

# Psychology and Medical Decision-Making

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community about autism, the difficulties associated with diagnosis, treatment, and education opportunities, and their personal informed and uninformed fears about the causes of autism (e.g., fear of vaccinations).

The research done thus far falls into Kon's (2009) two categories: *Lay of the Land* and *Ideal versus Reality*. Under *Lay of the Land*, I was able to identify attitudes, beliefs, and practices from the perspectives of not only future healthcare providers, but from the families who care for and support their children with autism. I took this research one step further after having identified two serious ethical problems regarding diagnosis (e.g., many persons are given a different disease label, such as mental retardation, instead of autism) and the inconsistent or unavailable healthcare coverage for those diagnosed as "autistic." Besides making the narratives a regular part of the medical curriculum for first-year medical students, supplemented with narrative ethics materials and approaches for ethical/clinical decision-making, further proposed research will identify physicians' attitudes, fears, and concerns surrounding the diagnosis and treatment of autism, patient adherence (or lack of) to recommended, regulated and experimental therapies, and, most importantly, their therapeutic interactions with their patients (i.e., do physicians have the knowledge and skills to even communicate or interact with moderate to low functioning persons with autism, and/or do they rely on family reports?). I see this research program expanding, but without some philosophical considerations, such as the (epistemological) problem of other minds (i.e., how can I know that others have minds?), where persons with autism are said to lack the capacity to infer what others are thinking, along with subsequent ethical considerations (e.g., challenges to

the therapeutic relationship and how physicians ought to care for autistic persons), the empirically driven questions being asked, the hypotheses being considered, and the ethical problems being identified may not be as rich, interesting, or relevant, or may leave us with too many gaps, unanswered questions, or unidentified problems just as I have experienced with philosophical inquiry without empirical support.

By quantitatively and qualitatively acquiring and examining the self-reported experiences of individuals with mental disorders, as well as those professionals who classify, diagnose, and treat, we are able to progress through Kon's (2009) hierarchy of research categories with the goal of patient care, while informing and being informed by philosophical inquiry along the way. As I see it, what results from this fusion of bioethical approaches and progression of research is not only improved patient care, but a collective, *better* understanding of normative concepts (and their meanings) that often compromise medical practice and patient care (e.g., autonomy, justice, health, illness, empathy, for example). As a philosopher and medical educator, I applaud Dr. Kon for alleviating the tension between classical philosophical inquiry and empirical research. ■

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In the target article discussion of the *Changing Ethical Norms* category, Kon (2009) rightly highlights the contributions psychological research can make to bioethics. In this commentary, we suggest that psychology can be relevant not only at the *Changing Ethical Norms* level of work, but also at the *Ideal versus Reality* and *Improving Care* levels. Thus, our aim is not to suggest potential criticisms or refinements of Kon's proposed framework, but rather to elaborate on

the potential contributions of one particular domain of empirical research, psychology. We provide two examples of research relevant to the sorts of decisions encountered in the medical context: findings concerning 1) probabilistic reasoning and 2) framing effects. We then conclude by sketching the broader bioethical implications of such findings.

Probabilistic reasoning is an important part of medical decision-making at both the diagnosis and treatment stages.

Here we will focus on the effects that a particular sort of error in probabilistic reasoning, base rate neglect, can have on the interpretation of diagnostic tests. The basic idea is this: the fact that the accuracy of a test for some disease (or drug) is  $X\%$  does not necessarily mean that a particular person who tests positive has an  $X\%$  chance of having the disease (or of having the drug in her system). Rather, the probability will depend on the overall prevalence (base rate) of the disease in the population; if the disease is very rare, there is a good chance that the individual doesn't have it (i.e., that the result is a false positive).

Consider the following example. For simplicity's sake, assume that the reliability of the test is 95% for both positive and negative results and that there are no additional symptoms that corroborate the positive test (e.g., it is part of a routine screening). Say that Jon's physician orders a test for disease X, which is known to affect 1% of the general population. Alarming, the test comes back positive. Is there a 95% chance that Jon has disease X, as many people's intuitions suggest?

The mathematically rigorous way to answer this question—which is essentially a question of conditional probabilities (i.e., the probability of A given B)—is by using a formula known as *Bayes' Rule*. This shows that Jon actually has a 16.10% chance of having disease X, which is higher than the 1% assumed prior to the positive test but still far less than 95%. At least mathematically, the problem has been solved. Unfortunately, Bayes' Rule is not particularly intuitive or memorable for those who don't use it on a regular basis.

Fortunately, however, psychologists have found a strikingly simple method of improving people's reasoning about conditional probabilities: present the information in terms of frequencies rather than percentages. For instance, Gigerenzer and Hoffrage (1995) found that subjects presented with frequency formats were significantly more likely than subjects presented with percentage formats to produce judgments that accorded with Bayes' Rule (50% versus 28% in one version of the experiment, 46% versus 16% in another).

How might the frequency format strategy be applied to the case of Jon and disease X? Start by taking a hypothetical (representative) population of, say, 10,000 people. Of these 10,000, 100 (1%) have disease X, and 95 of these 100 (95%) will test positive. However, of the 9,900 who do not have disease X, 495 (100 - 95 = 5%) will *also* test positive. So how many of the people who test positive actually have disease X? To answer this, all we need to do is divide the number of people who have the disease *and* test positive (95) by the total number of people who test positive (95 + 495 = 590). Expressing this fraction, 95/590, as a percentage gives the same answer as Bayes' Rule, that Jon has a 16.10% chance of having disease X.

Nearly as important as its accuracy—particularly at a time when patients are increasingly seeking to understand and take a role in their care—is the fact that the frequency format approach makes it remarkably clear *why* the answer

is what it is. Rather than a number appearing essentially out of thin air (or at least out of a tangle of algebraic terms), as with Bayes' Rule, the frequency format approach allows anyone with knowledge of basic arithmetical operations to see where the answer comes from.

The most obvious application of the frequency format approach is to the diagnosis process. The literature on the effects of how decisions are framed, meanwhile, is particularly relevant to treatment decisions. In their seminal paper on framing effects, Tversky and Kahneman (1981) demonstrated that preferences can be reversed depending on whether a choice is framed in terms of gains or losses: participants were risk-averse in the former case and risk-taking in the latter. In one experiment, Tversky and Kahneman (1981) presented subjects with the following scenario:

Imagine that the U.S. is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimate of the consequences of the programs are as follows:

One group of participants received a description that was framed in terms of gains (lives saved):

If Program A is adopted, 200 people will be saved.  
If Program B is adopted, there is 1/3 probability that 600 people will be saved, and 2/3 probability that no people will be saved.

Another received a description framed in terms of losses (deaths):

If Program C is adopted 400 people will die.  
If Program D is adopted there is 1/3 probability that nobody will die, and 2/3 probability that 600 people will die (453).

Participants were then asked which of the programs—the expected outcomes of which are mathematically equivalent—they would prefer. The difference between the versions was striking. In "gains" version, 72% favored the program with the certain outcome (Program A), with only 28% preferring the program with the probabilistic outcome (Program B). In the "losses" version, however, the pattern was reversed, with only 22% favoring the certain outcome (Program C) and 78% favoring the probabilistic outcome (Program D) (Tversky and Kahneman, 1981).

One obvious application of such findings is to public health decisions that often take a form similar to the hypothetical case used in Tversky and Kahneman's (1981) study. But knowledge of and correction for framing effects could also be relevant at the level of individual treatment decisions. Without such knowledge and corrective measures, patients' choices could be unduly affected—and medically unjustified practice variations introduced—by how the possible outcomes of a procedure or course of treatment are presented. For instance, the decision of a patient contemplating whether or not to undergo knee surgery could

change depending on whether the possible outcomes of the surgery are presented in terms of gains (e.g., a 60% chance of regaining full functionality) or losses (e.g., a 40% chance of being left worse off than before).

The above is, of course, only the most cursory of examinations of the psychological literature on decision-making. Nevertheless, we believe that it points to some general suggestions about how psychological research can contribute to bioethical issues.

At the Ideal versus Reality level, research on the psychology of decision-making suggest ways in which the ideals of informed choice and patient autonomy may, despite the best intentions and efforts of practitioners, sometimes not be met in reality. Even if patients are given all available information, their decisions may fail to be genuinely informed due to an inability to interpret and reason effectively about the information. This may be manifested in objectively incorrect inferences, but as noted above, it may also take the more subtle form of being unable to understand the justification for correct information. Such deviations from informed choice have the further effect of undermining patient autonomy, since they reduce patients' ability to act in their own best interests as effectively as they otherwise would.

As described by Kon (2009), research at the Ideal versus Reality level can in turn motivate work at the Improving Care level. Although how best to implement psychologi-

cally motivated improvements in care is, of course, a matter for empirical research, work such as that of Gigerenzer and Hoffrage (1995) suggests that some of the relevant work may already have been done. One job of bioethicists and practitioners, then, is to examine how such findings might best be applied to the medical context.

We thus suggest that psychological research may have a large role to play in bioethics, informing not only Kon's (2009) Changing Ethical Norms level, but also his Ideal versus Reality and Improving Care levels. The vast literature on how people make decisions is likely to be a fruitful source of ideas for improving diagnoses and treatment decisions. Moreover, it has the potential to enhance informed choice and patient autonomy, and the changes in practice it motivates are likely to be relatively easily and cost-effectively implemented relative to their promised benefits. ■

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# An Engine, Not a Pyramid

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The target article by Alexander Kon (2009) offers an excellent conceptual toolkit to analyze the current literature on empirical bioethics, a topic which has attracted so much attention in the bioethics community all over the world that it is possible now to record and discuss the birth of an 'empirical turn' in bioethics research (Borry et al. 2005). This literature is expanding (as of February 2008, the Project MUSE search engine reports 465 hits for the terms *empirical AND bioethics*) and Kon's (2009) target article provides a helpful way of making sense out of it. It also helps overcome the division between paternalism and autonomy that still pervades much of the discussions about the relationship of ethics and health care. While the history of this relationship has often been read as a successful battle for patient autonomy and against medical paternalism couched

as beneficence, attempts to curb autonomy's expansion as the hegemonic value in bioethics are being mounted today, not only in America but also in Europe (Casado da Rocha 2009).

Kon's (2009) basic point is that empirical research informs bioethics at one of four levels. The image he presents is that of a pyramid in which each level builds on the other, and all "appear to have a hierarchical order" (59). However, we find this to be controversial. The alleged hierarchical relationship between the four categories of empirical research does not seem to be the most accurate logical structure because the changeable ethical norms that Kon places at the tip of the pyramid are also fundamental in setting its lower levels: the relevant 'land' (ethics committees, attitudes and preferences, and difficult choices), the ideal against which