Applied Cognitive Psychology and the "Strong Replacement" of Epistemology by Normative Psychology

Carole J. Lee

Philosophy of the Social Sciences 2008; 38; 55
DOI: 10.1177/0048393107311025

Philosophy of the Social Sciences
Volume 38 Number 1
March 2008 55-75

10.1177/0048393107311025
http://pos.sagepub.com
hosted at
http://online.sagepub.com

Applied Cognitive Psychology and the "Strong Replacement" of Epistemology by Normative Psychology

Carole J. Lee
Mount Holyoke College

Applied Cognitive Psychology (ACP) is normative in the sense that (1) it aims to make recommendations for improving human judgment; (2) it aims to have a practical impact on morally and politically significant human decisions and actions; and (3) it studies normative, rational judgment qua rational judgment. These nonstandard ways of understanding ACP as normative collectively suggest a new interpretation of the strong replacement thesis that does not call for replacing normative epistemic concepts, relations, and inquiries with descriptive, causal ones. Rather, it calls for recognizing that the aims and normative inquiries of epistemology and normative psychology have become intermutual in nature.

Keywords: Heuristics and biases; applied cognitive psychology; normative psychology; *rationality; naturalized epistemology; Epistemics; Applied Naturalized Epistemology; strong replacement; strategic reliabilism; ameliorative psychology*

Applied cognitive psychology's methods and aims reveal a discipline that is normative in ways that diverge from the standard account (Davidson 2001; Dennett 1987; Quine 1960).[1] Applied cognitive psychology (ACP) can be understood to be normative in the following three senses:

Author's Note: Many thanks to Elizabeth Anderson, Peter Railton, James Joyce, Norbert Schwarz, and the editors for their helpful comments.

1. Traditionally, philosophers understood Psychology as normative in virtue of claims about requirements for mental state attribution. The standard argument put forward by Donald Davidson and others is that the very possibility of belief and desire attribution requires their general conformance to norms of rationality.

Received 6 September 2006

1. ACP aims to make recommendations for improving human judgment.
2. ACP aims to guide morally and politically significant human decisions and actions.
3. ACP studies normative, rational judgment, *qua* rational judgment.

In this article, I will argue that ACP emerged as a normative psychology, understood in the above ways, in critical response to the methods, values, and aims of the heuristics and biases (HB) research program. To flesh out this analysis, I will begin the article with a historical narrative on the HB research program and ACP's critiques. In these critiques, ACP contrasts its own disciplinary methods and aims with those of the HB research program. I will use ACP researchers' programmatic claims to substantiate my claims 1-3 above.

Along the way, I will discuss how each of these ways of understanding ACP as normative contributes to naturalized epistemology's self-understanding. In particular, I will argue that the first way of understanding ACP as normative casts psychology and Epistemics as disciplines with shared aims. The second way of understanding ACP as normative suggests a move toward an Applied Naturalized Epistemology in which the success of an epistemic theory depends on value judgments about what count as significant human decisions and actions. The third way of understanding ACP as normative reveals how psychology can positively and directly inform the *content* of our recommendations about how best to reason. Finally, I will argue that these ways of understanding ACP as normative suggests a new interpretation of the strong replacement thesis that does not call for replacing normative epistemic concepts, relations, and inquiries with descriptive, causal ones.

1. Historical Background: HB Research Program and ACP's Critiques

In the 1950's and 1960's, the disciplinary tendency in research on decision-making had been to see "man as an intuitive statistician" (Peterson and Beach, 1967).[2] For example, Ward Edwards, the founder of judgment and decision making research, theorized that the mind is a reasonably good

2. This view fits the psychological literature on decision making in particular. Social psychological research in the 1950's and 1960's witnessed other, competing perspectives focused on cognitive consistency, wishful thinking, group dynamics, and social comparison processes. For these areas of research, see Taylor 1998.

(though conservative) Bayesian statistician (Edwards 1966). Wilson Tanner and John Swets introduced the theory of signal detectability for psychophysical judgments, which described the mind's detection of a stimulus (such as an auditory tone or light signal against a "noisy" background) as an inference following the Neyman-Pearson technique of hypothesis testing (Tanner and Swets, 1954). And, Jean Piaget and Barbel Inhelder took the formal laws of probability to be the laws of the adolescent and adult mind (Piaget and Inhelder, 1951).

In 1974, Daniel Kahneman and Amos Tversky's *Science* article "Judgment under Uncertainty: Heuristics and Biases" became the catalyst that shifted psychology's primary disciplinary interest away from rational cognitive processes to irrational ones (Tversky and Kahneman 1974). Their article summarized twelve biases in human judgment, including insensitivity to prior probabilities. The "accumulation of demonstrations in which intelligent people violate elementary rules of logic or statistics" raised serious doubts about "the descriptive adequacy of rational models of judgment and decision making" (Kahneman and Tversky 1982b).[3]

Kahneman and Tversky's self-avowed "methodological focus on errors and the role of judgment biases" became an institutional norm (Kahneman and Tversky 1996, 582). In the decade that followed, articles reporting good and poor performance were published in comparable numbers. However, psychologists became disproportionately interested in experimental tasks demonstrating poor participant performance (Lopes 1991). Studies reporting poor subject performance were cited an average of 27.8 times while studies reporting good subject performance were cited an average 4.7 times: a 6:1 ratio (Christensen-Szalanski and Beach 1984). The disciplinary focus on irrational judgments extended to judgments traditionally studied by other social scientific domains. Researchers provided work demonstrating systematically irrational judgments and choices in medical diagnosis, law, economics, management science, and political science (Bazerman 1990; Casscells, Schoenberger, and Grayboys 1978; Eddy 1982; Elstein, Shulman, and Sprafka 1990; Kahneman and Tversky 1979; Korobkin and Ulen 2000; Saks and Kidd 1980; Sniderman, Brody, and Tetlock 1991; Sunstein 1997; Thompson and Schumann 1987; Tversky and Kahneman, 1981 and 1986).

Kahneman and Tversky's HB research program did not denounce human reasoning as *universally* fallacious. From a theoretical point of view, their

3. Other biases reported include the effect of arbitrary anchors on estimates of quantities, availability biases in judgment of frequency, illusory correlation, nonregressive prediction, and misconceptions of randomness.

work has always recognized that heuristic-driven judgment is usually rational or valid. They claim "heuristics are highly economical and *usually* effective" (Tversky and Kahneman 1974). They freely admit to a systematic focus on tasks eliciting irrational judgment. However, they have maintained that the "main goal of this research" is more general and scientific in nature. Their goal is to understand "the cognitive processes that produce both *valid* and invalid judgments" (Kahneman and Tversky 1996). Their recognition that heuristics are sometimes valid and that human judgment is sometimes rational embraces the more cautious, qualified conclusion that human judgment exhibits particular kinds of biases under *some* conditions or contexts of reasoning.

Rhetorically speaking, however, Kahneman and Tversky seemed to encourage their readers to draw much stronger conclusions. They have said things like, "[i]n making predictions and judgments under uncertainty, people do not appear to follow the calculus of chance or the statistical theory of prediction" (Kahneman and Tversky 1982a, 237). This unqualified conclusion suggests the stronger claim that *under no circumstances* do people seem to conform to the rules of probability or statistics. Such unqualified, stronger claims—coupled with a nearly unwavering focus on tasks eliciting irrational judgment—presented human irrationality as a kind of universal, immutable fact, "like gravity" (Lopes 1991, 67). Researchers in other social scientific fields certainly got this impression, as did some psychologists.[4]

Kahneman and Tversky did not take pains to disabuse researchers from this impression. As Baruch Fischhoff remarked, the "retelling of these results has tended to accentuate the negative" about human judgment "in part because the pioneering studies showed their caution more in claims that were not made than in claims that were denied." He suggested that psychologists "should monitor the way that those results are used, for cases where the hedges are either trimmed or magnified, either by those who fail to appreciate the niceties of experimental design or by those who choose to ignore them, in order to achieve some rhetorical purpose" (Fischhoff, 1983, 521-2).

Psychologists were quick to critique the over-generalizations drawn from Kahneman and Tversky's studies. The year after Kahneman, Paul Slovic, and Tversky's canonical book *Judgment Under Uncertainty: Heuristics and Biases* was published, Ward Edwards, the founder of research on human

4. Between 1975 and 1980, Kahneman and Tversky's *Science* article was cited 227 times in 127 different journals. Of these, about 20 percent of the citations were in sources outside of psychology; and, of these, all these used the citation to support the overgeneralization that people are poor decision-makers (Berkeley and Humphreys 1982).

judgment under uncertainty, objected to this genre of research for having failed "to heed the urging of Egon Brunswik (1955) that generalizations from laboratory tasks should consider the degree to which the task (and the person performing it) resemble or represent the context to which the generalization is made" (Brunswik 1955; Edwards 1983, 512). He criticized the HB research program for not making explicit the fact that "both their methods and their selection of subjects encourage the occurrence of error" (Edwards 1983, 512). Edwards disagreed so strongly with the overgeneralizations drawn from this research that he felt "ashamed about my own role in starting it off."[5]

Other psychologists agreed with Edwards that the unqualified "rejection of human capability to perform probabilistic tasks is extremely premature." Robin Hogarth pointed out that "the conditions under which such heuristics can be valid have not been specified and that research had only covered a narrow spectrum of judgment and decision behavior" (Hogarth 1981, 197-8). Fischhoff also questioned the robustness of the HB studies and suggested that the "reanalysis of existing studies" should "acknowledge that all faithfully collected and replicated data have some range of validity. The 'trick' is to clarify what that range is" (Fischhoff 1983, 517).

ACP researchers actively sought to limit the scope of Kahneman and Tversky's claims about human irrationality by modifying the original experimental tasks to decrease or eliminate judgment biases. This responsive research served three purposes. First, this research underscored the methodological point that experimental evidence can only properly support claims about the *particular* ways in which we are rational or irrational in *specific* contexts of reasoning. Second, in light of empirical work on the context-sensitivity of rational judgment, psychologists began to ask questions about *which* contexts of reasoning are significant for empirical study. They explicitly argued that moral and political interests should determine what kinds of judgments, tasks, and subjects should constitute significant areas of research. Third, research seeking to identify rational cognitive processes demonstrated the practical implications of discovering the conditions promoting rational rather than irrational judgment. In particular, such research provides better grounds for positive recommendations about how to facilitate rational judgment. I will explicate each of these points, and their implications for naturalized epistemology, in the sections that follow.

---

5. Edwards goes on to explain how his frustration exhibited itself in his own research: "I remained silent about it because I believed, wrongly, that it was a fad and would die out—though those of you who have followed my work will note that I published not a word about conservatism in probabilistic inference since about 1970" (Edwards 1983, 508).

2. The Lesson of Context-Specificity for ACP and Naturalized Epistemology

Researchers in psychology began work to focus on identifying the range of validity for judgment biases. Fischhoff proposed to do this by identifying the conditions in which judgment biases disappear. He imagined a project of destructive testing—a tool in engineering—where "a proposed design is subjected to conditions intended to push it to and beyond its limits of viability" with the goal of identifying "where it is to be trusted and why it works when it does." When the phenomenon of interest is a "judgment bias, destructive testing takes the form of debiasing efforts." When we find conditions under which "a bias fails, the result is improved judgment" (Fischhoff 1982, 423). Such a project suggested the beginnings of a more general disciplinary shift in focus—away from conditions promoting judgment biases—toward conditions promoting rational judgment.[6]

Psychologists began to scout out the robustness of Kahneman and Tversky's findings and the proper scope of Kahneman and Tversky's conclusions about human judgment. Some of the more prominent research in this vein emerged in the 1990's. In particular, Gerd Gigerenzer's work on the use of frequencies in probability judgments provides a clear example of this genre of research. He has argued that recognizing the distinction between single-event probabilities and frequencies "unearth[s] the reasonableness hidden by the perspective of the HB program" by making "several apparently stable cognitive illusions disappear" (Gigerenzer 1994, 141-2).

For example, recall the conjunction fallacy. The key experimental task used to establish the conjunction fallacy was the *Linda Problem*:

> Linda is 31 years old, single, outspoken, and very bright. She majored in philosophy. As a student, she was deeply concerned with issues of discrimination and social justice, and also participated in anti-nuclear demonstrations.
>
> Please rank the following statements by their probability, using 1 for the most probable and 8 for the least probable.
>
> Linda is a teacher in elementary school.
>
> Linda works in a bookstore and takes Yoga classes.

6. Fischhoff and others were involved in applied cognitive psychological research aimed at improving medical diagnosis and informed consent. See, for example, Fischhoff 1979 and1980.

> Linda is active in the feminist movement.
>
> Linda is a psychiatric social worker.
>
> Linda is a member of the league of Women Voters.
>
> Linda is a bank teller.
>
> Linda is an insurance salesperson.
>
> Linda is a bank teller and is active in the feminist movement (Tversky and Kahneman 1982, 93).

Kahneman and Tversky found that the vast majority of statistically naïve *and* statistically sophisticated subjects rated the conjunction of events as more probable than either conjunct, in violation of the conjunction rule.[7]

Impressed by their experimental results, Kahneman and Tversky took their research to demonstrate the "massive failure of the conjunction rule" and speculated that the conjunction fallacy must affect the judgments of "political analysts, jurors, judges, and physicians" (Tversky and Kahneman 1982, 94). In the same breath, they admit that their experimental tasks "were constructed to elicit conjunction errors, and they do not provide an unbiased estimate of the prevalence of these errors" (Tversky and Kahneman 1983, 311). Yet, this passage continues, in a less careful manner, to suggest that the conjunction fallacy is "only a symptom of a more general phenomenon: people tend to overestimate the probabilities of representative (or available) events and/or underestimate the probabilities of less representative events" (Tversky and Kahneman 1983, 311).

Ralph Hertwig and Gigerenzer demonstrated the limited scope of the conjunction fallacy. They found that subjects would conform to the conjunction rule in the Linda problem when the statistical information and questions were restated in terms of frequencies (Gigerenzer 1996):

> In an opinion poll, the 200 women selected to participate have the following features in common: They are, on average, 30 years old, single, and very bright. They majored in philosophy. As students, they were deeply concerned with issues of discrimination and social justice and also participated in anti-nuclear demonstrations.

---

7. According to probability theory, the probability of two independent events A and B is equal to or less than the probability of each of its conjuncts: $p(A \,\&\, B) \leq p(A)$ and $p(A \,\&\, B) \leq p(B)$. Subjects should rank the probability that Linda's both a bank teller and active in the feminist movement as equal to or lower than the ranking each of these conjuncts taken alone (Tversky and Kahneman 1982).

> Please estimate the frequency of the following events.
>
> How many of the 200 women are bank tellers? ___ of 200
>
> How many of the 200 women are active feminists? ___ of 200
>
> How many of the 200 women are bank tellers and active feminists? ___ of 200 (Hertwig and Gigerenzer 1999, 291)

Under this condition, subjects did not violate the conjunction rule.

Kahneman and Tversky were the first to discover that frequency presentations improve probability judgments (Tversky and Kahneman, 1983). And, this finding confers credibility to their claim that they never assumed that "heuristics are independent of content, task, and representation" (Kahneman and Tversky 1996, 583). However, it was Hertwig and Gigerenzer who connected this discovery with practical concerns about how to *improve* human reasoning *and* with questions about the robustness of judgmental biases. Hertwig and Gigerenzer argued that this discovery served as a counterexample to the over-generalized claim that human judgment cannot conform to the conjunction axiom (or any other probabilistic rule). If the mind did not have a heuristic for making probability judgments in conformance to the conjunction rule, then subject responses should not improve with changes in how the information is represented.

Kahneman and Tversky failed to appreciate the nature and reach of these rational cognitive processes because of their self-avowed focus on discovering biased and irrational heuristics. Research that focused explicitly on identifying conditions promoting rational judgment discovered that frequencies worked to debias judgments in tasks used to demonstrate the overconfidence effect, the base rate effect, and the conjunction fallacy (Gigerenzer 1991 and 1994; Gigerenzer, Hoffrage, and Kleinbolting 1991; Hertwig and Gigerenzer 1999; Klayman et al. 1999). ACP researchers' context-sensitive approach served to underscore the importance of the lesson of context-specificity: experimental evidence demonstrates the particular ways in which we arrive at rational or irrational judgments in specific contexts of reasoning.

This context-sensitive approach also suggests that psychologists can discover rational or irrational cognitive processes depending on the kind of conditions and judgments they decide to focus on. Hertwig and Gigerenzer proposed a kind of frequency algorithm as the rational cognitive process responsible for subjects' improved conditional probability judgments. In contrast, Kahneman and Tversky proposed the representativeness heuristic as the biased cognitive process responsible for irrational judgment. With

respect to Kahneman and Tversky's focus on irrational cognitive processes, Lawrence Phillips thought it "revealing" that researchers "prefer to focus on the deficiencies, to develop explanations and models to account for these deficiencies, rather than to look for the characteristics of tasks that would enable people with different capacities to do well" (Phillips 1983, 533).

It is important to note that the lesson of context-specificity applies to both sides of the rationality debate. Gigerenzer does not always take sufficient care in his claims about the scope of rational judgment. Kahneman and Tversky rightly catch Gigerenzer at suggesting this kind of overgeneralization in his claims about frequency judgments:

> The major empirical claim in Gigerenzer's critique, that cognitive illusions "disappear" when people assess frequencies rather than subjective probabilities, also rests on a surprisingly selective reading of the evidence . . . Systematic biases in judgments of frequency have been observed in numerous other studies. (Kahneman and Tversky 1996, 584)

The moral to draw from contemporary research should be that researchers should make sufficiently qualified claims about the scope and conditions for irrational judgment *and* for rational judgment.

By appreciating the lability of judgment across contexts, the lesson of context-sensitivity takes the first steps toward diffusing the rationality debate. Kahneman, Tversky, Hertwig, and Gigerenzer agree on the normativity of Bayes' Rule. They also agree that frequency formats improve conformance to Bayes' Rule. So, both the HB and ACP research programs sometimes agree on evaluative claims about the conditions that facilitate rational judgment under uncertainty. The consensus suggests that both sides of the debate appreciate that human judgment is not inherently rational or irrational, but is highly sensitive to contextual factors.

By agreeing on empirically grounded, evaluative claims about the contexts of reasoning that improve judgment, both approaches can contribute to the project of debiasing contexts of reasoning. Rather than modify "cognitive processes to fit the environment better, one can modify the environment to fit the processes that people bring to it" (Klayman and Brown 1993, 100). Such a research program embraces the lesson of context-specificity: it seeks to identify "sub-environments in which people could be doing better given their goals and their resources" for the purposes of designing conditions "that avoid or compensate for anticipated errors" (Klayman and Brown 1993, 100).

Such contexts and conditions can include environments created and constituted by social institutions. Indeed, other social sciences have focused on how institutions can do so. For example, Arthur Lupia has argued that American citizens successfully use party-affiliation as a reliable heuristic in deciding who to vote for: American political party systems are structured in ways that enable our notoriously ignorant citizenry to use this limited, but reliable information to cast reasoned votes (Lupia and McCubbins 1998). Legal scholars have proposed new regulations in tort and contract law to deflect negative consequences of individuals' judgment biases (Posner 2005). Likewise, researchers in organizational psychology suggest the implementation of cognitive repairs to deflect negative consequences of judgmental biases.

So, from the perspective of naturalized epistemology, HB and ACP can be methodologically complimentary: HB identifies the tasks in which human reasoning needs to be improved (though this is not its disciplinary aim, as I will discuss in the next section), while ACP identifies the conditions that actually improve and debias judgment. This collaborative approach works in cases where both parties agree on evaluative claims about the conditions that improve human judgment.[8]

3. Shared Aims for ACP and Naturalized Epistemology

ACP researchers who took the lesson of context-sensitivity seriously began to ask important questions about the direction of future research on human judgment. *Which* types of contexts of reasoning should researchers be interested in studying? Kahneman and Tversky justify their focus on judgment biases for the broader intellectual goal of gaining an understanding of normal cognitive processes (the way researchers study "illusions to

8. The lability of human judgment across contexts of reasoning raises important meta-epistemic questions about what the proper standards for rational judgment should be. Given the context-sensitivity of human judgment, how robust should epistemically laudable heuristics or strategies of reasoning be across contexts of reasoning? If naturalized epistemology takes advantage of psychology's more detailed, contextualized, and evaluative claims about human judgment to prescribe context-specific recommendations, it faces more meta-epistemic questions about the proper generality of those recommendations. To which contexts should our normative evaluations of heuristics be attached? Furthermore, given the individual differences observed between subjects in experiments, should naturalized epistemology seek to prescribe epistemic theories tailored for specific classes of individual cognizers?

understand the principles of normal perception") (Kahneman and Tversky 1982b). Originally, Fischhoff's proposed change in research agenda toward identifying conditions of rational judgment was justified by the same goal: to understand normal cognitive processes.

However, researchers began to criticize the rationale behind Kahneman and Tversky's research. As early as 1979, Alan Baddeley noted "a basic change in attitudes away from the ivory-tower view of the 1960s that the pursuit of knowledge—any knowledge—for its own sake was sufficient end in itself" (Baddeley 1979, 367-9). He suggested a trend toward wanting to do research that is "at least potentially useful." He noted that governmental institutions issuing research grants preferred "research yielding practical benefits" (Baddeley 1979, 367-9). Baddeley called psychological research focused on seeking theories that bear on real life problems *Applied Cognitive Psychology*. He observed that a focus on "real-world problems" changes the orientation of theorizing "by drawing attention to interesting and important questions and by ensuring that our theories and concepts do not become too laboratory and paradigm bound."

Like Baddeley, Edwards suggests that researchers change their *rationale* for psychological research and let such rationales guide the kinds of questions and experimental tasks they pursue. Edwards also urged psychologists to adopt the research methods of those "practically-oriented" researchers "who define their roles as being to help others to perform intellectual tasks, notably decision making" (Edwards 1983, 512). A practical, applied orientation would require researchers to "learn how to get access to the populations to which we wish to generalize" and to identify "the myriad kind of tasks" that "especially deserve our attention" (Edwards 1983, 512).

Such research took the lesson of context-sensitivity seriously. One of Edwards's "ground rules" for research was that such research focus on "tasks representative of the kinds of tasks that we wish our generalizations to cover," which required studying "specific classes of minds performing specific kinds of tasks." Edwards's commitment to the context-sensitivity of judgment allows for the empirical discovery of differences in reasoning across groups, individuals, contents, and contexts.

Fischhoff also urged researchers to look to practical concerns in defining their research agendas. In 1983 he called for researchers to "study judgment not just as an intellectual curiosity, or as a key to understanding basic cognitive processes, but also as a guide to action." He claimed that it is in virtue of researchers' interest in providing practical guidance that motivates the disciplinary interest in the "global appraisal of "how much do people know?" or "how good is people's judgment?"" (Fischhoff 1983).

These researchers' claims about proper research agenda suggest two different, but connected ways in which to understand ACP as normative. On one hand, ACP is normative in the sense that it aims to make recommendations for improving human judgment. This makes ACP normative in the sense that Epistemics aims to be normative. Both seek to make prescriptive and empirically informed recommendations to help individuals reason better (Goldman 1978).

ACP's aim to make these recommendations is grounded in a more fundamental interest. Recall Fischhoff's call for researchers to "study judgment not just as an intellectual curiosity, or as a key to understanding basic cognitive processes, but also as a guide to action." For him, it is in virtue of researchers' interest in providing *practical guidance* that motivates the disciplinary interest in the "global appraisal of "how much do people know?" or "how good is people's judgment?"" (Fischhoff 1983). Ultimately, what is at stake in empirical research on rational and irrational human judgment are the human decisions and actions resulting from such judgments. ACP is normative in the sense that it aims to have a practical and helpful impact on morally and politically significant human decisions and actions. ACP aims to make recommendations for improving human judgment because good decision-making generally rests on rational judgments.

By identifying what they take to be at stake in improving and studying human judgment, ACP researchers provide a theoretical blueprint for an Applied Naturalized Epistemology. The key features of Applied Naturalized Epistemology are its orientation toward informing significant human decisions and its broader normative perspective. Applied Naturalized Epistemology aims to make recommendations about epistemically good judgment that guide significant human decisions and actions. As a result, Applied Naturalized Epistemology draws on a broader normative perspective on the moral, political, personal, and prudential features of human decisions and actions in defending and challenging epistemic claims. Because Applied Naturalized Epistemology's recommendations are responsive to significant human decisions and actions, truth alone is not sufficient for the epistemic respectability of a belief or reasoning strategy. Notice, however, that by making epistemic theories responsive to a notion of significant human decision or action, we do not render the ideal of truth irrelevant since we often need to have true beliefs to carry out successful decisions and actions (Lacey 1999).

Recently, naturalized epistemologists Michael Bishop and J. D. Trout have given "systematic voice" and "theoretical foundation" to ACP's blueprint

for an Applied Naturalized Epistemology.[9] Their view is that "[e]pistemology, if it is to achieve its normative potential, must make firm contact with the sorts of reasoning errors that lead to horrendous and avoidable outcomes" (Bishop and Trout 2005, 7). Without this kind of action-guiding power, epistemology loses its "practical relevance" (Bishop and Trout 2005, 20). Their theory recommends the allocation of cognitive resources to reasoning strategies that "tackle problems that are most likely to promote" an individual's well-being, and away from those that undermine it. Because their account of epistemic significance "resides, ultimately, in judgments about what conduces to human well-being," their "theory has the wherewithal to make such recommendations even if the prescribed change of focus does not lead to a greater number of truths" (Bishop and Trout 2005, 66). However, truth still plays an important role since "in the long run, poor reasoning tends to lead to worse outcomes than good reasoning" (Bishop and Trout 2005, 20).

For now, I wish to remain agnostic with respect to Bishop and Trout's particular account of significance, which involves the "requirements" or conditions of human "well-being," "happiness," and "welfare."[10] However, I would like to note that their naturalized approach to significance is extremely appealing. They observe that, as long as human well-being is part of the natural world, we can use empirical evidence to identify the conditions contributing toward well-being (Bishop and Trout, 2005). In doing so, the findings of such research can presumably challenge our normative notion of well-being itself. Whatever account of significance an Applied Naturalized Epistemology adopts should be naturalist in the sense that it conceives of the conditions of significant human decisions and actions as natural phenomena,

9. In discussing their account of Strategic Reliabilism, Bishop and Trout refer to a field of Ameliorative Psychology that shares many of the characteristic features of ACP. In particular, Ameliorative Psychology investigates good reasoning, makes normative recommendations about how to reason, and includes the disciplines of psychology (including especially research on Statistical Prediction Rules) as well as statistics, machine learning, and Artificial Intelligence. In this article, I chose to retain Baddeley's terminology "Applied Cognitive Psychology" to avoid confusing this research program with the more narrowly focused "Meliorist" research program. According to Keith Stanovich, the Meliorist position seeks to improve human judgment by getting our cognitive machinery to operate differently. In contrast, the Apologist approach seeks to improve judgment by presenting information in a way that is better suited for already existing cognitive processes (e.g., changing probabilistic information into frequencies) (Bishop and Trout 2005; Stanovich 1999).

10. Well-being, happiness, and welfare do not necessarily capture the same normative concept. However, their account assumes that individuals can weigh different, objective reasons against each other (Bishop and Trout 2005).

subject to empirical study. It should also be naturalist in the sense that the concept of significant decision and action is fallible and responsive to empirical research. However, it need not be naturalist in the sense that it conceives of significant decision or action as natural kinds with discoverable essences or natures.

4. ACP's Focus on Rational Judgment and Naturalized Epistemology

ACP researchers discovered that their evaluative claims about the conditions facilitating rational judgment can figure directly and positively into the *content* of their epistemic recommendations. For example, Gigerenzer and others discovered that frequency formats facilitate rational conditional probability judgments. The evaluative claim that "frequency formats facilitate rational conditional probability judgments" describes the empirically discovered means for achieving this type of rational judgment. As such, this evaluative claim is easily turned into the bluntly normative recommendation to state probabilistic information in terms of frequencies.[11]

ACP is normative in the sense that it studies normative, rational judgment *qua* rational judgment. That ACP seeks to explain the causes of normative judgment is not sufficient to make it normative. Rather, what makes it normative is that it goes on to *evaluate* such judgments as rational. Indeed, it is in virtue of researchers' *normative evaluations* of the rationality of these judgments that they are motivated to study and explain them.

ACP is motivated to study and explain rational judgment because doing so is instrumental in achieving its disciplinary aims to improve human judgment and decision-making. ACP researchers achieve the disciplinary aim it shares with Epistemics by issuing in recommendations about how to reason. By linking these recommended ways of reasoning to improved human decision making and actions, ACP researchers achieve the disciplinary aim it shares with Applied Naturalized Epistemology. For example, the risk communication field discovered that frequency formats and pictographs help patients better understand risk information and make better medical decisions (Fagerlin, Wang, and Ubel 2005; Fischhoff 1995). And, applied research

11. ACP researchers also discovered that subjects could be coaxed into providing normatively appropriate probability judgments by changing the order in which information was presented and the way in which the personality descriptions were said to be selected (Ginossar and Trope 1987; Krosnick, Li, and Lehman 1990).

on frequency effects also suggest that frequency formats help jurists and judges draw statistical and Bayesian inferences from forensic DNA analyses, leading to less convictions (Koehler 2001a and 2001b; Lindsey, Hertwig, and Gigerenzer 2003).

So, the ways in which ACP can be understood to be normative are connected with one another. ACP is normative in the sense that it focuses on rational judgment *qua* rational judgment. Doing so enables researchers to arrive at the kind of evaluative claims that figure positively and directly into the content of recommendations about how to improve human judgment—an aim ACP shares with Epistemics. Such recommendations are instrumental toward achieving ACP's aim to guide morally and politically significant decisions and actions—an aim ACP shares with Applied Naturalized Epistemology.

5. The New Strong Replacement Thesis

Appreciating the ways in which psychology is normative suggests that we should update our interpretation of the strong replacement thesis. The strong replacement thesis, characteristically attributed to W. V. Quine, claims that epistemological questions can be replaced by psychological questions without any loss of content (Kornblith 1997). The standard interpretation of the strong replacement thesis involves replacing the normative evidential relation with purely descriptive, causal-nomological input-output patterns (Kim 1997). This interpretation of the strong replacement thesis stems from Quine's behaviorist approach to psychology. For him, psychology involved studying "the stimulation of sensory receptors" and their relation to "the torrential output" of human subjects "for somewhat the same reasons that always promoted epistemology; namely, in order to see how evidence relates to theory" (Quine 1969, 25)

Jaegwon Kim observes that such a proposal would be a "moribund" for normative epistemology. If we purge epistemology of its defining normative concepts—such as justification and evidence—we are no longer talking about a systematic, normative epistemology, but a different topic altogether. For Kim, "one thing is 'evidence' for another just in case the first tends to enhance the reasonableness or justification of the second." Therefore, although "the causal relation between sensory input and cognitive output is a relation between "evidence and theory," this by itself does not make it "an *evidential relation*" (Kim 1997, 306).

The strong replacement thesis can avoid Kim's objection from normativity if we simply trade Quine's behaviorist psychology for the kind of

normative psychology ACP affords. In ACP, the causal relationships between input and outputs are normative, evidential relationships. This is not because ACP defines or reduces evidential relationships to causal-nomological ones. Rather, it is because ACP chooses to study those causal relations that also constitute normative, evidential relationships for independent or additional reasons.[12]

For example, ACP researchers focus on frequency information and their causal relationship to conditional probability judgments because an evidential or justificatory relationship already exists between them.[13] The normativity of Bayes' Rule is not reduced to a descriptive causal relationship between inputs and outputs. ACP researchers choose these evidential-cum-causal relationships as their object of study because such work figures directly and positively into recommendations about how to facilitate rational judgment.

The new strong replacement thesis claims that epistemological questions can be replaced by the questions of normative psychology without any loss of content. As I argued above, the strong replacement of epistemology by a normative psychology like ACP need not reduce epistemology's normative relations to descriptive ones. Additionally, the conceptual, methodological, and explanatory debates with which ACP researchers have engaged demonstrate the range of their normative questions and concerns. ACP researchers' concerns about the improvement of human judgment and decision-making have raised contentious normative debates about the proper conceptualization and norms of rationality. For example, Gigerenzer and Tversky and

12. Both internalists and reliabilists can agree that the causal reliability of a cognitive process is not sufficient for justification. Internalists like Kim would argue that the normativity of the causal relationship has nothing to do with the reliability of the cognitive processes. In contrast, some reliabilists might argue that reliability is just one of the necessary conditions for justification. Some reliabilists would agree with internalists that reliability is not sufficient for the normativity of a causal relationship between input and output beliefs. For example, well-founded reliabilism imposes the additional requirement that beliefs be well-founded on evidence to be justified. For a very compelling account of well-founded reliabilism, see Comesana 2006.

13. In his work on the frequency effect, Gigerenzer seems to be concerned about the *statistical validity* of using Bayes Rule in particular experimental tasks. For example, Gigerenzer and Hoffrage ask subjects to consider a mammography problem set in a medical context. Here, the reference class is clearly specified and the samples (it is reasonable to presume) were randomly selected and sufficiently large for the purpose of making predictions about new cases. However, I should note that in his research on *ecologically rational* fast and frugal heuristics, Gigerenzer adopts more of a reliabilist approach to norms of reasoning, where the normativity of a heuristic depends on the relative likelihood that it produces true beliefs.

Kahneman argue over whether the application of probabilistic rules is universally or situationally normative.[14] And, they disagree over the proper interpretation of probability as single-events or frequencies (Gigerenzer 1994). ACP's critiques of the HB research program also illustrate that psychologists engage in normative debates about proper methods and standards for hypothesis verification. And, psychologists in these opposing research programs disagree over what constitutes a satisfactory explanation in psychological research on reasoning (Gigerenzer 1996). These questions about the proper conduct of scientific inquiry are analogous to traditional epistemological questions about how we ought to conduct and organize our own doxastic practices (Boyd 1990).

The new strong replacement thesis does not call for replacing normative concepts, relations, or questions with descriptive, causal ones. Rather, it calls for recognizing that the aims and normative inquiries of epistemology and normative psychology have become intermutual in nature. What are the conditions that facilitate rational judgment? What does it mean for a judgment to be rational? What is an epistemic norm? What methods of reasoning should we prescribe? When should we believe a hypothesis or explanation? What methods should we use in gathering and analyzing empirical evidence about human judgment? These normative questions are the shared province of epistemology and normative psychology.

6. Conclusions

Once we appreciate the connected ways in which ACP is normative, it becomes clear that ACP can be understood as undertaking an active research program in Epistemics and Applied Naturalized Epistemology. ACP is normative in the sense that Epistemics is normative: both aim to make recommendations about how to improve human judgment. Likewise, ACP is normative in the sense that an Applied Naturalized Epistemology is normative: both aim to guide morally and politically significant human decisions and actions. Finally, ACP is normative in the sense that it studies normative, rational judgment, *qua* rational judgment. This research focus reveals how

14. Gigerenzer attacks the very notion of content-free norms—viz. formal algorithms (or rules, such as the conjunction rule) arrived at *a priori* and deployed independently of substantial knowledge about the agent's epistemic situation (Gigerenzer 2001; Kahneman and Tversky, 1996).

psychology's evaluative claims positively and directly inform the content of our recommendations about how best to reason well. Ultimately, this analysis suggests reinterpreting the strong replacement thesis as a call for the replacement of epistemology by a normative psychology like ACP. This strong replacement does not call for the replacement of normative evidential relations or questions with causal-nomological ones. Rather, it calls for recognizing that the aims and normative inquiries of epistemology and normative psychology have become intermutual.

Philosophers of science might take issue with the ways in which I have understood ACP to be "normative." They might observe that scientific inquiry is generally understood to be normative in the sense that it is guided by cognitive values such as empirical adequacy, unified explanation, and predictive power. It is uncontroversial to say that psychology is a normative science *qua* science. What is controversial is whether the sciences are *value-free* in the sense that their content remains unaffected by practical (i.e., moral and political) value judgments (Lacey 1999). Those who argue that science is not value-free understand a "normative science" to be one in which the criteria for a scientific theory's cognitive value depends on practical value judgments (Lacey 1999).

The notion that psychology is normative in this stronger sense of "normative science" raises questions that naturalized epistemologists should address in building a more critical and reflective engagement with psychology. Do practical value judgments guide the aims of ACP, as well as its concepts, methods, hypotheses, and explanatory standards? Do practical value judgments guide ACP researchers' judgments about the relative cognitive value of competing psychological theories and explanations? If so, how should naturalized epistemologists navigate empirical and normative debates in psychology?

References

Baddeley, A. 1979. Applied cognitive and cognitive applied psychology: The case of face recognition. In *Perspectives on Memory Research: Essays in Honor of Uppsala University's 500th Anniversary*, edited by L.-G. Nilsson. New York, NY: Lawrence Erlbaum Associates.

Bazerman, M. H. 1990. *Judgment in managerial decision making*. New York, NY: Wiley.

Berkeley, D., and P. Humphreys. 1982. Structuring decision problems and the "bias heuristic." *Acta Psychologica* 50 (3): 201-52.

Bishop, M. A., and J. D. 2005. *Epistemology and the psychology of human judgment*. Oxford: Oxford University Press.

Boyd, R. 1990. Realism, approximate truth, and philosophical method. *Minnesota Studies in the Philosophy of Science* XIV:355-91.

Brunswik, E. 1955. Symposium on the probability approach in psychology. *Psychological Review* 62 (3): 193-217.

Casscells, W., A. Schoenberger, and T. B. Grayboys. 1978. Interpretation by physicians of clinical laboratory results. *New England Journal of Medicine* 299:999-1000.

Christensen-Szalanski, J. J. J., and L. R. Beach. 1984. The citation bias: Fad and fashion in the judgment and decision literature. *American Psychologist* 39:75-8.

Comesana, J. 2006. A well-founded solution to the generality problem. *Philosophical Studies* 129 (1): 27-47.

Davidson, D. 2001. Radical interpretation (1973). In *Inquiries into truth and interpretation,* 125-140. New York, NY: Oxford University Press.

Dennett, D. C. 1987. True believers: The intentional strategy and why it works. In *The Intentional Stance*, 13-35. Cambridge, MA: The MIT Press.

Eddy, D. M. 1982. Probabilistic reasoning in clinical medicine. In *Judgment Under Uncertainty*, edited by D. Kahneman, P. Slovic, and A. Tversky, 249-67. Cambridge, UK: Cambridge University Press.

Edwards, W. 1966. *Nonconservative information processing systems* (No. 5893-22-F). Ann Arbor, MI: University of Michigan, Institute of Science and Technology.

———. 1983. Human cognitive capabilities, representativeness, and ground rules for research. In *Analysing and aiding decision processes* vol. 18, edited by P. Humphreys, O. Svenson, and A. Vari, 507-13. Amsterdam: North-Holland Publishing Company.

Elstein, A. S., L. S. Shulman, and S. A. Sprafka. 1990. Medical problem solving: A ten-year retrospective. *Evaluation and the Health Professions* 13 (1): 5-36.

Fagerlin, A., C. Wang, and P. A. Ubel. 2005. Reducing the influence of anecdotal reasoning on people's health care decisions: Is a picture worth a thousand statistics? *Medical Decision Making* 25 (4): 398-405.

Fischhoff, B. 1979. Informed consent in societal risk-benefit decisions. *Technical Forecasting and Social Change* 13:347-58.

———. 1980. Clinical decision analysis. *Operations Research* 28:28-43.

———. 1982. Debiasing. In *Judgment under uncertainty: Heuristics and biases*, edited by D. Kahneman, P. Slovic, and A. Tversky, 422-44. Cambridge, U.K.: Cambridge University Press.

———. 1983. Reconstructive criticism. In *Analysing and aiding decision processes* vol. 18, edited by P. Humphreys, O. Svenson, and A. Vari, 515-23. Amsterdam: North-Holland Publishing Company.

———. 1995. Risk perception and communication unplugged: Twenty years of process. *Risk Analysis* 15 (2): 137-45.

Gigerenzer, G. 1991. How to make cognitive illusions disappear: Beyond "Heuristics and Biases." *European Review of Social Psychology* 2:83-115.

———. 1994. Why the distinction between single-event probabilities and frequencies is important for psychology (and vice versa). In *Subjective Probability*, edited by G. Wright and P. Ayton, 129-61. New York, NY: John Wiley & Sons.

———. 1996. On narrow norms and vague heuristics: A reply to Kahneman and Tversky (1996). *Psychological Review* 103 (3): 592-96.

———. 2001. Content-blind norms, no norms, or good norms? A reply to Vranas. *Cognition* 81:93-103.

Gigerenzer, G., U. Hoffrage, and H. Kleinbolting. 1991. Probabilistic mental models: A Brunswikian theory of confidence. *Psychological Review* 98 (4): 506-28.

Ginossar, Z., and Y. Trope. 1987. Problem solving in judgment under uncertainty. *Journal of Personality and Social Psychology* 52 (3): 464-74.

Goldman, A. I. 1978. Epistemics: The regulative theory of cognition. *The Journal of Philosophy* 75 (10): 509-23.

Hertwig, R., and G. Gigerenzer. 1999. The "conjunction fallacy" revisited: How intelligent inferences look like reasoning errors. *Journal of Behavioral Decision Making* 12:275-305.

Hogarth, R. M. 1981. Beyond discrete biases: Functional and dysfunctional aspects of judgmental heuristics. *Psychological Bulletin* 90 (2): 197-217.

Kahneman, D., and A. Tversky. 1979. Prospect theory: An analysis of decision under risk. *Econometrica* 47 (2): 263-92.

Kahneman, D., and A. Tversky. 1982a. On the psychology of prediction (1973). In *Judgment under uncertainty: Heuristics and biases,* edited by D. Kahneman, P. Slovic, and A. Tversky, 48-68. New York: Cambridge University Press.

———. 1982b. On the study of statistical intuitions. In *Judgment under uncertainty: Heuristics and biases,* edited by D. Kahneman, P. Slovic, and A. Tversky, 493-508. New York: Cambridge University Press.

———. 1996. On the reality of cognitive illusions. *Psychological Review* 103 (3): 582-91.

Kim, J. 1997. What is "naturalized epistemology"? In *Epistemology: An Anthology*, edited by E. Sosa and J. Kim, 301-13. Oxford: Blackwell Publishers, Ltd.

Klayman, J., and K. Brown. 1993. Debias the environment instead of the judge: An alternative approach to reducing error in diagnostic (and other) judgment. *Cognition* 49:97-122.

Klayman, J., J. B. Soll, C. Gonzalez-Vallejo, and S. Barlas. 1999. Overconfidence: It depends on how, what, and whom you ask. *Organizational Behavior and Human Performance* 79 (3): 216-47.

Koehler, J. J. 2001a. The psychology of numbers in the courtroom: How to make DNA-match statistics seem impressive or insufficient. *Southern California Law Review* 74:1275-8.

———. 2001b. When are people persuaded by DNA match statistics? *Law and Human Behavior* 25:493-503.

Kornblith, H. 1997. Introduction: What is naturalistic epistemology? In *Naturalizing Epistemology*, edited by H. Kornblith, 1-14. Cambridge, MA: The MIT Press.

Korobkin, R. B., and T. S. Ulen. 2000. Law and behavioral science: Removing the rationality assumption from law and economics. *California Law Review* 88:1051-144.

Krosnick, J. A., F. Li, and D. R. Lehman. 1990. Conversational conventions, order of information acquisition, and the effect of base rates and individuating information on social judgments. *Journal of Personality and Social Psychology* 59 (6): 1140-52.

Lacey, H. 1999. *Is science value free? Values and scientific understanding.* New York: Routledge.

Lindsey, S., R. Hertwig, G. Gigerenzer. 2003. Communicating statistical evidence. *Jurimetrics* 43 (Winter): 147-63.

Lopes, L. L. 1991. The rhetoric of irrationality. *Theory and Psychology* 1 (1): 65-82.

Lupia, A., and M. D. McCubbins. 1998. *The democratic dilemma: Can citizens learn what they need to know?* Cambridge, UK: Cambridge University Press.

Peterson, C. R., and L. R. Beach. 1967. Man as an intuitive statistician. *Psychological Bulletin* 68:29-46.

Phillips, L. D. 1983. A theoretical perspective on heuristics and biases in probabilistic thinking. In *Analysing and aiding decision processes* vol. 14, edited by P. Humphreys, O. Svenson, A. Vari, 525-43. Amsterdam: North-Holland Publishing Co.

Piaget, J., and B. Inhelder. 1951. *The origin of the idea of chance in children.* New York: Norton.

Posner, E. A. 2005. Probability errors: Some positive and normative implications for tort and contract law. In *The Law and Economics of Irrational Behavior*, edited by F. Parisi and V. L. Smith, 456-73. Stanford, CA: Stanford University Press.

Quine, W. V. O. 1960. Translation and meaning. In *Word and object*, 26-79. Cambridge, MA: The Technology Press of the Massachusetts Institute of Technology.

———. 1969. Epistemology naturalized. In *Ontological relativity and other essays,* 1-21. New York: Columbia University Press.

Saks, M. J., and R. F. Kidd. 1980. Human information processing and adjudication: Trial by heuristics. *Law and Society Review* 15 (1): 123-60.

Sniderman, P. M., R. A/ Brody, and P. E. Tetlock. 1991. *Reasoning and choice: Explorations in political psychology*. New York: Cambridge University Press.

Stanovich, K. E. 1999. *Who is rational? Studies of individual differences in reasoning*. Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Sunstein, C. R. 1997. Behavioral analysis of law. *University of Chicago Law Review* 64:1175-95.

Tanner, W. P., and J. A. Swets. 1954. A decision-making theory of visual detection. *Psychological Review* 61 (6): 401-9.

Taylor, S. E. 1998. The social being in social psychology. In *The Handbook of Social Psychology* vol.1, edited by D. T. Gilbert, S. T. Fiske, and G. Lindzey, 58-95. Boston: The McGraw Hill Companies, Inc.

Thompson, W. C., and E. L. Schumann. 1987. Interpretation of statistical evidence in criminal trials: The prosecutor's fallacy and the defense attorney's fallacy. *Law and Human Behavior* 11:167-87.

Tversky, A., and D. Kahneman. 1974. Judgment under uncertainty: Heuristics and biases. *Science* 185 (4157): 1124-31.

Tversky, A., and D. Kahneman. 1981. The framing of decisions and the psychology of choice. *Science* 211 (4481): 453-8.

———. 1982. Judgments of and by representativeness. In *Judgment under uncertainty: heuristics and biases*, edited by D. Kahneman, P. Slovic, and A. Tversky, 84-98. New York: Cambridge University Press.

———. 1983. Extensional versus intuitive reasoning: The conjunction fallacy in probability judgment. *Psychological Review* 90 (4): 293-315.

———. 1986. Rational choice and the framing of decisions. *The Journal of Business* 59 (4) Part 2: The behavioral foundations of economic theory, S251-S278.

Carole J. Lee is an assistant professor of philosophy at Mount Holyoke College. Her work focuses on the normativity of psychology, the methodological roles that rationality serves in psychological theorizing, and the implications of that these have for naturalized epistemology.