controlled by an outside source, what counts as relevant counterexample? For many delusions, the intuitive problem is not that we have reason to believe that they are false, but rather that we have no reason to believe that they are true. Yet these would appear to be "arational" and thus by our earlier description would not be considered to be "delusional."

This is the case only if we neglect contextual restrictors. We suggested earlier that the little boy, as he grows

older and more experienced at having his hypotheses contradicted, might eventually filter his hypotheses through a set of conceptual rules that automatically restrict his models. These rules would include probabilistic maxims of the following type: the future is likely to resemble the past; information that is gathered from many sources is more likely to be true than information gathered from only one source; one should give higher credence to events of intrinsically higher probability and lower credence to events of intrinsically lower probability; some coincidental events should be judged as being random rather than causal because they share no other relevant features; the likelihood of events occurring randomly is inversely proportional to the number of times that they occur coincidentally; and so on. The fact that these are identified as "common sense" is hardly accidental. They form the basis of our communal experience of the world. These contextual premises themselves provide preliminary counterexamples and serve to restrict models at perhaps an even more fundamental level than do empirical counterexamples. The hypothesized failure of delusional patients to make adequate use of contextual restrictors is consistent both with studies that have shown a tendency for them to "jump to conclusions" in forming judgments<sup>7,8</sup> and with patients' focus on present information to the exclusion of relevant past experience.<sup>9</sup>

Contextual restrictors may provide the needed distinction between bizarre delusions and commonly shared arational beliefs. This is because arational beliefs that run counter to the opinions of one's peers are *prima facie* examples of immunity to (contextual) counterexample, since the experiences and conclusions of others are a valuable tool in preserving truth-value. Bizarre delusions typically violate not only the criterion of "peer review," but other contextual restrictions that govern causation, regularity, and randomness as well. What is perhaps most critical here is not just that patients' beliefs are of low probability, but that the patients' "investment" in these beliefs is disproportional to their probability of being true. Thus, a woman who believes in the Virgin Mary's potential to perform miracles is not necessarily delusional if her arational belief does not prevent her from taking steps to act on her own behalf. The same believer, on the other hand, might very well be recognized as delusional if she gives away all of her possessions and takes to sea in a leaky boat in the expectation that she will be saved. Of course, these cases are not limited to the religious domain; a similar example might be drawn with an optimistic buyer of lottery tickets. It is important to note that probabilistic considerations are relevant only in the face of arational beliefs; irrational beliefs are always, upon this model,

considered to be delusions, regardless of functional or social considerations. Rational false beliefs, on the other hand, are always considered to be nondelusional, again regardless of functional or social considerations. Rational false beliefs are defined here as those that would have been likely to be true given contextual premises, and for which no counterexample has yet been presented. An example would be the parent who believes that his or her child is in school because the child is usually in school during the day, unaware of the fact that the child has been taken to a hospital.

Because assessment of immunity to counterexamples requires two variables that are evaluated with respect to one another—the presence of counterexamples versus the recognition of counterexamples—it follows that the severity of a delusion can be described according to that continuum. (The model is set forth in Table 1.) In most circumstances, the degree of immunity is not neatly quantifiable because the presence of counterexamples must be estimated. However, intuitive distinctions can still be made. The woman who believes that her neighbor hates her is presumably more delusional if she bases her judgment on two interactions consistent with her belief and fifteen interactions inconsistent with her belief than if she bases her judgment on two consistent interactions and three inconsistent interactions. The critical issue is how much information must be ignored in order to maintain the belief, where the amount of information one must ignore is directly proportional to the severity of the delusion.

This “mathematics of counterexamples” would account for our perception that bizarre delusions are symptoms of a more severe pathology than non-bizarre delusions. For any given false belief, the number of actual counterexamples is relatively small because the opportunities for testing the belief are limited by its content. For example, if I believe that my neighbor hates me, then the possibilities for my confronting counterexamples are limited to the number of my possible interactions with that neighbor. On the other hand, contextual counterexamples, being much more general guidelines for how the world works, are found at every

turn, and their applicability is not limited by exact content. Contextual rules about causation and randomness, for instance, are reinforced within a wide variety of situations, from the machinations of a job promotion to the catching of a cold. Since the opportunities for counterexample are so much more prevalent, the violation of contextual restrictors must necessarily ignore a much larger share of the world’s available information. Therefore, by our hypothesis, the delusions that such violations produce would be predictably much more severe.

From this viewpoint, then, the distinction between bizarre and non-bizarre delusions is one of degree, rather than one of kind. For both, the underlying mechanism is a failure to adequately restrict one’s mental models. For bizarre delusions the failure is more diffuse, encompassing recognition not only of concrete counterexamples to the model, but of contextual ones as well. The hypothesis that bizarre delusions exist as a proper subset of non-bizarre delusions is obviously testable, for it predicts that patients with bizarre delusions will have the cognitive characteristics of patients with non-bizarre delusions, while the converse will not be true.

CONCLUSIONS AND CASE EXAMPLES OF SHARED BELIEFS

It may be objected that this is only a question of redefinition by means of added modifiers, that what we call “delusions that are false and impair functioning,” DSM simply calls “delusions.” Moreover, since generally only people with delusions that are “false and impair functioning” will even be seen for treatment, why not restrict the set, at least for clinical purposes? We have argued and will argue that “delusions” need neither be false nor impair functioning to be the product of pathological reasoning and to appear intuitively deviant. We have emphasized above that broadening the diagnosis to avoid socially relativistic criteria simplifies the task of finding a biological correlate to delusions and gains much-needed precision. Our argument began from the observation that if symptoms of psychosis are to be consid-

TABLE 1. Model restriction criteria for the diagnosis of delusions

Basis for Belief	True Belief	False Belief
Irrational (holds belief in face of actual counterexample to belief)	Nonexistent, by definition	Delusional
Arational (no actual counterexample; no rational evidence for belief)	Violates contextual restrictors: delusional No violation of contential restrictors: nondelusional	Violates contextual restrictors: delusional No violation of contextual restrictors: nondelusional
Rational (no actual counterexample; rational evidence for belief)	Nondelusional	Nondelusional

ered brain-based, then their presence must signify an impairment of cognitive functioning, where “adequate cognitive functioning” can be objectively defined. We have made the claim that such a standard exists. This is the preservation of truth-value, analogous to other medical standards of functioning, in that it makes the survival of the organism primary. We have said that reasoning in the real world cannot be straightforwardly deductive because of the lack of a prespecified set of relevant premises. A persuasive alternative to deductive inference was suggested in the form of Johnson-Laird’s theory of model restriction, which gives a large role to recognition of counterexamples in creating true belief systems about the world. We are then able to use a revised theory of model restriction to classify beliefs as being either pathological or nonpathological symptoms by reference to their violation of either actual (i.e., concrete) or contextual (i.e., probabilistic) counterexamples.

This revised diagnostic criterion shifts the focus from whether the belief is true and culturally accepted to the question of how the belief was arrived at and maintained. It is only the latter issue that is dictated by neurobiological function; the objective state of the outside world and its culture are not. Since we believe that only factors that have biological effects can be relevant in making a medical diagnosis, we believe that the diagnostic criterion suggested above is a useful alternative to the traditional manner of viewing delusions. The usefulness of the cultural condition, in this view, is that it makes evident one of our strongest contextual premises, that beliefs that are held by many people are more likely to be true than beliefs that are held by few.

**The Trembling Flower** (arational; true; reduced functioning). A 19-year-old college student in New York is diagnosed with mania. He believes that his girlfriend, a student at Berkeley, is cheating on him. He states his reason for this belief in the following manner: “The trembling of the petals on this flower prove to me that my lover is betraying me.” The flower in question is a lily that she has given him during a visit. The girlfriend confides privately to the psychiatrist that she is, in fact, having an affair in California with a classmate and that she has not told her boyfriend.

*Comments:* This case qualifies as a delusion by model-restriction criteria (because of contextual counterexamples), but not by DSM criteria (because the content of the belief is true). This type of example points out the limitations of the DSM requirement that a belief be false and supports our argument that what is pathological about delusional ideation is not the content of the belief, per se, but the method by which it is reached and maintained.

**The Practice of Voodoo** (irrational; false; uncertain effect on functioning). Voodoo is a culturally accepted religion in the Caribbean Islands, as well as in areas of New York City. A common practice is to attempt to affect a person, either positively or maliciously, by manipulating effigies that contain fragments of the person’s clothing, nails, or hair. The type of manipulation done to the effigy is supposed to correspond to the type of benefit or injury done to the person it represents. Because the benefit or injury seldom follows the manipulation, disconfirmation is nearly universal.

*Comments:* From a simplistic point of view, this case qualifies as a delusion by model-restriction criteria (because of actual counterexamples), but not by DSM criteria (because the belief is shared by a culture). However, what complicates the matter is that not all members of the culture can be characterized uniformly, since some have personal experience with actual counterexamples while others have only confirmational experience based on biased hearsay. The degree to which individual members of the culture do or do not suffer from delusion would be dependent on the degree to which they have had to ignore the presence of counterexamples in order to maintain their beliefs. This variety of experience is something that DSM’s cultural condition ignores. It treats such beliefs as normal by virtue of cultural immunity, whether the subject in question is a witch doctor who has large amounts of personal experience from which to draw conclusions, or a person with no personal experience from which to draw conclusions who simply holds the beliefs as part of his or her upbringing.

**The God Box** (arational; uncertain truth; reduced functioning). A 20-year-old female college student in a city in Maryland was told in her church youth group to create a “God Box.” Whenever she has a problem, she is supposed to write it on a small piece of paper and put it in the God Box. She can then “forget about it and let God take care of it as is His will.”

*Comments:* Since God presumably works in ways that cannot be predicted, there is no way to disconfirm this hypothesis. It does not flagrantly violate any contextual counterexamples, since the correspondence of passivity with negative outcomes is acceptable (negative outcomes can always be interpreted as “His will”). Therefore, this does not qualify as a delusion by model-restriction criteria, even if it does seem to be pathological for other reasons. DSM’s treatment of this case would seem to depend on whether a church group of unspecified size would qualify as a “subculture” or not.

**The Family of Opus Dei Holocaust Revisionists** (arational, false; uncertain effect on functioning). A 22-year-old man, a successful graphic artist in the suburbs of Washington, DC, believes that Jewish “Elders” fabricated the Holocaust

for profit and to cover up the Jews' extermination of ethnic Ukrainians. When asked how he reconciles this belief with the large amount of literature that contradicts his thesis, he points out that Jews control the publishing industry. When asked how he reconciles this belief with the contrary information that he learned in his college history class, he points out that Jews also control academia. He claims to have learned these beliefs from his parents and family. His parents are member of the small Catholic sect Opus Dei and teach in an Opus Dei high school. The family is apparently stockpiling arms in their basement in preparation for a "race war."

*Comments.* This case qualifies as a delusion by model-restriction criteria because of contextual counterexamples, considering the unlikelihood of such a vast and secret conspiracy given other facts about the way the world works. This example beautifully illustrates the tendency for patients to salvage actual counterexamples at the expense of contextual counterexamples. DSM's treatment of this case would seem to depend upon whether the young man's family would qualify as a "subculture" or not.

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## Commentary: Knowing and Valuing

John Cutting, M.D., F.R.C.P., F.R.C.Psych.,  
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This is a delightfully well written paper on a cognitive theory of delusions. Quite why the term "neurobiologically" appears in the title and why it was sent to *The Journal of Neuropsychiatry and Clinical Neurosciences* is a mystery, because there is no mention of the brain whatsoever, and the article concerns matters that are as far away from the brain as one could get.

The thesis put forward is that the stumbling block in most definitions of delusion, including the various DSM versions, is the rider that tries to separate them from cultural and subcultural beliefs outside the assumed mainstream of humanity. Further, it is the authors' view that a particular sort of cognitive structure, unusual in "normals," is responsible for the delusion.

With regard to the impetus for their article—the problem of what to do with people who simply have "funny" beliefs, relative to the mainstream—I am in total sympathy, although I would separate religious beliefs from "funny" beliefs, for reasons that I shall deal with below. I am in sympathy with the authors because, having thought about the matter for nearly 30 years, it is only recently that I have come upon a possible solution of this.

With respect to their proposed solution, or rather re-evaluation, I have little sympathy, although I recognize that within a cognitive model of delusions it might be seen as an advance.

What we are dealing with in this article is a proposed alteration in how a human being cognizes—knows—what is going on. This is the preoccupation of all psychologists, by definition, and of psychiatrists who concern themselves with this. Frankly, their proposal does not interest me at all. It is an issue between psychologists as to whether cognition is like this or like that. Time and time again psychiatrists get dragged into such debates, or, rarely in my experience, purposely start them.

What a delusion is cannot be worked out on this level, for the reason that cognition, by its nature, flattens out all matters. What I mean by this is that if there are, by virtue of their essence in the world, a variety of totally dissimilar sorts of entities—God, the number 3, a living

bear, a human being by the name of Joe Smith, a stone, a thought of being lonely—then when it comes to cognizing them, they all appear on the same level, regardless of the massive difference between them in how they actually are.

Delusions, in my view, are not the by-product of inefficient cognition, regardless of whether cognition takes place by the mechanism suggested by these authors or by some other mechanism. Delusions stem from some problem prior to cognition, and cognition only rationalizes what is presented. I can support this thesis “neurobiologically,” unlike the cognitive thesis put forward here, which, by its nature, is insupportable “neurobiologically”! Cognition is knowledge, and if there is knowledge, there must be something which knowledge knows about.

What does knowledge know about? It knows something as something, and this second (latter) something is always something else from the first something. The second something might be the current use-value of the first something (science) or the species salvation-value (religion) or simply the wonder that there is anything at all (philosophy).

You might say—what is all this nonsense about a first something that is secondarily interpreted in three ways: scientific, religious, or philosophical? All I can say is that if you look carefully at what schizophrenics say about matters you will find that they eschew the use-value of any matter but are quite preoccupied with the religious (salvation) value and philosophical (wonderment) value of what is.

To return to the authors’ starting point—the unsatisfactory nature of the cultural/subcultural clause in DSM-IV’s definition of delusion—they are quite right to question this. What I have suggested here is that their answer is quite unsatisfactory, too, though I might say no more unsatisfactory than anyone else’s answer about delusion over the last two hundred years or so since it became a question-worthy topic.

What is overwhelmingly apparent in life, it seems to me, is that different people interpret the same event (a first something) in different ways. Whether their interpretations fall into these three classes referred to is arguable, and whether humans’ interpretations are more standardized now than in earlier eras is also arguable. Regardless of these issues, it is clear that, as the authors say early on in their article, there is a *primordial truth* for all humans concerning some matters (holes in the road, for example) and it is this truth from which schizophrenics do depart, and which has to be explained. That there are some marginal situations in which a normal person’s

assigning an event a religious or philosophical value rather than a use-value seems bizarre in the context of our overwhelmingly use-value-oriented society is simply a diagnostic problem. It is not a reason for invoking a different cognitive structure in those who deviate from society’s norms. Cognition “realizes” (i.e., knows) values. If the values, relative to a use-value-oriented society, are anomalous, so is the cognition. If a human’s brain is such (and here we do invoke a neurobiological variable) that that human being is valuing awry, then cognition merely follows on and its knowledge is only as accurate as cognitive structures allow it to be—i.e., inaccurate given the primordial anomalous situation.

In short, we have here a brave, well-argued attempt to explain delusions by invoking an anomalous cognitive approach to all matters. I say, and I can produce philosophical support for my position, that cognition is merely knowledge of some primordial situation. Delusions arise from a problem in this primordial situation, and do not result primarily from an inefficient strategy within knowing.

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## Commentary: A Culturally Invariant Neuropsychiatry?

**Horacio Fabrega, Jr., M.D.**

Mujica-Parodi and Sackeim’s paper brings into focus misconceptions about the differences between the tenets of neuropsychiatry and those of cultural psychiatry. In seeking to formulate delusions so as to avoid taking into consideration the content of beliefs in a patient’s culture, a requirement stipulated by the DSM system, they propose a model of rationality that is allegedly universal and not subject to cultural variation. How well they succeed depends on whether application of their model of concept formation and restriction manages to really avoid quandaries of meaning and semantics. The latter are central considerations in the study of psychiatric disorders in cultural psychiatry. What follow are comments on some of the basic assumptions and claims of the Mujica-Parodi and Sackeim formulation.

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## GENERAL BACKGROUND

The evolution of knowledge of clinical psychiatry is largely a product of developments during the nineteenth century that took place in Anglo-European societies and began in general medicine. It involved two empirically interconnected trends that can be separated only on analytic grounds. First, there took place systematic observation of patients that culminated in the refinement of a system of concepts about and terms referring to disturbances of human psychology and behavior, along with the criteria and principles pertaining to how this descriptive system was to be used. Second, there took place the creation of a science about the many psychiatric disorders that came to be named and described by means of the descriptive system, using the science of medicine that evolved to predominate in the nineteenth century.<sup>1</sup> The first development involved the evolution of a science of *descriptive psychopathology* and the latter the scientific knowledge referenced by the *historiography of clinical psychiatry*.<sup>2,3</sup> The paper by Mujica-Parodi and Sackeim grows out of this tradition of clinical scholarship.

## THE CULTURAL AND HISTORICAL ROOTS OF NEUROPSYCHIATRY

How cultural assumptions and values have influenced the development of descriptive psychopathology and the generation of knowledge about psychiatric disorders is a relatively neglected topic, and only the bare outlines can be drawn here. To begin with, a cultural rationale rooted in middle-class values and standards set apart individuals worthy of study by the budding protopsychiatrists or "alienists" during the eighteenth and nineteenth centuries.<sup>4-6</sup> The rationale consisted of Anglo-European values and norms about normality and deviance as applied to rationality and social conduct and responsibility. In essence, it created the population and standards of reference on the basis of which a science of psychiatry was formulated and could evolve.

In their efforts to clarify parameters of "pathology" of behavior alienists drew on notions of "common sense" pertaining to mental characteristics, since these are what the prevailing view in medicine and in the culture at large stipulated were responsible for behavior. Beliefs, emotional experience, and modes of reasoning constituted dominant areas of investigation. Here, an appeal was made to categories of mind tempered by and filtered through the prisms of inherited cultural knowledge about behavior. The tradition of faculty psychology, with its emphasis on cognition, affection, and

conation or will, functioned as a source of knowledge.<sup>7</sup> So did the writings of John Locke (1632–1704) pertaining to the association of ideas in the construction of an individual's picture of social reality and the self. Finally, ideas about form and content expounded by Immanuel Kant (1724–1804) were also influential. The form as compared with the content inherent in a feature of mind came to play a determinate role in the delineation of signs and symptoms of mental illness.

Wilbush<sup>8</sup> emphasizes that a clear separation between signs and symptoms even in general medicine was not satisfactorily arrived at until well past the middle of the nineteenth century and still remains elusive. He presents an analysis of the channels of clinical information (i.e., how persons and bodies "communicate" disease and pathology) in general medicine that is equally germane to psychiatry. It draws a distinction between symptoms (e.g., spontaneously volunteered verbalizations of patients steeped in cultural values and semantic habits), semeions (i.e., patient answers to specific questions posed by the clinician based on his or her culturally specific theory of pathology and physiology), and signs (e.g., clinician-observed or -elicited physical changes or responses of the body of the patient). Wilbush's analysis is highly consistent with the methodology of Mujica-Parodi and Sackeim, for they begin with possible symptoms and seek semeions, items of knowledge based on a rationalistic theory of the mind, and claim for one of these (i.e., delusion) the status of a sign of brain pathology.

In their search for the pathology of mind, alienists brought to bear standards and conventions about speech, about the deployment of language including semantic knowledge, and about the character of thought, rationality, and memory, as well as notions pertaining to emotional balance and regulation. While elements of human psychology continued to be important (and still are) for neuropsychiatry, by the end of the nineteenth century other parameters became important. Aspects of personal identity (e.g., age, phase of life) and features of disorders viewed in a temporal frame of reference (e.g., rate of evolution of symptoms, clinical course) became important. Interestingly, a cultural and linguistic factor in this broadening of emphasis is evident in the case of Kraepelin: his lack of proficiency in the native languages of patients at the Estonian asylum he worked in made psychological examination difficult, leading him to concentrate on items of information that did not require assessments dependent on his own language and culture.<sup>9</sup>

The cultural logic of Western medicine required alienists to look also for lesions and pathologies of the brain, a topic that cannot be dealt with fully here. The impor-

tance of brain function and lesion is a feature that underpins the logic of Mujica-Parodi and Sackeim. Suffice it to say that this emphasis is linked to cultural ideas and interpretations about the importance of the nervous system and of pathological anatomy—ideas that had formed an integral part of the ethos of Western medicine since the eighteenth century, before alienists were really in the picture.<sup>10,11</sup> Great ancient traditions of medicine that addressed psychiatric phenomena naturalistically (e.g., India, China) used analytic constructs and did not rely on the nervous system or brain anatomy.

All traditions of medicine concentrate on physical changes in the body, and Western medicine is no exception here. With respect to budding alienists, this led them to search for body markers of mental illness. Considerations that were initially important involved facial appearance, complexion, color, temperature, and texture of skin, bodily gestures, voluntary and involuntary movement, pain, general level of energy and motivation, and parameters of respiration, pulse, digestion, and excretion.<sup>3</sup> By the end of the nineteenth century, these “signs” of mental illness lessened in importance and aspects of pathological psychology increased. A return to the somatic sphere is evident in recent psychiatric theory involving indicators of somatoform disorders, a task that brings into play the ideas of Wilbush<sup>8</sup> described earlier.

#### WHY AND HOW NEUROPSYCHIATRY COMPLEMENTS CULTURAL PSYCHIATRY

Psychiatry seeks a universal science about the functioning of the “psyche” and its disturbances. However, how the mind works involves an amalgam of two sets of factors: conceptual models and reasoning principles (like those of Mujica-Parodi and Sackeim), on the one hand, and features of language and culture, on the other. The two are very difficult if not impossible to untangle.<sup>12–16</sup> Anthropologists and linguists agree that through an amalgam of meaning-creating systems, individuals fashion their personal experience, their sense of reality, their social behavior, and the requirements for social order.

Systems of meaning are crucial in cultural psychiatry. It does not posit an opposition or exclusivity between the domains of brain function and cultural meaning systems. Both together are products of the evolutionary process. Generalizations from knowledge in primatology, biological anthropology, cognitive archeology, evolutionary biology, and evolutionary psychology underscore the phylogeny of human traits like cognition, culture, and language, including psychopathology.<sup>17,18</sup>

This base of knowledge indicates that all facets of human behavior are a product of natural selection. The mechanisms responsible for human behavior (termed adaptations or algorithms) unite aspects of brain and culture.

A central concern of cultural psychiatry is grappling with the quandary created by the Western (i.e., cultural) conception of mind/body dualism. The quandary encompasses issues like mind, semantics, meaning, and relativism, on the one hand, compared with brain mechanism, physiological pathology, and physical irreducibility, on the other. Dualism figures centrally in the analysis provided by Mujica-Parodi and Sackeim. They imply that culture is something external that is merely “added to” the brain’s operations. The latter, they imply, is the organ that natural selection has perfected and is where traits like delusion come from or are situated (i.e., embodied). Their proposal stipulates that one of the purely “natural” functions and operations of the brain is to produce rationality. In describing this, they imply that culture can be detoured around, thereby avoiding the pitfalls of having to deal with “vague,” opaque, and ambiguous stuff like symbols, meaning, and values that vary significantly across languages and cultures.

To what extent aspects of human language, cognition, and symbolization—and along with this, culture—constitute true (i.e., naturally selected) adaptations in the classic sense, as compared with exaptations that proved favorable or the passive interplay of independent physical brain changes with selective pressures based on contingencies of social ecology, is highly contested in evolutionary biology and psychology, linguistics, biological anthropology, and cognitive archeology.<sup>19–26</sup> Nevertheless, that mind, behavior, culture, and brain have a long prehistory and in their integration figure in the equation of adaptation and maladaptation or psychopathology seems incontrovertible.<sup>19,27–30</sup> Generalizations about the integrated character of human biological evolution anchor the conviction of cultural psychiatrists that handling aspects of culture/mind and biology/brain in an either/or manner is unproductive.<sup>18</sup>

#### WHY MUJICA-PARODI AND SACKEIM’S PROPOSAL FOR CULTURAL INVARIANCE IS MISLEADING

Mujica-Parodi and Sackeim’s informative article ventures into the complicated terrain surveyed by both cultural psychiatrists and neuropsychiatrists. In a succinct and elegant way they propose that diagnosing delusion involves analysis of how beliefs are formed, confirmed, and disconfirmed, and come to represent the fixed “re-

ality" of the outside world. Like neuroscientists, they equate their rational model with the workings and malfunctioning of the brain (i.e., "physical irreducibility" and "physiological pathology"). Yet a brain that is independent of experiences through enculturation, as mentioned above, is inconceivable, its possibility certainly contradicted by what is taken for granted in evolutionary psychology, anthropology, and linguistics. To a cultural psychiatrist, that which makes delusions clinically relevant is part of a larger package: diagnosis involves a careful analysis of the amalgam of meaning-creating systems referred to earlier that includes syntax, grammar, semantics, metaphor, metonymy, imaginative models of reasoning, and conventionally named objects.<sup>12-15</sup> This system constitutes knowledge, belief, and an individual's sense of "reality" and has to be understood in order for analysis of mental content and clinical diagnosis to proceed. At stake also is the question of the universality of sickness, which is based on cultural standards, compared with disease, pathology, and injury, which are based on biomedical standards.<sup>31-33</sup>

Mujica-Parodi and Sackeim employ an indirect and, in the end, a not completely satisfactory strategy to avoid the pitfalls of relative meaning. They provide a cogent discussion of how categories and beliefs are acquired, affirmed, disconfirmed, and validated. As their analysis shows, however, to carry out this strategy successfully requires a diagnostician to have knowledge of basic tenets of his or her own culture and language and that of the subject. In other words, the authors' appeals to contextual premises and contextual and concrete examples and counterexamples necessarily plunges them into the "messy," "opaque," and "vague" world of language and culture, namely, calibrating the symbolic meaning and acceptability of items of information. Furthermore, and more importantly, teasing apart theoretical scenarios of how beliefs are formed, disconfirmed, etc., and how rationality operates is comparatively easy when the subjects share the author's own culture, sense of reality, and especially their language, as is the case in their examples. The "problem" about delusion escalates exponentially when features of language and related figurative and imaginative models of reasoning come into play, as they necessarily do in the case of subjects who speak highly different languages and share different epistemic worlds.<sup>12-16</sup>

The idea of cultural reality goes beyond purely matters of "fact" (sometimes very hard to establish), and well beyond that of spotting a hole in the ground in order to avoid it. Although culture finds its full realization and function in the area of social communication, as Mujica-Parodi and Sackeim correctly point out, social communication entails a consideration of subtle, com-

plex issues involving ethnosemantics and ethnopsychology (including ritual, myth, and cosmology) that incorporate cognitive models shaped by syntax and grammar. Higher primates (and most complex biological organisms, for that matter) reason by means of an apparatus that can be said to seek, pursue, and/or carry out truth-value judgments. However, during human biological evolution, following the pongid/hominid split around five million years ago, the capacity to endow social life with cultural symbols and meaning was further elaborated to this "natural" and social intelligence.<sup>34,35</sup> Hominid phenotypes that increased survival and reproduction and met requirements for an adaptation did have to accurately "track" the environment. In other words, based on experience they had to produce more or less truthful accounts about the environment and more or less accurate and valid inferences about its workings. However, in association with and inseparable from such a "model of rationality," biological evolution also produced a capacity for endowing its operation with content and meaning.<sup>36</sup> The latter, the creation of a symbolic world or niche,<sup>26</sup> organizes cultural material that provides individuals with a sense of group identity, social history, and cosmological placement. Cultural psychiatrists agree that delusions are probably universal markers of some of forms of psychopathology. However, they also believe that it is misleading to claim that delusions are diagnosed by positing a purely mechanical model of rationality that allegedly avoids cultural content.

An example may prove helpful. Studies of hunter-gatherer communities inform us that its members, as a consequence of securing a livelihood and materially pursuing subsistence, view the physical habitat as peopled by diverse beings with which they are in communion and which participate in the economy of subsistence. Subjects attribute to an animal motives and ways of thinking and behavior that are complementary to their own, and even features of the physical landscape (e.g., mountains, rivers) as well as geophysical agents or forces (e.g., the sun, wind, rain) are regarded as personal powers (i.e., personified), which is to say that they are thought to have awareness, agency, and intentionality.<sup>37</sup> What this implies is that daily pursuits can be expected to be associated with forms of experience not unlike those realized by the following statements: "I must be deceptive so as to avoid giving clues to the geese, who are planning to avoid me," "I must be careful in what I do because lions may be watching and spying on me," "The wind and cold have been conspiring against me now for days." This, of course, is my logical, English gloss on the matter. In reality, these beliefs will be intricately textured in a complex grammar and system of

lexical units. At issue is the fact that persons "know" the physical habitat and landscape intimately in the way they also "know" close relatives who share life on a day-to-day basis. These hypothetical statements enunciate a cultural phenomenology of "one world" in which persons operate as unitary beings or organisms-persons, relating on a one-to-one basis both to other persons and to nonhuman agencies and entities in their environment, there existing no absolute separation. Such modes of thinking are not merely figurative or metaphorical but in some ways literal, since they reflect the common, shared world in which groupmates and entities of the physical habitat and landscape interact as personalized beings. Hunter-gatherers I am sure develop delusions when psychotic, but spotting them and untangling them from normal animistic beliefs requires sensitivity to and familiarity with complex aspects of language and culture not unlike those entailed by notions outlined by Mujica-Parodi and Sackeim. To conclude that a hunter-gatherer's persistent belief should have been disconfirmed or that it is inconsistent with other beliefs that she or he holds does involve applying a model of rationality but also an understanding of a whole network of concepts and beliefs. In other words, to diagnose a delusion by means of Mujica-Parodi and Sackeim's model is to necessarily involve oneself in and come to understand what culture stands for and how it works to produce meaning.

## SUMMARY

When one unpacks Mujica-Parodi and Sackeim's protocol, it seems to say the following: a) humans are furnished with a rational apparatus that produces knowledge about the behavioral environment and rules of inference in terms of which individuals understand a fixed "reality" and adapt to it, and b) it is possible to clinically diagnose the functionality, "normality versus pathology," of the apparatus without taking into consideration systems of symbols and their meaning that comprise culture. Even if one agrees with a part of their basic premise, namely, that the model of rationality and belief formation that they propose is an innate property of *Homo sapiens*, ascertaining its workings necessarily enmeshes the diagnostician in a complex exegesis that requires knowledge of his or her and the client's language and culture. How items of information are labeled, confirmed, disconfirmed, and incorporated into meaningful social discourse constitutes the essence of culture and language and of higher cortical functions. The authors seek to render the task of recognizing a delusion easier by relying on a model of rationality that allegedly does

not involve culturally specific knowledge. However, an appeal to such a seemingly universal, pan-cultural model of rationality requires that the diagnostician already "know" his/her own and the examinee's language and culture. The authors' analysis proposes a neuropsychiatric solution to problems of diagnosis but really exemplifies and reinforces essential tenets of cultural psychiatry.

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## Reply to Dr. Cutting and Dr. Fabrega

**L. R. Mujica-Parodi, Ph.D.**  
**Harold. A. Sackeim, Ph.D.**

**John Cutting**

It is an honor to share this forum with Dr. John Cutting, as his work on psychopathology has been truly seminal

to the field. We base our following comments not simply upon Cutting's remarks in this issue but on his book, *The Right Cerebral Hemisphere and Psychiatric Disorders*,<sup>1</sup> which offers a more detailed presentation of his views regarding delusions in schizophrenia. In all instances, we will try to make our abbreviated remarks self-contained so that reference to outside texts is not necessary; however, the reader is certainly encouraged to review Cutting's work for a more complete context.

Central to Cutting's view is the idea that a delusion's form provides critical clues as to the neurological impairments that give rise to it, and vice-versa. This is in marked contrast, as he points out, to the prevailing psychiatric tradition of using form simply for the purpose of diagnosing and categorizing a mental illness, or as a psychodynamic curiosity reflected by the individual patient. Cutting divides neurological impairments that potentially cause delusions in terms of their laterality, taking particular note of the respective brain regions' roles in distinguishing between classes and their members. Cutting argues that, consistent with the left hemisphere's responsibility for the abstraction of common properties, left-hemisphere aberrations are more likely to cause impairments in a patient's ability to *group* individual members by their common class. On the other hand, consistent with the right hemisphere's responsibility for recognizing individual variation, right-hemisphere aberrations are more likely to cause impairments in a patient's ability to *recognize uniqueness* within a common class.

These impairments, according to Cutting, dictate the form that a particular delusion may take. Left-hemisphere aberrations may cause delusions of persecution, reference, and influence (endowing inappropriate uniqueness or significance to objects and/or events that are, in fact, common), while right-hemisphere aberrations may cause delusions of misidentification or reduplication (endowing inappropriate generality to objects and/or events that are, in fact, unique). Cutting attributes a third type of delusion, characterized by "imminent misadventure to others, and bizarre happenings in the immediate vicinity," to chronic generalized cortical dysfunction.

Schizophrenic delusions, Cutting argues, typically stem from a hemispheric imbalance in which impairment of the right hemisphere results in domination by the left. This is surprising, since—by Cutting's scheme—one would thus expect to see the majority of schizophrenic delusions of the misidentification/reduplication variety with a minority of schizophrenic delusions of the persecutory/reference/influence variety. Yet clinically, delusions of persecution, reference, and influence are by far the most common in schizophrenia. While Cutting states that studies suggest patients are more likely to create classes from individuals than are healthy

control subjects (pp. 315–318), he also argues that schizophrenic delusions are characterized principally by a patient's tendency to imbue unimportant trivial events with importance—a tendency that he defines as “philosophical” or “religious” in his commentary to our article. Although intuitively appealing, attributions of this sort often suffer from vagueness and underdetermination. For example, the “philosophical” or “religious” nature of schizophrenic delusions may be understood as finding meaning (individual significance) in common (general) events, just as they may be equally understood as finding greater universal significance (generality) in unique events. Since Cutting identifies class-to-member and member-to-class reasoning with opposite neurological lateralities, and since he also views laterality as key to his conception of schizophrenic delusions, any ambiguity on this point would appear to weaken the efficacy of his method.

As Cutting points out in his book, the connection between schizophrenic cognitive symptoms and class-member processing has a venerable history, likely beginning with von Domarus's work in the 1940s on an alternative “schizophrenic logic” in which patients viewed two items as identical if they shared any properties in common. Subsequent work on this topic was inconclusive, which elsewhere we have attributed to a) the conflating of all schizophrenic patients in spite of varied cognitive symptoms (which makes it difficult to note how delusional patients differ from schizophrenic patients who are nondelusional); b) poor design of logical reasoning problems that often resulted in fatal floor effects for both patients and control subjects; c) lack of adequate control tasks (i.e., equivalent reasoning problems that were not of the class-member variety); and d) the differences in reasoning found between different patient groups when presented with affect-neutral versus affect-laden material—although certainly more progress has been made in this last area than in the other three.<sup>2</sup>

The first author's results from research in this area, although preliminary at this point, do not readily support the notion that class-member reasoning per se constitutes the area of delusional patients' reasoning that is disproportionately affected, but rather that class-member reasoning is disproportionately affected by emotional arousal, and that emotional arousal most affects delusional patients.<sup>3</sup> On a Logical Reasoning test that required drawing propositional inferences, as well as choosing relevant versus irrelevant information using both class-member reasoning and propositional reasoning, there were significant differences between groups of healthy control subjects ( $n=16$ ), delusional patients ( $n=10$ ), thought-disordered patients ( $n=5$ ) and schizophrenic

patients who were neither delusional nor thought-disordered ( $n=13$ ) on all three types of reasoning ( $P=0.005$ ,  $0.024$ , and  $0.012$ , respectively). On all three types of reasoning, healthy control subjects performed best (approximately 60% correct), followed by delusional patients, non-delusional/non-thought-disordered patients, and finally thought-disordered patients. Post hoc analysis revealed that for each test, the significant differences were mostly due to differences between healthy control subjects and patients who were thought-disordered rather than between delusional patients and any of the other three groups.

In the same Logical Reasoning task, the items described above were additionally presented in identical form but using violent language, which was designed to induce mild emotional arousal in subjects while they performed the task. Interestingly, in the emotionally arousing context, delusional patients' performance showed marked differences from both that of healthy control subjects and those of other patients, and in this context, class-member reasoning did in fact stand out. The decline in performance from nonaroused to aroused conditions (counterbalanced for order) were the most striking for delusional patients ( $P=0.004$ ;  $df=9$ ) when compared both to patients with other symptoms and to healthy control subjects. In choosing relevant from irrelevant information, the decline in performance under arousal for delusional patients was significantly greater in the class-member reasoning section than in the propositional reasoning section ( $P=0.033$ ;  $df=9$  for decline in class-member reasoning). For healthy control subjects, performance under arousal was minimally improved for propositional inferences. In choosing relevant from irrelevant information under arousal, healthy control subjects' performance declined slightly for the propositional reasoning, but reached the trend level ( $P=0.083$ ;  $df=15$ ) for the class-member reasoning. Nondelusional/non-thought-disordered patients displayed a pattern similar that of to delusional patients, although less exaggerated (decline under arousal was significant only for one section, again class-member reasoning,  $P=0.017$ ;  $df=11$ ). Patients with formal thought disorder showed significant improvement under arousal, but only for the class-member reasoning ( $P=0.035$ ;  $df=4$ ). Our data suggest not only that class-member reasoning, as opposed to other forms of reasoning, may be unusually sensitive to emotional arousal, but also that delusional patients stand out from other patients in that they are most likely to feel the deleterious effects of that arousal. Therefore, even under minimal emotional stimulation, delusional patients appear to be most likely to suffer deficits in class-member reasoning, consistent with Cutting's neurological predictions.

Where Cutting views the distinction between class-to-member versus member-to-class to be important to understanding the neural foundations of delusional content, we suggest that either type of class-member reasoning may be reducible to a more fundamental problem in sorting data and recognizing counterexamples—in this case, appropriately identifying the relevance or irrelevance of information in forming and amending beliefs. As we have tried to point out in our article, the ability to identify an experience as “general,” for instance, critically depends upon the ability to provide counterexamples to its uniqueness, just as the ability to identify an experience as “unique” critically depends upon the ability to provide counterexamples to its generality. Further analysis of the results described above showed that thought-disordered patients committed their errors almost entirely by *taking in* too much information (assigning inappropriate relevance to irrelevant information), whereas all other patient groups as well as healthy control subjects committed their errors generally by *blocking out* too much information (treating relevant information as if it were irrelevant). These patterns were particularly pronounced during arousal.

Our article focused on providing diagnostic criteria for delusions that would be at least consistent with a neurobiological explanation, rather than focusing on the neurobiological explanation itself. This does not mean that such an explanation is lacking, or that the theory that we advance is, as Cutting alleges, “untestable”: adequately recognizing counterexamples is certainly as biologically brain-based an ability as Cutting’s identification of classes, and neurobiology surely “flattens out” the exact content of delusions just as surely and appropriately as do considerations of information processing. Current neuropsychological and neuroimaging (functional MRI) studies by the first author have centered on testing whether the recognition of counterexamples may be grounded in a more fundamental deficit in “filtering,” related to other, preattentive or minimally attentive deficits in sensory gating significantly associated with schizophrenia, combined with a strong and inappropriately generated affective component. If so, then the problem is not simply the failure to recognize counterexamples, but the combination of a strong, inappropriately activated emotional state (such as fear, anxiety, or euphoria) in need of explanation, coupled with a generalized failure to adequately discriminate between relevant and irrelevant information, interacting with a relatively intact ability to reason. We say “relatively intact” because, as with all individuals both healthy and not, reasoning ability—and particular that involving class-member reasoning—seems to decrease proportionally to the amount of emotional arousal; however, delu-

sional patients seem, by our results, to require significantly less emotional stimulation in order to become aroused. Since we postulate that the foundational problem is the delusional patient’s inappropriate choice of the information from which he will infer, rather than an impaired inference process itself, we are in agreement with Cutting’s suspicion that at least one of the neurological problems to be identified concerns “input,” rather than “processing.” Our hypothesis that delusional patients possess an emotional vulnerability that further compromises their ability to correctly identify the relevance of information provides needed consistency both with the emotional themes that are characteristic of delusions and with a wide range of evidence that the formation and maintenance of delusions are exacerbated by emotional stress.

Horacio Fabrega, Jr.

Where Dr. Cutting argues that our formulation lacks neurobiological rigor, Horacio Fabrega, Jr., suggests just the opposite—that we rely unproductively on neurobiology in clarifying a problem that is inextricably cultural. Dr. Fabrega additionally finds that our method may suffer from a form of hypocrisy, if putting the ostensibly culturally neutral criteria into practice requires that, for all intents and purposes, one still must implicitly use cultural considerations during evaluation. Obviously, this scenario would be worse than the current DSM standard, since cultural considerations would be used but not openly recognized and identified.

Dr. Fabrega’s first claim, that delusions are inherently cultural constructs, “the amalgam of meaning-creating systems referred to earlier that includes syntax, grammar, semantics, metaphor, metonymy, imaginative models of reasoning, and conventionally named objects,” functions in his critique more as a self-evident assumption than a derived conclusion. Our article, of course, was written around the very question of whether delusions could be explained as constructs of inefficient information-processing without reference to syntax, grammar, semantics, metaphor, metonymy, etc.—the motivation for which was precisely an attempt to move toward neurobiology in diagnosing (and eventually, in treating) delusions. The thrust of our methodological differences with Dr. Fabrega seem to stem from our conviction that, in order to find the biological cause of delusions, or any other symptom for that matter, it is first necessary to abstract foundational deficits that could ground the random complexity that these deficits may entail. Such foundation deficits would thus occur independently of the complicated culture-context in which delusions actually are observed. This would mean, essentially, moving from a complicated set of culturally

bound symptoms to a more simple set of biologically understood causes, a process that we view as absolutely necessary if psychiatry is to be absorbed into the rest of the natural sciences.

Dr. Fabrega's second concern, regarding the potential for hypocrisy, is certainly apt and a potential problem to which we have given some consideration. We have said that in testing model-restriction, the clinician needs to focus on how the patient formed and maintained his beliefs, rather than on the beliefs' specific content. In order to do so, the clinician must estimate to the best of her abilities the following: a) the number of potential counterexamples to the patient's belief, and b) the degree to which the patient appropriately responds to counterexamples that could disprove or cast doubt on the belief. Answering the latter can be determined solely with respect to the patient. Answering the former—i.e., determining the number of counterexamples to which he could reasonably be expected to have been exposed—arguably must be dependent on knowledge of the patient's culture.

Although we are very sympathetic to this criticism, we have also tried to make a compelling case in our article that the opposite is often true: that taking cultural considerations too seriously actually can obscure an accurate understanding of the real exposure that a patient has had to counterexamples. As one of our case examples, we presented a scenario in which a patient lives in a culture in which voodoo is widely practiced and believed. We pointed out that exposure to possible counterexamples to voodoo, even within this single

well-described culture, can vary enormously depending upon different participants' roles in that culture. Information about actual counterexamples, in this case, can and should be determined only by specifically questioning the patient and people who are close to him about these, because general knowledge of the culture may presume more or less exposure to actual counterexamples than is actually present for that individual. As we explained, a patient from this culture may have had personal experience with voodoo, or he may have simply heard about it from friends, family, or neighbors. Even if he has had personal experience with voodoo, he may or may not have been in a position to be exposed to counterexamples to his practice of voodoo, either through inability to assess the results or because the hoped-for results may actually have been confirmed. Contextual (in contrast to actual, or "concrete") counterexamples may also be evaluated outside the cultural context, even more easily, by questioning that determines the degree to which everyday laws of probability are maintained in various types of scenarios, both more and less abstract.

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