Chapter 1

CONCEPTUALIZING AND MEASURING INTUITION: A REVIEW OF RECENT TRENDS

Erik Dane
Jesse H. Jones Graduate School of Management, Rice University, Houston, TX, USA

Michael G. Pratt
Carroll School of Management, Boston College, Boston, MA, USA

Discussion surrounding intuition has burgeoned in a variety of arenas in recent years. In popular writings, for example, a number of authors have pointed to the role that intuition may play in organizational and managerial decision making (e.g. Gigerenzer, 2007; Gladwell, 2005; Klein, 2003; Myers, 2002). Concurrently, there has been an outpouring of academic research directed toward understanding intuition, mirroring interest in psychology in automaticity (Bargh and Chartrand, 1999) and dual-process theories (e.g. Epstein, 2002; Kahneman, 2003; Sloman, 1996). Emerging research has centered on (1) what intuition is (e.g. Dane and Pratt, 2007; Hodgkinson, Langan-Fox and Sadler-Smith, 2008; Kahneman, 2003; Lieberman, 2000; Sadler-Smith and Shefy, 2007; Shirley and Langan-Fox, 1996; Sinclair, Sadler-Smith and Hodgkinson, 2009); (2) the factors that prompt individuals to trust and use it (e.g. Denes-Raj and Epstein, 1994; Epstein, 2002; Hodgkinson, Langan-Fox and Sadler-Smith, 2008; Hodgkinson and Sadler-Smith, 2003); and (3) the factors that account for when intuition should be used, especially in terms of when it is as or more effective than analytical decision making (e.g. Dane and Pratt, 2007; Hogarth, 2001; Khatri and Ng, 2000). In addition to growth in these conceptual areas, there has also been a wide range of methods proposed to examine intuition and intuitive processes.

Fortunately, this proliferation of ideas has not entirely fragmented the field. As we discuss below, there is emergent agreement on some crucial facets of

International Review of Industrial and Organizational Psychology, 2009, Volume 24.
Edited by G. P. Hodgkinson and J. K. Ford.

intuition. This growing conceptual convergence marks a critical juncture in the study of intuition; it demonstrates that a phenomenon that historically has been slippery to formal conceptualization and measurement may indeed be amenable to systematic interpretation and exploration. The main goal of our review is to explore these conceptual and methodological advances. We begin by looking at how intuition is defined. In this vein, we review in detail the critical functions of intuition and the possibility that there may be different 'types' of intuitions based on variations in these underlying functions. Thus, we strive to point out key areas of convergence and divergence regarding the nature of intuition. Building on this discussion, we provide a brief review of literature focused on the other lines of intuition research noted above concerning when people trust and use their intuition and as well as when it should be used. We then examine how researchers have attempted to capture intuition methodologically. Here, we do not focus on convergence, as there appears to be little of it. Rather, we seek to detail the breadth of techniques that researchers have used to prime, identify, and evaluate intuition, both in the laboratory and in the field. We conclude this chapter by discussing critical issues raised in our review that have implications for the future of intuition research.

THE STUDY OF INTUITION: CONCEPTUAL CONVERGENCE AND DIVERGENCE

As noted above, there has been an outpouring of research concerning three conceptual questions: (1) What is intuition? (2) When do people trust and use their intuition? (3) When should intuition be used? Although we address all three questions to some degree, we spend most of our efforts on the first question as it has garnered much attention in existing work, and because new perspectives on what intuition is continue to emerge. We also feel that it is only through achieving a comprehensive understanding of what intuition is that scholars may systematically investigate issues concerning the use and effectiveness of intuition.

What Is Intuition?

Because writers have discussed intuition across a range of academic and nonacademic domains, the intuition concept has had a wide range of terms associated with it. We devoted a significant portion of a previous article (Dane and Pratt, 2007) to the question of what intuition is. We identified the features of intuition that are 'common and central' across many definitions of intuition and across a variety of disciplinary domains (e.g. Barnard, 1938; Bruner, 1962; Hogarth, 2001; Jung, 1933; Kahneman, 2003; Lieberman, 2000; Rorty, 1967;

Shapiro and Spence, 1997; Shirley and Langan-Fox, 1996; Simon, 1996; Wild, 1938). On the basis of our review, we noted that the 'outcome' of intuiting is an intuitive judgment. With regard to the process of intuition, we found that most conceptualizations include the following features: (1) nonconscious information processing, (2) holistic associations, (3) affect, and (4) speed. Below, we briefly describe each of these process features (for a more detailed explanation, see Dane and Pratt, 2007).

First, a central feature of intuitions is that they arise from operations that occur in the nonconscious system of information processing. The concept of nonconscious processing links intuition to a growing consensus among scholars that humans process information through two distinct cognitive systems: nonconscious and conscious. This nonconscious system, which is believed by some to be the evolutionarily older of the two systems (Epstein, 1994; Reber, 1992), has been referred to as 'experiential' (Epstein, 1994), 'automatic' (Bargh and Chartrand, 1999), 'associative' (Sloman, 1996), 'impulsive' (Strack and Deutsch, 2004), and 'system 1' (Kahneman, 2003; Stanovich and West, 2000). Nonconscious processing is contrasted with conscious processing, which has also been referred to as 'rational' (Epstein, 2002), 'intentional' (Bargh and Chartrand, 1999), 'rule based' (Sloman, 1996), 'reflective' (Strack and Deutsch, 2004), and 'system 2' (Kahneman, 2003; Stanovich and West, 2000). While the conscious system of processing permits individuals to analyze problems in a deliberate, sequential, and attentive manner, the nonconscious system allows individuals to learn from experience and develop feelings of knowing in the absence of conscious attention (Dane and Pratt, 2007; Hogarth, 2001). Intuition falls squarely within the nonconscious system of information processing (Dane and Pratt, 2007; Epstein, 2008; Hodgkinson, Langan-Fox and Sadler-Smith, 2008).

Second, intuition involves drawing holistic associations (Epstein, 1994; Shapiro and Spence, 1997). These associations may stem from relatively simple cognitive heuristics (Tversky and Kahneman, 1974), or more complex pattern 'chunks' developed through years of training and experience (Simon, 1997; Simon and Chase, 1973). As nonconsciously held patterns are linked to environmental stimuli through a holistic and associative cognitive process, intuitive judgments arise.

Third, intuitions are viewed as being 'affectively charged'. We have argued that affect may accompany both the intuition process as well as the outcomes of this process – intuitive judgments (Dane and Pratt, 2007). At the process level, intuitions arise via the nonconscious system of processing, a system often viewed as being imbued with emotionally based content and operations (see Epstein, 2002). This contention is complemented by neuroscience research pointing to a link between intuition and affect via activation of basal ganglia and related structures (see Lieberman, 2000, 2007). At the judgment level, intuitive judgments may be accompanied by affect. This is reflected in the

expressions 'gut feelings' and 'gut instincts' – terms that reflect the affective tenor of the intuitive judgments themselves.

Fourth, intuition is notable for its speed (Bastick, 1982; Dane and Pratt, 2007; Kahneman, 2003). Unlike analytical evaluations, intuitions arise rapidly through 'immediate apprehension' (Rorty, 1967, p. 74). This feature of intuition is tied to intuition's relationship to the nonconscious system of processing – a system that operates relatively automatically and rapidly (Bargh, 1996; Epstein, 1994; Reber, 1992).

On the basis of evidence supporting the integration of the above features, we argued that intuitions are 'affectively charged judgments that arise through rapid, nonconscious, and holistic associations' (Dane and Pratt, 2007, p. 40). In advancing this definition, we contended that the defining features of intuition account not just for what intuition is, but also for how it differs from other decision-making processes. For instance, we noted that analytical decision making is highly dissimilar to intuition in that analytical approaches involve the use of systematic procedures designed to thoroughly assess all pertinent information, evaluate costs and benefits, and invoke conscious deliberation. Our definition of intuition also helped to differentiate the concept of intuition from related constructs such as 'insight'. Although both concepts involve some degree of nonconscious thought, we observed that insight involves an ultimate recognition of the logical connections supporting a particular solution, whereas intuition does not.

While scholars appear to be converging on what intuition is[1] (i.e. what features constitute intuition), a review of the literature reveals that scholars continue to look at intuitions in different ways. In particular, intuition has been posited to play a role toward multiple and distinct ends. Researchers have viewed intuitions as serving at least three different functions: as a vehicle for problem-solving, as an input to making moral decisions, and as an instrument facilitating creativity. As a shorthand description, we refer to these functions of intuition as different 'types' of intuition. We suggest that besides their different functions (e.g. moral intuitions are used to make decisions about what is right or wrong in a given situation), these intuition types may also differ in certain ways with regard to the nature of their holistic associations, affect, and speed (three of the four definitional features of intuition noted above). All types of intuitions are posed to arise through nonconscious processes. Table 1.1 summarizes our observations regarding how these types of intuition may differ. Below, we explore these potential distinctions in detail.

[1] We should note that some perspectives on intuition take a more spiritual or psychic explanation regarding the sources of intuition (Vaughan, 1979; Wild, 1938). Rogers and Wiseman (2006) recently found that individuals who consider themselves highly intuitive will sometimes give spiritual or psychic explanations for their intuitive abilities. Acknowledgment of the spiritual side of intuition can be found in research on nurses (e.g. Smith, Thurkettle and dela Cruz, 2004) and midwives (e.g. Davis-Floyd and Davis, 1996). While we acknowledge that there may be spiritual aspects to intuition, this area of intuition is beyond the scope of this review.

Table 1.1 Intuition types

Intuition Type	Description	Nature of Associations	Affect	Level of Incubation
Problem-Solving	Automatic acts of recognition due to pattern matching (e.g. Hogarth, 2001; Simon, 1996)	Largely convergent/tight Based on highly specific domain knowledge	Relatively low intensity	Low to none
Moral	Affective, automatic reactions to issues that are viewed as having moral/ethical content (e.g. Haidt, 2001; Sonenshein, 2007)	Largely convergent/tight Based on moral prototypes	Relatively high intensity	Low to none
Creative	Feelings that arise when knowledge is combined in novel ways (e.g. Miller and Ireland, 2005; Policastro, 1995)	Largely divergent/broad Based on integration of knowledge across different domains	Relatively high intensity	Often high

Problem-Solving Intuition

The most common conceptualization of intuition in the literature is what we refer to here as 'problem-solving' intuition. Problem-solving intuitions, as the name implies, are intuitions used when individuals are faced with a problem-solving or decision-making dilemma. These problems may range from a chess player selecting a move during a chess game (Simon and Chase, 1973), to a fire chief determining how to deploy his or her firefighters to combat a house fire (Klein, 1998), to a brand manager predicting how consumers will respond to a marketing initiative (Blattberg and Hoch, 1990).

The process underlying these intuitions is 'pattern matching', which is often honed through repeated training and practice (e.g. Hogarth, 2001; Simon, 1996). As such, problem-solving intuition has been connected to domain knowledge, or expertise (e.g. Dreyfus and Dreyfus, 1986; Hogarth, 2001; Simon, 1987, 1997; Simon and Chase, 1973). Indeed, this type of intuition has even been referred to as 'intuition-as-expertise' (Sadler-Smith and Shefy, 2004). However, we decided not to label this type of intuition with an 'expertise' modifier for three reasons.

First, we view expertise as an antecedent to intuitive judgments, rather than as a characteristic feature of such judgments. Thus, we sought to avoid conflating this type of intuition with one of its causes. Second, we recognized that each of the types of intuition we discuss, particularly creative intuition, may be related to expertise. Third, not all problem-solving intuitions arise as a result

of expertise. Some problem-solving intuitions are fostered through relatively simple heuristics (Tversky and Kahneman, 1974). Consequently, viewing expertise as unique to problem-solving intuition may be misguided. Keeping these provisos in mind, we reassert our contention, consistent with the view of many scholars, that problem-solving intuition involves pattern matching. That is, we argue that no matter what the complexity of one's cognitive structures, problem-solving intuition involves a process whereby current situations are viewed in terms of their similarity or differences with past experiences.

The various characteristics of problem-solving intuitions can be found in Table 1.1. As noted in this table, the associations made when employing problem-solving intuition are largely 'tight' – that is, convergent. The tightness of associations is evident when considering that this type of intuition involves 'recognition' – does something belong to a certain category or not? For example, experts have accrued complex cognitive schemas that permit them to partially circumvent limits on attention and working memory through the internalization and automation of cognitive processes that formerly may have proved effortful and challenging (Prietula and Simon, 1989; Schneider and Shiffrin, 1977; Simon and Chase, 1973). The result is that experts, when exposed to particular scenarios they have encountered numerous times before, may match patterns between their environment and deeply held knowledge structures. In support of this claim, Miller and Ireland (2005, p. 21) argue that intuition via 'automated expertise' involves 'recognition of a familiar situation' as well as 'previous learning related to that situation'. This notion complements Simon's (1996) contention that an intuitive act of recognition includes (nonconscious) recognition of the situation itself, and also the most appropriate action for dealing with it. However, one need not have extensive experience for such pattern matching to transpire. Matching on simple stereotypes and other uses of heuristics may also occur.

With regard to the other characteristics of problem-solving intuition, relatively less theorizing has occurred. Concerning affect, it has been suggested that the strength of the 'affective tag' associated with intuition may vary depending on the type of judgments made (Sadler-Smith, Hodgkinson and Sinclair, 2008). Along these lines, research on intuition-as-expertise, a form of problem-solving intuition, suggests that these intuitions often involve relatively low levels of affective intensity (Sadler-Smith and Shefy, 2004), at least compared to other intuition types.

In terms of speed, problem-solving intuitions are typically viewed as occurring very fast. Simon (1987) noted that chess grandmasters can play speed chess against as many as 50 opponents concurrently without a significant decrease in performance because of their ability to intuitively assess what move to make next by a quick glance at the position of pieces on each chessboard. A focus on the rapid nature of intuition is common to many conceptualizations of intuition rooted in the problem-solving framework (e.g. Kahneman, 2003; Lieberman, 2000).

The nature of problem-solving intuitions described above (i.e. that they arise through rapid, convergent pattern matching and tend to involve low levels of affect) will serve as the baseline for which we compare other intuition types. Toward this end, we turn to the concept of moral intuition.

Moral Intuition

In recent years, there has been increasing interest in the role that intuition may play with respect to moral judgments. Perhaps the most well known is the 'social intuitionist' perspective (see Haidt, 2001, 2007). This perspective calls into question 'rationalist' approaches that suggest moral reasoning is a deliberative, conscious process (e.g. Jones, 1991; Kohlberg, 1981; Rest, 1986). The social intuitionist view, which has had support from studies in neurophysiology (Greene and Haidt, 2002; Greene *et al.*, 2004), suggests that many if not most moral judgments stem from nonconscious, affective processes (e.g. Greene and Haidt, 2002; Haidt, 2007; Haidt and Kesebir, 2008; Sonenshein, 2007). A similar conclusion is also drawn from recent work on the 'universal moral grammar' (UMG) perspective on moral intuiting (Hauser *et al.*, 2007; Mikhail, 2007). One critical difference between UMG and the social intuitionist approach, however, is that the former draws heavily on linguistic theories (especially Chomsky's), likening moral development to language acquisition (see Hauser *et al.*, 2007 for a broader discussion of the differences between the UMG and social intuitionist perspectives).

Moral intuition, as the name implies, focuses specifically on ethical dilemmas. Haidt (2001) starts his foundational paper asking readers to think about the morality of consensual, adult, and safe sex between a brother and sister. Hauser and colleagues (Hauser *et al.*, 2007) discuss various 'trolley' or 'train' scenarios whereby one has a choice of whether and how to stop a trolley that is heading toward five people on the same track. And Sonenshein (2007) raises issues involving plant closures and cheating suppliers. While these may be seen as problem-solving scenarios, they differ from the types of judgments discussed in the preceding section, which are often assessed through a criterion of 'effectiveness' (Dane and Pratt, 2007). Moral decisions are not typically viewed as being effective or not, but rather as being right or wrong. Moreover, moral decisions are often appraised 'anthropocentrically' through culturally based customs, interactions, and interpretations (see Haidt and Kesebir, 2008).

Nonetheless, as reflected in Table 1.1, there are a number of similarities between problem-solving and moral intuitions. First, as with all types of intuitions, moral intuitions are said to occur nonconsciously. Support for this assertion – in both social intuitionist and UMG perspectives – comes from the observation that people are often not able to explain why they think something is right or wrong (Haidt, 2001, 2007; Haidt and Hersh, 2001; Haidt, Koller and Dias, 1993; Hauser *et al.*, 2007). That is, while individuals may sometimes be able to identify and delineate available ethical principles that

justify their intuition (such as certain 'principles of harm' – see Cushman, Young and Hauser, 2006), the rationalization process may prove difficult in many cases.

Second, like problem-solving intuitions, moral intuitions may involve a pattern matching process whereby features of a given scenario are rapidly and automatically compared to prototypes of ethical situations that have been stored in the 'X-system' of the human brain – a nonconscious, automatic system of processing often linked to intuition (see Lieberman, 2000; see also the 'experiential system' of dual-processing theories noted above). Reynolds provides a case in point:

> When a supervisor ... secretly offers a promotion in exchange for sexual favors, the elements of this experience are immediately processed, organized, and matched to an existing prototype of quid pro quo sexual harassment. The situation can then be presented reflexively to consciousness as an ethical (and legal) issue. In this way, ethical prototypes allow decision makers to recognize ethical situations automatically (Reynolds, 2006, p. 739).

Because moral intuitions involve a matching categorization process between a situation and a prototype, moral intuitions are often conceptualized as involving relatively tight or convergent cognitive associations.

Whereas the development of the cognitive structures underlying problem-solving intuition have been shown to be largely a by-product of learning under appropriate conditions (Dane and Pratt, 2007; Ericsson and Charness, 1994; Hogarth, 2001), the source of morality-based structures – or 'prototypes' – remains a somewhat open question. Evidence suggests that the foundations of the ethical 'prototypes' underlying moral intuitions are part innate and part social. Haidt (2001) discusses research that has indicated a biological basis of behavior among primates in line with prescriptive rules. Despite this innate basis for moral intuitions, culture undoubtedly shapes and influences the acceptable ethical codes of its members (Haidt, 2001; Haidt, Koller and Dias, 1993). Most or all cultures appear to emphasize some combination of five types of moral issues: harm/care, fairness/reciprocity, ingroup/loyalty, authority/respect, and purity/sanctity (Haidt and Graham, 2007; Haidt and Joseph, 2004). Cultures differ in that they influence which of these issues get the most attention. By culture, we mean not only national or ethnic cultures, but also 'smaller' cultures such as organizational and professional ones. For example, as noted by Sonenshein (2007), individuals may internalize the moral values of their organizations as they undergo socialization. UMG also takes an interactionist perspective, noting that the development of an intuitive 'grammar' is based on cognitive systems that are 'largely pre-determined by the inherent structure of the mind, but whose ontogenetic development must be triggered and shaped by appropriate experience and can be impeded by hostile learning environments' (Mikhail, 2007, p. 144).

Finally, like problem-solving intuitions, moral intuitions are believed to occur rapidly. According to Reynolds (2006), ethical situations are likely to have

prototypical characteristics that are recognized and responded to almost immediately through a pattern matching process. As Haidt (2001, p. 818) notes, 'One sees or hears about a social event and one instantly feels approval or disapproval.' This suggests a relatively straightforward stimulus–response type of association in which an external pattern is rapidly equated with one that has been previously encoded internally.

The biggest difference between problem-solving and moral intuition is that the latter is often conceptualized as involving more intense emotions – that is, emotions that are higher on the arousal continuum. As Haidt, Koller and Dias (1993) observe, judgments of immorality are often grounded in feelings of disgust – feelings that involve a considerable degree of affective arousal. Haidt and colleagues note further that intuitive responses to moral issues often involve 'strong and clear' convictions (1993, p. 626) and that moral arguments often consist of 'bitterness' and 'self-righteousness' (Haidt, 2001, p. 823). Perhaps for this reason, Haidt (2007) stresses that moral intuitions are heavily 'affectively laden'. On this characteristic, moral intuition is closer to creative intuition.

Creative Intuition

While problem-solving and moral intuition are similar in that they ultimately involve a type of convergent categorization (e.g. is this right or wrong, good or evil?), some research has argued for the existence of a potentially different type of intuition – one linked to a creative act of synthesis in which disparate elements are fused together in novel combinations (e.g. Crossan, Lane and White, 1999; Duggan, 2007; Policastro, 1995; Raidl and Lubart, 2000/2001).

Following Policastro (1995, p. 99), who views such intuition as 'a vague anticipatory perception that orients creative work in a promising direction', we refer to this type of intuition as 'creative' intuition. This is not to say that intuition is the same as creativity, or that all intuitions lead to creative outcomes. Rather, this label accords with the view shared by some that intuition may be a key *input* in the creative process. To illustrate, Langer (1989, p. 117) makes the claim that creativity arises through an 'intuitive experience of the world'. Supporting this contention, Garfield *et al.* (2001) found a positive relationship between the use of an intuitive creativity technique and the generation of novel ideas in a laboratory study.

Occupational applications of creative intuition may include identifying and developing a radically different type of automobile to bring to market (Hayashi, 2001), devising entrepreneurial ideas (Crossan, Lane and White, 1999; Mitchell, Friga and Mitchell, 2005), and generating scientific discoveries (Marton, Fensham and Chaiklin, 1994). Creative intuitions may also be particularly relevant in strategic decision making (Khatri and Ng, 2000) and in situations where few precedents for a particular course of action exist (Agor, 1986).

A number of scholars have drawn distinctions between intuitions that serve creative ends (i.e. creative intuition) from those that do not. For example, Isenberg (1984) contrasts intuitions that allow managers 'to perform well-learned behavior patterns rapidly', involving an effortless, automatic performance of 'learned behavioral sequences' (1984, p. 85), from intuitions that involve synthesizing 'isolated bits of data and experience into an integrated picture' that is more than the sum of its parts (1984, p. 85). Similarly, Crossan, Lane and White (1999) differentiated between 'a process of (past) pattern recognition' that permits experts to 'no longer have to think consciously about action' (1999, p. 526) – and an 'entrepreneurial' view of intuition, concerned with making novel connections and discerning new possibilities. Crossan, Lane and White (1999) suggested further that some intuitions support 'exploitation', while other intuitions support 'exploration'.

One hallmark of creative intuition, setting it apart from problem-solving and moral intuition, is that the cognitive associations fostering creative intuitions tend to be more divergent than convergent. In discussions of the role of intuition in creativity, intuition has been described as a process of 'linking disparate elements of information' (Raidl and Lubart, 2000/2001, p. 219), and as a method for 'bringing past elements together in a new and useful way' (Duggan, 2007, p. 152). Likewise, Miller and Ireland discuss 'holistic hunch' intuition as involving a 'subconscious synthesis of information drawn from diverse experiences' in which information is 'combined in complex ways' (2005, p. 21). Similarly, Crossan, Lane and White (1999) note that entrepreneurial intuition (akin to what we are calling creative intuition) is relevant to innovation and involves making novel connections, perceiving new relationships, and discerning possibilities. They point to a role of this type of intuition in 'exploration', much as Bowers *et al.* (1990) point to a role of intuition in 'discovery'. In sum, because creative intuitions tend to involve blending or integrating fairly diverse aspects of information in novel ways, they are often associated with discovery or the generation of something 'truly new', rather than simply 'old wine in a new bottle' (George, 2007, p. 449). The other types of intuition reviewed here are less relevant to creativity because they rely on convergent associations – operations less conducive to creativity than divergent thinking (Amabile, 1996; Barron and Harrington, 1981; George, 2007).

Creative intuitions also differ from problem-solving intuitions in terms of their affective intensity. For example, Miller and Ireland (2005) equate holistic hunches (a creative form of intuition) with 'strong feelings', and Sadler-Smith and Shefy (2004) label a concept similar to what we refer to as creative intuition as 'intuition-as-feeling' to accentuate its connection to relatively high levels of affect. Along like lines, the experience of a creative-type intuition has been described as a 'subconscious, visceral feeling' that 'just felt right' (see Hayashi, 2001, p. 60) – characteristics associated with a highly affective experience.

Finally, as noted in Table 1.1, creative intuition appears to take longer than either problem-solving or moral intuition from the point at which an

issue is presented to the point at which the intuitive judgment arises. Viewing intuition as anything but immediate is rare, although Hogarth (2001) raises this possibility. More recently, work suggests that that some sort of extended processing time, akin to incubation, may precede some forms of intuition, such as creative intuition (see Dijksterhuis and Nordgren, 2006; Smith and Dodds, 1999). Before proceeding along this line of reasoning, it is important to acknowledge that in so doing our intent is not to reentangle concepts that have recently been disentangled (see Dane and Pratt, 2007; Hodgkinson, Langan-Fox and Sadler-Smith, 2008). First, we should be careful not to mistake insight (Sternberg and Davidson, 1995) with creative intuition, even though both may involve an incubation period. Unlike insight, in which one 'suddenly becomes aware of the logical relations between a problem and the answer' (Lieberman, 2000, p. 110), creative intuitions – like all intuitions – involve a feeling that cannot be accounted for consciously or logically. Second, although creative intuitions appear to be preceded by an incubation period, it is critical to note that the ultimate emergence of the intuitive judgment (as with all types of intuition) occurs via a rapid associative process. To be clear, the timing difference between creative intuitions and problem-solving and moral intuitions lies in the period between the point at which the decision scenario is presented to the decision-maker and the point at which the intuitive response emerges. With creative intuition, some degree of incubation appears to be an antecedent to the rapid, holistic, and associative operations that produce the intuition; with the other two types of intuition, problems are presented and intuition nearly instantly follows.

To illustrate the concept of creative intuition, consider an anecdote offered by Hayashi (2001). After pondering what products might help save then-struggling Chrysler in 1988, company president Bob Lutz experienced an intuition while taking a weekend drive. This intuition was that it would behoove Chrysler to produce a high-end sports car. The result was the development of the Dodge Viper, which became a runaway success. This intuition appears to be of the creative type in the sense that it appeared following an incubation period. Further, unlike insight, there was no accompanied recognition of how the logical relations of the problem fit together.

Unconscious Thought Theory (UTT; Dijksterhuis, 2004; Dijksterhuis *et al.*, 2006; Dijksterhuis and Nordgren, 2006) provides a theoretical basis for the role of incubation in producing creative intuitions. The theory posits there are two modes of thought – a conscious mode and an unconscious mode. As stated by Dijksterhuis and Nordgren (2006, p. 96), 'Conscious thought is thought with attention; unconscious thought is thought without attention (or with attention directed elsewhere).' According to UTT, the unconscious mode of thinking is capable of drawing divergent associations; as such, it may produce judgments akin to those described here as creative intuitions.

In support of their theory, Dijksterhuis and colleagues have documented a number of instances in which focusing one's attention to matters besides a

given (complex) task can induce a period of unconscious thought that may precipitate intuitions of the creative variety. Dijksterhuis's findings and underlying theoretical framework support proverbial wisdom that, at least in some instances, individuals may benefit from 'sleeping on it' rather than either engaging in conscious thinking or acting immediately upon 'snap judgments'. While this line of work and others point to the existence of a creative type of intuition, proposing a creative type of intuition does raise some conceptual concerns. We address such concerns later in this chapter, in our future research section.

We now turn away from conceptual issues surrounding intuition. However, this departure is only temporary. We will return to issues concerning what intuition is and whether it may fairly be said that there are different types of intuition in the final section. Next, we turn to related lines of inquiry by reviewing research on when individuals rely on their intuitions to make decisions and when it is in their interest to do so. We note up front that the bulk of research examining these issues tends to view intuition from a problem-solving framework. Hence, there may be important boundary conditions concerning the findings noted below with regard to different types of intuition.

When Do People Trust and Use Their Intuition?

A number of researchers have investigated the conditions under which people take stock of and employ their intuitions. This research has revealed factors predicting whether individuals will use their intuitive judgments to make decisions. Most work has tended to focus on two factors in particular, mood states and individual differences.

First, several studies (Bless *et al.*, 1990; Elsbach and Barr, 1999; Isen *et al.*, 1982; King *et al.*, 2007; Ruder and Bless, 2003) indicate that individuals tend to rely on their intuitions when they are in positive mood states. In a review of the relationship between mood and decision making, Isen (2000, pp. 426–427) suggests that positive mood may facilitate complex decision making by increasing an individual's openness to information, thus leading to a 'greater integration of cognitive material'. In these situations, individuals may be more open to data gleaned from the nonconscious system of processing. An additional explanation is offered via the affect-as-information perspective (Schwarz and Clore, 1983). This view contends that negative moods signal that the environment is problematic; as such, individuals may attempt to ameliorate their situation by engaging in analytical, systematic approaches to processing information and making decisions. In contrast, positive moods signal a more benign environment; hence, individuals have less motivation to expend cognitive effort and are content to rely on their intuitions (Bless *et al.*, 1996; Schwarz, 1990). In reviewing these findings, it is worth noting that while mood is a factor associated with whether individuals will trust and use their intuitions, it also is a feature associated with the experience of intuition itself

(to varying levels of intensity – see previous discussion). Scholars may benefit from keeping these distinctions in mind as they further consider the role of affect as both a determinant and a characteristic of intuitive decision making.

Second, research has explored whether there are individual differences in individuals' propensities to use intuition. For example, drawing on Jung's (1933) conception of intuition as a personality characteristic, the Myers–Briggs Type Indicator (MBTI; Briggs and Myers, 1976) includes a measure of 'intuition' (i.e. 'intuiting' vs. 'sensing') as an individual's propensity to perceive and rely on implicit patterns, meanings, and possibilities (Quenk, 2000). Although intuition, as conceptualized within the MBTI, is not synonymous with intuition as we defined it above, the MBTI provides evidence that individuals perceive reality in different ways, and suggests that those individuals with a preference for intuitive perception may rely on intuition in making judgments. In a related vein, Epstein and colleagues (Epstein *et al.*, 1996; Pacini and Epstein, 1999) argue that individuals differ in their reliance on each of two independent modes of thinking: analytical–rational and intuitive–experiential. Accordingly, Pacini and Epstein (1999) constructed a Rational–Experiential Inventory (REI) that assessed individual personality differences in the use of rational versus experiential (intuitive) thinking. This research suggests that individuals have distinct preferences for using their intuitions and/or their analytic capabilities to make decisions. Recent work by Hodgkinson and colleagues (Hodgkinson and Sadler-Smith, 2003; Hodgkinson, Langan-Fox and Sadler-Smith, 2008) provides strong support for Epstein's independent modes perspective (as compared to a uni-dimensional perspective – see Allinson and Hayes, 1996) on both theoretical and empirical grounds.

While there is evidence that mood states and individual differences play a role in determining whether an individual will use intuition to make decisions, other factors have been proposed as well. For example, some have posited that organizational culture (or even climate-like) factors will influence the degree to which organizational members trust their intuitions. Along these lines, Burke and Miller (1999) suggest that intuition will flourish in an organization to the extent that it is valued and cultivated through leadership, political climate, and socialization processes. Agor (1986), in contrast, notes that many executives operate in cultures that emphasize the use of analytical skills and logic, thus making the open use of intuition 'taboo'.

Dane and Pratt (2007) further suggest that more macro-cultural forces may impact upon individuals' use of intuition. They note that individuals living or working in cultures characterized by a low emphasis on 'uncertainty avoidance' (Cyert and March, 1963; Hofstede, 2001) are willing to 'take unknown risks' and are 'comfortable with ambiguity and chaos' (Hofstede, 2001, p. 161). Because intuitions are difficult to justify rationally and often involve unknown risk levels, members of cultures low in uncertainty avoidance may be more inclined than others to rely on their intuitions to make decisions.

Finally, Keltner, Gruenfeld and Anderson (2003) have drawn upon research on social cognition (e.g. Fiske, 1993; Neuberg and Fiske, 1987) to propose that high levels of power may lead individuals to make judgments through relatively automatic, as opposed to conscious and deliberative, channels of information processing. For example, it has been demonstrated in an experimental setting that individuals assigned to a high-power condition tend to unconsciously ignore information that would challenge stereotypes concerning internship applicants they are instructed to evaluate (Goodwin *et al.*, 2000). This suggests that power holders may be inclined to rely on stereotypes rather than to engage in more analytical forms of thinking that may help overcome stereotype biases. Considerable scholarship has found that stereotypes may be automatically activated via the nonconscious system of information processing (e.g. Banaji, Hardin and Rothman, 1993; Devine, 1989; Macrae, Milne and Bodenhausen, 1994) – the same system responsible for the production of intuitive judgments. Insofar as individuals in positions of elevated power rely on the products of their nonconscious system, and avoid thinking analytically, such individuals may be more inclined to trust their intuitions than low-power individuals, who may tend to employ a more controlled, conscious approach to decision making (Keltner, Gruenfeld and Anderson, 2003).

When Should Intuition Be Used?

A third long-standing issue concerns if and when intuition should be used to make decisions. This issue is typically framed in terms of comparing the effectiveness of judgments stemming from problem-solving intuitions versus those stemming from rational or analytical procedures. For decades, a number of scholars largely dismissed the usefulness of intuition for making decisions in organizations due to its potential to lead to erroneous, biased, or inaccurate decisions, and instead argued for the superiority of analytical decision-making methods (e.g. Dawes, Faust and Meehl, 1989; Kahneman, Slovic and Tversky, 1982; Meehl, 1954). Thus, the prescription among many decision-making researchers was – and often continues to be – that managers should avoid making intuitive decisions, and instead be analytical whenever possible (e.g. Bonabeau, 2003; Schoemaker and Russo, 1993). In recent years, such prescriptions have been challenged. As organizational decision-making environments become increasingly fast paced and dynamic, a rising focus on how to achieve decision making that is both rapid and effective among today's managers has led some scholars to reconsider the potential merits of intuition (e.g. Gigerenzer, 2007; Sadler-Smith, Hodgkinson and Sinclair, 2008; Sadler-Smith and Shefy, 2004, 2007). In this vein, a number of researchers now contend that, in certain cases, intuition may prove more effective than previously believed. And, while some researchers continue to present arguments for the limitations of intuitive decision making, for example in the area of clinical decision making in health care

(e.g. Croskerry, 2006; Groopman, 2007), there is a growing recognition that the question of whether intuition is superior or inferior to analysis is a complex one – a question not necessarily susceptible to a simple yes/no answer. Indeed, several recent articles (Dane and Pratt, 2007; Hodgkinson, Langan-Fox and Sadler-Smith, 2008; Sadler-Smith and Sparrow, 2008; Sinclair, Sadler-Smith and Hodgkinson, 2009) have suggested that the effectiveness of intuitive decision making may be contingent on a range of factors. Along these lines, evidence suggests that intuitions tend to be relatively more accurate when decision-makers have accrued significant levels of expertise such that their cognitive schemas are 'complex and domain relevant' (Dane and Pratt, 2007). Such schemas arise as individuals accrue domain experiences while receiving feedback that is 'relevant and exacting' (Hogarth, 2001). The investment it takes for individuals to attain high levels of expertise is far from trivial. Khatri and Ng (2000, p. 58) argue that for managerial intuition to be effective, it 'requires years of experience in problem solving and is founded upon a solid and complete grasp of the details of the business'. This perspective fits with research suggesting that the acquisition of expertise in many domains requires a number of years of 'deliberate practice' and training (Ericsson and Charness, 1994).

While expertise is a critical factor accounting for intuition effectiveness, research also suggests that intuitive judgments may be relatively more accurate in relation to certain types of tasks than on others. In particular, the effectiveness of intuition has been shown to vary to the extent a task is intellective versus judgmental. Intellective tasks, which involve a 'definite objective criterion of success within the definitions, rules, operations, and relationships of a particular conceptual system' (Laughlin, 1980, p. 128), may be ill suited to intuitive decision making. Such tasks tend to be highly structured and have a definite, objective criterion of success. These properties make such tasks conducive to the use of an analytical decision-making approach. Analysis permits individuals to decompose a structured problem into constituent parts and reason toward a solution (Dane, Rockmann and Pratt, 2005; Shapiro and Spence, 1997). In contrast, judgmental tasks, which involve 'political, ethical, aesthetic, or behavioral judgments for which there is no objective criterion or demonstrable solution' (Laughlin, 1980, p. 128), may be well suited to intuitive as opposed to analytical decision making. These tasks involve unstructured problem situations. Intuition, as an associative process, may help to integrate the disparate elements of such problems into a coherent perception of how to proceed (Dane, Rockmann and Pratt, 2005; Dane and Pratt, 2007).

In addition to the structure of a given task, the effectiveness of intuition may also vary with regard to the time pressure associated with that task. It is perhaps not surprising that intuition has been examined with regard to the decisions made by firefighters (Klein, 1998), military commanders (Kaempf

et al., 1996), emergency room surgeons (Abernathy and Hamm, 1995), and corporate executives operating in time-sensitive conditions (Agor, 1986; Burke and Miller, 1999; Hayashi, 2001). Within these occupations, poor outcomes often result from a failure to take action. In some cases, lack of action is a result of excessive decision analysis, or so-called 'paralysis by analysis' (Langley, 1995; Mintzberg, 1994, p. 325). For this reason, the effectiveness of intuitive decision making compared to analytical decision making may increase positively as a function of time pressure.

Despite growing convergence on the conditions that favor intuitive judgments over analytical, scholars continue to suggest that optimal decisions may involve the use of both types of decisions. For example, in an oft-cited work in the intuition literature, Simon (1987) argued that effective managers will approach problems using both intuition and analysis, switching decision styles as conditions warrant. This view accords with empirical evidence that managers frequently draw on intuition and analysis as separate 'inputs' when making decisions (Burke and Miller, 1999). Even the UMG perspective on moral intuition views the process of moral decision making as incorporating both intuitive and rational modes of decision making (Hauser *et al.*, 2007).

While agreeing that combining analytical and intuitive approaches may bear considerable returns, researchers have rarely considered the best method by which to employ or integrate them, and the work that does exist is somewhat contradictory. For instance, Shapiro and Spence (1997) suggest that there is merit in recording one's intuition first and then assessing a problem analytically. In contrast, Agor (1986) recommends intuition as a means of synthesizing information that has been previously gathered and analyzed. This and other conceptual points of disagreement will be taken up again in the final section of this chapter. We now turn to a topic that has engendered far more divergence than convergence among scholars: the methodological assessment of intuition.

CAPTURING INTUITION EMPIRICALLY

Despite a growing interest among researchers in the various types and potential merits of intuition, empirical research on intuition remains limited. In part, this is because intuition is a nonconscious process that is difficult to pin down methodologically. Intuition researchers face the challenge of determining how best to access, view, or demonstrate intuition processes and outcomes as they occur or have occurred. Despite a lack of agreement on which methodological approaches are most efficacious toward this end, a number of approaches have emerged. The purpose of this section is to summarize and critique extant research methods for capturing intuition. In this pursuit, we review a range of research methods directed toward fostering and assessing intuition in

laboratory and field settings.[2] Moreover, in line with our conceptual review, we note which of the existing measures have been used to assess which types of intuition. Our review of existing methods is summarized in Table 1.2.

Direct Instruction

One method, which we will refer to as *direct instruction*, is premised on the assumption that decision making can be manipulated by instructing individuals to adopt an intuitive approach to decision making for a given set of tasks. This method has been employed almost exclusively through experimental research on utilizing problem-solving intuition (and analysis). A foundational study that relied on this approach was conducted by Wilson and Schooler (1991), who placed participants into either an analytical or control condition and asked them to perform a judgment task. Similar methods have also been employed by Hammond *et al.* (1987) and McMackin and Slovic (2000). However, in these studies researchers did not directly instruct participants to make decisions either analytically or intuitively. Instead, one condition involved instructions to induce analytical reasoning, but the other condition served as a control condition – one in which no decision-making instruction (e.g. to make decisions intuitively) was given.

In the effort to create a more balanced and direct experimental inducement of decision-making approaches, Dane, Rockmann and Pratt (2005) instructed participants in their lab studies to perform tasks either analytically or intuitively. Consistent with previous research (e.g. Wilson and Schooler, 1991), participants in the analytical condition were first asked to write down a list of factors they thought would be important to making their decisions and were instructed to think about each task in depth before making a decision. Participants in the intuitive condition did not write down a list of decision factors and were instructed to avoid thinking very hard about the tasks and to make decisions on the basis of their gut instinct reactions. Manipulation checks revealed that participants made decisions in line with the condition to which they had been assigned. Moreover, task performance varied as a function of condition on several tasks, providing additional support for the effectiveness of these manipulations.

Jordan, Whitfield and Zeigler-Hill (2007, p. 1073) employed a similar method to inducing analytical (or, in their words, 'rational') and intuitive

[2] In reviewing a range of intuition measurement techniques in this section, we refrain from discussing measurement scales concerned with individual differences in decision-making styles (see Allinson and Hayes, 1996; Hodgkinson and Sadler-Smith, 2003; Pacini and Epstein, 1999). Intuitive decision-making is conceptually distinct from an individual's inclination to think intuitively (an intuition 'use' factor – see the section below, entitled 'When Do People Trust and Use their Intuition?'). The focus of the present section is on identifying and measuring intuition when it actually occurs, as opposed to assessing an individual's natural tendency to employ intuitive (or analytical) decision-making approaches.

Table 1.2 Intuition measurement methods

Method	Primary Strength	Primary Weakness	Intuition Type(s) Most Commonly Associated	Representative Research
Direct Instruction	High level of researcher control	Difficult to assess whether intuition is being employed	Problem-solving	McMackin and Slovic (2000); Wilson and Schooler (1991); Jordan, Whitfield and Zeigler-Hill, (2007)
Retrospective Reports	Can be employed in field research	Involves post-hoc interpretation	Problem-solving	Hoffman, Crandall and Shadbolt (1998); Klein (1998)
Incubational Method	Limited likelihood of demand artifacts	May be difficult to ascertain relative contribution of intuition versus analysis	Creative	Dijksterhuis (2004); Dijksterhuis *et al.* (2006)
Scenario Based	Separates personal attachments from moral judgments; allows assessment of relatively subtle differences in moral intuiting	May not be generalizable to 'real world' moral intuiting	Moral	Greene *et al.* (2004); Hauser *et al.* (2007)
Neurological and Physiological	Potentially provides direct, observable evidence of intuitive processing; can be used in conjunction with other measures (e.g. scenarios)	Costly, time intensive, and complex; moral reasoning likely involves multiple systems; measurement often done under artificial settings	Problem-solving, Moral	Casebeer and Churchland (2003); Greene and Haidt (2002); Lieberman (2000); Moll *et al.* (2002)
Affective Priming	Limited likelihood of demand artifacts	Affective processing may not be synonymous with intuition	Moral	Hsee and Rottenstreich (2004); Small, Loewenstein and Slovic (2007)

decision making; in a laboratory decision-making task, these researchers instructed participants in the intuitive condition to 'use gut feelings to decide', and instructed those in the analytical condition to 'decide carefully, to write down each consideration and why they felt it was important'. These experimental instructions were complemented with a further manipulation designed to enhance participants' compliance with their assigned decision-making condition. Prior to receiving the direct instruction to make decisions intuitively (or analytically), participants were told that intuitive (or analytical) decision making was supported with evidence as being an effective way to make decisions. Those in the intuitive condition were told, 'There is clear evidence that people who adopt an intuitive approach to decision making are more successful in many areas of their lives.' Those in the analytical condition were told, 'People who adopt a rational approach to decision making are more successful.' Manipulation checks revealed that participants assigned to the intuition condition reported greater 'faith in intuition' than those in the analytical condition, providing at least indirect support that they relied on intuition as they made their decisions.

We contend that there are certain advantages to using direct instruction to assess intuition empirically. The use of direct instruction permits researchers a relatively high degree of control over the way in which research participants make decisions. This allows researchers to perform comparative tests of the effectiveness of different decision-making approaches on a variety of tasks. Additionally, direct instruction is relatively straightforward to employ. Participants may be instructed to 'rely on their gut feelings', or, in contrast, to 'be as analytical as possible'. The analytical decision-making approach may also be induced or enhanced by instructing participants to develop and rely on decision factors, criteria, or weightings.

Directly instructing participants to make decisions intuitively or analytically also carries limitations including but not restricted to those common to any form of making direct requests in a laboratory setting (e.g. demand characteristics). For example, although studies have found differences in task performance between analytical and intuitive (or nonanalytical) conditions, there is no way of knowing with certainty whether participants are truly thinking analytically or intuitively. This lack of an independent criterion renders the overall approach especially difficult as a basis for assessing the use of intuition.[3] To illustrate, instructing an individual to think intuitively may result in an individual making a 'guess' rather than formulating and relying upon an intuition. To help differentiate guessing from intuition, researchers could ask

[3] To help assess whether analytical methods were employed by participants in our own laboratory studies we examined participants' self-generated decision criteria for analytical decision-making. We found that nearly all participants listed a number of decision factors, which indicated that participants had complied with the analytical condition task instructions (for further details, see Dane, Rockmann and Pratt, 2005).

participants to report their confidence in their decisions. Confidence is often associated with intuitions, but not guesses (Dane and Pratt, 2007).

Furthermore, instructing individuals to rely on their intuition to make decisions may be difficult outside of laboratory conditions. Professional decision-makers would undoubtedly require a great degree of trust in the process and goals of the research program before they would be willing to perform occupational tasks (many of which may involve critical outcomes, such as making investments) according to directions issued by a researcher. Finally, because direct instruction typically involves instructing participants to 'go with their gut' on a task that they perform soon after instruction, the use of this method may be limited to capturing problem-solving or moral intuitions – intuition types that do not involve an incubation period.

Retrospective Reports

Another type of intuition measurement technique that is also associated with problem-solving intuition involves the use of *retrospective reports*. Through retrospective reports, research participants indicate to a researcher how they approached a decision-making problem after the problem has been solved. This process may be guided by research interviews, written descriptions of the decision-making process, or survey questionnaires and may occur immediately after task completion or take place at a later point in time. For example, in researching intuitive decision making among firefighters, Klein (1998) asked firefighters to talk about specific fires they had fought during the course of their careers. In a related vein, scholars have developed and employed a detailed, retrospective approach, the Critical Decision Method (CDM – see Hoffman, Crandall and Shadbolt, 1998), designed to enable decision-makers to recall the details of how they made decisions with regard to particular situations they encountered. Others have probed decision making retrospectively via the use of survey questionnaires to determine whether participants employed intuitive decision making as directed in experimental research (Dane, Rockmann and Pratt, 2005). Direct instruction and retrospective reports may thus be used in tandem within a single study to prompt intuitive decision making and detect the extent to which participants behave in accordance with experimental directions.

From a methodological perspective, retrospective reports are strong where priming is weak. Retrospective reports allow research participants the opportunity to indicate their perceptions about how they actually made their decisions; direct instruction, in contrast, rests on the assumption that participants will follow decision-making instructions. If participants deviated from following their prescribed decision-making approach (and were aware of doing so – an assumption we recognize as problematic), they can report this to researchers. In contrast, participants are not typically permitted the opportunity to notify researchers of this deviation in a laboratory research design that relies exclusively on direct instruction. Retrospective reports may also be more practical to use than priming when conducting field research with

organizational and professional participants. Such participants are likely to be more comfortable discussing or indicating how they made decisions rather than being compelled to make decisions through researcher-mandated approaches. Finally, retrospective reports may conceivably be used to capture all three intuition types reviewed above. That is, research participants could describe having used intuition during a particular episode, and researchers could identify which type of intuition was most likely at play on the basis of such factors as whether the research participant described an incubation period, or the degree of affect discussed by the research participant.

Like priming, retrospective reports also carry limitations. For instance, individual recall of past events may be incomplete or inaccurate (see Hoffman, Crandall and Shadbolt, 1998, for discussion). Thus, an individual may falsely report that a decision was made intuitively (or analytically) when, in fact, the decision was made in a different way. Furthermore, individuals may have different understandings of the concept of 'intuition'. As such, researchers must be very clear about what they mean by intuitive decision making when asking participants to indicate how closely their decision-making process drew upon intuition as it is scientifically defined.

Incubational Method

Dijksterhuis and colleagues (Dijksterhuis, 2004; Dijksterhuis *et al.*, 2006) have developed a novel approach that could be used to capture the nonconscious incubational aspect of what we have referred to in this chapter as creative intuition. Specifically, Dijksterhuis and colleagues have demonstrated that when participants are first presented with a task and then given a second task designed to occupy their conscious system of processing, their nonconscious system continues to operate upon the original task. To carry this out, researchers assign participants to a range of conditions, one of which is a nonconscious thought condition in which participants are exposed to a scenario and then distracted for several minutes by a task that consumes their conscious attention (e.g. an anagram task). Following the distraction task, participants are then directed back to the original scenario and asked to make a judgment (e.g. a creative judgment). One advantage of this method is that it is not highly subject to the demand characteristics that may arise with regard to the direct instruction technique.

The incubational method has successfully identified conditions under which the use of intuition (via incubation) performs particularly well when compared with other, more analytic, approaches.[4] As such, Dijksterhuis's research is

[4] It is important to note that Dijksterhuis also uses the incubational approach to assess what might be referred to here as problem-solving intuitions – intuitions which can be evaluated by their 'effectiveness'. We see additional merit to the incubational approach as a means of capturing creative intuitions given the incubation facet of this approach. We briefly return to the issue of which intuition type(s) Dijksterhuis and colleagues are concerned with in the final section of this chapter.

noteworthy not only for its methods but its contribution to theory as well. Nonetheless, the effectiveness of this experimental approach appears limited to cases in which researchers are interested mainly in intuitions that follow from incubation. The period of nonconscious thought (incubation) upon which this method hinges may limit the extent to which this method can accurately assess or document intuitions of the other varieties explored here. Additionally, because this method may lead research participants to think both consciously and nonconsciously about a problem, it could be difficult to pinpoint the relative contribution of intuitive versus analytical thought in guiding decision making under this approach.

Scenario Based

One means of priming moral intuitions is through the use of ethical scenarios. A popular set of scenarios are the 'trolley' or 'train' scenarios (Greene *et al.*, 2001, 2004). An example of such a scenario can be found in Hauser *et al.* (2007, p. 18):

> Denise is a passenger on a train whose driver has just shouted that the train's breaks have failed, and who then fainted of the shock. On the track ahead are five people; the banks are so steep that they will not be able to get off the track in time. The track has a side track leading off to the right, and Denise can turn the train onto it. Unfortunately there is one person on the right hand track. Denise can turn the train, killing the one; or she can refrain from turning the train, letting the five die.

Once administered, participants may be asked whether a particular action (e.g. Denise pulling a switch to turn the train) is moral or not. The use of intuition is deduced as individuals are often at a loss when attempting to explain the justifications for their particular choices (Hauser *et al.*, 2007). Alternatively, as we discuss below, participants may be assessed in terms of their neurological or physiological reactions. Moral intuition is assumed to occur here by differentiating how the body processes ethical scenarios differently from other scenarios (e.g. examining how different parts of the brain are activated by ethical scenarios vs. rational or nonethical scenarios). Thus, one advantage of such scenarios is that they can be used to examine the outcomes of moral intuiting – moral judgments – as well as to assess which heretofore hidden processes are occurring as moral intuiting is engaged. In addition, because these scenarios are artificial, individuals are less likely to have preexisting emotional entanglements with the issues raised, thus helping to make the results cleaner (see Hauser *et al.*, 2007).

Another advantage is that scenarios can be modified to gain nuanced understandings of how moral intuitions work. Recently, researchers have attempted to vary the scenarios in an attempt to show how UMG may add explanatory power over existing perspectives (e.g. rational or emotional). For example, Hauser and colleagues (2007) use ethical scenarios to explore how individuals differentially evaluate impersonal (e.g. pulling a switch a switch to turn the

train) versus personal (e.g. throwing a person in front of the train to block it) moral choices. They find evidence that these types of scenarios are processed differently, bolstering the work by Greene and colleagues (see Greene *et al.*, 2001, 2004) that has been used to support the social intuitionist approach. However, they go beyond the personal versus impersonal dimension by altering scenarios to get at another critical dimension of moral intuiting: intentionality. Specifically, they examine whether there are differences when harming another is viewed as a means to an end versus as a foreseen side effect (see the 'principle of double effect'). By showing that various demographic subsamples of individuals make similar distinctions, even if they cannot justify why, Hauser and colleagues support their notion that there may be a UMG.

The main shortcomings of scenario-based methods for capturing intuition are similar to the others we have discussed. First, as with the other approaches (e.g. direct instruction), the presence of intuition must be inferred; that said, assessing lack of justifications does help assuage this shortcoming. Second, and perhaps more problematically, the artificial nature of the scenarios limits their potential applicability in understanding 'real world' moral decision making. For example, individuals faced with moral decisions, such as whether to recall a defective product, are not emotionally detached from these events.

Neurological and Physiological Approaches

There has also been an increasing interest in exploring the physiological and neurological processes involved in intuition. Some of this research has focused on intuition of the type we have referred to as problem-solving intuition. For example, Lieberman (2000, 2007) offers a 'social cognitive neuroscience approach' to intuition which, as noted earlier, highlights the importance of the basil ganglia and related structures in both intuition and implicit learning. Other approaches have examined the area of 'moral cognitions' (see Casebeer and Churchland, 2003, for review). While some of this research specifically mentions 'moral intuitions' (e.g. Greene and Haidt, 2002), other writers do not refer to intuitions directly – rather they use terms such as 'moral emotions' (Moll *et al.*, 2002), 'moral cognitions' (Moll *et al.*, 2005), or 'moral judgments' (Greene *et al.*, 2001). Thus, researchers should be cautious about lumping together all physiological and neurological research on intuition, moral intuitions, and moral cognitions because it is not yet clear whether these researchers are examining the same or similar phenomena even though they use apparently similar terms. Further, it is unclear how these terms relate to each other. For example, while all moral intuitions are likely to involve moral emotions, the reverse is not necessarily true. Researchers, therefore, should clearly state whether they are examining intuition or some facet of intuition. Along these lines, it would be interesting to examine whether different types of intuition, such as problem-solving and moral, may have different physiological and neurological substrates.

Regarding intuition, broadly defined, a fair amount of recent work, including that cited above, involves brain imaging. Drawing on the pioneering work of Damasio and colleagues on brain injuries and social judgments (e.g. Anderson *et al.*, 1999; Eslinger and Damasio, 1985) researchers have used neural imaging techniques (such as functional magnetic resonance imaging – fMRI), to map out those areas of the brain most associated with moral cognition. As Moll and colleagues (2005, p. 800) note in their review:

> Overall, there is remarkable agreement between functional imaging and clinic-anatomical evidence about the brain areas involved in moral cognition. Activated regions include the anterior PFC (encompassing the frontopolar cortex, Brodmann's area (BA) 9/10), orbitofrontal cortex (OFC, especially its medial section, BA 10/11/25), possibly STS (BA 21/39), anterior temporal lobes (BA 20/21/38), insula, precuneus (BA 7/31), anterior cingulate cortex (ACC, BA 24/32) and limbic regions.
>
> Extract reprinted by permission from MacMillan Publishers Ltd: *Nature Reviews Neuroscience*, Moll, J., Zahn R., de Olivera-Souza, R. *et al.*, The neural basis of human moral cognition, **6**, 800, Copyright 2005.

To map these areas and differentiate them from those involved in making other types of judgments and decisions, researchers often provide participants with contrasts, either through scenarios (e.g. trolley scenarios) or visual images (e.g. abandoned children). These contrasts include: moral versus nonmoral dilemmas (Greene *et al.*, 2001), easy versus difficult personal moral judgments, utilitarian versus nonutilitarian personal moral judgments (Greene *et al.*, 2004), and moral pictures versus unpleasant, pleasant, visually arousing, neutral, and scrambled pictures (Moll *et al.*, 2002).

Results from this brain mapping research suggest that intuitions, particularly moral intuitions, are closely related to affect (Greene *et al.*, 2001; Greene and Haidt, 2002; Moll *et al.*, 2002, 2005) and the areas of the brain associated with social cognition (Greene *et al.*, 2001; Greene and Haidt, 2002). Greene and Haidt (2002) have drawn upon this research as support for their social intuitionist model and Reynolds (2006) has synthesized this research to develop a neurocognitive model of moral decision making. While these lines of research are promising, Casebeer and Churchland (2003) caution researchers to remember that moral representations are likely to be highly distributed throughout the brain, and not centered on a specific region. Some research has taken this line of reasoning further to suggest that intuition may involve other areas of the body. For example, McCraty, Atkinson and Bradley (2004a, 2004b) suggest that the heart plays a role intuition. Specifically, using measures of heart rate variability, they demonstrate that the heart recognizes and responds to intuitive information, and may receive this information before the brain does. Similarly, Bechara *et al.* (1997) link intuitive knowledge and galvanic skin responses by demonstrating that when engaging in a gambling game, individuals exhibit 'micro-sweating', or changes in skin conductance, prior to attaining a conscious understanding of the game's risks.

By seemingly providing visible evidence that intuitive processes are indeed occurring, neurological and physiological measures have a distinct advantage over the previously noted measures where the use of intuition has to be assumed. Moreover, given that such testing also involves the prompting of intuitive processing, neurological and physiological measures may be used in conjunction with other methods (e.g. scenario based). However, there are also some distinct disadvantages of these types of measures. To begin, neurological and physiological measures are highly costly (e.g. equipment, training) and intensive in terms of time, as participants cannot be run in groups. In addition, as noted by Casebeer and Churchland (2003), such tests cannot yet be done in the 'field', thus intuitive reasoning is often being induced under very artificial conditions. Finally, if intuitive processing is indeed a system-wide phenomenon, researchers must be careful about where they seek to measure intuition, especially if they are focusing on only one part of the body (e.g. the brain).

Affect Priming

Recent research has shown that an affective mode of processing – a processing mode that may be closely aligned with intuitive, nonconscious operations – can be 'primed' via tasks that engage affective processing (Hsee and Rottenstreich, 2004; Small, Loewenstein and Slovic, 2007). For example, to induce an 'affective' method of judgment, experimenters may pose the following question to participants, 'When you hear the word "baby", what do you feel?' When given a decision-making task immediately following the 'affect' task, participants tend to make judgments based more on affect than on conscious, analytical processes. This method mitigates one of the key limitations associated with direct instruction. Specifically, this approach – which we refer to as *affect priming* – is less susceptible than direct instruction to hypothesis guessing. The link between asking participants about how they feel with regard to a particular topic and assessing their feelings on an ostensibly unrelated judgment task is not an explicit or obvious one; rather, the effect involves subtle and nonconscious priming (for a review of studies that employ priming techniques, see Bargh and Chartrand, 1999).

One limitation of the affect priming approach is that, as noted above, it is not a method that was designed to capture intuition per se. Instead, Hsee and Rottenstreich (2004) developed and employed this method so as to induce 'valuation by feeling', whereby individuals assess or express their preferences toward a stimulus or target on the basis of their feelings. Although this approach is potentially useful from an intuition research standpoint in that it hones in on affect – a critical element of intuition (particularly in the moral and creative types of intuition) – it is not yet clear that the experimental procedures associated with affective priming induce intuitive processes and intuitive judgments. Also, because affect priming is generally followed by an instruction to participants to make an immediate decision, this approach may not provide an opportunity for incubation (which, we have argued, is a core element to

creative intuitions). Thus, this approach may not be well suited to the study of creative intuition. It could, however, be very useful to capturing intuitions that involve a high degree of affect and no incubation period – i.e. moral intuition.

LOOKING AHEAD: INTUITION RESEARCH AVENUES

We have argued that research on intuition has centered on what intuition is, which factors prompt individuals to trust and use it, and when intuition should be used. We have also reviewed a myriad of ways that researchers have attempted to measure intuitive processes and/or outcomes. To conclude, we turn to relatively unexplored research avenues in each of these areas. Our suggestions for future research are meant to be illustrative of the types of work that might be undertaken in each of these areas, rather than being comprehensive.

What Is Intuition? Issues with Differentiating Intuition Types

We argued for the possibility that there may be different types of intuition. Drawing on a number of lines of extant research, we suggested that there is some degree of evidence for the existence of problem-solving, moral, and creative intuitions. While we posited that each of these intuition types fits the definition of intuition we advanced previously (Dane and Pratt, 2007) we view these types of intuition as varying in some respects with regard to their underlying features. Because scholars have only recently begun to converge on a set of properties that characterize the concept of intuition and distinguish intuition from related phenomena (e.g. intuition vs. insight), the delineation of intuition into different types raises at least two conceptual questions that may require further research to sufficiently resolve.

First, we contended that a feature differentiating creative intuition from problem-solving and moral intuition is the degree to which incubation plays a role in the formation of the intuitive judgment. Although we argued that creative intuitions arise via an incubation period, we have maintained that creative intuitions are conceptually distinct from insights – a potentially similar outcome of cognitive incubation that is also of relevance to problem-solving and decision making (see Sternberg and Davidson, 1995). Because literature speaking to the concept of creative intuition is both relatively limited and primarily theoretical, further research is necessary to confirm that creative intuitions do indeed differ from insight. In a related vein, if these phenomena are in fact different, as maintained here, it remains an open question whether any process that requires a significant incubation period merits the descriptor 'intuition' given that numerous scholars have identified 'speed' as a hallmark characteristic of intuition (see Dane and Pratt, 2007; see also Hogarth, 2001, for a dissenting view). In evaluating this issue, scholars may wish to focus in particular on the work of Dijksterhuis and colleagues (Dijksterhuis, 2004; Dijksterhuis *et al.*, 2006; Dijksterhuis and Meurs, 2006; Dijksterhuis and Nordgren, 2006), whose research not only provides a theoretical rationale

for the role of incubation in creativity, but also posits that a type of problem-solving intuition may also be contingent on an incubation period.[5] Specifically, Dijksterhuis and Nordgren (2006) discuss the notion of 'summary judgment' intuitions, which are purported to arise via incubation in response to decision tasks that are largely noncreative (e.g. making a decision concerning which apartment to rent). For arguments against posing a creative intuition type, researchers may look at Hodgkinson and colleagues (2008) who see incubation as intimately tied to insight only.

To avoid a proliferation of intuition 'type' taxonomies, we suggest that researchers may need to avoid lumping many if not all nonconsciously based forms of judgment under the rubric of intuition. At the same time, until more empirical work has been done in the area, researchers must also be cautious to avoid dismissing certain forms of cognition (e.g. processes that involve incubation) as definitely nonintuitive, as doing so might minimize the power and richness of the intuition construct.

Second, in drawing distinctions among different intuition types, we argued that the nature of the affect associated with the intuitive experience may in part differentiate some intuitions from others. In particular, we posited that moral and creative intuitions may be imbued with a higher level of affective arousal than problem-solving intuition. Not only is further research necessary to substantiate this claim, but there is also another meaningful distinction concerning affect not discussed thus far. Although we have explored intuitions with regard to the arousal dimension of affect, it is worth noting that affective experiences can also be categorized by their degree of pleasantness (see Russell, 2003). Extant literature is relatively limited with regard to assessing the degree to which different types of intuition may vary along the pleasantness dimension. However, it bears mentioning that researchers have identified some intuitions as being of a pleasant variety and others of a more unpleasant nature. For example, when executives make certain intuitive decisions, they often experience positive feelings of excitement and harmony (Agor, 1986). As Michael Eisner, CEO of Walt Disney, has stated, the sensation associated with certain intuitive judgments is often like, 'looking at a great piece of art for the first time' (as reported in Hayashi, 2001, p. 62). Other notable examples of intuition involve negative emotions. For example, Klein (1998) reports an incident in which, when fighting a fire, a fire lieutenant immediately ordered his men to leave a burning residential house when he started to feel as if something was 'not right'. As soon as his men left the building, the floor on which they had been standing collapsed. Our own field research (in progress) on firefighters similarly suggests that these intuitions are often associated with negative affect. Likewise, other empirical research has shown that prior to airline disasters, pilots often have an unpleasant feeling that something is amiss (Bangs, 2004).

[5] Astute readers will notice that the notion of problem-solving intuitions being grounded in incubation goes against the claim, advanced here, that problem-solving intuitions tend to involve little to no incubation. Clearly further work is necessary to conclude whether incubation can be a precursor to at least some instances of non-creative intuition.

While the intuitions in the examples above may fit the problem-solving or creative types, scholars have suggested that moral intuitions may also be either positive or negative in their valence. Indeed, in conceptualizing moral judgments (and positing that these judgments arise intuitively), Haidt (2001, p. 817) defines them as 'evaluations *(good vs. bad)* of the actions or character of a person that are made with respect to a set of virtues held to be obligatory by a culture or subculture' (italics added for emphasis). From both a philosophical and psychological perspective, the valence issue lies at the core of moral intuition; it is because a potential course of action feels 'right' (a pleasant feeling) or 'wrong' (an unpleasant feeling) that one develops a sense of how to behave ethically in a given situation. That said, as we have noted earlier, most research in this area has focused on negative emotions, such as disgust.

In sum, pleasant versus unpleasant affect would seem to be a relevant dimension to consider in evaluating the emotional underpinnings of moral intuitions, as well as the other types of intuition reviewed above. However, because current understanding concerning the nature of and variations along the various dimensions of affect in relation to intuitions is limited, further research is necessary, especially regarding the role of the pleasantness dimension, with regard to the different types of intuition enumerated above.

When Do People Trust and Use their Intuitions?

The Case of Moral Intuition

As noted earlier, at present most of the research on the factors leading people to trust their intuitions has focused on problem-solving intuitions. However, research on moral intuition has expanded in recent years (e.g. Greene and Haidt, 2002; Haidt, 2007; Haidt and Graham, 2007). While this research has suggested that moral intuitions should generally be followed, further research is needed to identify the conditions under which individuals actually do (or do not) – or even when they should (or should not) – follow their moral intuitions.

In addition, it would be helpful to stand back and investigate the factors that facilitate or impede the formation of moral intuitions. For example, Moore and Loewenstein (2004) argue that self-interest exerts an influence on decision making primarily via nonconscious channels, whereas consideration of ethical and professional obligations tends to be activated through more conscious cognitive avenues. As such, in situations in which self-interest and ethics are in clear tension, individuals often focus on self-interest concerns through a largely nonconscious, automatic process, and hence, fail to notice or devote significant thought to considerations of ethics. This phenomenon aligns with the position put forth by Tenbrunsel and Messick (2004) that individuals have a tendency to engage in self-deception so as to disguise or distort violations of ethical principles. In essence, individuals often do not 'see' the ethical elements of a given scenario because they 'fade' the ethics from the dilemma, leaving

only an 'ethically colorless' view of the issue. This tendency not to recognize that an ethical issue exists until it is perhaps too late has been used to partially account for recent corporate scandals (see Bazerman, 2006; Moore and Loewenstein, 2004).

Integrating the observations noted above with our earlier discussion of the features of moral intuition, it appears that the relationship between the nonconscious system of processing and ethical judgments is complex and potentially contradictory: nonconscious processes often work against the identification of problems as being ethical, but when a problem is categorized as an ethical issue (see Sonenshein, 2007), the nonconscious system produces moral intuitions that provide decision-makers with a sense of right and wrong. Given this conundrum, researchers might fruitfully explore how to overcome the nonconscious barriers of moral problem recognition in order to better facilitate the generation of moral intuitions.

As an aside, the issue of ethical fading in more mundane, 'real life' situations may also serve as evidence that assessing moral intuitions via scenarios – where the ethical components of the decisions are quite obvious (e.g. someone will die) – may be overly artificial (Hauser *et al.*, 2007). This suggests that in the future researchers should employ scenarios that vary in the starkness of their ethical overtones.

The Potential Role of Mindfulness

The above discussion suggests that individuals can only use intuitions when they are aware of them. While various scholars have commented on whether and how conscious and nonconscious systems of processing may be engaged concurrently (e.g. Epstein, 2002; Ferreira *et al.*, 2006; Hodgkinson and Sadler-Smith, 2003; Hodgkinson, Langan-Fox and Sadler-Smith, 2008), and debated the extent to which they are linked to particular neurological pathways and related mechanisms (e.g. Hodgkinson, Langan-Fox and Sadler-Smith, 2008; Lieberman, 2000, 2007; Lieberman, Jarcho and Satpute, 2004), relatively little attention has focused on the extent to which and in what ways individuals can consciously adopt particular frames of mind that make them more or less aware of or attentive to the products that emerge from their nonconscious system of processing, such as their intuitive judgments.

Recent work has raised the possibility that the degree to which individuals are in touch with nonconscious operations (and the 'products' of the nonconscious system – e.g. intuitive judgments) may be related to the concept of *mindfulness* (Brown and Ryan, 2003; Brown, Ryan and Creswell, 2007; Weick and Sutcliffe, 2006). Following the lead of Brown and Ryan (2003: p. 822), we conceptualize mindfulness in a manner consistent with its historical meaning among Buddhist and other contemplative traditions: 'the state of being attentive to and aware of what is taking place in the present'. From this perspective, mindfulness is a type of consciousness that occurs when one's attention to the

present situation becomes highly open and receptive (Brown and Ryan, 2003). It should be noted that the heightened sense of awareness and attention to the present moment that marks mindfulness applies not only to events surrounding the individual, but also to the mental and emotional processes that occur *within* the individual. These two distinct loci of attention for an individual experiencing mindfulness are reflected in the claim that mindfulness involves the 'clear and single-minded awareness of what actually happens *to* us and *in* us, at the successive moments of perception' (Thera, 1972, p. 5, emphasis as per original).

When individuals are in a state of mindfulness, they may have greater awareness or access to internal processes or the products thereof to which they might otherwise not be attuned. In this vein, Brown and Ryan (2003) have demonstrated that mindfulness is positively related to the degree of congruity individuals experience between their explicit and implicit emotions. This suggests that individuals are more consciously aware of or in touch with their underlying emotions to the extent that they are in mindful states of consciousness.

Drawing on the notion that mindfulness may perhaps attune individuals to nonconsciously based phenomena, Sadler-Smith and Shefy (2007) included a mindfulness task in the catalog of techniques they employed with the aim of training sample managers who were enrolled in an MBA program to become more 'intuitively aware'. Following a period of instruction designed to inculcate awareness of mindfulness and related states of consciousness, the participants of this study reported that they were better able to identify the contexts in which they were most in tune with their intuitions and became more confident in their ability to draw on their intuitions in decision-making situations. These observations suggest that scholars might benefit from further exploring the role of mindfulness in permitting individuals to become more aware of certain intuitive judgments that might otherwise be difficult to access (e.g. moral intuitions). Taking this further, such a perspective shifts attention from a focus on conscious *versus* nonconscious decision making toward a focus on how we can use one information system (conscious, analytical) to help us become more aware of the other system (nonconscious, intuitive). Building on the notion derived from dual-process theories of cognition that both processing systems may play complementary roles in decision making, we next examine how intuitions (of different types) can be used in tandem with analysis to produce effective decisions.

When Should Intuition Be Used?

Earlier, we provided a brief overview of research concerned with when individuals should use their intuition to make decisions. We noted the role of expertise and task characteristics toward this end. Additionally, we argued

that effective decision making may, in some instances, involve the combined use of intuition and analysis. Unfortunately, despite arguments that individuals may benefit from switching between intuitive and analytical approaches to problem-solving (e.g. Hodgkinson and Sadler-Smith, 2003; Louis and Sutton, 1991; Simon, 1987), little research agreement has emerged concerning the preferred sequence by which individuals should employ these approaches (e.g. Should one take stock of one's intuition first and then engage in analysis? Or, should one expect intuition to play a key role after engaging in an analytical decision-making process?).

Drawing on the framework advanced here, we suggest that part of the reason for the existence of different prescriptions is that scholars have not considered or specified how different types of intuition may be relevant to consider during different stages of the decision-making process. In particular, individuals are likely to experience problem-solving and moral intuitions prior to assessing a problem analytically. Such intuitions, as argued above, tend to appear with little to no incubation, in direct response to a problem scenario. Taking note of these intuitions as they occur may be critical in light of evidence that individuals may be led inappropriately astray from highly accurate intuitive judgments when they are instructed to adopt an analytical approach to making decisions (e.g. Fallshore and Schooler, 1995; McMackin and Slovic, 2000; Wilson and Schooler, 1991). Indeed, as discussed above, the emergence of moral intuitions early in the decision-making process should be given particular weight, given that the nonconscious system often filters out the ethical features of a problem. Hence, when individuals are fortunate to experience these intuitions, they should take careful note of them. At the same time, we suggest that individuals should be wary of immediately acting upon their intuitions – particularly problem-solving intuitions. The roots of this admonishment lie in the vast body of research on intuitive and heuristic biases (e.g. Ariely, 2008; Bazerman, 2006; Tversky and Kahneman, 1974). Accordingly, for a decision-making problem in which a decision does not need to be made immediately, a reasonable course of action may be for individuals to take note of their problem-solving and/or moral intuitions at the outset, and then perhaps put these intuitions on hold. By recording initial intuitions and then temporarily placing them on the backburner, decision-makers may be less prone to make confirmation biases (see Nickerson, 1998, for review) as they enter into a more conscious phase of problem analysis.

Following an analytical assessment of the problem, we contend that individuals should not only return to their initial intuitions, and assess them vis-à-vis the products of their analysis, but they should also remain attuned to the emergence of creative intuitions. In contrast to problem-solving and moral intuitions, individuals are likely to experience creative intuitions after a problem has been given a period of consideration and incubation. Creative intuitions may serve as integrating mechanisms – gut feelings that tie

together and perhaps build upon a variety of aspects associated with a complex problem. Thus, in recommending that intuition be applied as a way to 'synthesize' information that has already been gathered and analyzed, Agor (1986) appears to be addressing the type of intuition referred to here as 'creative'. Dijksterhuis and Nordgren (2006) advocate a similar role for intuition (i.e. as a synthesizing form of cognition) and suggest that the effectiveness of such intuitions is likely to vary with the amount of analytical information gathering as well as the length of the incubation period that occurred preceding the emergence of the intuition.

Taken together, we speculate that individuals may benefit from intuition both before and after engaging in analysis. The key to making sense of the multitude of prescriptions on this issue is to understand which type of intuition one is considering. Future research should seek to validate and extend upon these conjectures to better orient our understanding of when, in the course of the decision-making process, individuals should use their intuitions.

To close this subsection, we recognize that we have for the sake of parsimony limited our discussion of future research thus far to the three questions we used to organize the conceptual portion of our chapter. However, researchers also need to ask new questions, and therefore explore even more unchartered territory. For example, research on intuitions has largely been at the individual level. Much less attention has been paid to how individuals within problem-solving groups may come to combine their intuitions to make decisions. Similarly, given that moral intuitions are culturally bound (Haidt and Kesebir, 2008), it would be interesting to see how multicultural groups process moral issues. These new questions may entail developing new methods – such as observational and other qualitative methods. It is to such methodological issues that we now turn.

Measuring Intuition

As we have discussed, there is little consensus regarding how intuitions are captured methodologically. At some level, this is not surprising. Some methods are aimed at assessing specific types of intuitions (e.g. problem-solving or moral). Some are concerned with how intuitions are processed (e.g. neurological approaches), while others are more concerned with outcomes in the form of intuitive judgments (e.g. direct instruction). Hence, one might expect that different methods will reflect the different aims of researchers. However, a common issue to most of the measurement methods we have reviewed is the question of whether intuition is really occurring at all. With the possible exception of neurological and physiological methods, our measures are, at best, indirect. Of course, this criticism can be leveled against many psychological measures.

Given the paucity of research addressing the methodological issues involved in capturing intuition, several avenues of inquiry remain open. For example,

work needs to be undertaken to assess the validity and reliability of the various measures currently in use. Moreover, it would be interesting to use multiple measurements within single studies or across sequences of studies in order to assess the degree to which they result in similar sets of findings. In so doing, it would be especially interesting to compare intuition measurements aimed at specific types of intuition to see if there is an empirical basis for the tripartite distinction we have enumerated in this chapter.

Another potentially fruitful avenue for research would entail considering new combinations of the approaches summarized in Table 1.2. For example, would using direct instruction rather than visual images (e.g. abandoned children living on the streets) trigger activation of the neural mechanisms implicated in the operation of intuitive systems? Might it be possible to verify retrospective accounts of intuition using neurological and physiological tests? Ideally, findings obtained through advances in physiological and neurological measures of intuition will converge with those obtained by means of conventional self-report, interview, and observational measures.

Finally, we encourage researchers to continue to craft new measures and methods for capturing intuition. In particular, an examination of Table 1.1 reveals a need for additional measures of creative intuition. Moreover, moral intuition researchers might borrow from research on affect priming, or research in neurophysiology that uses visual images, as opposed to relying exclusively on scenarios to trigger moral intuitions.

CONCLUSION

We are heartened that scholars operating in fields within or related to industrial and organizational psychology have increasingly taken up the 'nonconscious' torch and used it to illuminate understanding of a variety of work-related phenomena. The recent rise in research concerning the role of intuition in effective problem-solving, moral judgments, and creativity illustrate the diversity of these efforts. Our review suggests that although intuition research has converged on some key definitional issues, further conceptual development is certainly needed for the field to maintain its momentum. While we focused here on whether there are different types of intuition, it should be noted that scholars have only recently begun to agree on a scientific conceptualization of the construct. There is perhaps room for additional work on what intuition is at a general level, as well as whether there are various types of intuition in the more specific senses explored herein. Equally critical, our review suggests that empirical research on intuition remains largely fragmented in terms of how intuition is measured. Further work is thus necessary to better understand the most effective approaches for capturing intuition empirically. We thus appeal for more research that clarifies and assesses intuitive processes and outcomes.

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