TARGET ARTICLE

Jamil Zaki
Kevin Ochsner

Reintegrating the Study of Accuracy Into Social Cognition Research 159

COMMENTARIES

Bahador Bahrami
Chris D. Frith

Interacting Minds: A Framework for Combining Process- and Accuracy-Oriented Social Cognitive Research 183

Nicholas Epley
Tal Eyal

Integrations Need Both Breadth and Depth: Commentary on Zaki and Ochsner 187

Judith A. Hall
C. Randall Colvin

On Making a Thriving Field Even Better: Acknowledging the Past and Looking to the Future 193

William Ickes

Everyday Mind Reading Is Driven by Motives and Goals 200

David A. Kenny

History, Dialectics, and Dynamics 207

Christian Keysers
Lawrie S. McKay

How to Make Social Neuroscience Social 210

Marco Iacoboni

Social Cognition, Accuracy, and Physiology 217

Elysia R. Todd
David C. Funder

Organizing Interactions in the Study of Judgmental Accuracy 219

REPLY

Jamil Zaki
Kerin Ochsner

On the Reintegration of Accuracy in Social Cognition Research: Let Us Count the Ways 221
Reintegrating the Study of Accuracy Into Social Cognition Research

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Understanding the contents of other minds is a vital and ubiquitous task that humans perform with impressive skill. As such, it is surprising that the majority of social cognition research—whether behavioral or neuroscientific—focuses on the processes people use when attempting to understand each other while ignoring how well those attempts fare. Here we review historical reasons for the contemporary dominance of process-oriented research as well as the resurgence in the last decades of new approaches to studying interpersonal accuracy. Although in principle both the accuracy-oriented and process-oriented approaches study related aspects of the same phenomena, in practice they have made strikingly little contact with each other. We argue that integrating these approaches could expand our understanding of social cognition, both by suggesting new ways to synthesize extant data and generate novel predictions and lines of research, and by providing a framework for accomplishing such an integration. This integration can be especially useful in highlighting the deeply contextualized nature of the relationships between social cognitive processes, accuracy, and adaptive social behavior.

Introduction

One of human beings’ most impressive accomplishments is our ability to understand what other people are intending, thinking, and feeling. This requires perceivers (individuals focusing on someone else) to translate the observable behaviors of social targets (individuals who are the focus of perceivers’ attention) into inferences about those targets’ physically invisible but psychologically real, internal states. Whether we’re sniffing out the intentions of a used car salesman or figuring out the right thing to say to an upset friend, such inferences are critical to acting adaptively in social situations. Luckily, we are consummate experts at this task, accurately reading the internal mental states that guide other’s behavior with an ease and skill that would be shocking if it wasn’t so universal (Fiske, 1992; Swann, 1984).

For simplicity, we refer to this ability as mind perception, following Epley and Waytz (2009). Unlike global terms like “social cognition” or “person perception,” which can refer to the whole host of faculties we bring to bear in understanding all manner of transient and enduring characteristics of other people, mind perception zeroes in on the specific task and accomplishment of understanding others’ internal mental states. As such, for present purposes, it provides a convenient shorthand for referring specifically to this ability.

So how do perceivers draw inferences about targets’ minds, and why are we so adept at it? Given the importance of these two questions, it is unsurprising that they have been a central focus of psychological research for the greater part of a century, and more recently have gained a great deal of attention in neuroscience. What is surprising, however, is the lopsided way this attention has been distributed, focusing almost entirely on answering the first—but not the second—of these questions. The lion’s share of contemporary research focuses on characterizing the cognitive and neural processes perceivers engage when encountering other minds, while typically ignoring whether the engagement of these processes leads to accurate
inferences about those minds. In other words, the majority of relevant research has focused on the question of how perceivers respond to other minds, but not how well they understand those minds. Although relatively neglected, this second question is of clear importance, as the goal of everyday social cognition is not to simply draw any type of inference about targets but to use accurate inferences to guide social behavior.

How did this state of affairs come to pass, what are its implications for the field, and should we do anything about it? To address these questions, the remainder of this article is divided into four main parts. In the first, we review the central role accuracy once played in social psychological research and the historical trends responsible for its abandonment in favor of a near monopoly of process-oriented research. Here we also briefly review the current understanding of mind perception processes gleaned from behavioral and neuroscientific research (for more comprehensive reviews, see Decety & Jackson, 2004; Fiske & Taylor, 2007; Gilbert, 1998; Keysers & Gazzola, 2007; Macrae & Bodenhausen, 2000; Mitchell, 2009a; Saxe, Carey, & Kanwisher, 2004) as well as the comparatively smaller number of research programs that have developed novel approaches to measuring interpersonal accuracy (again, for more comprehensive reviews, see Funder, 1995; Ickes, 1997; Jussim, 2005; Kenny & Albright, 1987; Kruglanski, 1989; Swann, 1984).

The second section builds on this historical foundation by arguing that a critical missing element in mind perception research is the integration of process-oriented and accuracy-oriented approaches within studies and research programs. The essential argument is that social cognition should reclaim its past tradition of thinking about accuracy and combine it with the current focus on processes. Here we motivate and describe a framework for integrating these usually independent approaches. This framework draws equally from neuroscientific and behavioral research to explain social cognitive phenomena at multiple levels of analysis, including neural systems, psychological processes, behavioral accuracy, and other outcomes such as social well-being and the social deficits that characterize many psychiatric disorders.

The third section highlights five kinds of novel insights and predictions that can emerge from focusing on the relationships between mind perception processes and accuracy—as opposed to either in isolation. First, an integrated view can help to dispel some incorrect, but pervasive, assumptions about mind perceivers' abilities to be accurate, or the sources thereof. Second, integrating processes and outcomes allows for an interactionist approach to understanding when a given social cognitive process contributes to accuracy about others. Third, an integrated approach enables researchers to connect social cognitive processes with their ostensive goals: Skillfully navigating the social world and maintaining positive interpersonal relationships. Fourth, this multilevel approach can offer new insights about parallels between the mechanisms underlying mind perception and other, seemingly disparate cognitive domains. Fifth, this approach offers novel ways to study the social cognitive deficits that characterize many psychiatric illnesses.

In the fourth and last section, we conclude by summarizing the central arguments of the article and touching on the ways an integrative approach can move beyond the specific examples of mind perception considered here and be applied to the study of other domains of social cognition and person perception, including prospection and dispositional inference.

Where Are We and How Did We Get Here?

The Rise and Fall of Accuracy Research

In important ways, the dominance of process-oriented approaches to mind perception research stems from a revolution older (and slightly less hostile) than Cuba’s. In the first half of the 20th century, a central project of social psychology was determining the sources of accurate interpersonal inferences. Scores of studies were run with the goal of characterizing so-called good judges—that is, individuals naturally adept at understanding other minds—who could be tapped for jobs requiring interpersonal understanding, such as being judges or therapists. This work drew on a large, sometimes poorly organized, slew of criteria, both for defining and predicting accuracy. Depending on the study, accuracy was defined as a perceiver’s ability to recognize emotional facial expressions in photographs, provide personality ratings of targets that agreed with expert opinions, group consensus, or targets’ self-ratings, or to predict the behavior of target individuals or groups. Predictors of accuracy varied just as broadly and included gender, socioeconomic status, training in psychology, number of siblings, general intelligence, and aesthetic sensibility. Perhaps unsurprisingly, this proliferation of independent and dependent variables led to an explosion of relationships being tested, and “good judges” often eluded capture behind a tangle of correlations and effect sizes. Nevertheless, accuracy continued to enjoy a privileged status among research topics; in summarizing more than 50 studies of “good judges” conducted by the mid-20th century, Taft (1955) remained confident that “the practical importance of [accuracy research] in psychology is obvious.”

Writing a quarter century later, Schneider, Hastorf, and Ellsworth (1979) likely would have surprised Taft with their conclusion that, amidst the zeitgeist of social cognition research, “the accuracy issue [had] all but
faded from view” (p. 222). What happened in the intervening years? Although there are many explanations, among the most salient are the arguments presented by Lee Cronbach and his colleagues (Cronbach, 1955; Gage & Cronbach, 1955) that were published only a few months after Taft’s review. Cronbach presented a simple methodological criticism of the search for good judges: Quantifying accuracy as a subtraction between a perceiver’s judgment and those of a target or group ignored a host of factors that could affect perceivers’ apparent accuracy. For example, a perceiver with an accurate base rate for extraversion in the population could blindly apply that base rate to judge individuals she had never met and still appear to be a relatively “good judge.” In other words, Cronbach asserted that accuracy researchers were not measuring what they thought they were measuring—accuracy—but instead were measuring the influence of other, potentially less interesting phenomena.

A close read of the publications by Cronbach, Nathaniel Gage, and others suggests that they did not intend for their criticism to upend accuracy research altogether. Instead, they hoped that more sophisticated methods could help clarify the sources of accuracy by decomposing them into a number of constituent parts. In fact, many of the factors they described as relevant to accuracy (e.g., the use of stereotypes, assumed similarity between perceivers and targets) are quite similar to mind perception processes studied now (see the Experience Sharing and Mental State Attribution sections). Gage and Cronbach presciently suggested that person perception research would be served best by modeling the relationship between these processes (which they referred to as “intermediary keys”) and the accuracy or inaccuracy of resulting perceptions (Gage, Leavitt, & Cronbach, 1956). However, in lieu of taking up this challenge, accuracy researchers reacted by “crowding the exits” (Gilbert, 1998, p. 91), abandoning their endeavors almost completely for more than 25 years (Funder, 1987, 1995; Gilbert, 1998; Ickes, 1997; Ickes et al., 2000; Kenny & Albright, 1987).

Why did accuracy researchers so eagerly jump ship? Retellings of this historical trend converge on two points. First, the search for good judges suffered from a dearth of organizing principles and, as such, produced a jumble of loosely related findings, in which some factors predicted some types of accuracy some of the time (Dymond, 1949; Taft, 1955). Findings of any one study in this field were often idiosyncratic and irreproducible, and did not sum into programmatic, generative theoretical models. Second, no matter how organized accuracy researchers might have made their search for good judges, those judges—at least in the way researchers conceived of them—may have been more myth than reality. Early accuracy research staked much of its identity on isolating personality traits that would predict a perceiver’s accurate inferences about targets’ personality traits. In both cases, traits were defined as monolithic, stable qualities that should predict behavior across contexts. A good judge was considered to be someone who would accurately assess all social targets in all situations, and targets’ self-reported personality traits were considered to be similarly constant. In the last 40 years, however, the idea of traits as invariant predictors of behavior has given way to an interactionist perspective, which describes behavior as fundamentally dependent on both individuals and the situations they encounter (Bandura, 1978; Mischel, 1968, 1973; Mischel & Shoda, 1995). This reconceptualization—and the fact that the majority of accuracy research preceded it—makes it unsurprising that the search for good judges was plagued by the low correlations and inconsistent relationships that also characterized many trait-based predictions of behavior.

The general challenge to personality research issued by Mischel and others (Mischel, 1968, 1973; Mischel & Shoda, 1995) signaled a growing shift in attention toward the processes (or cognitive and affective “units”) mediating the relationships between individuals and situations as input and behavior as output. A similar shift took place in psychology more broadly (Neisser, 1967) and in due time took over the troubled field of interpersonal perception research.

The Reign of Process

Focusing on social cognitive processes, as opposed to accuracy, has proven extremely generative, as it allowed researchers to “zoom in” on more tractable elements of mind perception, produced replicable findings and generated relatively simple and falsifiable theoretical claims (for fantastic reviews of the process approach and its major findings, see Chaiken & Trope, 1999; Gilbert, 1998). At its root, process research was strongly influenced by Heider (1958), who suggested parallels between mind perception and object perception. Gage and Cronbach alluded to these parallels as well, arguing that mind perception and visual perception both are “dominated far more by what the Judge brings to it than what he takes in during it” (Gage & Cronbach, 1955, p. 420).

Following the leads of Heider, Gage, and Cronbach, process-oriented researchers set their sights inside perceivers’ heads. Instead of concerning themselves with the accuracy of perceivers’ inferences about targets’ reported states or observable behaviors—or even with actual social targets in any way—process models focused on a set of cognitive “tools” perceivers bring to bear when drawing inferences about targets in general. Although many such tools have been described (Ames, 2004; Chaiken & Trope, 1999; E. Smith & DeCoster, 2000), here we focus on two that have gained a great deal of attention in both psychological and
neuroscience research: experience sharing and mental state attribution.

Experience Sharing
President Bill Clinton famously claimed to “feel the pain” of Americans suffering during tough economic times. Perceivers of all stripes share the intuition that they vicariously experience the internal states of others. This idea also is found in 18th-century moral philosophy (Smith, 1790/2002), aesthetic theory (Lipps, 1903), and contemporary models of motor cognition (Dijksterhuis & Bargh, 2001; Prinz, 1997). The common thread uniting these theories is that when observing targets experiencing an internal state, perceivers engage many of the cognitive and somatic processes they would engage while experiencing those states themselves (Preston & de Waal, 2002).1 A link between the perception of others’ states and the evocation of similar states in one’s self is supported by various data, including demonstrations that perceivers often adopt the bodily postures (Chartrand & Bargh, 1999), facial expressions (Dimberg, Thunberg, & Elmehed, 2000), autonomic arousal (Vaughan & Lanzetta, 1980), and self-reported emotional states (Neumann & Strack, 2000) of targets.

In the last 15 years, neuroscience research has famously supported the idea of perception-action matching by identifying brain regions that demonstrate properties consistent with experience sharing. The common feature of these regions is that they become engaged both when perceivers experience an internal state themselves and when they observe targets experiencing those states. The specific regions demonstrating such shared activity for both self and other experiences depend on the type of internal state being shared (Decety & Jackson, 2004; Zaki & Ochsner, 2011b). For example, when both executing and observing motor acts, perceivers engage the so-called mirror neuron system, encompassing premotor, inferior frontal, and inferior parietal cortex (Iacoboni, 2005; Rizzolatti & Craighero, 2004; Rizzolatti & Sinigaglia, 2010). When experiencing and observing nonpainful touch, perceivers engage somatosensory cortex (Keysers, Kaas, & Gazzola, 2010; Keysers et al., 2004). When experiencing pain and observing (or knowing that) targets (are) in pain, perceivers also engage somatosensory cortex (Avenanti, Bueti, Galati, & Aglioti, 2005) and additionally recruit activity in regions related to the interoceptive and affective components of pain, including anterior insula and anterior cingulate cortex (Jackson, Meltzoff, & Decety, 2005; Morrison, Lloyd, di Pellegrino, & Roberts, 2004; Ochsner et al., 2008; Singer et al., 2004). The insula also is engaged both when perceivers feel disgust and observe it in others (Jabbi, Swart, & Keysers, 2007; Wicker et al., 2003), consistent with this region’s role in processing information from the viscera (Craig, 2009; Lamm & Singer, 2010). Recent data suggest that even the hippocampus and posterior medial frontal cortex exhibit overlapping engagement during action observation and imitation (Mukamel, Ekstrom, Kaplan, Iacoboni, & Fried, 2010). For simplicity, hereafter we refer to all brain regions demonstrating this property as experience sharing systems (ESS), with the understanding that this is a functional definition and not one based on specific cytoarchitectonic properties or patterns of anatomical connectivity.

The general overlap between self and other experience instantiated in the ESS has generated a great deal of excitement, for at least two reasons. First, as noted earlier, the ESS has been put forward as the likely neural basis of perception-action matching. This claim is plausible and well supported, especially given demonstrations that overlapping neural activity in the ESS often correlates with self-report and online measures of experience sharing (Pfeifer, Iacoboni, Mazzotta, & Dapretto, 2008; Singer et al., 2004). Second, evidence about the neural bases of experience sharing has led to several claims that such sharing is the primary mechanism underlying interpersonal understanding (Gallese & Goldman, 1998; Gallese, Keysers, & Rizzolatti, 2004). This argument aligns much less well with existing data than the first. On one hand, it is true that shared experience provides a parsimonious, efficient way for perceivers to learn from and learn about others’ motor intentions, affective states, and attitudes (Dijksterhuis & Bargh, 2001; Niedenthal, Barsalou, Winkielman, Krauth-Gruber, & Ric, 2005; Prinz, 1997; Schippers, Gazzola, Goebel, & Keysers, 2009; Schippers, Roebroeck, Renken, Nanetti, & Keysers, 2010). On the other hand, such sharing is a much less likely mediator of interpersonal understanding in other situations. This is because targets’ “higher level” intentions and beliefs often are translated only ambiguously into motor or somatic states. For example, the identical motor program of pushing someone could signify the very different intentions of starting a fight or saving an inattentive commuter from an oncoming bus (Jacob & Jeannerod, 2005).

The utility of experience sharing becomes even blurrier when one considers that nonverbal expressions of intentions, beliefs, and emotions often fail to match the states targets are actually experiencing. In many cases, targets with no interest in being understood—because they are lying to, competing with, or attempting to produce a specific impression in targets—intentionally dissociate their nonverbal expressions

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1In many ways, models of perception-action matching borrow from the more general idea of “embodied cognition,” which posits that concepts related to physical states (including, presumably, those of other people) are processed through sensory and motor representations (Barsalou, 2008; Decety, 1996; Kosslyn, Thompson, & Alpert, 1997; Niedenthal, Barsalou, Ric, & Krauth-Gruber, 2005; R. R. Smith & Collins, 2009).
from their internal states (Ansfield, 2007; Ekman, Friesen, & O’Sullivan, 1988; Ybarra et al., 2010). The situation improves only slightly for more forthcoming targets: Even when earnestly expressing themselves, these targets often produce ambiguous nonverbal cues. This is especially prevalent in the domain of emotional expression. Although Ekman and colleagues famously demonstrated the ease with which posed facial expressions of canonical emotions are recognized (Ekman, Sorenson, & Friesen, 1969), such expressions rarely occur outside artificial contexts such as emotion studies and tourist photos: Even while experiencing powerful emotions, targets in naturalistic settings often produce subtle cues that leave perceivers puzzling over what those targets are feeling (Fernandez-Dols, Carrera, & Russell, 2002; Russell, Bachorowski, & Fernandez-Dols, 2003; Zaki, Bolger, & Ochsner, 2009). In such situations (and they are common), it is unclear how perceivers’ use of experience sharing—by itself—could guide insightful inferences about target states.

**Mental State Attribution**

What is a perceiver to do, given the limitations of experience sharing? One alternative is to rely on contextually defined semantic information about targets’ likely states, which is based on what perceivers know of the target and situation they are observing. By way of illustration, consider encountering a friend you know, who is grieving the recent death of a family member. This friend displays a neutral facial expression and occasionally even smiles at you while talking about the funeral and events since. If you were to make a judgment about his or her feelings based solely on sharing the internal states implied by these expressions, you may decide that your friend actually feels fine. However, it is more likely that your knowledge about your friend’s situation will influence your judgments and lead you to the (probably correct) hypothesis that your friend’s outward appearance belies a more negative internal experience.

Perceivers commonly create and test such hypotheses about targets’ internal states. Although these hypotheses may be generated quickly and easily, they can typically be represented explicitly and propositionally within awareness as a perceiver effortfully deliberates about a target. We refer to this form of mind perception as mental state attribution to describe the process by which perceivers tie together multiple strands of information in the service of nuanced, flexible inferences about targets’ states and dispositions (Castelli, Happe, Frith, & Frith, 2000; Kelley, 1973; Saxe et al., 2004).

Like experience sharing, mental state attribution also has a relatively stable neural signature, involving multiple brain regions that support inferences about intentional states. Cognitive neuroscience research over the last 15 years has borrowed a number of paradigms from developmental and clinical traditions to study mental state attribution, usually by asking perceivers to draw inferences about the beliefs, knowledge, intentions, and emotions of others based on written vignettes, pictures, or cartoons. In a typical study, brain activity is compared between two conditions in which perceivers make judgments that differ only in their social or mental state content: For example, drawing inferences about the traits and states of intentional agents (e.g., “How dependable is Tracy?” “Is Kenneth’s belief up to date?”), as opposed to inanimate objects that nonetheless have similar characteristics (“How dependable is Tracy’s computer?” “Is Kenneth’s photograph up to date?”).

Regardless of the type of judgment being made about others or the medium in which target cues are presented, such comparisons produce a strikingly consistent pattern of activation in a network that includes: Medial prefrontal cortex, temporoparietal junction, posterior cingulate cortex, and temporal poles. We refer to this set of regions as the mental state attribution system (MSAS), again with the understanding that this categorization is somewhat loose and functional (for more descriptions of the MSAS and its functions, see Baron-Cohen et al., 1999; Castelli, Frith, Happe, & Frith, 2002; Fletcher et al., 1995; Goel, Grafman, Sadato, & Hallett, 1995; J. P. Mitchell, Heatherton, & Macrae, 2002; Ochsner et al., 2004; Olsson & Ochsner, 2008; Peelen, Atkinson, & Vuilleumier, 2010; Saxe & Kanwisher, 2003). Notably, many regions within the MSAS have been tied to humans’ more general ability to “project” themselves into distal scenarios or points of view (including the past, future, and uncertain or counterfactual concepts, as well as targets’ nonobservable mental states; see Buckner, Andrews-Hanna, & Schacter, 2008; J. P. Mitchell, 2009b; Schacter, Addis, & Buckner, 2007; Spreng, Mar, & Kim, 2009). This putative role for the MSAS—in lifting oneself out of the cognitive “here and now” and simulating past and future perspectives and states—is intriguing because it is complementary to the assumed functional role of the ESS in providing a basis for vicariously experiencing the motor, sensory, and visceral states of targets. All this being said, it is important to note that the specific computations carried out by MSAS regions remain to be precisely specified, and whatever they turn out to be, they also play functional roles in behaviors not obviously related to mind perception (Corbetta, Patel, & Shulman, 2008; Daw, Niv, & Dayan, 2005; for more on this, see Amodio & Frith, 2006; Cavanna & Trimble, 2006).
A Tale of Two Systems

Experience sharing and mental state attribution are functional cousins, serving the intimately related goals of sharing and appraising targets’ internal states. As such, one might expect them to work together often in guiding mind perception. This makes the lack of family resemblance in these processes—between either their behavioral and neural correlates or the research programs that have explored them—all the more striking. Extant data have supported a picture of these mind perception processes as surprisingly dissociable, in at least two ways.

First, experience sharing and mental state attribution differ in the level of effort they seem to require, as reflected both in these processes’ developmental trajectory and in the circumstances during which they are engaged. Developmentally, mental state attribution comes online concurrently with executive functions such as response inhibition (Carlson & Moses, 2001), and much later than behavioral signs of experience sharing (Flavell, 1999; Meltzoff & Decety, 2003; Meltzoff & Moore, 1977; Wellman, Cross, & Watson, 2001). Mental state attribution is most common when perceivers are given an incentive to make accurate or defensible judgments (Devine, Plant, Amodio, Harmon-Jones, & Vance, 2002; Kunda, 1990; Tetlock & Kim, 1987) and when they have the time and attentional firepower necessary to perform the necessary mental state calculus (Gilbert, Pelham, & Krull, 1989; Kruglanski & Freund, 1983). By contrast, sharing of targets’ motor and emotional states often occurs outside of awareness (Dijksterhuis & Bargh, 2001; Neumann & Strack, 2000), and regions within the ESS—but not the MSAS—are engaged even when perceivers’ attention to social targets is limited (Chong, Williams, Cunnington, & Mattingley, 2008; Spunt & Lieberman, 2011).

Second, as readers may have noticed, the brain regions making up the ESS and the MSAS are almost completely nonoverlapping. This dissociation holds up under meta-analytic scrutiny: Studies engaging one system rarely engage the other concurrently (Gobbini, Koralek, Bryan, Montgomery, & Haxby, 2007; van Overwalle & Baetsens, 2009). Even more strikingly, the situations and task parameters that engage the MSAS often dampen activity in the ESS, and vice versa, leading to suggestions that these neural systems sometimes “compete” with each other for the guidance of behavior. For example, Brass, Ruby, and Spengler (2009) demonstrated that when participants were asked to refrain from imitating targets’ movements, they demonstrated reduced engagement in the ESS and concurrently engaged areas within the MSAS. In another study, we (Zaki, Hennigan, Weber, & Ochsner, 2010) presented participants with nonverbal emotional expressions of targets combined with sentences describing the situational contexts to which targets were putatively reacting. In some cases, these two types of information suggested incongruent affective states (e.g., a happy-looking target paired with a contextual sentence stating that the target’s dog just died). Perceivers then were asked to judge how they believed targets felt. As perceivers relied more on target nonverbal behavior when making judgments, they increased engagement of their ESS and dampened engagement of the MSAS; the opposite pattern emerged as perceivers relied more on contextual cues.

The impressive dissociations between the cognitive and neural signatures of experience sharing and mental state attribution have sometimes motivated an “either/or” approach to mind perception, in which researchers focus on one process while ignoring—or dismissing the importance of—the other. As we see next, this view proves an ill fit for existing and emerging data (Apperly, 2008; J. P. Mitchell, 2005), and reintegrating accuracy into the study of mind perception provides a way to move past such assumptions in favor of potentially richer questions about how mind perception operates.

Accuracy Returns

As just described, a process-oriented approach to mind perception has been both generative—in its ability to produce robust, replicable findings and relatively lean theoretical accounts of processes—and potentially limiting—in its tendency to isolate the study of single processes and ignore (or remain agnostic about) their relationship to behavioral outcomes such as accuracy. If process- and accuracy-related research programs are to make mutually beneficial contact, however, the question naturally arises as to what has become of accuracy research while the process-oriented approach has dominated research on mind perception, and on social cognition more broadly. After suffering a 25-year dry spell following the critiques of Cronbach and others, interpersonal accuracy research has regrouped and grown steadily over recent decades. Existing reviews provide excellent and detailed descriptions of current approaches to accuracy research (Funder, 1995; Ickes, 1997; Jussim, 2005; Kenny & Albright, 1987; Swann, 1984). As such, we describe only four of these very briefly, with the goal of laying out the basics of the most common approaches so that in later sections we can explore their integration with process-oriented work. The first three of these accuracy types (pragmatic, realistic, and
Componential) focus inferences about dispositions, whereas the fourth (empathic) directly addresses mind perception.

**Pragmatic Accuracy**

One approach to accuracy has overcome problems in measurement and validity by circumventing them entirely. Instead of attempting to establish a criterion representing the “true” state or trait of targets and measuring interpersonal accuracy as the ability of perceivers’ inferences to approach that truth, the pragmatic approach focuses on the utility of social inferences for negotiating social relationships (Fiske, 1992, 1993; Jussim, 1991; E. R. Smith & Collins, 2009; Swann, 1984). Following Mischel’s interactionist approach to personality, if targets’ behavior varies stably across situations, then a perceiver’s accuracy for a target need not (and potentially cannot) encompass all of that target’s behavior. Rather, perceivers need only predict behavior relevant to domains in which they interact with a target (e.g., to successfully interact with John, his students need to accurately assess how hard a grader he is but not how much he loves banjo music). There is evidence that perceivers do achieve such “circumscribed accuracy” (Swann, 1984) and that they constrain their predictions about targets to situations relevant to their basis for judgment (Idson & Mischel, 2001; Noordewier & Stapel, 2009).

**Realistic Accuracy**

In contrast to pragmatic accuracy, the realistic accuracy approach takes as a starting point the idea that targets’ dispositions (e.g., a target’s level of extraversion) are real: that is, they exist independently of target and perceiver opinions. Thus, accuracy can be studied using methods used for construct validation by first identifying traits that are consensually perceived by others, predictive of behavior, and stable across time, and then examining how accurate perceivers are in perceiving such traits (Funder, 1995).

**Componential Accuracy**

Componential accuracy is embodied by Kenny and colleagues’ work (Kenny & Albright, 1987; Malloy & Kenny, 2006), which statistically disentangles multiple potential sources of interpersonal consensus in a manner similar to that suggested by Cronbach’s original critiques. Especially interesting for current purposes, component models provide behavioral cues about the processes that perceivers employ in drawing inferences about targets (e.g., projection or stereotyping). Unlike the realistic approach, however, component models remain agnostic about targets’ “real” traits and instead focus on the mix of sources that influence interpersonal judgments.

**Empathic Accuracy**

Pragmatic, realistic, and componential approaches to accuracy all share a focus on perceivers’ ability to gauge targets’ stable dispositions, but often, perceivers are more concerned with a target’s transient states (How does Frank feel right now? Is Jenna flirting with me?). Work on empathic accuracy examines interpersonal consensus about such states using paradigms in which perceivers’ rating of targets’ thoughts and feelings are compared with targets’ reports on their own states (Ickes, 1997; Ickes, Stinson, Bissonnette, & Garcia, 1990; Levenson & Ruef, 1992). Such paradigms have been used to examine the situational and individual-difference predictors of accuracy for emotions (Klein & Hodges, 2001; Pickett, Gardner, & Knowles, 2004; Simpson, Ickes, & Blackstone, 1995; Simpson, Orina, & Ickes, 2003; Stinson & Ickes, 1992). Similar approaches in nonverbal behavior also have examined the types of emotional cues (e.g., visual, prosodic) that predict accuracy, and in which circumstances they do so (Costanzo & Archer, 1989; Hall & Schmid Mast, 2007; Nowicki & Duke, 1994; Rosenthal, Hall, DiMatteo, Rogers, & Archer, 1979; Russell et al., 2003).

**Where Do We Go From Here? Integrating Process and Accuracy**

The process- and accuracy-oriented approaches described here ostensibly study two sides of the same social cognitive coin: How people go about attempting to understand each other and how well their attempts fare. As such, the relative lack of crosstalk between these approaches is at least somewhat surprising. In some cases, this disconnect may stem from perceptions that processes and accuracy are orthogonal and do not impact each other in lawful ways. If this were true, it would be unclear why single studies or research programs could meaningfully tie these phenomena together. In other cases, researchers may believe that processes and accuracy are related but that the structure of these relationships is obvious (e.g., the more a perceiver applies a given process, the more accurate their inferences will be), and therefore the explicit study of their connection offers little new insight about mind perception. If this were true, it would be unclear why examining process–accuracy relationships is a meaningful endeavor. In this section we address the first of these issues (how processes and outcomes can be brought together). In the third section we address the second (why bringing these phenomena together is important to the future of mind perception research).
A Framework for Integration

A Social Cognitive Neuroscience Approach

In building a framework for integrating research on process and accuracy, it should be highlighted that we adopt a social cognitive neuroscience (SCN) approach (Lieberman, 2007; J. P. Mitchell, 2006; Ochsner, 2007; Ochsner & Lieberman, 2001) that combines the theory and methods of cognitive neuroscience and social psychology. Two key ideas are embodied by this approach. The first idea is that behavior can be explained usefully at multiple levels of analysis, including (a) the social level describing behaviors and experience in their interpersonal context, (b) the cognitive level specifying underlying information processing mechanisms, and (c) the neural level specifying the neural systems that implement these processes. Whereas social psychology traditionally has been concerned primarily with the first two of these levels, and cognitive neuroscience primarily concerned with the latter two, SCN (or social neuroscience more broadly; see Cacioppo & Berntson, 1992) seeks to connect all three.

The second idea concerns the way in which we draw inferences about the relationships between these levels. In any given experiment we can manipulate and/or measure variables at the social (e.g., accurate vs. inaccurate inference) and neural (e.g., activity in specific brain systems) levels. By contrast, cognitive processes such as experience sharing and mental state attribution cannot be directly measured; their operation must be inferred from patterns we observe in social- and neural-level variables. For this reason, the SCN approach emphasizes the use of converging evidence from the social and neural levels to triangulate on psychological processes. This can provide greater leverage for testing psychological theories than approaches that emphasize only the social and cognitive, or cognitive and neural levels, respectively.

Applying SCN to Process-Accuracy Relationships

The SCN approach can be used to build a framework that uses behavioral (including self-report) and neuroscientific measures to draw inferences about how interpersonal accuracy is related to the underlying processes of experience sharing and mental state attribution. Although no one technique taken alone is sufficient to document the presence of a given cognitive process—or its effect on accuracy—the hope is that combining data from varying levels of analysis will afford us more traction in examining mind perception in a way that speaks to multiple domains of research.

Figure 1 illustrates this framework, using experience sharing as an example process. Cognitive/process-level phenomena—for example, a perceiver’s deployment of experience sharing—are impossible to observe directly. Even defining them requires wading into murky phenomenological terrain (e.g., “How can we really know what emotion a target is experiencing?”). However, each of these phenomena involves multiple measurable variables at the social/behavioral and neural levels. By way of comparison, consider that the study of affective experience (the leftmost phenomenon in Figure 1) has been well served by seeking out converging evidence from self-report, neural activity, and other domains (Barrett, 2009; Barrett, Mesquita, Ochsner, & Gross, 2007; Kober et al., 2008; Lindquist & Barrett, 2008). Similarly, we believe that the operation of mind perception processes and their effect on accuracy can be inferred best from the many measurable signs that these cognitive-level phenomena leave in their wake. These include activity in relevant neural systems, convergence between targets’ and perceivers’ reports of their own affect (a social/behavioral level sign of experience sharing), convergence between targets’ and perceivers’ reports on targets’ affect (a social/behavioral level sign of interpersonal accuracy), and correlations between target and perceiver neural or physiological activity over time (Marci & Orr, 2006; Schippers et al., 2009; Stephens, Silbert, & Hasson, 2010; Vaughan & Lanzetta, 1980). It is important to note that connections between phenomena can also be effectively interrogated by sampling evidence at multiple levels of observation. For example, a strong case for

Figure 1. A framework for combining neural and behavioral observations to gain traction on how and when mind perception processes produce accurate inferences. Note. ESS = experience sharing systems.
the idea that experience sharing contributes to interpersonal accuracy can be made by marshalling evidence that these phenomena are related at behavioral, experiential, and neural levels (Cacioppo & Bernston, 1992; Ochsner & Lieberman, 2001).

**Modeling Context Dependency**

As Lieberman (2005) pointed out, if a social psychologist was stranded on a desert island and given the choice of one idea to bring with her, a likely candidate would be “the power of the situation.” The SCN approach expands this “situationalist” focus to neuroscience research as well. Does Jack’s high score on a conscientiousness scale mean he won’t be found playing air guitar while standing precariously on a barstool this weekend? Will viewing a surprised face engage participants’ amygdala or not? The likely answer to these (and myriad other questions) is, It depends on the contexts in which behaviors and brain activity are embedded. Our own work and our examination of others’ work suggest that process-outcome relationships in mind perception are no exception to this trend. That is, asking whether experience sharing or mental state attribution (or any other mind perception process) produces accuracy is a conceptual nonstarter. Instead, researchers should focus on when these processes produce accuracy. This requires “zooming out” from a focus on processes or accuracy in isolation, to achieve a broader focus on contextual factors that determine their connection to each other.

Figure 2 displays such a broad view of accuracy, with an emphasis on the many moving parts that determine the course of a mind perception episode. In this model, both the cues produced by a target and those received by a perceiver constrain (a) the likelihood that a perceiver will engage a given mind perception process, and (b) the effect that process can be expected to have on accuracy. Zooming out also makes clear that neither cognitive processes nor accuracy are mind perception’s endgame. Both of these phenomena serve the more “downstream” goal of supporting adaptive social behavior and fostering positive social ties. Researchers often labor under the assumption that mind perception processes and interpersonal accuracy allow perceivers to “navigate,” “maneuver,” or otherwise locomote adeptly through their social world. However, there are likely cases in which a given process, or even accuracy, are not social interaction’s power steering. Processes and accuracy sometimes have no effect on social well-being, and can even reduce perceivers’ ability to connect fruitfully with others. Our approach emphasizes the need to model situational factors that determine when a process (or accuracy) helps—and when it harms—perceivers’ social interactions.

Thus, central to this model is a focus on two ways in which the relationship between cognitive processes and later outcomes are mediated by other factors. First, there is an emphasis on understanding the situational factors that determine whether a given process will produce accurate inferences. Second, there is an emphasis on understanding how accuracy itself can serve as a mediator between the use of a mind perception process and adaptive social outcomes.

It is worth noting that connections between mind perception phenomena are bidirectional and that the left–right direction in Figure 2 is not a timeline demarcating sequentially completed steps. Perceivers do not encounter targets, deploy a mind perception process, draw an (in)accurate inference, produce a socially (mal)adaptive behavior, and call it a day. Instead, social interactions are dynamic and dense with feedback loops (Freeman & Ambady, 2011; Kunda & Thagard, 1996). For example, learning that she is
mistaken or has behaved inappropriately, a perceiver may alter the way she engages during subsequent interactions with a target. Perceivers can shift their mind perception in multiple ways, including changing the content that they focus on when employing mental state attribution (such as the level at which they construe a target’s behavior; see Spunt, Satpute, & Lieberman, 2010; Vallacher & Wegner, 1987), or altogether changing the process they employ in perceiving that target (e.g., “turning up” one’s shared experience through perspective taking; see Batson, 1991; Lamm, Batson, & Decety, 2007). These adaptations can, in turn, serve perceivers’ goals of better understanding targets (Eyal & Epley, 2010). Such feedback processes are not limited to perceivers’ information processing; targets also may change the social cues they produce to clarify their internal states after learning that a perceiver has misjudged them (Swann & Ely, 1984; Swann, Hixon, Stein-Seroussi, & Gilbert, 1990), or (even more interesting) may change their self-view to match a perceiver’s initially erroneous judgment of them (Turner, 1991). The role of such feedback loops in mind perception is an emerging topic of enormous interest. However, because relatively little is known about how such feedback works—and to constrain the scope of this article—we focus predominantly on “left to right” relationships between the phenomena in Figure 2.

What Does This Buy Us? The (Basic and Applied) Fruits of Integration

Thus far, we have outlined a framework for integrating processes and accuracy in the study of mind perception. We now broaden our focus to suggest ways in which this integrative approach can foster novel insights and influence the way observations are made in behavioral, neuroscientific, and clinical mind perception research. We describe separately the potential advances that could be made for our understanding of mind perception in each of these domains, but we emphasize at the outset that a major advantage of integrating the study of processes and accuracy emerges specifically from bridging data gleaned from different approaches (e.g., neural and clinical) that too often are isolated from each other.

Specifically, we discuss five advantages an integration of process and accuracy have over the study of either in isolation: (a) overturning incorrect but pervasive assumptions about mind perception, (b) delineating the situation-specific relationships between processes and accuracy, (c) tying data about information processing more directly to evidence about social well-being, (d) drawing parallels between mind perception and other domains of cognition, and (e) mapping the domains in which social cognitive abnormalities in psychiatric disorders lead to functional impairments.

As previously mentioned, the majority of examples we discuss focus on mind perception accuracy for transient affective states (i.e., empathic accuracy) and not on inferences about other aspects of individuals, such as their stable dispositions. Beyond the pragmatic limitations of space, this narrowing of scope is motivated by two principled factors. First, empathic accuracy paradigms enjoy some psychometric strengths that obviate some of the early concerns leveled against accuracy research more generally. Historically, accuracy has been calculated as the simple difference between a perceiver’s rating of a target state or trait relative to some criterion measure (e.g., the target’s self-report). This approach is intended to index accuracy about the overall level of some attribute, has been common to many forms of accuracy research, and has been roundly criticized as statistically problematic (see earlier and see Cronbach, 1955; Kenny, 1991). By contrast, contemporary empathic accuracy paradigms record perceivers’ inferences, as well as targets’ self-report, at multiple timepoints. This allows researchers to compute a measure of accuracy for the time-varying dynamics of a target’s state, not just the overall average level of that state. For example, one can calculate the correlation between a perceiver’s inferences about a target’s affect and a target’s self-rating as they both vary across time. The resulting correlations reflect target–perceiver agreement about when a target felt relatively negative. It is important to note that such correlations are independent of the overall level of some state that perceivers infer that targets are experiencing and that targets assign to themselves. As such, dynamic measures are robust to many of the biases—including stereotype application, assumed similarity, or scale usage tendencies—that can inflate empathic accuracy measures defined as the difference between two global assessments.

Second, for reasons explained above (see Where Do We Go From Here?), we are especially interested in connecting measures of cognitive processes such as shared experience and mental state attribution to measures/correlates of interpersonal accuracy at the behavioral and neuroscientific levels. Because almost all neuroscience research on process use concerns the sharing and inferring of transient states (beliefs, emotions, intentions), and not static traits, empathic accuracy is a natural candidate for exploring process-accuracy relationships across multiple levels of analysis. This does not mean that this measure of accuracy is the only one that can be used to examine the connections we describe next. In fact, it is our hope that future researchers will be motivated to explore similar connections—at both the neural and behavioral levels—between mind perception processes and other forms of accuracy.
Contributions to Behavioral Approaches

Perceivers’ Mind Perception Abilities: Half Full or Half Empty?

Imagine an extraterrestrial preparing to make first contact with Earth. In advance of meeting humans, she decides to do research on our behavior, taps into PsycINFO, and reads all the work she can find on mind perception. She is disappointed to learn that people are, by and large, inept at understanding each other: They ascribe traits to each other based on demonstrably nontarget behaviors (Gilbert & Malone, 1995; Jones & Harris, 1967); erroneously impute their knowledge, beliefs, and preferences onto others (Epley et al., 2004; Gilovich, Medvec, & Savitsky, 2000; Gilovich, Savitsky, & Medvec, 1998; Ross, Greene, & House, 1977); and carelessly apply stereotypes (Fiske, 1998). They can correct these mistakes, but only through slow, labor-intensive application of rules, and in the absence of such efforts, they “default” to error and bias (Devine, 1989; Devine et al., 2002; Gilbert, Pinel, Wilson, Blumberg, & Wheatley, 1989).

Why has existing research equipped our interplanetary traveler with such underwhelming expectations? Because accuracy is hard to define, and the faults and foibles of mind perception have proved comparatively easier to uncover and eye-catching to boot, the process-oriented approach tends toward a potentially disheartening view of mind perceivers as “faulty computers,” running mind perception software that is often situation inappropriate (Higgins & Bargh, 1987; Krueger & Funder, 2004). This outlook gains further momentum from its contact with a historically popular view of decision making, which suggests that people—instead of optimizing their decisions based on all the information available to them—rely on simple judgmental heuristics that lead them toward a host of incorrect decisions about the outside world (Kahneman & Tversky, 1996; Tversky & Kahneman, 1974), the sources of their own behaviors and abilities (Nisbett & Wilson, 1977), and even the nature of those behaviors and abilities (Kruger, 1999; Kruger & Dunning, 1999).3

Is such a pessimistic attitude about mind perception warranted? Granted, perceivers can be induced into committing lawful, compelling errors when judging targets’ states and traits. However, studies of these effects often use statistically perfect judgments as a criterion against which to define social cognitive error (e.g., completely discounting nontarget information when making preference judgments, see Jones & Harris, 1967). Further, studies of social cognitive error typically use highly superficial and nonnaturalistic tasks that—in a manner analogous to visual illusions—are designed to create the errors they document (Funder, 1987) and may overlook the ways these errors actually reflect generally adaptive processing. These factors result in a “half-empty glass” view of perceivers who are seen in light of their errors and not their accomplishments (Krueger & Funder, 2004).

Traditionally, accuracy research has taken a much different tack: Comparing judgments made in more naturalistic settings (i.e., judgments made about actual social targets on the basis of complex behavior) to targets’ own self-perceptions. Further, accuracy in these studies is typically measured against a baseline of chance, as opposed to an assumption of perfect (and often perfectly rational) performance. This approach produces a more optimistic view of mind perceivers, who are shown to excel in a number of ways. First, perceivers largely agree with each other and establish impressive consensus about the states and traits of social targets, even when they have access only to “thin slices” of target behavior (Ambady & Rosenthal, 1992; 1993; but see also Ames, Kamrath, Suppes, & Bolger, 2010), or impoverished target cues (North, Todorov, & Osherson, 2010; Zaki, Bolger, et al., 2009). Second, perceivers’ inferences are impression predictors of target behavior (Funder, 1991; Moskovitz & Schwarz, 1982), even decades after perceivers’ from their initial impressions (Nave, Sherman, Funder, Hampson, & Goldberg, 2010). Third, perceivers achieve consensus with targets themselves (Ickes, 1997; Kenny & Albright, 1987; Levenson & Ruuf, 1992; Zaki, Bolger, & Ochsner, 2008). Finally, emerging evidence suggests that, at least in certain situations, perceivers have a well-calibrated understanding of when they are likely to be accurate, versus inaccurate, about target states (Kelly & Metcalfe, in press).

An integration of processes and accuracy can combine the strengths of each of these approaches in balancing views about perceivers’ skills in understanding targets. Specifically, not only can we document that perceivers fare pretty well in their endeavors (the conclusion of extant accuracy research) or that a given process sometimes fails them (the conclusion of extant process research), but we can more specifically chart the landscape of process-accuracy relationships to describe when a given process supports accuracy. We turn to this issue now.

Processes’ Situation-Specific Utility

When humans are equipped with more than one tool for completing a single task, a few questions naturally arise. One could ask which tool is better for completing that task (e.g., “Should I use the hammer or screwdriver for hanging this painting?”). However, a deeper question may be, Why would nature equip us with more than one tool for a single task? The answer is often that what appears to be a single task (e.g., hanging a painting), upon closer inspection, ends up splintering
into multiple, independent tasks each suited to different tools (e.g., hanging frames held up by screws vs. nails).

Perceivers’ repertoire of mind perception processes suggests just such a state of affairs: Shared experience, mental state attribution, and other processes likely exist in tandem because they each support accurate interpersonal understanding under differing circumstances. This perspective can clear up confusion in the extant literature on the process-accuracy relationship.

Consider the age-old search for the “good perceiver.” Popular intuition has long held that some individuals—specifically, those who tend to share others’ experiences—also should be adept at understanding those experiences (Allport & Allport, 1921). However, attempts to relate accuracy and experience sharing have fared surprisingly poorly (Hall, 1979; Ickes et al., 1990; Levenson & Ruef, 1992), leading modern accuracy research to largely abandon the search for “good perceivers” (Ickes et al., 2000). The model described in the Modeling Context Dependency section suggests a way out of this counterintuitive null finding: Lawful features of social situations may determine when experience sharing will come in handy to mind perceivers.

Following this logic, we recently tested the idea that a critical feature of a perceiver’s situation is the type of target they encounter. Our premise was that mind perception, as a fundamentally interpersonal process, should depend both on a perceiver’s tendencies to deploy specific kinds of processes—such as experience sharing—and features of targets that influence how easily they can be perceived—such as their trait levels of emotional expressivity (Gross & John, 1997; Zaki, Bolger, et al., 2009). Specifically, we predicted that perceivers high on the tendency to use experience sharing would be more accurate in judging the emotions of a target to the extent that the target sends strong expressive signals to their internal emotional state that the perceivers could share. In line with this prediction, we found that perceivers’ trait-level experience sharing predicted accuracy as a function of a target’s tendency to be emotionally expressive (Zaki et al., 2008). Findings like this both flesh out situation-specific utility of mind perception processes and highlight the importance of moving beyond the “perceiver-centric” view that has dominated process-oriented research for half a century.

Linking Processes to Social Well-Being and Dysfunction
Whereas the proximal goal of mind perception processes is forming an accurate impression of targets, the ultimate goal of such processes is to allow perceivers to function adaptively in the social world, by forming and maintaining social bonds with others. Positive social relationships are a central human need (Baumeister & Leary, 1995) that provides both psycho-logical and physical protection against environmental stressors (Bolger & Eckenrode, 1991; Cohen, Doyle, Skoner, Rabin, & Gwaltney, 1997; Hawkley, Burleson, Berntson, & Cacioppo, 2003). Indeed, discussions of mind perception often begin with the idea that processes such as experience sharing and mental state attribution are important because those processes support adaptive social behavior.

But do they? Perhaps only sometimes. On one hand, individual differences in experience sharing sometimes are associated with adaptive social behaviors, such as cooperation, altruism (Eisenberg & Miller, 1987; Johnson, 1975), or some measures of social skills (Baily, Henry, & Von Hippel, 2008; Pfeifer et al., 2008; Riggio, Tucker, & Coffaro, 1989), and individual differences in the tendency to employ mental state attribution may track with accommodating behavior during conflict in close relationships (Arriaga & Rusbult, 1998; Long & Andrews, 1990). On the other hand, some studies have found no relationship between these processes and social skills, adjustment, or integration (Cliffordson, 2002; McWirther, Bessett-Alesch, Horibata, & Gat, 2002).

The integrative approach we advocate suggests a novel prediction: Accuracy may serve as a “middle-man” mediating the relationship between deployment of a process and its ultimate adaptive goal of promoting social well-being. Support for this comes from the finding that interpersonal accuracy (especially concerning transient states such as thoughts and emotions) predicts adaptive relationship behavior, such as skillful social support (Verhofstad, Buysse, Ickes, Davis, & Devoldre, 2008); lower relationship abuse (Clements, Holtzworth-Munroe, Schweinle, & Ickes, 2007); and social adjustment in adolescents (Edwards, Manstead, & MacDonald, 1984; Gleason, Jensen-Campbell, & Ickes, 2009; Spence, 1987), college students (Carton, Kessler, & Pape, 1999; Zaki & Ochsner, 2011a), and adults (Bartz et al., 2010).

Of course, the idea that accuracy supports adaptive social function is nothing new (for a review of nearly 100 studies on this topic, see Hall, Andrzejewski, & Yopchick, 2009) and was, in fact, part of the impetus for the original accuracy movement described earlier. Today, well-known theories incorporate decoding of others’ states into larger constructs, such as emotional intelligence (Lopes, Grewal, Kadiis, Gall, & Salovey, 2006; Mayer, DiPaolo, & Salovey, 1990; Mayer, Salovey, & Caruso, 2008; Mayer, Salovey, Caruso, & Sitarenios, 2001) or affective social competence (Halberstadt, Denham, & Dunsmore, 2001). However, these frameworks often view accuracy as a precursor, or “lower level, fundamental skill” (Mayer et al., 2008, p. 506) that combines with other skills such as affect management and communication ability to produce a higher level set of abilities that support social function.
In contrast, mind perception researchers view accuracy itself as a complex outcome dependent on a suite of flexibly deployed cognitive processes. As such, research tying health and well-being to accuracy often makes little contact with work on the cognitive processes that produce accuracy. This is unfortunate, given that social cognitive work has begun to suggest that empathic accuracy does not always promote adaptive behavior. In fact, in some cases accuracy can be mal-adaptive, as when perceivers correctly intuit a target’s negative or relationship-damaging thoughts and feelings (Simpson et al., 1995; Simpson et al., 2003) or when accuracy prevents the application of (presumably adaptive) positive biases in self-perception that are characteristic of most individuals (Taylor & Brown, 1988).

Integrating processes and outcomes suggests ways to address these seemingly conflicting relationships between mind perception processes, accuracy, and adaptive social behavior by reframing the questions we ask. Instead of asking whether a given mind perception process promotes adaptive behavior, we might ask when its use is adaptive by virtue of producing accurate inferences, and when does that process motivate adaptive behaviors irrespective of (or even by reducing) accuracy?

Following a social cognitive neuroscience approach, both behavioral and neural correlates of mind perception processes and accuracy can be brought to bear in answering such questions, and testing models in which accuracy mediates the relationship between mind perception processes and social function. The use of brain activity to predict outcomes in the field is only now taking hold (cf. the “brain as predictor” model employed by Berkman, Falk, & Lieberman, 2011; Falk, Berkman, Mann, Harrison, & Lieberman, 2010) and stands to make headway in linking information processing to adaptive behavior in the social domain.

Contributions to Neuroscientific Approaches

Fleshing Out Single-Process Models

Dissociations between the neural systems supporting experience sharing and mental state attribution have prompted a curious debate among neuroscientists about which system is primarily responsible for mind perceivers’ abilities (Apperly, 2008). Some, following so-called simulation theory (Heal, 1996), have cited the role of the ESS as evidence that shared experience is the royal road to interpersonal understanding (e.g., Gallese & Goldman, 1998; Gallese et al., 2004). Others, following the tongue-twistingly named “theory theory” (Gopnik & Wellman, 1992), argue that mental state attribution, supported by the MSAS, is central to understanding targets (e.g., Saxe, 2005).

We believed such theories lack two features critical to forming a more complete theory of mind perception’s neural bases. First, in focusing on single neural systems, it is easy to forget that processing the complex social cues perceivers most often encounter in daily life typically draws on both the MSAS and ESS (among other regions). Second, MSAS and ESS-based theories of interpersonal understanding have proceeded largely in the absence of direct evidence about whether either neural system supports accuracy about actual social targets. This is because tasks engaging the ESS rarely require perceivers to infer targets’ internal states, and tasks tapping the MSAS typically employ extremely easy, simplified social tasks that produce ceiling effects. In each case, the ability to directly measure the neural systems supporting accurate, as opposed to inaccurate, social inferences is limited at best (Zaki & Ochsner, 2009). We now discuss each of these weaknesses in the literature—and how we believe they can be overcome—in turn.

Moving from single to multiple-process models.

In our view, nominating single processes or neural systems as supporting interpersonal understanding likely reflects a lack of contact between cognitive neuroscientific and behavioral approaches to mind perception. A major aim of cognitive neuroscience is using brain activity as a guide for interpreting multiple cognitive processes as either distinct (based on separable neural circuitry) or functionally related (based on overlapping neural circuitry; see Henson, 2005). This approach has helped to resolve a number debates about cognition, for example, providing evidence that visual imagery and visual perception are highly similar (Kosslyn et al., 1997), or that declarative and procedural memory are not (Buckner et al., 1995; Schacter, 1997).

However, such an approach also encourages researchers to emphasize single patches of neural real estate and to focus on tasks that excite their particular neural neighborhood. For example, a researcher examining the role of the ESS may be more interested in tasks tapping the ESS, such as perceivers’ sharing of targets motor intentions, disgust, or pain, and may pay less attention to false belief tasks that do not engage the ESS. Similarly, a researcher may pay more attention to data demonstrating that damage to the ESS impairs emotion perception (Adolphs, Damasio, Tranel, Cooper, & Damasio, 2000; Shamay-Tsoory, Tomer, Berger, Goldsher, & Aharon-Peretz, 2005) than to similar lesion data suggesting that the MSAS is necessary for making judgments about many forms of beliefs and intentions (Shamay-Tsoory, Aharon-Peretz, & Perry, 2009).

Nonetheless, the fact that neural systems can be dissociated does not imply that they are necessarily or even usually dissociated during social inferences, especially those based on the kinds of complex social information that we encounter in everyday situations (Keysers & Gazzola, 2007; Shamay-Tsoory, 2010;
nitive processes—support accuracy. It stands to reason, and, it stands to reason, their related cognitive processes may support accurate inferences, depending on types of social cues perceivers encounter and the inferences they are asked to make. Specifically—although direct evidence is still lacking—extant data suggest that the MSAS may support accurate inferences about complex, contextualized internal states (i.e., those that require understanding the source of a belief or emotion), whereas the ESS may support accuracy about states with more prominent bodily components, such as disgust or pain (Keysers & Gazzola, 2009; Lamm & Singer, 2010; Saarala et al., 2007; Zaki, Davis, & Ochsner, 2011; Zaki et al., 2010). Future work should investigate such possibilities.

Drawing Parallels With Other Phenomena

As previously described, a major aim of cognitive neuroscience is to “carve nature at its joints” by using imaging data to inform questions about the distinct or overlapping processing systems underlying various behaviors. In this regard, imaging data have proven to be particularly useful in addressing particular kinds of questions about processing mechanisms. One question ideally suited for imaging data is whether two different behavioral phenomena depend on common or distinct processing systems. By determining whether the two behaviors recruit similar or different neural systems one gains purchase on this question.

In the last decade, this approach has been applied to the study of social cognition to demonstrate that encountering, drawing inferences about, and responding to social information recruits brain regions largely distinct from those supporting processing of nonsocial information. Consider the example of cognitive control. Tasks requiring the engagement of control processes such as response inhibition or working memory engage lateral prefrontal and cingulate regions but seldom if ever activate regions within the MSAS (Botvinick, Braver, Barch, Carter, & Cohen, 2001; Wagner, Jonides, & Reading, 2004). In fact, cognitively demanding tasks deactivate several MSAS regions, and activity in regions associated with social and nonsocial task types demonstrates negative, reciprocal relationships (Drevets & Raichle, 1998; Fox et al., 2005). At first these findings were taken to mean that thinking about animate agents requires a discrete form of information processing unique to the social domain (J. P. Mitchell, 2008b) and that cognition and
socioemotional processes might be antagonistic to one another (Drevets & Raichle, 1998). More recent models have focused on the specific computations that may differentiate the demands of social versus nonsocial inference (Buckner & Carroll, 2007; J. P. Mitchell, 2009b).

Although useful for clarifying the boundaries between social and nonsocial cognition, a strong focus on dissociating their underlying processing systems may miss ways in which the two kinds of systems collaborate in everyday social interactions that demand more than one kind of process come into play. This bears on the previous discussion of cognitive control. Behavioral work suggests that mind perception—and specifically mental state attribution—is highly demanding, and succeeding in it depends on the availability of executive control resources (Apperly & Butterfill, 2009; Carlson & Moses, 2001). At first blush, this finding seems to clash with evidence that executive control and social cognition rely on different neural systems. This confusion is partially cleared up, however, when we consider that neuroimaging studies of mind perception often employ social tasks with limited or no executive demands (e.g., passive viewing of social targets), and when they do employ more difficult social tasks (e.g., some studies of mental state attribution), cognitive control demands are typically equated across the critical mind perception and baseline control conditions so as to isolate the neural correlates of mental state attribution.

As such, distinctions between neural systems involved in social and nonsocial information processing may not reflect “deep” dissociations between the computations underlying these phenomena. Instead, they may reflect the simple fact that, to date, extant work has largely focused on a particular question: Is mind perception different from other cognitive abilities? This question is addressed by attempting to isolate neural systems preferentially engaged by the presentation of, and judgments about, social cues. Typically, this is accomplished by stripping away the complexities of everyday social interaction to devise tasks simple enough that they depend most critically on only the specific mind perception process(es) of interest in a given study.

Asking a different question—for example, What do social and nonsocial information processing have in common?—suggests focusing on tasks that more closely match the complex processing demands of “everyday” social cognition where cognitive control processes might be important. For example, targets often produce unclear or contradictory feedback about their internal states, which perceivers must sort through or choose between in order to be accurate. In such cases, drawing accurate interpersonal inferences requires adjudication between multiple sources of social information (e.g., a target who looks sad but sounds happy). It is likely that these requirements functionally resemble other forms of response conflict that engage executive control centers in the brain. Studies of the neural correlates of perceiving conflicting social cues bear out this parallel by showing engagement of domain-general control systems (Decety & Chaminade, 2003; R. L. Mitchell, 2006; Wittfoth et al., 2009) that interact with regions in the ESS and MSAS to guide attention to the cues that perceivers find most relevant to deciding how targets feel (Zaki et al., 2010).

Thus, although the neural systems involved in mind perception and nonsocial cognition can be dissociated, exploring their common reliance on domain-general control systems can illuminate some of their similarities as well. Future work employing naturalistic social tasks in combination with measures of accuracy may serve to further characterize the links between mind perception processes and other cognitive abilities.

Contributions to Clinical Approaches

Finally, an integration of processes and accuracy has the potential to reframe thinking about clinical disorders characterized by social cognitive deficits. As with the study of healthy perceivers, this approach allows for a shift away from viewing these disorders as representing disruptions of single processes that invariably cause social symptoms and toward a focus on (a) seeing disorders as arising from abnormal profiles of function in multiple processes and their interrelationships and (b) examining the situation-specific effects of these processing abnormalities on social symptoms. Here we consider autism spectrum disorders (ASD) as an example case.

Processes and Accuracy in Autism

Individuals with ASD famously fail to engage in typical forms of interpersonal interactions (Lord et al., 1997; Lord, Rutter, & Le Couteur, 1994; Wing & Gould, 1979) and to normatively deploy mental state attribution and experience sharing or engage the neural systems underlying these processes (Baron-Cohen et al., 1985; Dapretto et al., 2006; Kennedy, Redcay, & Courchesne, 2006; Oberman, Ramachandran, & Pineda, 2008; Rogers, Hepburn, Stackhouse, & Wehner, 2003). The observed covariance between a specific kind of processing dysfunction (e.g., experience sharing) and abnormal social function in ASD is sometimes used as evidence that abnormalities in single mind perception processes underlie social deficits in autism (Baron-Cohen, 1994; Oberman & Ramachandran, 2007). On this view, abnormalities in either mental state attribution or experience sharing lead, more or less directly, to the complex social symptoms evinced by ASD.

Although processes such as those supporting experience sharing no doubt play some role in ASD, single
process models fail to square with several lines of evidence (Happe, Ronald, & Plomin, 2006). For example, not all studies of ASD document problems in mind perception tasks or their neural bases (Bird et al., 2010; Bowler, 1992; Castelli, 2005; Fan, Decety, Yang, Liu, & Cheng, 2010). Further, the few studies attempting to directly link deficits in mind perception processes with social symptom severity have yielded inconsistent results (Dapretto et al., 2006; Fombonne, Siddons, Achar, Frith, & Happe, 1994; Lombardo, Barnes, Wheelwright, & Baron-Cohen, 2007; Rogers et al., 2003; Tager-Flusberg, 2007). What’s more, interventions aimed at encouraging the use of mind perception tasks or their neural bases (Bird et al., 2010; Demurie, De Corel, & Roeyers, 2011; Roeyers, Mager, & Boer, 2006; Golan & Baron-Cohen, 2006; Hadwin, Baron-Cohen, Howlin, & Hill, 1996, 1997; Ozonoff & Miller, 1995). These disparities underscore the gap between successfully deploying a particular cognitive process and successfully interacting with others.

The model we are advocating here suggests that two conceptual shifts could better link information processing to social function in ASD. First is the proposition that adaptive social functioning depends on the simultaneous and concerted use of multiple processes to support accurate understanding of the complex social cues perceivers typically encounter. Extant tasks used to assess impairments in ASD (such as motor imitation or emotion identification using pictures) are ill suited to capturing such deficits, because they are aimed at assessing the deployment of single processes using highly simplified stimuli. Second, abnormalities in the operation of mind perception processes likely interact with features of a situation (e.g., the target to which a perceiver is paying attention), affecting social function more in some situations and less so or not at all in others. As such, moving beyond a “perceiver-centric” take on mind perception could allow for mapping the specific contextual domains in which the processing deficits characterizing ASD are most damaging to patients.

Although there are only three extant studies of empathic accuracy in ASD, they provide promising initial support for the more nuanced view we are advocating here. For example, individuals with ASD demonstrate more consistent impairments in empathic accuracy than in simpler, more canonical theory of mind tasks (Demurie, De Corel, & Roeyers, 2011; Roeyers, Buysse, Ponnet, & Pichal, 2001). Second, the one study examining contextual effects on accuracy deficits suggests that ASD individuals’ social cognitive problems are indeed selective and related to the types of cues they encounter. Specifically, ASD status predicted reduced accuracy when perceivers observed unstructured interactions between targets but not when they observed targets interviewing each other in a structured format (asking each other questions, such as “What do you like to do in your spare time?”; see Ponnet, Buysse, Roeyers, & De Clercq, 2008). These data suggest that examining context-dependent deficits in accuracy can help researchers map the domains in which individuals with ASD are likely to be more or less impaired and how these impairments evolve out of mind perception processes that support greater or lesser accuracy. Such an approach also suggests potential novel interventions based not on erasing cognitive deficits but rather on placing individuals in contexts/situations where those cognitive deficits are less likely to matter.

Consider anecdotal reports (Grandin & Barron, 2004) and empirical studies (Baron-Cohen, 2009; Baron-Cohen, Richler, Bisarya, Gurunathan, & Wheelwright, 2003) suggesting that individuals with ASD often compensate for mind perception deficits by using systemized rules to elaborately “work out” the likely experiences of social targets. Such a compensatory strategy could be most useful when targets are producing clear and structured cues about their internal states (as in the interview condition previously described) of the type produced by emotionally expressive targets (Zaki et al., 2008; Zaki, Bolger, et al., 2009). This suggests a form of intervention in which caregivers and family members of individuals with ASD could restructure their behavior to provide clear, readable cues about their internal states, thereby rendering the information-processing issues inherent to ASD less debilitating.

Although speculative, ideas like this one highlight a broader point: Integrating measures of mind perception processes, accuracy, and adaptive functioning can produce novel predictions about the domains in which information-processing deficits lead to clinical dysfunction, and suggest situation-specific interventions to alleviate such dysfunction.

Conclusions

Mind perception research has a long and sometimes rocky past. The early years were defined by the hunt for accuracy. This hunt never captured its quarry, which led researchers to focus almost exclusively on the information-processing steps underpinning social cognition—indeed, independent of accuracy. This shift has been enormously successful in characterizing the separable mechanisms through which perceivers try to understand targets, and recent work identifying neural signatures of these processes has made the endeavor even more compelling.

We have argued that mind perception research—in focusing almost exclusively on process—has
often chosen to ignore its past, and as a consequence has been limited in some important ways. The majority of current mind perception research is concerned with determining whether and when a given cognitive processes is in play—and neural correlates of these processes are—in many cases without reference to whether or to what extent one’s resulting understanding of another person is accurate. Or put another way, we know a lot about what processes people engage when they try to make sense of others minds but less about what determines whether they are accurate. This matters because in actual social encounters, a perceiver’s goal is not simply to draw any old inference about their social partners but (usually) to draw an accurate one.

There seem to be two main reasons that the process approach has failed to make contact with the accuracy approach. First, researchers may believe that accuracy is too difficult to quantify. Luckily, this concern is outdated. Following a 25-year hibernation, accuracy research has surged, producing a novel and varied approaches to quantifying accuracy and identifying its predictors. Second, even if process-oriented researchers believe that accuracy can be quantified, they may not believe doing so is relevant to their work. Here, we hope to have shown that this view may be shortsighted insofar as integration can provide several novel insights, predictions, and lines of research. Following the framework previously outlined, the strength of this approach comes from directly linking (either behavioral or neural) signs that a process has been deployed with signs that a perceiver has accurately decoded a target’s internal states, and in turn relating both of these constructs to adaptive outcomes in the social world. Critical to all of these connections is identifying first the contextual boundaries that determine when a process supports accuracy and, second, when accuracy predicts social well-being.

In elaborating this approach, we have purposefully constrained our focus to two processes—mental state attribution and experience sharing—and on one form of accuracy—the ability to correctly judge a target’s dynamic emotional experience—because we considered a limited focus to be necessary for fully fleshing out and illustrating the value of a process-accuracy integration in a single article. However, we hope that future work will port this approach to the study of other processes, such as stereotyping and projection (Hoch, 1987; Judd & Park, 1993; Jussim, 1991; Neyer, Banse, & Asendorpf, 1999); other forms of accuracy, such as predictions of one’s own future experiences (Gilbert et al., 1998; Kermer, Driver-Linn, Wilson, & Gilbert, 2006; Wilson, Wheatley, Meyers, Gilbert, & Axsom, 2000); and other forms of adaptive behavior, such as successful negotiation, cooperation, and accurate prediction about others’ actions (Coricelli & Nagel, 2009; Galinsky, Maddux, Gilin, & White, 2008; Hampton, Bossaerts, & O’Doherty, 2008; Valdesolo, Ouyang, & DeSteno, 2010).

Overall, we believe that this approach can reframe current data concerning mind perception processes, prompt richer questions about how people understand each other, and suggest new ways of testing these questions. The sorts of changes motivated by this approach will vary depending on the phenomenon being studied and level of analysis being employed. In some cases, questions will be refined from the categorical (“Which process leads to accuracy?”) to the conditional (“When will this process produce accuracy?”). In other cases, neuroscientists could shift away from characterizing single systems (“What processing steps are instantiated in the MSAS or ESS?”) and toward more holistically viewing these systems’ role in naturalistic situations (“How do the MSAS and ESS interact with each other and with other systems—like those involve in domain general cognitive control—to produce accurate inferences?”). Finally, in clinical settings, this could mean moving beyond characterizing psychiatric disorders as arising from deficits in single processes (“Do individuals with ASD fail to normatively employ mental state inference?”) to examining profiles of information-processing abnormalities across multiple processes in a broader social-cognitive context (“Under which situations will failing to employ mental state attribution most affect an ASD individual’s abilities to interact with others, and is there a way to attenuate this effect?”).

Let us end by saying that in no way do we wish to suggest that the current, process-focused approach dominating social cognition should be replaced by the one described here. That would be as counterproductive as the screeching halt of accuracy research half a century ago. Instead, we are making the simple point that—as so often is the case when two approaches provide different angles on the same, complex question—joining forces can be beneficial to everyone.

**Note**

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THE REINTEGRATION OF ACCURACY


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THE REINTEGRATION OF ACCURACY


COMMENTARIES

Interacting Minds: A Framework for Combining Process- and Accuracy-Oriented Social Cognitive Research

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Zaki and Ochsner underscore the importance of combining two different viewpoints in social cognition: a currently popular, process-oriented approach that is concerned with how we come to understand others’ mental states. The main insights from this mind perception research come from the ideas of theory of mind and understanding by simulation. Another, rather older approach focused on what enables human agents to understand others’ mental states better. The latter approach is motivated by the assumption that there must be some survival value in higher accuracy and reliability of our internal mental models of others’ intentions and beliefs. Accuracy research has been thwarted, Zaki and Ochsner argue, by a lack of principled theoretical approach leading to research programs plagued by a plethora of scattered and often difficult-to-replicate cross-correlations between multiple arbitrary dependent variables.

Both approaches are admittedly concerned with social interaction. However, both also address social interaction as yet another cognitive faculty serving the isolated agent. For example, in a game of poker, the accuracy approach may seek to understand who is better at calling bluffs. The process approach, on the other hand, may ask what happens in the poker player’s brain that enables him to call the bluff and raise the stakes as opposed to fold. But whether these findings will be essentially different from the work of a psychophysicist who investigates the object recognition that happens when the player reads his cards is far from decided (Frith & Frith, 2010).

Social interaction also allows agents to share information and make decisions together. This function is directly relevant to the accuracy and the process of social perception but is qualitatively different from what helps our poker player win the game. Every social agent is continuously sampling information and making judgments and inferences about her or his surrounding environment. These inferences are always corrupted by (extrinsic environmental as well as intrinsic neural) noise and therefore have limited reliability (Green & Swets, 1966). By interacting with other social agents who have obtained their own samples of information, individuals can benefit from the increased reliability of joint decisions (Nitzan & Paroush, 1985). Information sharing through interaction can lead to emergent forms of collective wisdom that could serve all members of a group. Indeed, such collective wisdom that arises from efficient near-optimal democratic decision-making strategies are amply observed in social animals such as bees and deer (Conradt & Roper, 2005, 2007; Seeley & Visscher, 2004a, 2004b) and has been the topic of much interest in humans (Surowiecki, 2004).

The research on collective wisdom asks what constitutes efficient social interaction. We are often told that “two heads are better than one.” But what are the minimum necessary or sufficient conditions for two heads together to excel better than one in isolation? Are there any limiting conditions to group benefit accrued by interaction? Are there any conditions where interaction is counterproductive and not advisable? These questions rephrase the Zaki and Ochsner’s idea of “accuracy of social perception” in the context of collective decision making.

The brain is a highly efficient information integration device that adeptly integrates information from
Commentaries

Leili and Majnun make joint decisions about where the ball landed. (A) The ball’s trajectory. (B) Leili and Majnun’s individual decisions are based on their respective noisy perceptual representations conceptualized here as Gaussian distributions. The figure was inspired by Ernst (2010).

Figure 1. Leili and Majnun make joint decisions about where the ball landed. (A) The ball’s trajectory. (B) Leili and Majnun’s individual decisions are based on their respective noisy perceptual representations conceptualized here as Gaussian distributions. The figure was inspired by Ernst (2010).

multiple sensory channels. A prominent example of such highly efficient integration is speech perception: Noisy visual and auditory information are efficiently and quickly combined almost as perfectly as mathematically possible (given their own inherent noise level) to maximize understanding (Ernst & Bulthoff, 2004). One brain can combine information optimally from multiple modalities. But can two different brains integrate information about the same modality? If yes, how does the integration happen? The answer to this question entails rephrasing Zaki and Ochsner’s process-oriented mind perception in terms of collective decision making: What is the nature of the shared information that contributes to making joint decisions?

It is interesting to note that these questions—which relate critically to the accuracy limit and the process of collective decisions—date back to (at least) the French revolution (Condorcet, 1785). However, it is only recently that they have been formally and rigorously addressed in humans (Bahrami et al., 2010; Sorkin, Hays, & West, 2001). The conceptual basis of this new approach to collective decision making is described next in the context of a game of tennis (see Figure 1).

Leili and Majnun—our two protagonists from here on—are watching a game of tennis (Figure 1). The ball has just landed very close to the line (Figure 1A, white arrow), and they disagree about whether it landed in or outside the court (Figure 1B). They will consult each other and arrive at a joint decision about the ball, and the game will then carry on. But let’s stop here and consider the situation. Each observer’s visual perception of what happened can be conceptualized as a normal distribution1 with a mean ($d_L$ for Leili and $d_M$ for Majnun) and a standard deviation ($\sigma_L$ and $\sigma_M$). The mean identifies the observer’s decision about whether the ball fell above (e.g., Leili) or below (e.g., Majnun) the thick black line that marks the border of the tennis court. The standard deviation of each distribution quantifies the amount of noise in the observer’s sensory representation and is inversely related to the observer’s perceptual sensitivity. A reliable percept would therefore be characterized by a mean with large magnitude (greater distance from the boundary, e.g., Majnun) and a small standard deviation (sharper, less noisy distribution, e.g., Leili).

This formulation is useful in many respects. First, a large body of literature in sensory psychophysics gives us reliable tools to empirically identify these parameters underlying the decisions made by Leili and Majnun. Such methods have been used to study the accuracy of visual perception in various conditions, such as the presence of distractors or changes in lighting conditions. The method of “change detection” is particularly useful for this purpose, as it allows the observer to compare two images or stimuli and determine whether a change has occurred. This method has been applied to various visual tasks, such as identifying the location of a target in a scene or determining the orientation of a line segment. The results of these experiments have shown that the accuracy of visual perception varies depending on the task and the conditions under which it is performed. For example, the accuracy of visual perception is typically highest when the task is simple and the conditions are optimal, such as in a laboratory setting with good lighting and minimal distractions. However, the accuracy of visual perception can be significantly reduced in more complex and distracting environments. This highlights the importance of considering the context in which visual perception occurs, as this can have a significant impact on the accuracy of the perception. Overall, the method of “change detection” provides a valuable tool for studying the accuracy of visual perception in various conditions, and it has been used in a wide range of studies to investigate the factors that influence visual perception.
Majnun in isolation and for the group (Green & Swets, 1966). Second, and more important, one could use this formulation to construct different models of collective decision making (Bahrami et al., 2010; Sorkin et al., 2001). Such models explicitly define a communication strategy in terms of which parameters Leili and Majnun share with each other and what decision rule they employ to combine the communicated parameters. The model takes \((d_L, d_M)\) and \((\sigma_L, \sigma_M)\)—which have been empirically determined (see previously)—and makes exact, specific predictions about the corresponding parameters for the joint performance.

By comparing the empirical and predicted parameters of the group’s performance, one could distinguish between alternative models of communication—thus addressing the “process” question proposed by Zaki and Ochsner (this issue). Once a winning model of communication is identified, one could then explore that model’s predictions for conditions under which two heads are expected to do better than one and when they are expected to do worse—thus addressing the “accuracy” question proposed by Zaki and Ochsner (this issue).

Take the simplest possible case: If all Leili and Majnun could communicate to each other was their disagreement (i.e., that \(d_L \times d_M < 0\)), then their joint sensitivity will be no better than the average of their individual sensitivities (Bahrami et al., 2010). A number of studies have shown that groups of two or more observers can achieve greater perceptual sensitivity than their respective individual members in isolation (Bahrami et al., 2010; Green & Swets, 1966; Sorkin et al., 2001). Clearly the content of communication is richer than just signifying disagreement.

On the other hand, what would happen if Leili and Majnun were so good at communicating that each could fully reconstruct the other’s internal sensory representation? The normal distribution is fully described by its mean and standard deviation. So, perfect communication would require Leili and Majnun to exchange the mean and the standard deviation of their respective internal normal distribution distinctly and accurately. The group’s sensitivity, \(S_{LM}\) (i.e., sharpness of the normal distribution) is then expected to be

\[
S_{LM} = \sqrt{S_L^2 + S_M^2}. \tag{1}
\]

It turns out that this is quite a tall order to fill for collective decision making. Sorkin et al. (2001) and Bahrami et al. (2010) have shown that group performance falls markedly short of this expectation. That complete and exact communication of sensory representations between separate brains is not possible is hardly surprising. Previous research in multisensory perception has shown that this model is a good predictor of how information from different sensory modalities, such as touch and vision are combined within the brain of the same observer (Alais & Burr, 2004; Ernst & Banks, 2002). Communication between brains is not as reliable or high-fidelity as communication within the same brain. Neither “just disagreement” nor “full-fledged communication” captures the characteristics of human collective decision making. A middle ground should be sought.

A useful clue about the likely strategy for collective decision may be obtained by noting that Leili and Majnun’s conversations leading to their joint decision are mostly about how confident they are about their decisions. Remember that a reliable decision is the one based a large mean and a small standard deviation. Therefore, the observer’s confidence in her or his decision could be conceptualized as the ratio of the observer’s mean to her or his standard deviation \((d_L / \sigma_L\) for Leili and \(d_M / \sigma_M\) for Majnun). The sign of this ratio would indicate the observer’s decision (e.g., positive indicating “in” for Leili and negative indicating “out” for Majnun). The magnitude of this ratio would correlate with the probability that the observer believes she or he has made the right decision. Once confidences are communicated, joint decision could be simply defined as the sign of the sum of confidences (Bahrami et al., 2010). This confidence sharing model predicts a more modest benefit from information sharing. The group’s sensitivity will be

\[
S_{LM} = \frac{S_L + S_M}{\sqrt{2}}. \tag{2}
\]

We have recently shown that this model captures group performance in collective decision making over a wide variety of experimental conditions (Bahrami et al., 2010; see the upcoming discussion for more details). As such, the confidence-sharing model provides an example for Zaki and Ochsner’s proposition for process-oriented understanding of social interaction. This model is based on a set of explicit and simple assumptions and offers a powerfully predictive account of the likely nature of communicated information and rules of interaction in collective decision making.

This model gives a markedly better fit to the data than the direct sharing model (Equation 1) when Leili and Majnun have very different sensitivities. If Leili is a much better tennis observer (i.e., more sensitive) than Majnun—specifically, if \(S_M / S_L < 0.4\)—then the confidence-sharing model predicts that the joint decisions will be less accurate than Leili’s individual decisions (i.e., \(S_{LM} < S_L\)). In contrast, the direct-sharing model predicts that the group will never do worse than the better member (see Bahrami et al., 2010, for details of calculations\(^2\)). Empirical results from

\(^2\)It is easy and quite fun to derive both of these predictions from Equations 1 and 2.
multiple experiments support the confidence-sharing model (Bahrami et al., 2011; Bahrami et al., 2010) indicating that a major determinant of the outcome of social interaction is the similarity in interacting agents’ competence (in our case captured empirically by perceptual sensitivity).

The relevance of these latter findings to addressing what Zaki and Ochsner proposed as a dearth of principled approaches to accuracy-oriented social cognitive research cannot be overstated. The confidence-sharing model offers specific predictions for when social interaction is accurate and group members benefit from cooperation/communication and for when it is not accurate and groups members suffer from being subjected to cooperation, for example, by the compulsion to comply with social/political correctness.

Current research in social cognitive neuroscience has already taken on board the notion that a comprehensive understanding of the social brain can happen only in an interactive context. It is in this context that combining accuracy-oriented and process-oriented social research can be most useful. Research in this area could benefit from scrutinizing examples such as the confidence-sharing model recounted here and exploring the conditions and situations where such models fail to account for social interactive behavior. For example, how is social learning incorporated in collective decision making? The confidence-sharing model assumes that human observer’s behavior in collective decision making is stationary and stable over time. But it is more than clear that social learning plays an important role in communication and collaboration. How and where such models will fail to explain social learning would be immensely instructive for social cognitive research.

Acknowledgments

This work was supported by a British Academy postdoctoral fellowship to Bahador Bahrami, the Danish National Research Foundation and the Danish Research Council for Culture and Communication, the European Union MindBridge project (Bahador Bahrami, Chris D. Frith), and the Wellcome Trust (Chris D. Frith). Support from the MINDLab UNIK initiative at Aarhus University was funded by the Danish Ministry of Science, Technology and Innovation.

Note

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Integrations Need Both Breadth and Depth: Commentary on Zaki and Ochsner

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Zaki and Ochsner (this issue) put out a call for social cognition researchers to integrate work on the processes that enable mind perception with work on the accuracy with which people reason about other minds. We welcome this call and believe it is long overdue. Indeed, the main reason that psychologists are interested in underlying psychological processes at all is because they give insight into how effectively these processes are likely to function in everyday life. Understanding how people reason about the minds of others is interesting mainly because it provides insight into how well they are likely to do so.

Zaki and Ochsner echo the arguments that process researchers have been making for many years—that people rely on multiple processes and cognitive tools to reason about the minds of others. We agree with Zaki and Ochsner that neuroscience may aid process researchers in understanding exactly how these different processes operate in any given social judgment given that these underlying processes cannot be observed directly. We also agree that neuroscience has the potential to provide a more concrete understanding of exactly when different processes are utilized to make inferences about the minds of others. And we therefore agree that neuroscience may help to integrate the processes that guide mind perception to the accuracy that those processes produce.

Although we found much to like in this target article, we also found three points that could count as disagreement. First, we are concerned that an increased focus on accuracy inevitably leads to useless and misleading arguments about how good people really are at judging the minds of others. Oversimplified statements that people are "consummate experts" or amateurs at judging the minds of others are a waste of time and reflect opinions from authors more than facts from experiments. Second, we think that Zaki and Ochsner have overlooked, or at least underemphasized, the main benefit of linking process to accuracy. This benefit is that understanding process enables researchers to predict when people are likely to be accurate and when they are not. This, in turn, also enables researchers to predict the systematic mistakes that people might make and provides insight into how to systematically increase or decrease accuracy. Finally, Zaki and Ochsner suggest focusing on the adaptive consequences of accuracy rather than simply on accuracy as an end goal in itself. We think that research area is already getting considerable attention, and instead we suggest zooming out to the beginning of the mind perception process to understand the factors that trigger people to think about the minds of others in the first place.

Oversimplifying Accuracy

Bernard Madoff ran an investment securities firm for nearly 50 years that defrauded its investors of billions of dollars. The magnitude of Madoff’s fraud appears unprecedented. More amazing, however, was that Madoff’s lies went undetected by his closest friends, and apparently even his family members, for well over 20 years. Day after day, year after year, one dinner party and lunch meeting after another, Madoff sat across the table from friends and family members and other close investors telling lies that nobody seemed able to detect. It is hard to fault Madoff’s investors. Detecting whether people are lying or telling the truth appears, based on experiment after experiment, with both novices and experts, to be a very difficult task. A recent meta-analysis of 206 lie detection experiments found that people could accurately distinguish between lies and truths 54% of the time, on average, when chance accuracy was 50% (Bond & DePaulo, 2006).

We were therefore rather surprised to read in the opening paragraphs of Zaki and Ochsner’s article that whether we’re sniffing out the intentions of a used car salesman or figuring out the right thing to say to an upset friend . . . we are consummate experts at this task, accurately reading the internal mental states that guide other’s behavior with an ease and skill that would be shocking if it wasn’t so universal. (p. 159)

Really? Lies and truths, remember, are detected accurately only 54% of the time. People do indeed find it easy to reason about the minds of others, but you have to evaluate the scientific evidence for accuracy with at
least one eye closed in order to conclude that “we are consummate experts.”

Our concern with this opening emphasis, revisited again later in the article in caricatured descriptions of the heuristics and biases research tradition, is important, because all calls to consider accuracy in social cognition seem to start out the same way, whether it is a call from a reporter or a call by researchers to study accuracy. These calls almost inevitably seek some statistics, ideally a single statistic, that will tell us how good people “really are” at whatever we are trying to measure accurately. The problem with a simple answer to these calls, such as the “consummate expert” characterization offered by Zaki and Ochsner, is that it is misleading to readers and unhelpful to psychological science.

It is misleading to readers because there is simply no general statement that can be made about how good people really are at understanding the minds of others. People are relatively good at some tasks, such as knowing how they will be judged by others in general, and relatively bad at more challenging versions of the same task, such as knowing how specific individuals within a group will judge them (Kenny & DePaulo, 1993). Some traits (e.g., extraversion) are easier to judge than others (e.g., neuroticism; Funder & Dobroth, 1987; Hall, Andrzejewski, Murphy, Schmid Mast, & Feinstein, 2008). Some people (e.g., high in intelligence) are better mind readers than others (Callaghan et al., 2005; Davis & Kraus, 1997; Realo et al., 2003). Some cultures (e.g., collectivistic) seem to foster capacities that would enable better mind reading than others (Cohen & Gunz, 2002; Wu & Keysar, 2007). Some people, such as our friends, are easier to read than others (Stinson & Ickes, 1992) but still not as easy to read as we might think (Savitsky, Keysar, Epley, Carter, & Swanson, 2011; Swann & Gill, 1997). Finally, trying harder to be accurate appears to improve accuracy in some domains (Epley, Keysar, Van Boven, & Gilovich, 2004) but has no effect in others (Hall et al., 2009; Myers & Hodges, 2009). The only general thing that can be said about mind perception is that it is sometimes better than chance, almost never perfect, and leaves plenty of opportunity for improvement.

Instead of noting the enormous variability in accuracy observed in both process- and accuracy-oriented research, Zaki and Ochsner (this issue) repeat a common (but empirically unsubstantiated) claim of critics that studies of social cognitive error “typically use highly superficial and nonnaturalistic tasks that . . . are designed to create the errors they document” (p. 169). We wonder what the actual evidence is for such a claim. For instance, process researchers study how partisans on opposite sides of the abortion debate (Chambers, Baron, & Inman, 2006), an educational dispute (Robinson, Keltner, Ward, & Ross, 1995), or a labor-management conflict (Robinson & Friedman, 1995) view each other’s attitudes and beliefs. Process researchers ask people to predict if someone else can detect when they are lying or telling the truth (Gilovich, Medvec, & Savitsky, 2000), predict how attractively they will be judged by a member of the opposite sex based on a photograph (Eyal & Epley, 2010), or predict when another person will be able to detect that they are “only teasing” when they poke fun at someone versus when they are actually intending to be critical (Kruger, Gordan, & Kuban, 2006). We are curious to know how these experiments count as “superficial” or “nonnaturalistic.”

Accuracy researchers, in contrast, take posed photographs of people pretending to experience an emotion and ask people to report what the person is “really feeling” (Nowicki & Carton, 1993). Or they clip out faces from advertisements, get consensus judgments from a small number of raters about what mental state that person is probably feeling or thinking, call those consensus judgments a measure of accuracy, and then measure how well people can predict those consensus judgments looking at only a cutout of the target’s eyes (Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001). Or they ask people to interact with each other, go back and watch a videotape of that interaction trying to remember every point at which they had a thought, and then measure how well the interaction partner can predict the other person’s recalled thought after the interaction (Ickes, 2003). We are curious to know in what way these studies are somehow deeper and more naturalistic.

Zaki and Ochsner are, however, absolutely right that accuracy researchers typically use chance as the baseline of comparison. Doing better than chance is therefore counted as evidence of accuracy, no matter how slight. Process researchers, in contrast, typically use perfect accuracy as the baseline, and any deviation is therefore counted as error, again no matter how slight. Whether people look like “consummate experts” or not therefore depends on the researcher’s basis of comparison rather than on people’s actual ability. We wish that researchers would stop making such claims. Accuracy research will benefit markedly, we think, when researchers get beyond overly simplistic statements about people’s true ability and instead attend to how the processes underlying mind perception can predict variability.

**Process Predicts Accuracy**

Accuracy researchers “crowded the exits” (Gilbert, 1998) after Cronbach’s critique and started studying more basic psychological processes because, at least in part, researchers had gotten ahead of themselves. Understanding the processes that enable mind perception is the first necessary step in understanding when those processes are going to produce accurate
judgments and when they are not. Early researchers had overlooked this first step altogether. With 30 years of subsequent process research, psychologists are now better positioned to understand when people are likely to be more or less accurate and how to increase accuracy systematically. The real benefit that we think comes from linking process to accuracy is the ability for underlying processes to predict accuracy. Zaki and Ochsner describe this possibility in their Processes’ Situation-Specific Utility section but underemphasize the value of this benefit.

One concrete example of how understanding process can both predict and enable accuracy comes from our own research (Eyal & Epley, 2010) examining how well people can intuit the impressions they are conveying to others. This is not an easy mind perception task. Other people’s impressions are not written on their faces in the same way that a simple emotion might be. In this case, people reason about the minds of others by using their own mental states—their own attitudes, beliefs, or impressions—as an initial starting point (Alicke, Dunning, & Krueger, 2005; Epley et al., 2004; Flavell, 1986; Keysar, Barr, Balin, & Brauner, 2000; Nickerson, 1999; Piaget, 1929; Smith, Coats, & Walling, 1999). This egocentric strategy enables accuracy when two people share the same psychological perspective but produces errors when perspectives differ (e.g., Gilovich et al., 2000; Gilovich, Savitsky, & Medvec, 1998; Keysar, 1994; Nickerson, 1999; Ross & Ward, 1996; Van Boven, Dunning, & Loewenstein, 2000).

Perspectives between two people may differ for many reasons. One of these differences is that people have much more information about themselves than others do (Jones & Nisbett, 1971). People are experts about themselves. Experts in any domain are able to notice fine-grained details and subtle distinctions that novices cannot even notice. People are therefore likely to think about themselves in much more low-level detail than others are (Chambers, Epley, Savitsky, & Windschitl, 2008; Eyal & Epley, 2010; Jones & Nisbett, 1971; Pronin, Gilovich, & Ross, 2004; Semin, 2004; Trope & Liberman, 2010). Others, in contrast, are relative novices and are therefore likely to think of the self in much more abstract, general, and high-level terms (Trope & Liberman, 2010). A professor, for instance, might evaluate the quality of her own lecture by thinking about low-level details of words and phrases in the lecture, whereas students are likely to evaluate the lecture in terms of its overall content and general interest. If people evaluate themselves under a microscope but are evaluated by others at the level of the naked eye, then people are likely to have some difficulty intuiting how they are viewed by others.

This insight from the process that guides mind perception suggests that aligning the level at which people construe themselves and others may increase accuracy. In a recent series of experiments we conducted to test this hypothesis (Eyal & Epley, 2010), participants anticipated how attractive they would be evaluated by another participant on the basis of a photograph. Half of the participants anticipated how they would be judged by someone looking at their picture later that day. The other half of participants anticipated how they would be judged by someone 3 months from now. The latter condition encourages a higher level self-construal than the former (Trope & Liberman, 2010). As predicted, participants were significantly more accurate, both in the correlation between predicted and actual evaluations and the absolute difference between them, when predicting how they would be evaluated 3 months from now than when intuiting how they would be judged right now. These differences were substantial. Participants were no better than chance at predicting how attractively they would be judged later that day ($r = -.24$) but were impressively accurate when predicting how they would be judged 3 months from now ($r = .55$).

Not only does understanding process identify how to increase accuracy for everyone but it also predicts which individuals are likely to be consistently more accurate than others. In particular, those who are particularly likely to think of themselves in high-level details should be more accurate predicting how they are evaluated by others than those who tend to think of themselves in low-level details. We measured this tendency using Vallacher and Wegner’s (1989) Action Identification Scale. In this version, people imagined themselves performing a variety of different activities (such as voting) and then indicated which description of the event they preferred, either a low-level description (marking a ballot) or a high-level description (influencing the election). As predicted, those who tended to describe their own behavior in high-level terms were more accurate predicting how attractive they would be rated by a member of the opposite sex ($r = .38$). The real benefit from integrating process and accuracy in mind perception, we believe, is that only an understanding of the former can provide systematic insight into the latter.

**Triggering Mind Perception**

Zaki and Ochsner suggest that mind perception researchers should “zoom out” to consider the relation not only between psychological processes and their downstream consequences for accuracy but also between accuracy and their yet further downstream consequences for adaptive outcomes. Although the outcomes of accuracy for adaptive functioning are interesting and important, considerable attention is already being paid to these outcomes. Less attention is being paid, we think, to the activation of mind
perception processes in the first place. What triggers people to think about, or activate, their capacity to reason about the minds of others? Understanding these factors would require zooming out to consider the very beginning of mind perception processes rather than the outcomes that emerge at the end.

A complete understanding of mind perception, we suggest, would then consider four critical components: activation (when mind perception is triggered), application (how people reason about the minds of others), accuracy (how well mind perception processes predict others’ mental states), and adaptive functioning (in what way is accuracy related to outcomes). We think that research on mind perception is in a similar position as research on stereotyping was roughly 20 years ago. At that time, psychologists considered stereotypes to be used almost inevitably in any social interaction. The only questions were how these stereotypes were applied to targets, how well these stereotypes actually predicted a target person’s behavior, and how much these stereotypes led to discriminatory outcomes. Real progress was made in understanding how stereotypes function in everyday life, however, by considering the upstream question of when stereotypes were activated in social interaction and when they were not. Although it is relatively easy to activate stereotypes in social interaction (Devine, 1989), it is not inevitable. Activating a stereotype from memory requires attentional effort (Gilbert & Hixon, 1991; Macrae, Milne, & Bodenhausen, 1994) and is driven by the situational cues in one’s environment (Wittenbrink, Judd, & Park, 2001). Knowing how stereotypes influence social life requires understanding when these processes are triggered in the first place.

Like stereotypes, mind perception processes are often considered to be activated almost inevitably whenever a person is in the midst of a social interaction. The ability to reason about the minds of others has been hypothesized to be a distinct neural module that is “rapid . . . automatic, requiring no effortful attention . . . and universal” (Stone, Baron-Cohen, & Knight, 1998, p. 640). People even find it relatively easy under the right circumstances to attribute minds to nonhuman agents, ranging from pets to gods to geometric shapes (Heider & Simmel, 1944; see Guthrie, 1993, and Epley, Waytz, & Cacioppo, 2007, for reviews). Mind perception is one of the capacities that make human beings especially intelligent compared to our nearest primate relatives (Herrmann, Call, Hernández-Lloreda, Hare, & Tomasello, 2007). It stands to reason that we would therefore make rampant use of our brain’s most prized possession.

Although people have the capacity to imagine the minds of others, just as they also have the capacity to use stereotypes when evaluating others, emerging research makes it clear that mind perception is not necessarily an automatically activated process and instead can be triggered by the individual or the situational context (for reviews, see Epley & Waytz, 2010; Waytz, Klein, & Epley, in press). These triggers matter because they not only help to explain when people are likely to reason about other minds relatively rampantly, such as when they anthropomorphize nonhuman agents, but also when people are likely to fail to consider the minds of other humans, behaving either completely egocentrically or treating other people as mindless animals or objects (Bandura, Underwood, & Fromson, 1975; Haslam, 2006; Leyens et al., 2003). The accuracy and adaptive outcomes of mind perception processes matter nothing for people’s behavior in everyday life if they are not activated in the first place.

Although still very much in the early stages of development, mind perception appears to be triggered by both motivational and cognitive factors. For example, thinking about the minds of others helps to explain their behavior and enables a closer personal connection with others, and people who are motivated either to explain another’s actions or to connect with another person are also more likely to activate their mind perception capacities (Epley, Akalis, Waytz, & Cacioppo, 2008; Waytz et al., 2010). Thinking about the minds of others is also triggered by the degree to which one is connected to, or engaged with, another person. Such connection and engagement is increased by feeling similar to another person, and similarity therefore seems to engage both the experience sharing (Avenanti, Sirigu, & Aglioti, 2010; Batson, 1994) as well as the mental state attribution processes involved in mind perception (Harris & Fiske, 2006). These triggers are often easy to miss in the empirical literature because researchers often put people into the very contexts where those triggers are already present, making mind perception seem more automatic than it may actually be. For instance, in the widely cited Heider and Simmel (1947) study that is commonly used to show how easily people attribute minds to almost anything (i.e., geometrical shapes), participants were asked to explain the behavior of the shapes, a powerful trigger for mind perception. We think that an increased focus on the triggers of mind perception processes is every bit as important as focusing on the outcomes that these processes produce.

Completely in line with the main arguments of Zaki and Ochsner, we think that neuroscience is uniquely positioned to reveal these triggers. Activation of mind perception processes can be detected especially well using neuroscientific methods compared to behavioral methods, even though neuroscientific methods to date have typically been applied in understanding which type of mind perception processes are utilized once someone has already been triggered to think about the mind of another person. We are, like Zaki and Ochsner, optimistic about the advances that may come from these methods if researchers begin studying not...
only how mind perception processes are used but also when they are activated.

Conclusion

Much of everyday life involves interacting with, or thinking about interactions with, other minds. Those minds most commonly come wrapped within a human body, but minds also appear in other animals, imagined supernatural agents, or even in one’s car or computer. Understanding how people act as intuitive psychologists to understand these other minds, and understanding how accurately we function as intuitive psychologists in everyday life, is therefore one of the most central issues in all of psychological science. We agree wholeheartedly with Zaki and Ochsner that psychological science will benefit from integrating mind perception processes with the accuracy of those processes, and we hope this general call will be both heard and accepted. We also agree with the bulk of their target article, particularly the benefit that could come from neuroscientific methods. We think, however, that psychological science will benefit particularly if researchers could set aside overly simplistic attempts to characterize and caricature both the processes that enable mind perception and the overall accuracy it produces, focus instead on using mind perception processes to predict both impressive cases of accuracy and error, and broaden their focus on mind perception processes even further to understand the triggers of mind perception.

Note

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References


On Making a Thriving Field Even Better: Acknowledging the Past and Looking to the Future

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It is very exciting that research on interpersonal accuracy has gained such keen interest in psychology and in adjacent fields. And well it should have, because social life depends on the ability to draw accurate interpersonal inferences of many sorts. In any interaction, and perhaps without even trying, a person makes judgments about some, maybe even all, of the following states and traits of other people: emotions; intentions; desires; needs; motives; interpersonal attitudes such as attraction or liking; personality; truthfulness; intelligence; thoughts; values; physical states; and social categorical attributes such as social class, occupation, status, ethnicity, national origin, sex, sexual orientation, and age.

Zaki and Ochsner (this issue) make a valuable contribution to understanding this important phenomenon by proposing ways in which accuracy can be related to neuropsychological and other social processes, especially ways that individual differences in accuracy might be explicable in terms of what is happening in the physical body, notably the brain. Attempts to understand the process of accurate judgment—not just judgment, but accurate judgment—are very much needed. How do people achieve accuracy? If we can unlock that mystery, we can progress toward understanding why some people are more accurate than others and how to maximize the chance that people will be accurate, by altering elements of the situation that help or hinder accuracy or by training people to enhance accuracy.

In the present commentary we wish to contribute additional ideas that may be useful for understanding the field and future research. First, we address the authors’ assertion that research on accuracy was moribund for many years prior to its recent rediscovery by a new generation of investigators. Then, we discuss the “process” concept and how it might most fruitfully be examined for understanding accuracy; we discuss choices among different accuracy tasks and paradigms; we discuss the different, possibly incommensurable, assumptions and goals held by researchers of process and researchers of accuracy; and finally, we ask, What is the final goal of process-accuracy integration?

Saying Something Does Not Make It So

It is common to read that research on accuracy died after Cronbach’s (1955) psychometric critique, and Zaki and Ochsner repeat this many times. They quote earlier writers who proclaimed that accuracy researchers “crowded the exits,” to the point that accuracy research “all but faded from view” (p. 160–161). They assert that researchers “eagerly jumped ship,” creating what they call a “25-year dry spell” (p. 164) and a “25-year hibernation” (p. 175). They say that the question of how well perceivers make their judgments was “relatively neglected” compared to research on how such judgments are made; even stronger is their statement that accuracy research experienced “abandonment” in favor of a ‘near monopoly’’ of process-oriented research (p. 160).

In addition to this claim that accuracy research in general died, they also say that researchers gave up looking for individual differences in accuracy because such individual differences could not be found. According to Zaki and Ochsner, empirical disappointments led modern accuracy research to largely abandon the search for “good perceivers.” And they conclude that “no matter how organized accuracy researchers might have made their search for good judges, those judges—at least in the way researchers conceived of them—may have been more myth than reality” (p. 161).

These are sweeping assertions. One source of difficulty in evaluating them is their breadth in terms of domains of accuracy research. Although Funder and West (1993) stated that researchers gave up doing research on accuracy of personality judgment for two decades after Cronbach, Zaki and Ochsner do not limit their “hibernation” claim to the topic of personality judgment. Personality judgment is only one, and not the most prevalent, domain in which accuracy has been investigated. Relatedly, it is unclear what domains of accuracy are relevant when Zaki and Ochsner discuss research on personal correlates of accuracy (i.e., the search for the “good judge”). Second, the years marking the onset and offset of the “hibernation” are unclear. By focusing their discussion on very recent work, Zaki and Ochsner imply that the dark ages of accuracy research persisted for a very long time.
In this section we argue that Zaki and Ochsner’s characterizations of accuracy research and its findings could create misleading impressions in readers.

Zaki and Ochsner (appropriately) consider interpersonal accuracy to encompass many content domains, and we do too. The first question we take up is whether researchers gave up studying accuracy of interpersonal judgment and whether there was ever a long period of demoralization.

Prominent programs of research were begun in the 1970s and continued strong in ensuing years. Ekman’s Pictures of Facial Affect were developed in that decade (Ekman, 1976) and were used in highly influential research on accuracy in emotion judgment by Ekman and by many other investigators. Both Ekman’s facial stimuli and others developed by Izard were used in seminal cross-cultural research on accuracy (Ekman & Friesen, 1971; Izard, 1971). The Profile of Nonverbal Sensitivity, a test of accuracy in decoding nonverbal cues, was developed in 1971 (Rosenthal, Hall, DiMatteo, Rogers, & Archer, 1979) and formed the basis of extensive research by its developers and others.

Not being sure exactly when the “25-year hibernation” began and ended, we might also include the extensive research of Nowicki and colleagues using the Diagnostic Analysis of Nonverbal Accuracy tests, begun in the 1980s and expanding quickly in the early 1990s (Nowicki & Duke, 1994). The Interpersonal Perception Task of Costanzo and Archer, another test of decoding interpersonal cues, was published in 1989. Reviews of standardized tests for measuring interpersonal accuracy and the research that uses them (Hall & Bernieri, 2001; Hall, Bernieri, & Carney, 2005) gives a glimpse into the large amount of research on accuracy that has been done continuously with these tests and many others—often systematically and programmatically—for many decades. Accuracy has not been recently discovered or re-discovered.

Furthermore, accuracy research was not done by obscure investigators who published in unimportant journals. In the 1970s, accuracy research was conducted by mainstream, and often highly visible, people such as Robert Rosenthal, Paul Ekman, Klaus Scherer, Ross Buck, Miron Zuckerman, Bella DePaulo, Carroll Izard, Douglas Jackson, and Lee Sechrest. Entering the field in the 1980s were David Funder, David Matsumoto, Patricia Noller, Frank Bernieri, Stephen Nowicki, and many others. These researchers would have been surprised to hear that their field was in “hibernation.” Furthermore, the journals were often mainstream. This list of names is not meant to be exhaustive—only illustrative of some nonobscure people who worked on accuracy during the years that Zaki and Ochsner might be considering inactive.

Further evidence against the “hibernation” claim is the existence of numerous meta-analyses, encompassing more than 50 years of research, that evaluated other overall levels of accuracy or correlates of accuracy. Consider the following meta-analyses:

- Gender differences in accuracy of decoding nonverbal cues: 75 studies (Hall, 1978), and 50 additional studies (Hall, 1984)
- Accuracy in detecting anxiety: 80 studies (Harrigan, Wilson, & Rosenthal, 2004)
- Accuracy in detecting deception: 206 studies (Bond & DePaulo, 2006)
- Cultural in-group advantage in interpersonal accuracy: 168 studies (Elfenbein & Ambady, 2002)
- Comparison of accuracy levels between tests and content domains: 108 studies (Hall, Andrzejewski, Murphy, Schmid Mast, & Feinstein, 2008)
- Psychosocial correlates of interpersonal accuracy: 215 studies (Hall, Andrzejewski, & Yopchick, 2009); 36 studies (Davis & Kraus, 1997)
- Relation of encoding accuracy to decoding accuracy: 40 studies (Elfenbein & Eisenkraft, 2010)
- Accuracy of judging personality: 199 studies (Connelly & Ones, 2010)
- Relation of intelligence to interpersonal accuracy: 38 studies (Murphy & Hall, 2011); 21 studies (Davis & Kraus, 1997)

Not only are the studies in these meta-analyses numerous, they also span a very wide range of years and give no evidence (to our eyes) that researchers “jumped ship” from this important topic. Connelly and Ones’s (2010) meta-analysis of studies reporting on accuracy of personality judgment using self-other agreement located one study in the 1950s, four in the 1960s, 15 in the 1970s, and 44 in the 1980s (B. Connelly, personal communication, February 20, 2011). Elfenbein and Ambady’s (2002) meta-analysis of accuracy across cultures found three studies before 1959, three in the 1960s, 18 in the 1970s, and 31 in the 1980s. In Bond and DePaulo’s (2006) meta-analysis of lie detection accuracy, it is stated that the articles dated from 1941 to 2005, with 103 studies published before 1995 (suggesting that many likely appeared in the 1970s and 1980s) and 103 after 1995. Instead of jumping ship or going into hibernation, many researchers seem to have pursued the topic of accuracy. It is unclear whether the trends indicate that research was once actively pursued, then stopped, and then started again, or whether it is rather a case of the field simply gaining steady momentum. We think the latter is more likely.

Zaki and Ochsner’s conclusion that researchers failed to find evidence for the “good judge” must also
be challenged. Many studies, conducted over many years, have found individual differences in accuracy and correlates of those individual differences. These correlates include personality, psychopathology, empathy, relationship quality, gender, dominance, workplace effectiveness, and intelligence (based on meta-analyses: Davis & Kraus, 1997; Elfenbein, Foo, White, Tan, & Aik, 2007; Hall, 1978, 1984; Hall, Halberstadt, & O’Brien, 1997; Hall, Andrzejski, et al., 2009; Marsh & Blair, 2008; Murphy & Hall, 2011). These effects are sometimes rather small, but they are real and therefore support the validity of the “good judge” construct. With correlational studies, of course, it is often not clear whether accuracy is the cause of, consequence of, or epiphenomenal to the correlated variable. But, still, it is clear that good and poor judges do differ in identifiable ways. There may be domains in which there is no reliable individual variation in accuracy (as indeed seems to be the case for accuracy of detecting deception; Bond & DePaulo, 2008), but a sweeping conclusion that individual differences and personal correlates do not exist cannot be supported.

Thus, we think it is quite possible that accuracy research did not die, and it is certainly the case that the search for the “good judge” did not fail. Although Zaki and Ochsnor make occasional mention of this topic’s long tradition, their article is imbued with the general notion that research was rare or feeble for a long time and needed new, recent thinking to be reclaimed as a fruitful research direction. Although it may be true that recent researchers are asking new questions (let us hope they are), this can be acknowledged without dismissing or ignoring what came before. Awareness of past research might also reveal that some of the “new” questions are not so new after all.

What Is a Fruitful Way to Relate Process to Accuracy?

The concept of process is central to Zaki and Ochsnor’s article, but it is not well defined by the authors. In theory, process could include what is happening while someone is making interpersonal judgments, what is happening while someone is making accurate interpersonal judgments, or what is happening before one makes such judgments that determines whether the judgments are accurate or not. We learn different things from these different definitions of “process.” Thus, for example, if we can see what brain regions are activated during a given accuracy task, this sheds light on process in the sense that we can see what is happening concurrently with the judgments, but it may not be informative about how accuracy is achieved. Alternatively, understanding antecedent factors that predict accuracy may shed light on how accuracy is maximized without revealing what parts of the brain are doing the work.

For many purposes, the approach that identifies “process” as something causally antecedent to accuracy is likely to be the most useful. One category of proximal causes is psychological states or actions that precede the judgments, such as the stimulus features perceivers attend to (Murphy & Isaacowitz, 2010; Schmid, Schmid Mast, Bombari, Mast, & Lobmaier, 2011), whether they carefully analyze the stimulus versus trust their first impression (Patterson & Stockbridge, 1998), what emotional state they are in (Ambady & Gray, 2002), how motivated they are to be accurate (Hall, Blanch, et al., 2009), and whether they are distracted by competing cognitive tasks (Phillips, Tunstall, & Channon, 2007). Of course, factors such as these may themselves be in a causal ordering with respect to each other. Research on such factors is, in fact, very unclear and contradictory, and there is evidence that the results depend on what kind of accuracy task is used (e.g., Hall, Blanch, et al., 1990; Phillips et al., 2007). Thus there is much room for fruitful research on proximal determinants of accuracy.

More distal, yet still context-specific, factors could influence the ones just identified. For example, one’s role-based power, one’s personal relationship to the person being judged (romantic partner vs. stranger), or the quality of one’s relationship with that person (happy vs. unhappy marriage partners) could influence judgment strategies, emotions, attention, cognitive load, and so forth. Lest the reader come away thinking that accuracy depends only on locally varying factors, the large literature on personal correlates of accuracy alluded to in the preceding section demonstrates that accuracy has traitlike properties, which implies distal causation stemming from formative experiences. Many authors have suggested what some of those might be, with candidates as diverse as early relations with parents, family expressive style, the experience of being a parent, dance or athletic training, occupational demands, gender socialization, and personality traits that are associated with certain social learning experiences and motivations (for review, see Hall, Andrzejski, et al., 2009). As stated earlier, ambiguity about causation is a weakness in this literature; researchers should work harder to study putative formative experiences in a way that permits causal inference.

A truly general trait of accuracy has eluded demonstration; different accuracy tasks are typically poorly correlated with each other (Hall, 2001) or have unknown relations to each other. Thus, a person may be consistent for a given kind of accuracy task without much generalization across tasks. When consistent accuracy does exist, it could be due to consistencies in proximal process variables (e.g., the person consistently applies the optimal judgment strategy).
But accuracy could also be the product of knowledge about the accuracy domain in question, which has accumulated over time—a possibility not explicitly discussed in Zaki and Ochsner’s article. The possibility that knowledge (either implicit or explicit) is a contributor to accuracy has both commonsense appeal and empirical support. Empirical support comes from lens-model studies that reveal which target behavioral cues are appropriately utilized by perceivers in making accurate judgments (Gifford, 1994; Scherer, 1978); appropriate use of a given cue implies knowledge about its relevance for the judgment in question. Support for knowledge as a determinant of accuracy also comes from studies where knowledge of nonverbal cue meanings was separately tested using a paper-and-pencil test and then correlated with accuracy of judging people in audiovisual tests (Davitz et al., 1964; Rosip & Hall, 2004). A balanced consideration of sources of accuracy should therefore include knowledge along with more transient and proximal factors.

How Should Accuracy Be Measured?

It is wonderful that many methods and instruments exist for assessing accuracy, and more appear all the time. Different approaches provide different windows into accuracy. It is important to discover the limitations and advantages of different approaches, how they relate to each other, and what each means. An arithmetic or absolute difference between judgment and criterion means something different from a correlation across items between judgment and criterion, which is different from a correlation across targets between judgment and criterion, which is different from a correlation across time between judgment and criterion, all of which are different from whether the judgment matches the specific content of the criterion. These are all examples of approaches to accuracy. Which approach is chosen should depend on the question being asked and what operational definition best maps on to the construct of interest, not on any predetermined notion of what is the right or best way to measure accuracy. Not only is there no best way in the abstract; we also know very little about which methods are best suited for different research goals and what answers different methods would yield if compared against each other. When testing their hypotheses, researchers tend to choose a method based on habit or familiarity rather than on empirical grounds, and they can hardly be blamed, because comparative research is lacking.

No method is perfect. One method may be especially vulnerable to response biases, while another method may be especially plagued by low variance between perceivers. Some methods are more vulnerable to stereotype accuracy than others; profile correlations across items are very vulnerable, whereas item-level correlations across targets are much less so, often not at all. The across-time correlational method of Zaki and Ochsner is vulnerable to a stereotype element, too, if the perceiver’s preconceived notion of how the rated construct varies over time happens to match the pattern rated by the target. It is also vulnerable to an assumed similarity artifact if the perceiver responds according to how he or she would have felt in the observed situation. Methods for separately measuring distinctive and stereotype components of accuracy allow for many interesting questions to be asked, but such methods are not always needed or applicable. Our goal as researchers is not to find the measure that is beyond reproach or that is right in a general sense, but rather to choose the measure that is right for our purposes.

Sometimes, researchers debate whether accuracy that draws on stereotype knowledge deserves to be called accuracy. However, they should not forget that any time perceivers apply a correct judgment heuristic, such as “wrinkled corrugator muscle means distress” or “loud voice means extraversion,” they are using information based on prior experience in a probabilistic way to guide their answers—in other words, they are applying stereotypes. Those wishing to banish stereotype-based accuracy from the list of true accuracies might be hard-pressed to justify giving credit to knowledge of what cues generally mean while discounting knowledge of what people are generally like.

Process and Accuracy, and the Assumptions That Guide Them

We appreciate Zaki and Ochsner’s efforts to bring research on mind perception processes and accuracy under one unifying umbrella. In this section, we discuss meta-theoretical issues that researchers confront, explicitly or implicitly, when attempting to integrate two disparate research areas. In their abstract, the authors state, “Although in principle both the accuracy- and process-oriented approaches study related aspects of the same phenomena [emphasis added], in practice they have made strikingly little contact with each other” (p. 159). Integration of this sort might appear to be straightforward when compared with attempts at integrating two independent theories, such as Dollard and Miller’s (1950) efforts to integrate psychoanalysis and learning theory. Nevertheless, Zaki and Ochsner’s proposal for integration faces several stubborn challenges of its own.

To highlight issues associated with integration, we present a hypothetical example. Consider the research topic “Driving to Fenway Park,” the home of the Boston Red Sox. In this example, process-oriented researchers are interested in the routes selected by drivers
traveling from their residences to Fenway Park. The researchers determine optimal driving routes and compare them to the routes selected by drivers. Consistent with their meta-theoretical beliefs, the process-oriented researchers evaluate the degree to which average drivers deviate from the experimenter-defined optimal route and manipulate situational factors to determine their effect on drivers' route selection to Fenway Park. In general, process-oriented researchers seek general laws that describe the inner workings of the human mind, focus on external factors that influence it, and are concerned with efficient causation (e.g., an event or action responsible for an effect; manipulation of independent variable responsible for effect on dependent variable).

In contrast, accuracy-oriented researchers determine driver accuracy by calculating how close each driver comes to locating the designated parking lot for participants at Fenway Park. Drivers are ranked according to their accuracy scores, and individual characteristics are sought that statistically predict drivers' rank order. Consistent with their meta-theoretical assumptions, accuracy-oriented researchers often focus on individual differences in judgment accuracy and use accuracy correlates as clues for enhancing accuracy and making inferences about underlying processes. In general, accuracy-oriented researchers study individual variation in human behavior, identify predictor and outcome variables, and are concerned both with efficient and teleological causation (i.e., people develop and mature toward desired end state; examples include Maslow's need hierarchy and Loevinger's, 1976, Ego-Development).

Although our Fenway Park studies were fictitious, they encapsulate real differences between process and accuracy researchers. As a result, we disagree with Zaki and Ochsner that process and accuracy researchers seek answers to the “same, complex question” (p. 175). For several decades, philosophers of science have argued that researchers' epistemological assumptions or “worldviews” may be so different that there is little or no basis for theoretical or empirical integration (Laudan, 1977; Overton & Reese, 1973; Pepper, 1942). Process-oriented researchers, according to contemporary philosophy of science, subscribe to a mechanistic worldview in which scientific knowledge is advanced by studying basic elements, behavior is a function of situational press, and causation is determined by antecedent–consequent relations (i.e., efficient causation). Accuracy researchers, in contrast, often subscribe to an “organismic” worldview in which scientific knowledge is advanced by studying the organization of structures within organisms, behavior is a function of organism–environment interaction, and causation is both quantitative (i.e., efficient causation) and qualitative (i.e., teleological causation).

Overton and Reese (1973) characterized mechanistic and organismic research programs as “incommensurable” due to their distinct meta-theoretical assumptions. And despite the proposal by Overton and Ennis (2006) to soften the strong stance taken by Overton and Reese, researchers who seek to integrate process and accuracy research will confront competing desiderata relating to priority (e.g., should research study route selected or successful arrival at Fenway Park), pragmatism (e.g., should research focus on training to enhance perceivers accuracy vs. process research to advance basic knowledge), and causation (e.g., experimental manipulations that cause selection of mind perception processes vs. practice and feedback to facilitate enhanced performance), among others. As a result, it behooves researchers to evaluate the potential benefits of integration compared with its numerous challenges. One might start this evaluation by elaborating the intermediate and terminal goals of the research; for example, the intermediate goal might be to implement an interdisciplinary multimethod approach (which the authors do), and the terminal goal might be to develop theory that encompasses empirical results from process and accuracy research (which the authors do not do).

What Is to be Gained by Integrating Process and Accuracy Research?

In the second section of their article, the authors purport to lay the conceptual foundation for integrating process and accuracy research. Given the authors’ overarching goal to integrate these two research areas, the details for achieving it are rather sparse. The first three paragraphs make the important point that successful integration requires multimethod research. We agree, and encourage all psychological researchers to use multiple methods. In the remaining five paragraphs, the authors describe their preferred social cognitive neuroscience approach for integrating process and accuracy. The approach involves three key components: situationally induced cognitive processes, neuroimaging analysis of the experience sharing and mental state attribution systems, and assessment of mind perception accuracy. Because participants’ mind perception processes produce “measurable signs that these cognitive level phenomena leave in their wake” (p. 166), inferences about process usage can be derived from the observed convergence among external data sources. Subsequently, integration of process and accuracy is achieved, according to the authors, by demonstrating empirical relations between process usage and mind perception accuracy.

Can Zaki and Ochsner’s proposed strategy successfully integrate two research traditions whose metatheoretical beliefs are considered incommensurable? Has the process-accuracy conundrum been solved? The
answer may be yes to both, but questions remain. In the Where Do We Go From Here? section of their article, one could construe the authors’ examples as a recommendation to set aside extant research findings and start a new line of integrated research that is relatively narrow in scope and relates experience sharing and mental state attribution processes to accuracy. On the other hand, the authors’ call for integration could be interpreted by readers as encouragement for process-oriented and accuracy-oriented researchers to reconcile and combine their independent research programs. Given the decades of research by process and accuracy researchers, we hope the intent of Zaki and Ochsner’s proposal is to integrate extant research findings and develop new research approaches that include both process and accuracy.

The authors argue that process-oriented and accuracy-oriented researchers study similar phenomena but that their respective findings have little impact on each other. Furthermore, they state that combining the two approaches “could expand our understanding of social cognition” (p. 159). Although this may be true, researchers who attempt to integrate theory and data derived from mechanistic and organismic worldviews may find it difficult to reconcile the differences in belief systems.

If the authors’ prescription for integrating process and accuracy is followed, can the two areas be united? Process- and accuracy-oriented approaches, and the theory, research, and methods uniquely associated with them, are not separate Lego structures easily united by a few common pieces. Instead, the two approaches are like combining Legos and wooden blocks. Unfortunately, Zaki and Ochsner do not consider the metatheoretical differences that may hinder integration, and they suggest that researchers will easily integrate the two approaches if given the right tools. We have not formally surveyed researchers’ opinions on this topic. However, over the years we have encountered process researchers who either are uninterested in the accuracy question or doubt that it can be empirically studied. Likewise, we have encountered accuracy researchers who see little relevance in experimental process research for judgments about real human beings in naturally occurring social situations.

Consistent with Overton and Reese (1973), the two approaches might very well be incommensurable; process-oriented researchers may remain largely uninterested in accuracy, and many accuracy-oriented researchers may view results from experimental research on process to be uninformative. Despite the possibility that these two approaches may not be good candidates for integration, there remains the possibility of an integrated program of research. As previously described, accuracy research often examines both the extent to which perceivers accurately judge others and correlates of judgmental accuracy, the latter of which may suggest processes that influence accuracy. We encourage accuracy researchers to give process issues more consideration in their own research. Despite questioning the viability of Zaki and Ochsner’s framework for integration, we congratulate them on their thoughtful article and acknowledge that it stimulated considerable thought among the present authors.

Note

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Everyday Mind Reading Is Driven by Motives and Goals

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The target article by Zaki and Ochsner (this issue) is an ambitious attempt to provide an overarching conceptual framework for the study of “everyday mind reading.” This conceptual framework is intended to address two major goals: (a) the integration of research on the processes by which everyday mind reading occurs with research on the accuracy of everyday mind reading, and (b) the triangulated integration of all relevant research findings across three levels of analysis: social behavior, cognitive/affective processes, and neural engagement.

At the risk of sounding like one of the blind men who is providing his own limited view of the elephant, I won’t attempt to evaluate Zaki and Ochsner’s organizational framework in toto. Instead, I limit my commentary to six issues that I hope both the authors and the readers of this exchange in Psychological Inquiry will find of interest. These issues concern (a) terminology, (b) the question of whether we humans are “consummate experts” at everyday mind reading, (c) the pitfalls of “perceiver-centric research,” (d) the importance of the motivation to be accurate or inaccurate, (e) linking accuracy/inaccuracy to adaptation, and (f) linking accuracy/inaccuracy to clinical problems.

Terminology

People are always going to disagree about terminology. I was acutely aware of that when I decided to reverse the word order in Carl Rogers’s (1957) term accurate empathy in order to emphasize the accuracy portion of the term empathic accuracy. Both elements of this term have been argued about for decades: empathy because, from the word’s inception, different people have used it to refer to (at least) seven or eight different things (see Ickes, 2003, pp. 61–65; also see Batson, 2009) and accuracy because of its different sources, which are often confounded and are sometimes artifact inducing (Cronbach, 1955; Gage & Cronbach, 1955; Kenny, West, Malloy, & Albright, 2006). Having been down that road myself, I am quite sensitive to people’s disagreements regarding terminology.

It’s not surprising, then, that with regard to the target article I find some of the terms that Zaki and Ochsner have used (or some of the ways they have used them) to be more problematic than others. Turning first to the less helpful usages, let’s consider the term mind perception. The authors like this term because it is broadly inclusive; I am more critical because I think it is too broadly inclusive. On the face of it, the term mind perception could refer to any number of things, some of which—such as introspection, the Turing test, and telepathy—don’t seem to fit well beneath the target article’s current meaning-umbrella. In short, I think that the term mind perception carries too much surplus meaning.

With regard to a contrasting example, I noticed that Zaki and Ochsner sometimes refer to my own term, empathic accuracy, in an overly restrictive way. After initially acknowledging that this term refers to a perceiver’s accuracy in inferring a target person’s thoughts and feelings, they later narrow its meaning to the accurate inference of feelings (i.e., affective states) only. I object. Empathic accuracy for thoughts is extremely important, and it should not be ignored or overlooked. In fact, the results of more than 20 years of research have shown that (a) people typically report about 67% more thoughts than feelings (Ickes & Cheng, 2011) and (b) the distinction between accuracy-for-thoughts and accuracy-for-feelings can sometimes, though not often, be important empirically as well as conceptually (e.g., see Barone et al., 2005).

On the other hand, I am pleased by other terms that Zaki and Ochsner have chosen to use, and by the way they have chosen to use them. To be specific, I applaud and endorse their proposal that we move away from such perpetually ambiguous and confusing terms as mentalizing, theory of mind, simulation, and (my nominee for the least felicitous term in this area of research) theory theory, and instead move toward the wide-scale adoption of their own preferred substitutes—mental state attribution (MSA) and experience sharing (ES). In my opinion, mental state attribution is less ambiguous, less cryptic, more accurately descriptive, and more heuristic than mentalizing, theory of mind, or theory theory. Similarly, I believe that experience sharing is better—on all of these same dimensions—than simulation or simulation theory. (As a quick example of why experience sharing is less ambiguous than simulation, note that the authors use the word simulation near the end of their Mental State Attribution section to refer to simulating a hypothetical reality through the process of mental state attribution—a meaning that is easily
I further applaud and endorse Zaki and Ochsner’s proposal to extend their preferred terms by adding the word **system** to each. This felicitous convention enables us to talk about a mental state attribution system (MSAS) and an experience sharing system (ESS) in ways that are not purely hypothetical but instead have the support of a developing body of neuroscience research findings. Although these terms may eventually prove to have their own limitations, and although there is always the possibility that even better terminology might come along later, I think that the MSAS, ES, and ESS neologisms are—for the present at least—clearly better than the more traditional but also more problematic terms they are intended to replace. Other people, of course, may (and, let’s face it, probably will) disagree.

Are We “Consummate Experts”?  

Beginning in their abstract, Zaki and Ochsner (this issue) state that “accurately understanding the contents of other minds is a . . . task that humans perform with impressive skill” (p. 159). Similarly, in the first paragraph of their introduction, they go on to describe us humans as “consummate experts at this task, accurately reading the internal mental states that guide other’s behavior with . . . ease” (p. 159).

Sorry, but in my opinion this is sheer hyperbole. The research on empathic accuracy reveals that we are substantially better than chance would predict at accurately inferring the specific content of other people’s thoughts and feelings. However, I believe that a phrase such as “consummate experts” is unjustified and misapplied. Instead, I would characterize human mind-readers as being “as good as we need to be, but not better than it’s good for us to be.”

This conclusion is based on the insights provided by empathic accuracy research, in which the empathic accuracy measure is computed as a ratio of the “total accuracy points earned” to the “total accuracy points possible” (Ickes, 2001, 2003). Baseline or chance-level accuracy typically averages about 5% in this research (Ickes, Stinson, Bissonnette, & Garcia, 1990; Stinson & Ickes, 1992). The empathic accuracy achieved by total strangers is substantially better than this 5% baseline, averaging about 20%. The empathic accuracy achieved by close friends is about 30%—notably better, but still far from perfect (100%). The average empathic accuracy of marriage partners is a little higher yet (30–35%), but again still very far from 100%. The average empathic accuracy of marriage partners is a little higher yet (30–35%), but again still very far from 100%. The average empathic accuracy achieved by close friends is about 30%—notably higher yet (30–35%), but again still very far from 100%. The average empathic accuracy achieved by total strangers is substantially better than this 5% baseline, averaging about 20%. The empathic accuracy achieved by close friends is about 30%—notably better, but still far from perfect (100%).

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After more than 20 years of research, we have yet to see any empathic superstars who score in the higher percentages—the upper 70s, the 80s, or the 90s.

Perhaps, compared to other species on this planet, we humans are indeed the greatest mind readers that evolutionary pressures have yet produced. I would hesitate to draw that conclusion because of its sheer presumptiveness, but I suppose it is possible. Before we congratulate ourselves too much, however, consider the possibility that it might not be to our advantage to be “consummately expert” mind readers but that it might instead be to our advantage to be “good enough, but not too good” at performing this task.

Biologists tell us that if there is a prime directive in nature, it is to ensure the survival of one’s own genes so they can be transmitted to one’s offspring and then protected until these offspring are able to mate and pass them on again. In other words, the prime directive is “Put yourself and your closest kin first—ahead of all others.” Consider, however, what would happen if we were so “consummately expert” as mind readers that we perceived the pain and need of everyone else we met as acutely and accurately as if it were our own. The likely outcome of this state of affairs is that the prime directive would no longer apply: we would repeatedly sacrifice our own interests for the sake of all others and put our own genes, and those of our descendants, at grave risk.

Because the empathic accuracy data suggest an apparent “ceiling” of approximately 60% on our ability to read other people’s minds, I am inclined to think that evolutionary pressures worked to calibrate this ceiling at that particular level. I suggest that these evolutionary pressures operated over countless generations to eventually optimize the effective range of empathic accuracy in humans so that it was high enough to enable us to deal effectively with others but was not so high that we put our genetic futures at grave risk by weighting everyone else’s interests as heavily as our own.1 I’m not sure how one would go about testing this hypothesis, but I think it’s a highly plausible one in light of the available data. So, in response to Zaki and Ochsner’s later question (Perceivers’ Abilities: Half Full or Half Empty? section) about whether the accuracy glass is “half full or half empty,” I suggest that Nature might reply, “It’s just right.”

On the Pitfalls of “Perceiver-centric Research”

Zaki and Ochsner (this issue) correctly note that the considerable body of research that has sought to determine the personality traits of “good” versus “poor” perceivers has generally failed to achieve this goal (for

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1By “us,” I mean to refer to typically developing humans—not those with a clinically significant organic or functional impairment of the mind-reading system.
reviews, see Davis & Kraus, 1997, and Ickes, 2003, chap. 7). In their The Rise and Fall of Accuracy Research section, Zaki and Ochsner suggest that this failure occurred because personality traits might not be related to perceivers' accuracy as “main effect” predictors but only as components of Trait × Situation interaction effects.

Although there might be some truth in this speculation (I think more data are needed to make a good case for it), a more obvious reason for the failure to find replicable personality predictors of perceivers' accuracy is that the variance in perceivers' inferential accuracy scores appears to be quite small in comparison to the variance in target persons' “readability” scores. This was the conclusion my colleagues and I reached when we applied Kenny’s (1994) social relations model to the empathic accuracy data in multiple data sets and found that the average amount of “perceiver variance” was surprisingly small (Ickes et al., 2000). It is a fundamental tenet of statistics that correlations are smaller (and therefore less likely to be significant) to the extent that the range (or variance) of the outcome variable is restricted. That’s what we have in this case. So a simpler explanation of the failure to find replicable “main effects” of personality variables predicting inferential accuracy scores is that there just isn’t much interperceiver variation in these scores for personality trait measures to account for. (For a related perspective on this issue, see Hodges, Laurent, & Lewis, 2011.)

There is an important qualification that applies to these findings. The research just described used only college students as the participants—a subject selection bias that might well have resulted in a relatively narrow range of perceivers' ability. To counter this problem, we could do what autism researchers do and expand the range of perceivers’ ability scores by including in our sample individuals who are known to be exceptionally poor “everyday mind readers.” Perhaps with a wider range of perceivers' ability available to study, the search for replicable personality predictors of inferential accuracy scores might prove to be more successful.

The Importance of Motivation

People who propose box models have to worry about the number of boxes they include. If they include too many boxes, their model may get criticized for failing to achieve theoretical parsimony; if they include too few boxes, their model may get criticized for failing to include some variable or process that is crucially important.

With regard to the box model depicted in Figure 2 of the target article and its accompanying elaboration in the text, I find much in this model to admire. One of its virtues is that it acknowledges the importance of both ES and MSA as potential determinants of inferential accuracy, rather than touting one process at the expense of the other (for a complementary perspective, see Hodges & Wegner, 1997). Another of its virtues is that it aspires to achieve a “triangulated” integration of all relevant research findings across three levels of analysis: social behavior, cognitive/affective processes, and neural engagement. Time will tell how successful the model will be in these respects, but there is no doubting its impressive scope or the high level of ambition that such an effort represents.

On the other hand, I also find that something crucially important is missing from Figure 2, and that missing element is the motivation to be either accurate or inaccurate in one’s inferences about another person’s current experience.2

The importance of the perceivers' motivation was suggested in the very first of our empathic accuracy studies, when we found that people were more accurate at “reading” the thoughts and feelings of opposite-sex strangers who were physically attractive than those who were less attractive (Ickes et al., 1990). Still, it wasn’t until several years had passed and the accumulating data had basically beat us over the head with the importance of the perceivers’ motivation that we began to give it the theoretical and research attention it deserved (e.g., Ickes & Simpson, 1997, 2001; Simpson, Ickes, & Blackstone, 1995; Simpson, Ickes, & Grich, 1999; Simpson, Kim, et al., 2011; Simpson, Oriña, & Ickes, 2003).

Some motives are externally induced (e.g., by a stranger’s physical attractiveness) and can therefore be addressed, as Zaki and Ochsner propose, under the general rubric of “context effects.” However, other motives are carried around inside the perceivers, sometimes interacting with relevant context variables and sometimes operating independent of them. For example, there is accumulating evidence that individuals who score high in anxious attachment become “hypervigilant” (and therefore more accurate) in regard to their romantic partner’s thoughts and feelings in contexts in which their relationship appears to be threatened (Dugosh, Cheng, & Park, 2011; Simpson et al., 1999; Simpson et al., 2011). This is a case in which the perceivers’ mind-reading motive interacts with a relevant context variable (perceived relationship threat) to affect the perceivers’ inferential accuracy. On the other hand, there is also accumulating evidence that individuals who score high in avoidant attachment are generally less motivated to learn what their partners are thinking and feeling (Rholes, Simpson, Trans, McLeish, & Friedman, 2007; Simpson et al., 1999; Simpson et al., 2011), an effect that appears to be relatively independent of context.

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2In fact, although the word motivation appears three times in the reference list of Zaki and Ochsner’s target article, it does not appear even a single time in the text!
In most of the laboratory research on inferential accuracy, the researcher takes great pains to ensure that all participants will be comparably motivated to make correct inferences, accomplishing this goal either by means of the task instructions, by presenting the task as a kind of “test,” or even by offering a financial incentive for good performance (Klein & Hodges, 2001). However, in people’s everyday lives, their motivation to be accurate or not is far more complicated and variable, stemming both from people’s long-standing motives and from the more transient, situationally induced motives that can quickly appear and then, just as quickly, vanish.

Imagine, for example, that a young man sees a beautiful woman sitting across the room in his local Starbucks. He asks if he can join her and is motivated by her beauty to hang on her every word, track her every facial expression, and decode every gesture and bit of body language in an attempt to understand her better. Two minutes later, however, he has already lost all of his patience with her annoying, insistent voice and her drama-queen attitude, and he is now actively “tuning her out.”

This is not just a fanciful example. There is accumulating evidence that perceivers can “dial down” or “dial up” their inferential accuracy skills virtually at will, in the service of their current motivations. For example, Thomas and Maio (2008) have shown that men dial up or dial down their empathic accuracy more or less in unison—its influence can be sufficient to produce an effect that is statistically significant when tested in comparison to the group of participants who don’t have the motivator.

After resisting the importance of mind-reading motivation for several years and eventually being forced by the data to acknowledge its pervasive effects, I can’t regard any theoretical model of the inferential accuracy process as complete unless it explicitly addresses the perceiver’s motivational concerns. In fact, it was this grudging admission that eventually led Jeffry Simpson and me to propose our empathic accuracy model, in which the perceiver’s motivation to be accurate or inaccurate plays a central theoretical role (Ickes & Simpson, 1997, 2001). So, although motivation is an “extra box” that can’t be neatly and easily integrated into Zaki and Ochsner’s Figure 2 model, I think they are well advised to try to figure out how to incorporate it. As we have seen, it is not just a matter of assuring the reader that “context” makes a difference.

Linking Accuracy/Inaccuracy to Adaptation

Zaki and Ochsner (this issue) are correct in calling for more attention to the links between inferential accuracy and adaptation (Linking Processes to Social Well-Being section). To put it simply, if evolutionary pressures have operated to promote our ES and MSA capabilities, we should expect that there are adaptive advantages associated with these capabilities.

As Zaki and Ochsner note, these capabilities are organized within a dynamic system. As Ickes et al. (2011) have noted, this system enables us not only to understand others but to modulate the degree of our empathic insight, dialing it up or dialing it down to fit the demands of the situation as well as our own personal needs and motives. According to Ickes and Decety (2009), current neuroscience views of this system challenge . . . the notion that there are domain-specific “theory of mind” modules in the brain. Alternative accounts (Decety & Lamm, 2007; Stone & Gerrans, 2007) argue that (a) elementary computational operations have evolved to perform social functions, and (b) evolution has constructed layers of increasing complexity, from nonrepresentational to representational and meta-representational mechanisms, which may be sufficient to provide a complete understanding of human social cognition. (Ickes & Decety, 2009, p. viii)

Given the vast reach and flexibility of this system, our personal adaptation will on most occasions be served by achieving greater accuracy in our understanding of others but will on other occasions be served by our becoming less accurate (or even willfully inaccurate). Consider, for example, the plight of certain dating couples who participated in the study by Simpson et al. (1995). The members of these couples reported that they were highly dependent on each other, yet they were also afraid that their relationship might not last. When they were put into an experimental situation in

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4If the motivator tends to affect the group of participants who have it in a fairly uniform way—leading them to either dial up or dial down their empathic accuracy more or less in unison—its influence can be sufficient to produce an effect that is statistically significant when tested in comparison to the group of participants who don’t have the motivator.
which they had good reason to believe that they were each harboring disloyal thoughts and feelings (about their attraction to alternative partners), they did a remarkably poor job of inferring each other’s thoughts and feelings. In fact, their empathic accuracy scores were found to be at chance-baseline levels (significantly below the average level that even total strangers typically achieve).

And was this a bad thing? No. As it turned out, the motivated inaccuracy displayed by these couples proved to be highly adaptive. These highly threatened, highly inaccurate couples were all still together several months later, whereas close to 30% of the less threatened but more accurate couples in the study had broken up by then. As this finding illustrates, sometimes our most adaptive response is to “not go there”—to stay out of our partner’s head and to not know because we do not want to know what he or she is currently thinking or feeling. The fact that such “motivated inaccuracy” can occur—and can help to sustain the relationship in the face of a rather intense short-term threat—suggests that the cognitive system that underlies our mind-reading skills is sufficiently flexible to enable us to adaptively dial down these skills as well as to dial them up.

In most situations, of course, our motive is to be more accurate—not less. For example, increased accuracy is an adaptive response when your romantic partner needs help and support, and it’s your job to figure out what kind of support is most needed. In this case, the available research shows that the more empathically accurate perceivers provide the most helpful instrumental support, presumably because these perceivers can read their partner’s mind well enough to know exactly what he or she needs (Verhofstadt, Buyse, Ickes, Davis, & Devoldre, 2008; Verhofstadt, Davis, & Ickes, 2011).

Finally, consider the problem faced by young adolescents who must deal with the stresses of poor peer relationships: experiencing social rejection and victimization and having relatively few friends. When Gleason, Jensen-Campbell, and Ickes (2009) examined how well young adolescents coped with this problem, they found that those with a high level of empathic accuracy coped the best. These adolescents were relatively unaffected by their poor peer relationships, whereas their less accurate counterparts wound up depressed and anxious, and were more likely to “act out.”

In summary, the empathic accuracy literature already provides compelling examples of the kind of research that Zaki and Ochsner have called for more of: research that links empathic accuracy to the important adaptations that individuals make in their everyday lives. Most of the time, such adaptations require us to dial up our everyday mind-reading skills. There are some occasions, however, when the adaptations require us to dial down our everyday mind-reading skills—to keep ourselves from not knowing things that do not appear to be in our current interest to know.

### Linking Accuracy/Inaccuracy to Clinical Problems

The empathic accuracy literature has also addressed Zaki and Ochsner’s call for more research that links people’s accuracy or inaccuracy to various clinical problems (Contributions to Clinical Approaches section). As my colleagues and I have noted elsewhere (Ickes, 2009; Rollings, Superman, & Ickes, 2010; Schmid Mast & Ickes, 2007), researchers have already examined the role of empathic accuracy in

- autism and Asperger syndrome (Demurie, De Corel, & Roeyers, 2011; Ponnet, Buyse, Roeyers, & De Clerq, 2008; Ponnet, Buyse, Roeyers, & De Corte, 2005; Ponnet, Roeyers, Buyse, De Clerq, & Van Der Heyden, 2004; Roeyers, Buyse, Ponnet, & Pichal, 2001)
- attention-deficit/hyperactivity disorder (Demurie et al., 2011)
- borderline personality disorder (Flury, Ickes, & Schweinle, 2008)
- marital conflict interactions (Simpson et al., 2011; Simpson et al., 2003)
- the social cognition of maritally aggressive/abusive men (Clements, Holzworth-Munroe, Schweinle, & Ickes, 2007; Robillard & Noller, 2011; Schweinle & Ickes, 2007; Schweinle et al., 2002; Schweinle, Ickes, Rollings, & Jacquot, 2010)
- the training of student therapists (Barone et al., 2005; Marangoi, Garcia, Ickes, & Teng, 1995).

Because the empathic accuracy paradigm is still relatively young, I have been impressed by how quickly all of this clinical/applied research has been done. The rapid progress of this work leads me to believe that it is only a matter of time until researchers who study other forms of inferential accuracy will begin to follow this lead.

### Conclusion

In summary, I regard Zaki and Ochsner’s target article as an ambitious, worthy, and even heroic effort to bring about an overarching conceptual organization that is long overdue. These authors have my sincere admiration for what they have already achieved. Their general model of the mind-reading process is incomplete, however, because it leaves out the crucial element of the perceiver’s motivation—the element that 20 years’ worth of research on empathic accuracy has consistently (and insistently) emphasized.
Note

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History, Dialectics, and Dynamics

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My commentary more elaborates on the Zaki and Ochsner (Z&O; this issue) target article than critiques it. Before I begin, the reader should be warned that I make no claims of being a neuroscientist or for that matter even a social-cognitive researcher. I do not know the difference between the somatosensory and the anterior cingulated cortex. “Cytoarchitectonic properties of anatomical connectivity” is something I gladly know nothing about. For those sections of the article that are neuroscientific, I offer no commentary. I do comment on history, the dialectical dance between accuracy and bias, and the dynamics of social perception. Not very surprisingly, I view their work through the lens of my own work.

History

My first set of comments concern history. Although Z&O do make clear that earlier accuracy research focused on individual differences, I do not think that they emphasize enough that this is at the heart of reason for the demise of interest in accuracy research. That is, if it is the case that in normal populations there are very small differences between people in their skill to read others, then measuring those individual differences and their correlates is very difficult. As we argued in Kenny and Albright (1987), researchers in the late 1950s inappropriately concluded that because individual differences in accuracy were weak, people were inaccurate. Obviously, such reasoning is fallacious, but it is what happened. To see that individual differences are weak in normal populations, consider, for example, the rather extensive analysis of individual differences in lie detection by Bond and DePaulo (2008), who found that a good lie detector (someone who is 1 SD above the mean) has only about a 1.5% chance more of being right than a poor lie detector (someone who is 1 SD below the mean). They state, “Lie detection accuracy is not a reliable individual difference” (p. 486). One of the key ideas in Z&O is that by looking at clinical populations, we have a much better chance of finding individual differences.

A second point is that although Cronbach laid out a clear way to study accuracy in 1955, just 3 years later (Cronbach, 1958) he said it was all wrong. If an expert like Cronbach might change his whole approach, how were practicing researchers to know what to do? Part of the demise of accuracy was due to the great uncertainty as to how to analyze accuracy data.

Third, I think that Cronbach and others thought that researchers should not be studying accuracy. They believed that people were not really very accurate, or if they were accurate, it was because they were biased. It is perhaps ironic that I am now engaging in mind reading of Cronbach and others, but I raise this issue because at the time many came away from reading Cronbach believing that people were not accurate. For example, Gage and Cronbach (1955) stated that “social perception . . . is dominated . . . by what the Judge brings to it than by what he takes in during it” (p. 420). Clearly they are suggesting that if we are to understand social perception, we would be much better off in studying biases than accuracy. Social psychologists were very eager to document these biases (Krueger & Funder, 2004).

Fourth, I think too it is important to realize that accuracy researchers did not all of sudden become cognitive scientists. Rather the movement in social psychology was to study attitude change, and eventually when it returned to the study of person perception the focus was on attribution theory. One of the early pioneers in attribution research was Daryl Bem (1967), who described himself at that time as a radical behaviorist, which is hardly social cognitive. Moreover, neither of the two major theoretical contributors to attribution theory, Edward “Ned” Jones and Harold Kelley, to my knowledge ever described themselves as “social-cognitive researchers.” Jones was downright dubious about social cognition, more for methodological than theoretical reasons, and Kelley viewed himself more as a relationship researcher than as a social cognitive researcher. All of which is not to say that eventually the successor to accuracy research was the social cognitive approach. However, their triumph occurred more than 25 years after the Cronbach critique.

The Dance Between Bias and Accuracy

The Z&O article emphasizes two very different lines of work on social perception. One is work on the process of judgment, and the other is work on whether those judgments are accurate. Z&O nicely document how these two lines of work have operated
independently. However, as they correctly argue, a complete analysis requires their simultaneous study.

Bias (what is essentially what Z&O call process) and accuracy are usually thought of as polar opposites. One can be biased or accurate, but one cannot be both. It might be better to think about bias and accuracy dialectically and allow for the two opposites to simultaneously exist. Echoing a point made by Cronbach (1955), bias, that is, assumed similarity, can lead to accuracy. Moreover we can, by having a biased and therefore incorrect view of reality, create that reality through the self-fulfilling prophecy. Bias and accuracy are not so much opposites, but they are dialectical dance partners.

I have been grappling with these issues for nearly 40 years. In my very first empirical publication (Curry & Kenny, 1974), I examined how perceived similarity and understanding one’s roommate’s personality and values relate to interpersonal attraction. In Berman and Kenny (1976), we examined how perceivers were able to recognize the true correlation in traits, as well as be biased by the halo effect. In the 1980s, I finally figured out how I should have done the analyses in Curry and Kenny (1974) and I wrote with Albright (1987; what I think is the best paper I have ever written) a post-Cronbachian approach to accuracy research. In Levesque and Kenny (1993), we took that approach and placed people in a situation in which presumably they were totally biased (i.e., zero acquaintance), but they achieved impressive accuracy. In Kenny, Bond, Mohr, and Horn (1996), we were able to show that perceivers were able to know how much two people like one another while they were biased by assumptions of balance, reciprocity, and agreement with self. Kenny and Acitelli (2001) highlighted the interplay between bias and accuracy and showed that romantic partners could be both biased and accurate in their perceptions of their partner; moreover, we showed how they were accurate by being biased. Finally, in Kenny (1991, 2004) I discussed a theoretical model of person perception which discusses the interplay between accuracy and bias.

I can remember in the 1990s discussing these issues with Ziva Kunda, and she suggested that I should try to investigate how both biases and truth can simultaneously influence judgments. Nearly 20 years later, Tessa West and I (West & Kenny, 2011) have undertaken this very project. We have created the truth and bias model (T&B). Z&O suggest that multiple processes simultaneously operate, and T&B allows for multiple biases and the truth to determine judgment. The T&B model complements rather than provides an alternative to the Gibsonian, Brunswikian, and Signal Detection Theory approaches. It also can, given the proper measurements, design, and analysis, measure individual differences in bias and accuracy and the correlation between bias and accuracy. It is very much in the spirit of Z&O’s call for uniting process and outcome research.

Dynamics of Perception

There is one point in Z&O to which I want to call special attention: “time-varying dynamics of the target’s state” (p. 168). Classically, most accuracy researchers used a standard set of judgments: All perceivers are given the same questions, and the issue is whether the perceiver is right or wrong on those questions. However, although it might be useful to know that my boss is generally an angry person, it is much more important for me to know when she is angry and when she is not. In particular, it is important for me to be sensitive to the transition from happy to angry and vice versa. Being sensitive to changes is what is important. As Z&O state (harkening back to Cronbach and Gage), if you just look at any one time to see if I know how angry she is, my accuracy will be largely due to my tendency to see her as angry (i.e., what is called in T&B directional bias).

T&B emphasize the procedure used by Levenson and Ruef (1992) of a perceiver viewing a target and continuously rating the target’s emotions. One nice feature of this approach is that it can be tailored to different populations. So, for instance, autistic children can try to read the emotions of their parent. Another nice feature is that the approach focuses on change. We should take a lesson from research on the unitization of events. Observers agree hardly at all in terms of parsing events into units (Newton & Engquist, 1976). However, what they do agree on is “when something happens,” or what are called break points. The Levenson and Ruef procedure can be used to determine whether people can recognize when a significant change occurs.

Methodologically, Cronbach (1955) was multivariate, but he looked at different variables, not the same variable moving through time. My two major publications on the measurement of accuracy (Kenny & Albright, 1987; Kenny & Winquist, 2001) focused too much on the snapshot of one point in time and not on the dynamics of social perception. Fortunately, using T&B (West & Kenny, 2011), we outline a method of the dynamic study of accuracy. I would think T&B could be adapted for the analysis of the Levenson and Ruef (1992) procedure.

Conclusion

Much of the discussion about accuracy research in social and personality psychology over the last 25 years is much like the discussion of sex by adolescent boys: They like to talk about why it is good to do, but they hardly ever actually do it. I think we have finally
turned a corner in accuracy research where we now have groups of researchers who have been studying accuracy, not just talking about it. What I find most refreshing about Z&O is that they are actually doing it, not just talking about doing it.

Acknowledgments

I thank Tessa V. West who provided with comments on an earlier version of this article.

Note

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How to Make Social Neuroscience Social

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Social neuroscience has had a boost over the last two decades. There have been a number of dominant themes in the course of this research, two of which are (a) the identification of systems involved in attributing beliefs, true or false, to others (e.g., Amodio & Frith, 2006; Ochsner et al., 2004; Saxe, Carey, & Kanwisher, 2004) and (b) the discovery that brain regions involved in our own actions, emotions, and sensations are recruited while we witness those of others (e.g., Iacoboni, 2009; Keysers & Gazzola, 2006; Keysers & Gazzola, 2009; Rizzolatti & Craighero, 2004). As Zaki and Ochsner (this issue) correctly conclude, the lion’s share of this research has focused on characterizing the cognitive and neural processes perceivers engage when encountering other minds. This approach has two conceptual limitations. First, it typically ignores whether the engagement of these processes leads to accurate inferences about those minds. Second, it is not social in the strong sense, as experiments typically only measured the brain activity and social perception of one isolated individual (the observer) while ignoring the relationship between that individual’s brain activity and perception and those of the target or other individuals.

In their target article, Zaki and Ochsner (this issue) advocate a refreshingly new perspective. They argue that the goal of mind perception is (a) to accurately perceive what goes on in others and (b) to ultimately help us interact better with others and be happier. Accordingly, one should ask not only what brain regions are recruited during mind perception, but also which of them lead to an accurate perception of what is on the mind of others and, to a lesser extent, which of them promote social functioning and happiness. Surprisingly, except for Zaki and Ochsner’s own work, there is indeed very little empirical work addressing these utilitarian questions.

In the field of social neuroscience, it is rare to find publications that propose profoundly novel approaches to the study of the social brain. We think that this is one of those rare articles that inspire us to look at the entire enterprise of social neuroscience from a novel angle. In what follows, we discuss four issues inspired by the target article that we hope extend and refine the ideas that Zaki and Ochsner have seeded. First, we argue that systematically inaccurate mind perception can be highly instructive about how people understand the minds of others. Second, we offer some examples where experience sharing is perhaps a more useful resource than Zaki and Ochsner presume. Third, we look at some limitations of measuring accuracy based on the reports of targets and observers, paying particular attention to “insight.” Finally, and most important, we look at three alternative approaches that are conceptually different but related to the accuracy research of Zaki and Ochsner. All of these issues help to make social neuroscience social again, by directly studying the relationship between multiple individuals—be it by comparing the brain activity of multiple individuals or by comparing brain activity with the quality of the individuals’ social relationships.

Understanding Is Understanding—Even if Inaccurate

A key point made in the target article is that mind perception has the aim of being accurate and that investigating regions of the brain in which activity correlates with accuracy is a way to focus in on the brain mechanisms that underlie our understanding of other people’s minds. We fully agree that this is a legitimate and understudied question. However, we believe it would be misleading to state that a brain region contributes to our understanding of other people’s minds only if its activity is correlated with an accurate report of the intentions or motivations of the observed agent. For example, while viewing a science fiction movie, we spontaneously attribute intentions and emotions to robots. Brain imaging has shown that when we observe the actions of a human (Figure 1a), the brain activity of the agent and the observer resemble each other in the mirror neuron system. Of interest, when we observe the actions of a robot, our brain activity is very dissimilar from that of the robotic agent. Hence, activity in the mirror neuron system of the observer can be said to be an accurate mirror of the
Figure 1. (Mis-)understanding robotic actions. Note. a. When subjects watch a human grasping a cocktail glass (left), the brain activity of the agent (middle) resembles that triggered in the mirror neuron system of the observer (right). Hence, the brain activity in the observer is a relatively accurate mirror of the state of the brain of the agent. b. When observing a robot grasp a glass (left), the "brain" activity of the robotic agent (middle) looks rather different than that of the observer (right). The brain activity of the observer is thus an inaccurate mirror of the state of mind of the agent, which is likely to underlie the anthropomorphic attribution of humanlike intentions and emotions to robots. We argue that this inaccurate brain activity contributes to our (false) understanding of robots just as much as the accurate mirroring of the human agent contributed to our understanding of humans. Brain activity was drawn on outlines of the brain based on the findings of Gazzola et al. (2007).

Experience Sharing and the Gut Feeling of Deception

Zaki and Ochsner suggest that experience sharing is a limited resource in accurately decoding the internal states of others. The reasons they cite are that people often attempt to conceal their internal states from observers for a variety of reasons, and that even when they do not, the cues presented to the observer are ambiguous. Is it really the case that deception is not accompanied by observable and diagnostic behaviors that can be shared to detect deception? Posed emotions differ in subtle but detectable ways from true emotions (e.g., McLellan, Johnston, Dalrymple-Alford, & Porter, 2009), and deceit is accompanied by subtle cues (e.g., fleeting gaze, etc.; Burns & Kintz, 1976). We would argue that sharing these behaviors might trigger a feeling of unease that could evoke a "gut feeling" of mistrust in the sharing observer. Our point is, therefore, as argued previously (Keysers & Gazzola, 2007), that discussing whether theory or simulation are better routes to mind perception is rather sterile. A more fertile approach might be to investigate how these two processes integrate to generate an understanding—or misunderstanding—of the mind of others.

Self-Report and the Bottleneck of Insight

Zaki and Ochsner (this issue) propose a technique to measure empathic accuracy. A target is filmed for a while and later asked to give a moment-to-moment report of how she felt. An observer then views this film and reports, on a moment-to-moment basis, how she thought the target had felt. Empathic accuracy is then simply the correlation between the two time series of moment-to-moment reports. To apply this measure to neuroscientific data, one then shows many such movies and examines if brain activity in certain regions...
COMMENTARIES

As highlighted by Zaki and Ochsner, the ability of an observer to make accurate judgments about an actor’s emotions is influenced by the expressivity of the actor and the empathic abilities of the observer (Gross & John, 1997; Zaki, Bolger, & Ochsner, 2009). However, given that the accuracy measure depends on the correlation of reports, there is another factor that influences both sides of the measurement, namely, alexithymia, which is the capacity of both parties to obtain insights into their own inner states, or its reverse.

Figure 2 shows how this can influence the reports of both the actor and observer, and hence the correlation between their reports. In essence, the self-report of actors is limited by their insight into their own emotions, such that even if they are highly expressive, they may be inaccurate in reporting their own internal state. Furthermore, if the observer has a well-tuned internal simulation/mirroring system, she might be able to generate inner states that are a highly accurate mirror of the inner states of the target. But if her insight is poor, she may inaccurately report the content of these simulations and generate low interreport accuracy. It is important to note that an observer’s behavioral reaction to a target is determined by many levels of representation of the feelings of the target. It is well known that observers sometimes unconsciously mimic the posture and tone of voice of a target, showing that nonconscious shared representations of the behavior of the target actually influence the behavior of the observer. At the same time, we have all experienced internal discourses in which we reason, “She doesn’t know that I know that Bob has left her, so I had better find an indirect way to ask her how she feels about that.” Finally, verbal reports are sometimes a direct component of our behavioral reaction to others: “You obviously look sad, what happened?” Hence, in the situated perspective adopted by Zaki and Ochsner, where what matters is ultimately to generate the most appropriate behavioral reaction, focusing on interreport correlation might underestimate the overall empathic accuracy because insight will act as a bottleneck, through which potentially more accurate and behaviorally relevant nonconscious representations of the targets feelings are filtered out. Similarly, and perhaps more important, in the case in which the target has poor insight whereas the observer has a finely tuned simulation system and good insight, the report of the observer may actually be a more accurate representation of the target’s inner states than the target’s self-report. This possibility is arguably the main motivation to seek the help of psychotherapists or friends in moments of great emotional turmoil: We intuitively feel that an external observer can sometimes gain insights into our own feelings that are more accurate than our own insights.

Figure 2. Empathic accuracy, as measured by the correspondence in time between two reports (how the target feels and how the observer thinks the target feels), is influenced by many variables. In addition to the expressivity and empathy of target and observers, the insight that both parties have in the hidden internal states of their own brains and body also limits the final measured accuracy. Investigators should therefore keep in mind that an observer might generate a very accurate simulation of the targets feelings, and hence react appropriately to the targets emotions, while still generating comparatively low measured empathic accuracy if one or both of the individuals have poor insight. A direct brain-to-brain approach, however, can provide different insights into the accuracy with which the covert neural states of the two participants resonate with each other.
A key point here is, thus, that although Zaki and Ochsner’s approach is an original and inspiring one to start shining light on the neural basis of accurate mind reading, one needs to be aware that it is limited or filtered by insight. Of importance, the approach does not allow for a direct quantification of the distorting effect of a lack of insight because it has no access to the hidden mental states that the observer is actually trying to read or the hidden mental states that observing the target has triggered in the observer. One of the great values of neuroscience in the social and cognitive domains is that it can provide insights into the mind without the filtering effect of self-reports. Next we describe three emerging new ways to look at neuroimaging data. Just as the approach of Zaki and Ochsner is inherently social because it analyzes neuroimaging data based on the correlation between the self-reports of a target and an observer, these new approaches make social neuroscience truly social. But unlike the former, they do not suffer from the filtering effect of self-report. We believe that combining all four approaches paves the way to a profoundly new way of doing social neuroscience.

Inherently Social Neuroscience Techniques

Directly Comparing the Brain Activity of Target and Observer

When the first publications on hyperscanning came out (Montague et al., 2002), people were excited about the technical prowess of scanning two people simultaneously. However, although many felt that hyperscanning was going to be the answer to important neuroscientific questions, people failed to deduce quite what these questions were going to be.

In recent articles, we examined the relationship between the brain activity of an observer and a target while they were trying to read each other’s mind (Schippers, Gazzola, Goebel, & Keysers, 2009; Schippers, Roebroeck, Renken, Nanetti, & Keysers, 2010). For this experiment, we used the game of charades, in which one partner is given a word and the instruction to use gestures to convey the meaning of the word to the other partner. If the other partner guesses the word correctly, the team wins a point. Because we could measure the brain activity of the gesturing partner while generating the gestures and of the observing partner while trying to guess the word, we could use a novel approach to examine social interactions. Rather than asking, like Zaki and Ochsner, whether activity in a certain brain region predicts how accurately the observer can guess the word that is on the mind of the gesturer (a correlation between interpersonal agreement and neural activity), we could directly ask which brain regions contained accurate information about the state of the other person’s brain.

Social interactions often introduce significant delays between the minds of two people. Imagine having to gesture “violin player” to your partner. The brain activity representing the verbal description will be the first thing generated in your brain. You will then generate a plan of how to gesture it in your motor cortices. Finally you will execute the gesture. Your partner will see the gesture unfold over 1 or 2 s and integrate that visual information into a motor representation of the act of playing the violin in her motor system. She will finally transform this motor description into a verbal one. The corresponding motor and verbal descriptions in the two brains will thus occur seconds apart. We, therefore, needed to develop a technique that can detect corresponding neural representations in the two brains without knowing exactly when they will occur relative to each other. Granger causality provides a method suitable for such analyses (Schippers et al., 2010). When applied to data across two brains, it essentially asks whether activity in the recent past of the target’s brain can predict the present brain activity of the observer or, seen the other way around, whether the brain activity of the observer contains accurate information about the recent past of the brain activity of the target. How many seconds of brain activity are considered the “recent past” of the target’s brain activity is a free parameter of this approach. We found that looking about 4 s into the past of the target was appropriate for the kind of gestures we examined.

As previously mentioned, we had argued a number of years ago—without relating to accuracy—that it was futile to discuss whether the mirror neuron system or mentalizing brain regions are more important for understanding others (Keysers & Gazzola, 2007) and that the two systems probably work together whenever we have to deduce thoughts from actions. Surprisingly, traditional analyses methods found that while trying to read what word was on the mind of the target in the game of charades, only regions of the mirror neuron system augmented their activity compared to a baseline—mentalizing brain regions had activity that was no larger than during the baseline (Schippers et al., 2009). However, directly comparing the brain activity between the target and observer, as previously explained, revealed that both mirror neuron system regions and mentalizing regions had activity in the observer that contained information about the state of the motor cortex of the target (Schippers et al., 2010). This finding has four implications. It confirms our idea that the mirror neuron system and mentalizing brain regions both contain accurate information about the content of a target’s brain/mind. It shows that it is possible to identify which parts of an observer’s brain contain accurate information about the brain/mind of a target, without needing to rely on self-reports that are potentially filtered by a lack of insight. It also affords the neuroscientist with another truly social method, by showing that
in addition to the between-report-accuracy approach of Zaki and Ochsner, another viable method exists that does not study brains in isolation. Finally, between-brain analyses like ours depend not on the overall level of brain activity in a region but on the pattern of temporal fluctuations around this overall level. This gives these methods the power to detect the involvement of mentalizing regions in the medial prefrontal cortex during communication that, as they are part of the default network, classical methods failed to identify due to their tendency to reduce their activity during a task rather than increasing it. Making social neuroscience truly social using between brain analyses is thus not only conceptually elegant, it generates new insights into the working of the social brain.

At least two other publications have since followed a similar route to examining the neural basis of mind perception. Stephens and collaborators (Stephens, Silbert, & Hasson, 2010) have elegantly shown that the neural basis of speech perception can be identified by comparing the brain activity of the speaker and the listener. Anders and collaborators (Anders, Heinzle, Weiskopf, Ethofer, & Haynes, 2010) have shown that the patterns of activation in regions of an observer’s brain contain information about the activity in the corresponding regions of the brain of a target who is expressing emotion through facial expressions.

**Directly Comparing the Brain Activity of Multiple Observers**

Although the aforementioned approach looks directly at the concordance between the brain activity of an observer and a target, another successful approach has been to examine the concordance between the brain activity of multiple observers. The rationale behind the two approaches differs significantly. The former directly examines what brain activity in an observer is an accurate representation of that of the target. In this way it is social and similar to the approach of Zaki and Ochsner in its concentration on accurate representations of other people’s minds. As previously discussed in the example of robotic mind perception, one might argue that neural processes that systematically lead to the misunderstanding of other people’s minds are as much a part of mind perception as those that lead to accurate understanding. Examining the concordance between the brain activity of many observers of a target allows us to identify regions generating both accurate and inaccurate perceptions of other people’s minds.

In a seminal article, Hasson and collaborators (Hasson, Nir, Levy, Fuhrmann, & Malach, 2004) have pioneered this approach. They showed the Sergio Leone movie *The Good, the Bad and the Ugly* to five viewers while measuring their brain activity. The authors then looked for voxels in the brain in which the brain activity, during the vision of certain scenes, went up and down in synchrony. This approach identified a number of brain regions that were synchronous across viewers at certain points in the movie. The investigators then looked at the content of the movie at the time these regions became synchronized across viewers to determine the content of the representations that were being systematically generated in these regions across viewers. One of the regions showing this property was the fusiform face area, which synchronized across viewers when scenes including faces were being watched, elegantly confirming what we already knew about this region from more classical experiments. More important, however, they also found that the somatosensory cortices synchronized across viewers while watching actors manipulate objects in their hands. As such, this social technique unravelled the involvement of somatosensory regions in social perception without directly aiming to do so. As in the aforementioned case of observer-target comparisons, performing truly social neuroscience hence not only confirms what we know from studying brains in isolation but also generates new knowledge. Unaware of their findings, we were performing, in parallel, a study that directly tested our hunch that somatosensory regions might be important in social perception (Keysers et al., 2004): We touched participants on their legs and showed them movies of other individuals being touched. By comparing the location of activation in viewers of touch and in people experiencing touch, we could show that somatosensory cortices were activated in both, confirming (without aiming to do so) the validity of Hasson et al.’s interviewer correlation approach. Thanks to these experiments, we finally realize how important somatosensory regions are in mind perception (Keysers, Kaas, & Gazzola, 2010).

**Relating Brain Activity to Levels of Social Functioning**

A fundamentally different way to make neuroscience social is to relate brain activity not to accuracy or the brain activity of others, but to the level of social functioning of participants. Are people with more activity in a certain region better in the real social situations that we face in the world “out there” but that are hard to simulate in the scanner environment? In a recent study we showed that activity in the inferior frontal gyrus (thought to form a critical part of the mirror neuron system) of autistic individuals increases with age (Bastiaansen et al., 2011). To examine whether this change of activity was meaningful for real social life out there, we asked the participants and a close relative of each participant to judge the level of functioning of each participant in the social world. Questions included how many hours participants spend alone, how many friends they have, how often they go to parties, and whether they have regular employment.
By relating brain activity to the responses of the participant and a close relative (to overcome the problem of self-report), we could show that increased activity in the inferior frontal gyrus indeed went along with better social functioning where it really matters: out there in the real social world. Looking at brain activity and social functioning in this way confirmed what people had hypothesized for a long while: that activity in the mirror neuron system is socially adaptive. Pfeifer and her collaborators have also shown that increased activity in this region goes hand-in-hand with higher interpersonal competence in typically developing children (Pfeifer, Iacoboni, Mazziotta, & Dapretto, 2008).

Summary and Conclusion

Social neuroscience used to be a rather unsocial enterprise. The brain activity of observers was measured in isolation while viewing a variety of stimuli. The only social aspect was that the stimuli happened to involve other human beings. Over the last few years, social neuroscience has seen the emergence of a number of truly novel approaches. One of these is excellently described in the inspiring target article of Zaki and Ochsner. In this commentary, we point out a number of issues that arise when using this approach: first, that they may have underestimated the utility of experience sharing; second, that inaccurate understanding can shed light on mind perception; and third, that this approach is sensitive to the degree of insight the target and observer have into their own inner states. Most important, however, we hope to have shown that three other truly social approaches have emerged in the recent past: direct comparisons of the brain activity of the observer and target, direct comparisons of the brain activity of many observers and comparisons between brain activity in the lab, and social competence in the real world. Together, these four approaches come close to what one might call a “paradigm shift” in neuroscience. The brain is no longer an isolated stimulus-processing machine, with social stimuli just being another type of sensory input. The brain is seen as a device that resonates with the brain of other individuals to allow us to interact effectively with them. Understanding their minds is no longer an end to itself but a means to successful social interactions. In this approach, social neuroscience becomes truly different from other forms of neuroscience. Social neuroscience becomes truly social.

Note

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Social Cognition, Accuracy, and Physiology

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Zaki and Ochsner (this issue) make an important point regarding the integration of process-oriented research with accuracy-oriented research in social cognition. This position is valid and desirable. One issue that does not emerge very clearly from Zaki and Ochsner’s proposal, though, is that some processes in social cognition are dedicated to solving relatively simple problems and that the accuracy expected for these problems, at least in the healthy brain, should be 100%, thus making accuracy research for such processes less crucial.

Zaki and Ochsner describe the process-oriented research on the Experience Sharing System (ESS) and the Mental State Attribution System (MSAS). They point out that one of the problems of the ESS in mediating interpersonal understanding is that “higher level” intentions and beliefs often are not unambiguously translated into motor and somatic states” (p. 162). I couldn’t agree more.

The problem with the process-oriented research on ESS and MSAS is that it often assumes that these two systems compete for interpersonal understanding. There is little competition, however, between these two systems. The ESS and the phenomena of mirroring associated with it are very good at dealing with relatively simple actions that are the fabric of our everyday existence. I am reaching for a glass of wine at dinner. What can I do with it? Well, in principle I could pour the wine on the table, just to see what kind of color the tablecloth would get, or I could splash the wine on the face of the person I am having dinner with. I could also violently smash the glass on the wall. I could do all these things. However, I have reached for and grasped a glass of wine at a dinner table probably thousands of times in my life, and I invariably drank the wine. Or, at the end of the dinner, put the empty glass in the dishwasher.

When I see somebody grasping a cup of coffee, when one of my trainees enters my office for a meeting and I look at her face, when I go around the city and watch people smiling at me, or hugging each other, when I am in line in a movie theatre, I am surrounded by people who are busy making very predictable actions that express relatively simple intentions. The ESS is really good at effortlessly facilitating interpersonal understanding for these simple scenarios. These scenarios, however, although simple, are also very important, because they are the overwhelming majority of the kind of things we deal with in our social life. We all understand these situations 100% of the time. Indeed, if we fail to grasp the meaning of these very simple situations, it most likely means that something is wrong with our brain. Thus, although I applaud Zaki and Ochsner call for the integration of process-oriented and accuracy-oriented research, I also think that accuracy-oriented research is less crucial in the field of ESS research.

The MSAS plays an important role in more complex situations, and for those situations accuracy-oriented research is certainly valuable, because our accuracy at interpersonal understanding for those situations is far below 100%.

Zaki and Ochsner (this issue) argue that “both the ESS and the MSAS are concurrently engaged by ‘naturalistic’ mind perception tasks” (p. 172). This statement clearly relies on the assumption that we know how to identify ESS and MSAS. I argue next that this is not as simple as it may seem.

The brain imaging literature has consistently associated a set of cortical brain areas with MSAS, as Zaki and Ochsner point out. There is a problem, however, with the interpretation of the physiological response of this set of areas (or at least with the most prominent ones). Many studies have reported “activation” for mental state attribution tasks compared to control tasks in these areas. The problem, however, is that plotting the activity of these areas reveals almost invariably reduced activity for both mental state attribution tasks and control tasks. Control tasks simply show a consistently higher reduction of activity, compared to the mental state attribution tasks (Mitchell, Heatherton, & Macrae, 2002). Thus, the subtraction of the control task activity to the mental state attribution task activity yields a positive value but only because both values are negative values and the absolute value of the control task is higher than the absolute value of the “experimental” task (the mental state attribution task).

The common practice in neurophysiology, however, is to consider the response with the highest absolute value the most important for neural coding. That is, when a neuron increases its baseline firing rate to the presentation of two stimuli, the stimulus yielding the...
highest increase in firing rate is considered preferentially coded by that neuron. Using the same logic, when a neuron decreases its baseline firing rate in response to two stimuli, the stimulus with the highest decrease in firing rate (highest absolute value) is considered preferentially coded by that neuron. The same logic applies to the local field potential, an electrical parameter of neural activity that correlates with the BOLD fMRI signal even better than the spiking activity of neurons. Mysteriously, the set of areas associated with MSAS have been exempted from this typical neurophysiological interpretation. Indeed, the opposite logic is applied to them, on the basis that they have high baseline activity during rest (Mitchell et al., 2002). However, neurons also have different baseline firing rates. Neurons with extremely high baseline firing rate tend to code stimuli with reduction of the firing rate (inhibition). Nevertheless, the traditional interpretive logic in neurophysiology that looks at absolute amount of deviation from baseline activity has been always applied to the responses of these neurons.

There is no solid rationale for applying this “reversed” interpretive logic to the cortical areas associated with MSAS. There are, however, historical reasons. Many fMRI studies on MSAS have been performed with no resting conditions, on the account that the resting condition cannot be controlled. Furthermore, for many years there has been little awareness of the unusually high baseline activity in the areas associated with MSAS and of the task-induced reduction of activity in these areas. When this issue emerged, there was already a literature linking that set of areas to MSAS. Rather than revising the thinking about the processes in those areas, the community revised its own thinking on how to interpret activity changes, but only when applied to the areas associated with MSAS. This is clearly irrational. It’s also problematic, because there are studies showing increased activity in these areas during mental state attribution tasks (Iacoboni et al., 2004; Mitchell, Macrae, & Banaji, 2004). At this point, the social cognitive neuroscience community simply ignores this issue, and I doubt that my comments here will produce any change. Eventually, however, this illogical practice will have to be faced and resolved.

A final comment on autism. Autism spectrum disorder has a very complex phenotype, most likely due to multiple factors. Autistic traits also vary in the neurotypical population. Some of the inconsistencies in the literature are likely due to recruitment issues. If my control group has subjects that are high in autistic traits and my autism spectrum disorder group is high functioning, it is not unlikely that group differences cannot be demonstrated. Furthermore, in studies looking at linking deficits in mind perception with social symptom severity, the choice of the bio-marker is critical. Good bio-markers will succeed (Dapretto et al., 2006), not so good ones may fail.

Although it is true that some interventions show only task-specific improvements, others show promising preliminary results that generalize beyond the intervention (Ingersoll, 2010; Ingersoll & Lalonde, 2010; Ingersoll & Schreibman, 2006). This is probably because the intervention acts on and improves a core functional deficit associated with the condition.

Note
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Zaki and Ochsner join the long line of commentators urging scientists in cognitive psychology and neuroscience to draw from research in social and personality psychology and vice versa (e.g., Banaji, 2010; Cacioppo & Berntson, 1992; Heatherton, Macrae, & Kelley, 2004). The particular contribution of Zaki and Ochsner is to emphasize the integration of personality/social research on the accuracy of social judgments into investigations of cognitive processes illuminated by neuroscience.

Those of us already on the front lines of accuracy research (e.g., Funder, 1980, 1982, 1995; Letzring, Wells, & Funder, 2006) do not need to be convinced of its utility. However, the authors of the target article appear to believe that some psychologists still need to be convinced that the study of accuracy is important. The purpose of our comment is to support their efforts and to discuss further how the integration they suggest might be organized.

The most interesting part of the target article might be its demonstration of how findings from the study of cognition and neuroscience suggest theoretical insights for personality and social psychology. Using their own work as an illustration (Zaki, Bolger, & Ochsner, 2008; section 3.1.2), Zaki and Ochsner report that accuracy depends not only on the type of information one receives but also on the particular mental process used to interpret that information. To reach this conclusion, the authors assume that a person’s tendency to use a particular mental process (experience sharing) can be tapped by his or her self-report of an individual difference variable (empathy). However, empathy could be associated with any number of different mental processes, attitudes, or patterns of emotional response. For the argument that the authors are making, more direct indicators of mental process would provide stronger support. Still, if their implication is valid, a judge who uses experience sharing to infer a target’s current psychological state will be accurate only to the degree to which the target is expressive, or provides information that is emotional in nature. In short, the authors argue, the target information must match up with the judge’s process if accuracy is to be achieved.

The Realistic Accuracy Model (RAM; Funder, 1995) organizes four moderators of accuracy and the interactions among those moderators. The interaction identified by Zaki et al. (2008) exemplifies what RAM refers to as “sensitivity,” the interaction between characteristics of the judge and specific aspects of relevant information (see Funder, 1995, Table 2). Because RAM offers a potentially useful rubric for organizing interactions such as those studied by Zaki et al., we offer a brief summary.

**RAM**

The RAM focuses on judgments made about traits rather than current thoughts and feelings (the focus of Zaki and Ochsner), but we would suggest the basic processes are similar. RAM begins with the premise that traits are real properties of target persons. It further presumes that people sometimes make judgments about traits and that sometimes the judgments are accurate. For an accurate judgment to be accomplished, four things must happen. First, the target person must emit behaviors that are relevant to the trait in question. Second, these behaviors must be available to the judge (e.g., emitted in his or her presence). Third, the judge must detect and, finally, correctly utilize these relevant, available, behavioral cues in order to produce a correct judgment. If one simply substitutes “psychological state” for “trait” in the preceding description, we believe exactly the same sequence applies. Either way, unless relevant information is available to a judge who detects and utilizes it correctly, accurate judgment simply cannot happen.

A central purpose of RAM is to account for the four basic moderators of accuracy identified by decades of research by many investigators. When phrased in terms of the circumstances that make accurate judgment more likely, the moderators are good target, good trait, good information, and good judge. Each of these moderators has received empirical investigation. For example, Colvin (1993) painted a picture of a good target as a person with a coherent personality who is psychologically well adjusted. Moreover, some traits are more easily judged than others. “Good traits” are related to behaviors that are visible and readily expressed (Funder & Dobroth, 1987). “Good information” can be thought of in terms of quantity (more information is generally better; Blackman & Funder, 1988) and quality (behavioral observations in unstructured situations yield more accurate judgments of personality than do...
observations in highly structured ones; Letzring et al.,
2006).

The remaining moderator has a more checkered past. Zaki and Ochsner relate the history of the search for the “good judge” in the traditional fashion. Although plenty of interesting findings about the good judge can be found in the contemporary literature (see Letzring, 2008), the nature of some of the historically long-standing problems in that area of research illustrate the value of the points raised by the target article. One reason why the search for the good judge has proven so difficult is that properties of the judge, target, trait, and information on which the judgment is based all might interact in the determination of accuracy. This fact presents a daunting and potentially disorganized research agenda.

One way to bring order to the research enterprise is through the use of theory. For example, the individual difference (judge) variable studied by Zaki et al. (2008) was conceptualized as the tendency to utilize a particular cognitive system (experience sharing). This is an excellent start. The identification of stable neurological and cognitive systems specialized for person perception promises to fill a theoretical void by identifying the potential characteristics of the good judge that are the most promising to study.

A portion of the RAM presented by Funder (1995, Table 2), reproduced here as Table 1, can also be useful. The table labels each of the six interactions among the four basic moderators of accuracy (see Funder, 1999, for a detailed treatment of each). One of them is “sensitivity,” which, as mentioned, encompasses Zaki et al.’s (2008) assertion that the accuracy of particular judges depends on the type of information that is available. The remaining five interactions also deserve research attention. More generally, this table can organize and suggest future research on moderators of accuracy and their interactions and tie new research to existing findings in the literature of person perception.

Table 1. Interactions among Moderators of Accuracy in Personality Judgment.

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Acknowledgments

Preparation of this commentary was assisted by National Science Foundation Grant BNS BCS-0642243 (David C. Funder, Principal Investigator). Any opinions, findings, and conclusions or recommendations expressed in this commentary are those of the individual researchers and do not necessarily reflect the views of the National Science Foundation. We thank Esther Guillaume for comments on an earlier draft.

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Note

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On the Reintegration of Accuracy in Social Cognition Research: Let Us Count the Ways

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When we set out to write this review, both of us were a bit apprehensive about the responses we would receive. This anxiety was driven not just by our imaginations but also by colleagues who often seemed to take a hostile stance toward the very idea of studying interpersonal accuracy. While discussing the troubles of accuracy research following Cronbach’s (1955) complaint, and our recent forays into this area of research, one senior colleague told us that the entire endeavor “should have stayed dead.” Another colleague encouraged us to reconsider using the “toxic” term accuracy if we wanted anyone to listen to us.

As such, we were thrilled (and a touch relieved) to find, instead, an enormously generative set of responses to our article, which—although sometimes taking issue with the details of our approach and framework—rarely challenged the notion of accuracy as a meaningful or measurable construct. Perhaps the deck was stacked; many of the commentators are accuracy researchers whose work has inspired much of our own. However, even among more “process-oriented” researchers, and across behavioral and neuroscientific perspectives, the commentaries broadly converged on the idea that integrating accuracy and process in social cognition is desirable and feasible.

We like consensus, but we love new ideas, and that’s what these commentaries contain in abundance. Many provide particular visions about how process- and accuracy-oriented research can and should be brought together, and indeed, how they already are being integrated. Although the landscapes each commentator sees for the future of the field often differ from each other, and from our own, in important ways, there also were commonalities in their content and architecture. Above all else, we are heartened by the sheer number of novel and innovative approaches to these issues embodied in these commentaries. It has become almost canonical for psychologists to dismiss accuracy research as anemic or anachronistic, and the idea of integrating accuracy- and process-based approaches to social cognition is sometimes seen as too complex or vague an endeavor to be worth pursuing. By our count, this pessimism clashes with key ideas expressed by virtually every commentator.

We see these commentaries as coalescing around a set of core questions that the field of accuracy research needs to answer—and in many cases already has begun to answer. Next we describe five such questions. Between the commentators, others, and ourselves, a growing number of researchers are not only posing these questions but also producing creative new ways to answer them. Although much work obviously remains to be done, counting the ways research is moving forward leaves us optimistic about the future of accuracy as an integrated part of social cognition research.

How Accurate Are Perceivers, and How Accurate Do They Want to Be?  

Epley and Eyal (this issue) and Ickes (this issue) take issue with our characterization of perceivers as “consummate experts” at mind perception, and we agree that this term lacks precision. On one hand, perceivers’ skills are impressive in a number of ways. Especially in the domain of emotion perception, the fact that we can so quickly combine myriad informational sources together into any coherent inferences about targets is nontrivial. Further, judging performance on many emotion perception tasks is problematic because so many individuals often perform at ceiling when identifying affective states. Thus, even if perceivers fail to attain accuracy in some task types (lie detection is a prime example), they are quite accurate in others.

On the other hand, we agree with both commentaries that the only broad statement about accuracy that rests
entirely on solid empirical ground is that perceivers are better than chance, and worse than perfect, at judging social targets. We do believe that—at least in process-oriented research—the “worse than perfect” side of that equation has held too much sway in the literature (perhaps because this domain of research typically uses perfect accuracy as a baseline; see also Krueger & Funder, 2004). That said, we agree with Epley and Eyal and with Ickes that emphasizing the other side of the equation is not as useful as balancing the two. In fact, we believe that the integrative approach we advocate assumes this balanced view of perceivers’ skills. Specifically, we suggest that more attention should be paid to shifts in accuracy that result from alterations in social context and process use. Such shifts could not occur if perceivers were always perfect—or always terrible—at drawing inferences about targets. Thus, even if our use of the term “expert” was a bit cavalier, we believe our approach emphasizes the variance between perfection and chance that actually characterizes perceivers.

Perhaps a deeper and more interesting question is, “How accurate do perceivers want to be?” One might imagine that even if humans are not always consume mentality perception experts, we should always strive toward perfect accuracy. Such expertise would save us from Ponzi schemes, unfaithful spouses, and other inaccuracy-related pitfalls. Ickes, however, points out that—in many cases—perceivers have other motives and may sometimes avoid the very information they could use to accurately assess targets (Kunda, 1990). We strongly agree that variance in motivation powerfully affects accuracy and could play out across contexts (e.g., the same individual may be motivated to be accurate in the face of positive information and inaccurate in the face of threatening information) or across individuals (e.g., someone high in the need to belong or low in socioeconomic status may chronically strive to accurately assess others’ views of him, in order to tailor his behavior to interaction partners). This variance can importantly play into a discussion of when accuracy is highest and what accurate perceivers look like (see next).

How Should Accuracy Be Measured?

If psychology were to be compared to physics, interpersonal accuracy might be seen as a kind of quantum phenomenon: Just as measuring one feature of a particle’s state introduces uncertainty about its other features, accuracy can also change—sometimes dramatically—as a function of how it is measured and who is doing the measuring. As a result, there sometimes seem to be almost as many accuracy measurements as there are accuracy researchers (as noted by many commentators, and especially Hall & Colvin, this issue).

At first blush, this variance seems problematic. After all, methodological inconsistency was one of the primary charges leveled at the “first wave” of accuracy researchers (Gage & Cronbach, 1955). Especially troubling are the theoretical pitfalls inherent to operationalizing accuracy. The slipperiness of the concept requires any researcher to make some a priori assumptions about what counts as accuracy, which can be dangerous. This is known as the “criterion question”: Who or what is the authority on a social target’s traits or states? If Liz says she is nervous, is she right? What if her friends—or FACS coders, who know more about her facial expressions than she does (Ekman & Friesen, 1975/2003)—disagree? If she is not experiencing physiological arousal, is she calmer than she believes? If we were to measure activity in her insula, would it “know” more than she does about her current levels of disgust? Defining a criterion requires a researcher to decide which of these noisy, often contradictory, signals to trust. That researcher’s definition of accuracy (and its legitimacy) will, from that point on, be constrained by her criterion assumptions, any of which is necessarily imperfect.

Our own work and that of the commentators illustrate a wide range of such criteria, and a range of resulting issues. As noted by Keysers and McKay (this issue), our own choice of a criterion (a target’s self-reported emotion) is not without problems: If a target is incorrect about his own emotions, then a perceiver who agrees with him is only dubiously accurate. Keysers and McKay argue that neural engagement does not suffer from this bias, and as such shared patterns of engagement across perceivers and targets (Schippers, Gazzola, Goebel, & Keysers, 2009; Schippers, Roebroeck, Renken, Nanetti, & Keysers, 2010), or across multiple perceivers viewing the same target (Stephens, Silbert, & Hasson, 2010) may provide a purer measure of accuracy than any based on self-report.

We find this idea intriguing and think that studies of brain–brain correspondence are a vital new source of data in this domain. At the same time, we caution that shared neural states are not necessarily indicative of correspondence between psychological states or meaningful interpersonal understanding. For example, two people looking at each other’s faces will almost certainly coengage striate and extrastriate cortex involved in perceiving complex visual stimuli, but all this coactivation tells us is that they have simultaneously seen something (likely each other), not that they have understood each other’s states or traits.

Keysers and McKay (this issue) and Iacoboni (this issue) suggest that “resonance” between the mirror neuron systems (MNS) of two individuals more deeply connects to empathic understanding. To a certain extent, we agree, especially when perceivers are attempting to accurately understand relatively “low-”level
motor or communicative intentions, such as a target reaching for a glass or playing charades. However, even coactivation of regions in this system could reflect a “shallow” level of accuracy that would leave most perceivers unsatisfied. This is because—contra Iacoboni’s view—we think that many important psychological states are not mapped in any direct way to motor acts that can be represented in the mirror neuron system (cf. Hickok, 2009).

Consider the example from our target article: A perceiver witnesses a target shoving someone else. Coengagement of the MNS could theoretically provide a measure of how much the perceiver understands the target’s “low-level” intention (i.e., to push), and (even better) a measure not limited by the target’s own insights about her behavior. However, as is the case with facial expressions of emotion (Aviezer et al., 2009; Carroll & Russell, 1996; Kim et al., 2004; Russell, Bachorowski, & Fernandez-Dols, 2003; Zaki, Hennigan, Weber, & Ochsner, 2010), the meaning of nonfacial motor acts also vary significantly depending on the context in which they are embedded. Thus, simply understanding that a target wishes to push an unsuspecting person—and the neural resonance that can index such understanding—provide little insight about whether a perceiver correctly gauged the deeper meaning of a target’s internal states (e.g., shoving the person to start a fight vs. attempting to save him from an oncoming bus).

Iacoboni has previously demonstrated that the MNS is sensitive to the presence or absence of contextual cues surrounding a movement (Iacoboni et al., 2005), suggesting that this system may incorporate contextual information about a target’s intention as well as their motor acts. Be that as it may, we are more convinced by data suggesting that attention to context and “deeper” internal states (e.g., why someone is performing an action as opposed to how they are performing it) engages the mental state attribution system in addition to the mirror neuron system (de Lange, Spronk, Willems, Toni, & Bekkering, 2008; Spunt & Lieberman, 2011; Spunt, Satpute, & Lieberman, 2010). Further, engagement of both systems tracks with accuracy as measured by multiple criteria, including agreement with targets themselves (Zaki, Weber, Bolger, & Ochsner, 2009) and objective memory for the content of targets’ anecdotes (Stephens et al., 2010). Together, these data strongly suggest that coengagement of the MNS across target and perceiver cannot tell the whole story of interpersonal accuracy.

Finally, although Iacoboni (this issue) believes that interpreting brain activity related to mental state attribution is complicated by the fact that some key regions related to this process (e.g., the medial prefrontal cortex) are tonically active at rest, researchers have taken this issue to heart for almost a decade. In fact, the striking overlap between areas related to mental state attribution and the brain’s “default network” now guides thinking about the ubiquity and centrality of social information processing to the human mind (Buckner, Andrews-Hanna, & Schacter, 2008; Buckner & Carroll, 2007; Mitchell, 2009; Wagner, Kelley, & Heatherton, 2011). For example, research on mindwandering and stimulus-independent thought suggest that when in a “default,” non-task-oriented mode, what people do much of the time is make attributions about their feelings and thoughts concerning things that are personally relevant to them, like their goals and interpersonal relationships (Christoff, Gordon, Smallwood, Smith, & Schooler, 2009; Mason et al., 2007). More broadly, organs that are tonically active at rest are not precluded from tracking subjective or psychological states in important and tractable ways. For example, though everyone hopes that their heart remains tonically active, variance in heart rate (and even second derivatives describing variance in heart rate variance) are reliable, meaningful correlates of internal subjective states (Berntson et al., 1997).

Thus, although we strongly agree that shared perceiver-target neural activity should join the cadre of criteria that can be used to assess interpersonal accuracy, we do not believe that neural resonance merits a privileged ranking as less biased or more informative than other criterion measures. Like examination of behavior and self-report, the utility of neural resonance lying in adding to a broader triangulation—based on aggregation of multiple types of data that are relevant to multiple criteria—on when and how perceivers achieve accuracy.

Thus, we propose settling our differences over the quality of any one criterion by instead focusing on aggregating data gleaned from the use of multiple criteria (in fact, as many criteria as possible). Before we can do so, however, it is worth asking the question, Why is such aggregation worthwhile? More specifically, what does the whole (aggregation across criteria) provide that is greater than the sum of its parts (separate lines of data from separate criteria)? We believe there are at least two answers to this question, which couldn’t be more different from each other.

Convergence Across Criteria

Measuring emotional states ranks among the oldest and most Herculean challenges in psychological research. This endeavor spans a number of qualitatively different problems. Intuitively, researchers wish to understand the psychological ingredients—such as perception of bodily states and contextually driven appraisals—that constitute emotional states (Cannon, 1927; Forgas, 1995; James, 1884; Schachter & Singer, 1962; Scherer, Schorr, & Johnstone, 2001; Storbeck & Clore, 2007). In attempting to understand these ingredients, they run into another thorny question:
Which levels of analysis—for example, behavioral (self-reports & expressions) or physiological arousal (e.g., heart rate)—provide valid information about when an emotion is occurring (Ekman, Levenson, & Friesen, 1983; Ekman, Sorenson, & Friesen, 1969; Robinson & Clore, 2002)? Note that this second issue eerily resembles the criterion question just described. As such, these questions can be thought of as independent and sequential: Before delving into the components (independent variables) that produce and track emotion, one must identify the measurements (dependent variables) that signify that an emotion has occurred.

As it turned out, this sequence is not nearly as tidy as one might have imagined. Researchers argue about the relative validity of different criteria, and—even worse—self-reported, behavioral, and physiological measurements of emotion often misbehave by failing to track with each other (Mauss, Levenson, McCarter, Wilhelm, & Gross, 2005), especially in some circumstances and for some individuals (Ansfield, 2007; Gross, John, & Richards, 2000). However, emotion research’s melee of operationalizations gave way to a deeper insight about emotion: The psychological ingredients and levels of analysis questions surrounding it are not at all independent. Instead, to validly identify the independent variables that produce emotion, one must demonstrate that they do so across a range of criteria. This “meta-criterion” produced a generative, qualitatively novel approach to defining emotion that brought research above the fray of argumentation over any one criterion’s validity (Barrett, 2009; Barrett, Mesquita, Ochsner, & Gross, 2007; Gross & Barrett, 2011; Russell & Barrett, 1999).

Social cognitive research is approaching a similar moment, when convergence across criteria can be used as its own metacriterion to validate the role of predictors (such as cognitive processes) in producing interpersonal accuracy. At least some predictors do produce such cross-criterion consistency. For example, experience sharing and mental state attribution predict accuracy across a number of criteria. These relationships are relatively robust to differences in how processes are measured—through developmental trajectories (Eisenberg, 1989), self-report (Hall & Colvin, this issue) physiological arousal (Levenson & Ruef, 1992), motor mimicry (Dimberg, Thunberg, & Elmehed, 2000; Stel & van Knippenberg, 2008), neural activity (Zaki et al., 2009; Stephens et al., 2010), and its absence in neuropsychiatric patients (Fernandez-Duque, Hodges, Baird, & Black, 2010; Goodkind et al., 2011)—and differences in how accuracy is measured—through memory for target behavior (Hastie & Kumar, 1979; Mitchell, Macrae, & Banaji, 2004; Stephens et al., 2010), agreement across perceivers (Kenny et al., 2007), agreement with targets themselves (Ickes, 1997), and response latency (Stel & van Knippenberg, 2008). Perhaps more important, the moderators that determine when these processes will produce accuracy (e.g., target expressivity, perceiver motivation) hold relatively constant across domains of study and criteria. For example, although knowing what someone is feeling and what that person is like in general may seem quite different, Funder (this issue) points out (and we agree) that there is impressive consistency between the factors that determine whether individuals’ traits and states will be successfully transmitted by targets and received by perceivers.

Divergence Between Criteria

Disagreement is often as generative as agreement, and we think the “noise” created by the use of multiple criteria of accuracy is no exception. In many cases, apparent confounds between accuracy, on one hand, and the criteria used to define it, on the other, might turn out to not be confounds at all but rather clues about systematic moderators of accuracy. Consider the examples described by Epley and Eyal (this issue) in which perceivers are relatively inaccurate. These inaccuracy-producing situations cluster around two types of social tasks: (a) drawing inferences about opponents in a debate or negotiation, and (b) understanding how one will be perceived by others. Epley and Eyal claim that such situations provide accuracy criteria that are as valid (or more valid) as (or than) those produced by tasks in which perceivers are relatively accurate (e.g., rating pictures of faces or videotaped interactions). Thus, on the face of it, Epley and Eyal’s examples suggest that optimism about perceivers’ accuracy is driven by the use of unrealistic criteria, and altering these criteria overturns this rosy viewpoint.

Does this mean that accuracy is impossible to measure consistently or that perceivers are prone to failure when measured in the most realistic way? We don’t think so, and instead find the divergent levels of accuracy produced by these measures deeply informative. Ickes (this issue) and Epley and colleagues (Epley, Keysar, Van Boven, & Gilovich, 2004; Gilovich, Medvec, & Savitsky, 2000) have documented two particularly strong forces that can influence accuracy. First, people are accurate when motivated to be so—for example, when targets are attractive (Ickes, Stinson, Bissonnette, & Garcia, 1990), or when perceivers have been rejected (Pickett, Gardner, & Knowles, 2004) or feel a lack of power (Kraus, Cote, & Kelner, 2010)—and inaccurate when motivated to be so—for example, when accuracy is self-threatening (Simpson, Ickes, & Blackstone, 1995; Simpson, Orina, & Ickes, 2003) or when inaccuracy can bolster one’s self-image (Kruger, 1999; Taylor & Brown, 1988). Second, perceivers have an especially difficult time overcoming the curse of their own knowledge in understanding what targets do.
not know (Gilovich et al., 2000; Gilovich, Savitsky, & Medvec, 1998), even when such knowledge objectively harms perceivers’ accuracy (Epley et al., 2004) and their ability to optimally interact with targets (Camerer, Loewenstein, & Weber, 1989).

These two forces reframe the difference between methods used by process and accuracy researchers and make it unsurprising that these two groups reached different conclusions about perceivers’ skills. Specifically, the examples of (in)accurate social perception highlighted by Epley and Eyal (this issue) are those in which people are (a) unmotivated to be accurate and (b) most cursed with their own knowledge when trying to be accurate. Anyone who has watched cable news in the last few years likely understands that people with strong opinions often have little interest in taking the perspective of those on the other side. This disinterest may be well guided, because perspective taking in contentious situations can sometimes produce dissonance and even worsen the outcome of intergroup interactions (Cikara, Bruneau, & Saxe, 2011; Vorauer, Martens, & Sasaki, 2009; Vorauer & Sasaki, 2009). Similarly, people are least likely to be accurate when accuracy requires them to overcome intimate self-knowledge (i.e., rate how they will be perceived by targets), especially when such ratings are further tangled with motivational forces (e.g., rating how attractive one will be rated by others compounds self-knowledge and motivated reasoning).

Eyal and Epley (2010, this issue) leverage these well-known biases to produce an intervention for improving accuracy (see ‘manipulating process use can alter accuracy’ below), and we commend this step in merging information about processes and accuracy. However, it is worth noting that they begin with situations in which accuracy is most likely to be poor (i.e., classes of judgment that are most loaded with motivational biases and the curse of knowledge) and in greatest need of improvement. Accuracy researchers in many other domains have, instead, sought to describe the performance of perceivers in more “neutral” settings where, in fact, accuracy can be a good bit better. For example, there is no clear reason that rating the emotions of a stranger or the traits of someone described in a vignette would systematically draw out inaccuracy related to the curse of knowledge or self-serving biases.

Which criterion, then, should we trust more: the one that pinpoints our biases and inaccuracies, or the one that does not? Our point here is that neither is more “naturalistic” or important than the other. Instead, these criteria differ in some of the very psychological ingredients that produce (in)accuracy in the first place, and this difference—in and of itself—unearths some deeper information about when perceivers are likely to be most (in)accurate. In other words, when there is a divergence in accuracy across criteria, the deeper question might not be “which criterion is better?” but rather “what does this divergence tell us about the contexts in which perceivers are most likely to be accurate?”

What Does a “Good Perceiver” Look Like?

A perennial goal of accuracy research is to identify the dispositions that track stably with interpersonal acuity. How has this search for “good judges” fared? This depends on whom you ask. Our initial article (as well as Ickes, Kenny, and Funder’s commentaries in this issue) described the good judge as elusive at best, and imaginary at worst, and claim that stable correlates of accuracy are hard to come by. Hall and Colvin (this issue) provide a valuable counterpoint to this view by presenting a wealth of data demonstrating that a number of dispositional features (e.g., intelligence, Big Five personality scores, and gender) do predict interpersonal accuracy.

What underlies this disparity? One possibility is that researchers’ ability to identify trait-level predictors of accuracy—like the overall levels of accuracy they document—depend on the criteria they employ. For the most part, the literature Hall and Colvin describe uses standardized tests of interpersonal sensitivity, such as the Profile of Nonverbal Sensitivity (Rosenthal, Hall, DiMatteo, Rogers, & Archer, 1979), Interpersonal Perception Test (Costanzo & Archer, 1989), or identification of emotions from canonically posed facial expressions (Ekman & Friesen, 1975/2003). In almost all cases, accuracy in these tests is defined as a convergence between perceivers’ inferences about social cues prepared by researchers (i.e., designed to represent a given internal state) and the normative response to those cues (i.e., the state they are designed to represent). In other words, these tasks provide stable and structural “right answers” about target states, which perceivers either tap into or not.

These relatively standardized tests advance accuracy research in at least two ways: (a) by allowing for comparability across numerous studies, and (b) providing the power to detect small but consistent signatures of good perceivers. They also differ consequentially from “idiosyncratic” accuracy measures, in which the critical stimuli are not standardized or designed by researchers but rather are produced spontaneously by targets. It is this latter accuracy criterion that was most hamstringed by the methodological critiques of Cronbach and others: Idiosyncratic accuracy measures often required a “subtraction” between perceiver inferences and target self reports, and issues with this measurement produced deep problems for early accuracy researchers. Standardized accuracy tests at least partly overcome this problem by replacing such subtractions with more tractable measures of whether perceivers produce correct
(i.e., normative) judgments about experimenter-designed social cues. This may partially explain why—as Hall and Colvin note—standardized tests (largely in the domain of nonverbal sensitivity) did not suffer the slowdown that idiosyncratic accuracy measures did in the post-Cronbach age.

However, the advantages of standardizing accuracy measures come—we think—at a real cost. This is because posed and acted expressions of emotions and social relationships necessarily diverge from “real” behavior produced by targets. This divergence may shed some light on disparities between the picture of accuracy, and accurate judges, that standardized and idiosyncratic approaches produce. For example, gender and self-reported empathy predict accuracy as defined by standardized measures (Hall, Andrzejewski, & Yopchick, 2009) but not as defined idiosyncratically (Ickes, 2003; Levenson & Ruef, 1992; Zaki, Bolger, & Ochsner, 2008).

Our explanation for this disparity tracks closely with Ickes’s (this issue): standardized measures partial out much of the variance that ends up being most important to idiosyncratic measures of accuracy and, most likely, to accuracy outside of the lab. Specifically, standardized measures rarely account for the broad disparities between how different targets translate their states and traits into perceptible cues. In many naturalistic situations, it is these differences, more than perceiver traits, that drive accuracy (Ickes et al., 2000; Snodgrass, Hecht, & Ploutz-Snyder, 1998; Zaki et al., 2008). In other words, perceiver traits may predict accuracy but only when other, potentially stronger predictors (e.g., variance in targets’ expressivity) are removed from the equation.

Does this mean that including target variance in a predictive model destroys any prospects of identifying good judges? We don’t think so; in fact, we think it will enrich our understanding of differences between perceivers by affording a more nuanced, conditionalized view of interperceiver differences. Specifically, people may differ not in how accurate they are, full stop, but rather in when or for whom they are relatively accurate or inaccurate. This interactionist approach reframes individual differences as dependent on context, and specifically the social contexts provided by the targets with whom perceivers interact (Mischel, 1973; Mischel & Shoda, 1995; Zayas, Shoda, & Ayduk, 2002). Such an approach can open numerous avenues for incorporating the situational forces that powerfully affect accuracy and examine their interaction with individual differences in perceivers’ motivational and cognitive tendencies (or cognitive and affective “units”; see Mischel & Shoda, 1995). For example, if perceivers are more accurate when in a position of low social power, then we might ask which perceivers are most sensitive to that effect. We continue to feel that such an approach can refine the study of good perceivers and produce stable predictors of accuracy that generalize across many different contexts (e.g., different social targets).

**How Can Processes and Accuracy Be Integrated Best?**

The central aim of our target article was to provide a framework for systematically relating social cognitive processes and measures of interpersonal accuracy to one another. Our hope was to promote thinking about the ways in which research focusing on these two domains could inform each other rather than continue in isolation. The data presented and arguments made in the commentaries suggest at least three ways in which processes and accuracy can be fruitfully related to each other, which we consider in turn.

**Manipulating Process Use Can Alter Accuracy**

Epley and Eyal (this issue) demonstrate one way in which process-based research can make direct predictions about when perceivers are likely to be more or less accurate. They draw on the idea that individuals tend to construe their own experiences and behaviors at a fine-grained, detailed level but think about others at a coarser, more global level. This asymmetry in construal levels lawfully produces two errors: A perceiver will often underascribe fine-grained detail to others’ experience while considering too many such details when guessing how others will view the perceiver herself. Although this bias has been characterized across many studies (Gilovich et al., 1998), Eyal and Epley (2010) went one step further by showing how manipulated shifts in construal level can alter accuracy. In a simple paradigm, they induced perceivers to be more detailed when thinking about others and more general when thinking about themselves. By going against their baseline tendencies, this exercise heightened perceivers’ accuracy, both about others’ experiences and how others would view perceivers themselves. Other process-based approaches can similarly increase accuracy. For example, building on evidence that perceivers tend to overascribe their own internal states onto targets, Todd, Hanko, Galinsky, and Mussweiler (2011) demonstrated that inducing a “difference mindset” (priming people to think of disparities between themselves and others) improved accuracy in a number of domains.

**Accuracy Can Tell Us About Process Use**

The strategy of converting well-known processing biases into prescriptions for improving accuracy epitomizes the integrative style of research we hope to see
much more of in the future. However, like social cognitive biases themselves, these improvements may be local to particular classes of inferences. For example, differences in perceivers’ construal levels when drawing inferences about themselves and others are likely most pronounced in when perceivers are drawing inferences about stable, traitlike attributes (e.g., how attractive a perceiver thinks others will find him or how conscientious he believes a target to be). When drawing other types of inferences—critically including inferences about how others are feeling—perceivers may naturally “match” construal levels with targets; indeed, the phenomenon of experience sharing suggests such matching. More important, strategies that produce accuracy in some contexts can reduce accuracy in others. For example, although assuming similarity with targets is often bad for accuracy, it can also often improve accuracy (Hoch, 1987; Neyer, Banse, & Asendorpf, 1999).

Such complexities do more than provide boundary conditions on the utility of process-based techniques for improving accuracy. They also demonstrate the utility of accuracy-based research to circle back and inform our understanding of social cognitive processing. Biases such as assumptions of self-other similarity may not exist solely because they such assumptions are cost little in information-processing terms but also because they work (i.e., produce accuracy) in some cases. As such, measuring accuracy can help researchers understand the nature and utility of the processes they study. West and Kenny’s Truth and Bias Model (Kenny, this issue; West & Kenny, 2011) provides a method for gathering just such information. The strength of its contribution comes from quantifying the role of multiple processes in producing accuracy across different contexts. This approach could enrich the new tack being taken by Epley, Eyal, Todd, and others: In addition to trying to improve accuracy by reducing well-known processing biases, these researchers could ask when reducing a given bias should be expected to help accuracy, and when it might be expected to hurt it.

Comparison With Other Domains Can Shed Light on Processes and Accuracy

A third way to unite processes and accuracy is by way of analogy to other domains in which these phenomena are already more intertwined than they are in social cognition research. Bahrami and Frith (this issue; Bahrami et al., 2010) offer a compelling example of such a parallel in their model of social decision making. This model quantitatively captures the rules by which two observer’s individual perceptions of the outside world aggregate into a joint, multiperson perceptual judgment.

Of course, Bahrami and Frith’s approach does not tackle mind perception proper, in that it models two perceivers’ cooperative attempts to understand physical events, not perceivers’ attempts to understand each other’s internal state. However, their model nonetheless lays a rich groundwork for integrating social cognition and decision-making research. For example, we would expect the quality of joint decisions to be critically limited not only by the judgments and confidence of each interlocutor but also by each person’s ability to accurately understand their interaction partner’s confidence. As Bahrami and Frith point out, this ability will be shaped importantly by the motives of each individual. To follow Bahrami and Frith’s athletics example (but in a context more familiar to us), two individuals watching a basketball go out of bounds at an NBA game not only perceive a sensory event but also imbue the simple physics of that event with deep affective significance. A Boston Celtics fan’s motivation for her team to keep the ball can not only influence her willingness to say that it was last touched by the opposing team from Los Angeles but can also shift her private perception of what occurred (Balcetis & Dunning, 2006, 2010) and her confidence in that percept. This same fan may be highly motivated to accurately understand and integrate another Celtics fan’s perception into her final judgment of the event but much less motivated to understand what a Lakers fan witnessed. As anyone familiar with a contentious sports rivalry knows, such motivations can produce extremely noisy perceptions of physical events across fans of different teams. Thus, models of multiperson decision making should incorporate roles for affect and motivation in shaping the interpersonal judgment steps Bahrami and Frith describe so nicely.

That said, a broader point that we see in Bahrami and Frith’s commentary is that considering the cognitive “building blocks” underlying mind perception can provide important clues about the structure of social cognitive processes and their relation to accuracy. Oftentimes, this requires incorporating models and paradigms inspired by research outside of mind perception (and social psychology altogether). In our target article, we mentioned executive function as one such building block that supports accurate perception of complex social cues (Davis & Kraus, 1997). Another domain we feel can connect well with research on mind perception is the study of reward processing and feedback learning. People find being accurate rewarding (Tricomi, Delgado, McCandliss, McClelland, & Fiez, 2006; Tricomi & Fiez, 2008), and we expect that being accurate about other people also would be perceived as rewarding. If—like other rewards—accuracy feedback motivates changes in behavior, this could provide a mechanism for understanding the origins of (and a possible means for changing) perceivers’ cognitive biases when encountering targets. For example, if the strategic bias to assume self-other similarity has been reinforced over time (by affording an accurate
Can Processes and Accuracy Be Integrated at All?

Our article was meant as a call for researchers to spend a lot of time attempting to explicitly integrate process and accuracy measures in single research programs and to taxonomize the relationships between these phenomena. But the very act of making that request begs the question of whether such an integration is even possible. If the answer to that question is no, then this endeavor is in trouble from the get-go. Hall and Colvin (this issue) caution that such trouble may be on the horizon. They argue that process- and accuracy-oriented researchers begin with different metatheoretical points of view (in Kuhn’s, 1962, terms: “mutually incommensurable paradigms”) that could hamper our ability to fruitfully compare notes or combine forces.

We find this argument interesting but believe that these theoretical differences are more historical than intrinsic, and offer—by way of counterpoint—an existence proof that integration across process- and accuracy-oriented research is both possible and currently thriving. A number of the commentaries in this issue not only argue for cross-talk between these domains but also, more important, exemplify the fact that such integration is already occurring and can continue to expand. In counting the ways that such progress is being made across just this small sample of researchers, we feel more confident than ever that the future of this endeavor is bright.

Acknowledgments

We thank Adam Waytz for helpful comments on a manuscript version of this response.

Note

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of the National Academy of Sciences of the United States of America, 107, 9388–9393.


