CHAPTER 23

Visual versus Verbal Thinking and Dual-Process Moral Cognition

Elinor Amit, Sara Gottlieb, and Joshua D. Greene

Moral judgments are not produced by a unified "moral faculty." Instead, they are influenced by a combination of automatic emotional responses and controlled cognitive processes with distinctive cognitive profiles (Cushman, Young, & Hauser, 2006; Greene, Morelli, Lowenberg, Nystrom, & Cohen, 2008; Moore, Clark, & Kane, 2008; Paxton, Ungar, & Greene, 2011) and neural substrates (Greene, Sommerville, Nystrom, Darley, & Cohen, 2001; Greene, Nystrom, Engell, Darley, & Cohen, 2004; Mendez, Anderson, & Shapira, 2005; Koenigs et al., 2007; Ciaramelli, Muccioli, Ladavas, & Di Pellegrino, 2007). This dual-process framework (Shiffrin & Schneider, 1977; Sloman, 1996; Loewenstein, 1996; Chaiken & Trope, 1999; Metcalfe & Mischel, 1999; Lieberman, Gaunt, Gilbert, & Trope, 2002; Stanovich & West, 2000; Kahneman, 2003, 2011) answers some questions while raising many others, including the following: What triggers the automatic emotional responses that influence our moral judgments? What accounts for the variability in these "gut reactions," both from person to person and situation to situation? Parallel questions arise concerning the influence of controlled cognition on moral judgment. In this chapter, we address these questions, focusing on the role of domain-general cognitive processes. More specifically, we consider the respective influences of *visual* and *verbal* thinking on moral judgment.

First, we briefly review the most relevant literature on automatic versus controlled processes in moral judgment and decision making. Next, we discuss the distinctive features of visual versus verbal processing, then present a set of related hypotheses concerning the respective influences of visual and verbal thinking on moral judgment, followed by evidence indicating a special connection between visual imagery and deontological moral judgment. We also consider a possible relationship between visual and verbal cognition on the one hand, and the primary and secondary emotion distinction on the other. Finally, we conclude with some speculative thoughts concerning the relationships among the various cognitive distinctions discussed in this chapter.

MORAL DILEMMAS AND DUAL-PROCESS MORAL COGNITION

We and others have used moral dilemmas in experiments aimed at breaking moral judgment down into component processes. (Early examples include Greene et al., 2001, 2004, 2008; Mendez et al., 2005; Koenigs et al., 2007; Ciaramelli et al., 2007; Cushman et al., 2006. Earlier work examined

moral dilemmas, but without a dual-process framework: Petrinovich, O'Neill, & Jorgensen, 1993, Mikhail, 2000). This is a useful strategy given that moral dilemmas tend to erupt at the fault lines between competing cognitive processes (Cushman & Greene, 2012). On a philosophical level, these dilemmas capture the pervasive tension between the rights of the individual and the greater good (Greene, 2007; Paxton, Bruni, & Greene, 2013). On a cognitive level, they reveal the dual-process structure of moral cognition. For example, in the classic *footbridge* dilemma (Thomson, 1985), one can save five lives by pushing an innocent person into the path of a runaway trolley. Here, *deontological* judgments favoring the rights of the individual ("It's wrong to push the man, even if it saves more lives") are preferentially supported by automatic emotional responses (Greene et al., 2001; Mendez et al., 2005; Koenigs et al., 2007; Ciaramelli et al., 2007), while *utilitarian* (or *consequentialist*) judgments favoring the greater good ("Better to push and save more lives") are preferentially supported by controlled cognitive processes (Greene et al., 2004, 2008).

Before moving on, we wish to clarify our use of the potentially misleading word *cognitive*. It sometimes refers to a class of psychological processes to be contrasted with more emotional or affective processes, as in the journal *Social Cognitive and Affective Neuroscience*. At other times, *cognitive* refers more broadly to psychological process that may be characterized in terms of information processing (i.e., all psychological processes), as in the journal *Trends in Cognitive Sciences*, which covers research in all areas of psychology including emotion/affect. Emotions are "cognitive" in the second sense but not the first. Here we avoid the more narrow use of *cognitive,* which we regard as a relic from a time when psychologists failed to appreciate the information-processing nature of emotions. When we wish to distinguish automatic emotional responses from the more controlled processes on the opposite side of our dual-process framework, we refer to the latter as *controlled* processes or *controlled cognitive* processes, with no implication that emotions are not "cognitive" in the broader, information-processing sense. Likewise, we recognize that not all automatic processes are emotional, as in, for example, early visual processing.

The distinction between automatic and controlled processes is familiar enough, but it is used by different researchers to contrast different clusters of characteristics. Along with the core automatic–controlled distinction, researchers often distinguish between processes that are fast versus slow, unconscious versus conscious, implicit versus explicit, effortless versus effortful, intuitive versus reflective, more emotional versus less emotional, and those that require minimal versus substantial use of central cognitive resources (Evans, 2008; Kahneman, 2003). In the context of moral judgment, we believe that all of these distinctions apply, but with some caveats. In our view—indeed, in any sensible view of moral psychology—automatic and controlled processes interact, which makes teasing apart their respective contributions challenging. Controlled, conscious, reflective processes may bring to light new information (e.g., through explicit reasoning) or highlight old information (e.g., through heightened attention or willful acts of imagination). These private mental acts may then trigger automatic emotional responses. For example, one might respond to an imagined scene much as one would respond to the scene itself. But in the case of the imagined scene the response is triggered automatically by an endogenous controlled cognitive process rather than by an external stimulus. (See Cushman, Gray, Gaffey, & Mendes, 2012, described below.) Having had such a response, one might become consciously aware of the response, if not the complete chain of cognitive events that triggered it. One might reflect on that response, deliberate about it, and ultimately override its action tendency. Thus, when it comes to complex judgments and decisions, it may be rare for a behavioral response to be purely automatic, and it may be impossible for a behavioral response to be purely controlled: Controlled cognitive processes must have something more automatic on which to operate (Miller & Cohen, 2001). Nevertheless, it may be possible to identify distinctive influences of automatic and controlled processes on moral judgment, as we explain below.

Initial evidence for our dual-process theory of moral judgment came from functional

magnetic resonance imaging (fMRI) studies demonstrating the engagement of brain regions associated with emotion and social cognition in response to "personal" dilemmas such as the footbridge case (Greene et al., 2001, 2004; Schaich Borg, Hynes, Van Horn, Grafton, & Sinnott-Armstrong, 2006). These regions include the ventromedial prefrontal cortex (vmPFC) and the amygdala. A study of patients with frontotemporal dementia (FTD), which produces "emotional blunting," provided more direct causal evidence for the connection between emotional responses and deontological judgment (Mendez et al., 2005). Here, patients with FTD, relative to control subjects/patients, were three times more likely to favor pushing the man off the footbridge in the name of the greater good. Subsequent studies examining patients with vmPFC damage underscored this point, showing that patients with such emotion-related damage make more utilitarian judgments (Koenigs et al., 2007; Ciaramelli et al., 2007; Moretto, Ladavas, Mattioli, & di Pellegrino, 2010; Thomas, Croft, & Tranel, 2011). Likewise, a positive emotion induction can increase utilitarian judgment, counteracting the negative emotional response to pushing the man (Valedesolo & DeSteno, 2006), though this does not work for all positive emotions (Strohminger, Lewis, & Meyer, 2011). Other studies have linked deontological judgment to heightened physiological responses (Moretto et al., 2010; Navarrete, McDonald, Mott, & Asher, 2012, Cushman et al., 2012) and normal conscious access to one's emotional states, as compared to individuals with degrees of alexithymia (Koven, 2011). On a molecular level, deontological judgment is increased by citalopram, a selective serotonin reuptake inhibitor (SSRI) that, in the short-term, heightens certain kinds of emotional responses by increasing the availability of serotonin (Crockett, Clark, Hauser, & Robbins, 2010). Conversely, deontological judgment can be reduced by the anti-anxiety drug lorazepam (Perkins et al., 2012).

On the other side of the dual-process equation, many studies associate utilitarian judgments favoring the greater good with the engagement of controlled cognition. Brain regions associated with cognitive control, most notably parts of dorsolateral PFC, exhibit increased activity when people make utilitarian judgments (Greene et al., 2004). More recent behavioral studies implicate controlled cognition by showing that cognitive load selectively interferes with utilitarian judgment (Greene et al., 2008, Trémolière, Neys, & Bonnefon, 2012), that utilitarian judgment increases with deliberation time (Suter & Hertwig, 2011), and that utilitarian judgment can be increased by inducing a more reflective mindset (Paxton et al., 2011). Other correlational studies associate utilitarian judgment with increased "need for cognition" (Bartels, 2008) and (for some instances of utilitarian judgment) working memory capacity (Moore et al., 2008). Some have argued that utilitarian judgments in response to moral dilemmas reflect an absence of concern about doing harm rather than a moral concern for the greater good. Most notably, Bartels and Pizzaro (2011) found that utilitarian judgments are positively related to various antisocial personality characteristics, including psychopathy and Machiavellianism. However, more recent evidence (Conway & Gawronski, 2013) generated using the "process dissociation" procedure (Jacoby, 1991) casts doubt on this view by distinguishing lack of concern about harming people (what one might call "un-deontology") from positive utilitarian moral concerns. Conway and Gawronski (2013) show that deontological and utilitarian motivations are distinct moral motivations with distinct cognitive profiles, consistent with the dual-process theory described earlier: Subjects with stronger deontological inclinations tend to be higher in empathic concern, and deontological inclinations are selectively increased by an empathy manipulation. In contrast, subjects with stronger utilitarian inclinations tend to be higher in "need for cognition" (Cacioppo & Petty, 1982), and utilitarian inclinations are selectively decreased by cognitive load.

THE NOT SPECIFICALLY MORAL DOMAIN

For centuries philosophers and folk psychologists have referred to a "moral sense" or "moral faculty," an idea that retains proponents today (Mikhail 2000, 2011; Hauser, 2006). As noted earlier, a strong form of

psychological faculty for morality has been ruled out, as moral judgment involves the operations of distinct and often competing cognitive systems. The mere "involvement" of diverse cognitive systems does not, by itself, challenge the idea of a core "moral faculty." People who respond to moral questions must, at the very least, rely on auditory or visual cognition to receive information about the question at hand. Likewise, moral judges must use their capacities for language, memory, motor responding, and so forth, in familiar and routine ways. But the dual-process theory outlined earlier poses a deeper challenge to theories positing a unified moral faculty. If we are correct, it is not just that multiple systems are "involved." Instead, different cognitive systems underwrite different kinds of moral values. In other words, moral cognition is fractured in a deep way.

Much of the idea of a "moral faculty" might be retained if these distinct cognitive systems were dedicated specifically to moral judgment, but we have already seen evidence that they are not. For example, we know that various forms of cognitive load interfere specifically with utilitarian moral judgment (Greene et al., 2008; Trémolière et al., 2012; Conway & Gawronski, 2013). The concurrent tasks used in these load paradigms have nothing to do with morality (e.g., hitting a button when a certain number appears) Thus, these cognitive load experiments show that moral judgment depends, at least to some extent, on domain-general processing. More to the point, these studies show that *specific kinds* of moral judgment *depend preferentially* on domain-general processing. In other words, the role that controlled cognition plays in moral judgment is not merely like the role that auditory processing plays in hearing about moral dilemmas.

We have seen similar evidence on the emotional side. Once again, positive emotions (more specifically, "mirth") can have a distinctive influence on moral judgment (Valdesolo & DeSteno, 2006), indicating that moral emotions exist in an affective space that is shared with emotional responses that are not naturally regarded as "moral." This should come as no surprise given that moral considerations must be weighed against other considerations that are not necessarily moral, a capability that would appear to require a "common currency" for moral and nonmoral values (Chib, Rangel, Shimojo, & O'Doherty, 2009). The most direct evidence for this idea comes from Shenhav and Greene (2010), who conducted an fMRI study in which they varied the magnitude and probability of morally salient outcomes. For example, abandoning one drowning person might enable one to save five others with a probability of 50%, or 20 others with a probability of 40%, and so on. They provided evidence that moral judgments such as these rely on domain-general valuation mechanisms, ones that also represent and integrate information about probability and magnitude in nonmoral contexts, such as self-interested economic decision making (Knutson, Taylor, Kaufman, Peterson, & Glover, 2005). Thus, core representations of value in moral judgment are probably not representations of *moral* value per se, but simply value in a more generic sense. Furthermore, it seems that emotional responses, such as the negative response to pushing the man off the footbridge, depend in surprising ways on how our brains represent actions: People are more likely to approve of using a person as a trolley-stopper if, instead of pushing the man directly off the footbridge, one hits a switch that drops him through a trap door (Cushman et al., 2006; Greene et al., 2009).

The foregoing discussion indicates that a lot of moral thinking is not specifically moral thinking: Moral judgment depends in substantive ways on cognitive systems that perform rather general (not specifically moral) functions. This naturally prompts the question: What other kinds of not specifically moral thinking have distinctive influences on moral judgment? Here we consider the respective contributions of *visual* and *verbal* thinking to moral judgment. We begin with a discussion of distinctive features of visual and verbal thinking.

THE ADAPTIVE DESIGN OF INFORMATION PROCESSING: VISUAL VERSUS VERBAL

Pictures are concrete representations that in nearly all cases[1] physically resemble their referent objects. They are *analog* representations (Goodman, 1976). In contrast, words

in nearly all cases[2] represent more abstractly and bear more arbitrary relations to their referents. Words are *digital* representations that comprise a finite set of discrete units.

Words typically correspond to categories and refer to a broad range of concrete objects (Glaser, 1992; Paivio, 1986). Consider, for example, visual and verbal representations of a chair or the concept "chair." A picture of a chair will typically represent some specific chair, with a specific number of legs, adjoined at specific angles, etc. But the word *chair* is far more general.There is effectively an infinite number of ways in which one can draw a chair, or even a kitchen chair, or a red kitchen chair with four legs. Words are, once again, more abstract.

One of the most influential theories concerning differences in the processing of pictures and words is the dual-coding theory (DCT, Paivio, 1986). According to DCT, there are two separate representation systems. One is specialized for representing information conveyed by spatial, nonverbal stimuli, and the other is specialized for representing information conveyed verbally. Words are initially represented by the verbal system, and scenes and pictures are initially represented by the nonverbal or imagery system. In subsequent processing, each stimulus can be coded by the other system as well—hence the possibility of dual coding. The theory does not posit mutually exclusive processing of words and pictures: Each stimulus can be encoded and processed by each of the two systems. The major explanatory variable in the theory is the imaginability of the input. Pictures are readily imaginable. Concrete words are also easily imaginable; therefore, such words are likely to be encoded by the image system as well as the verbal system. In contrast, abstract words are likely to be encoded by the verbal system only. This difference explains the superiority in memory of concrete over abstract words, and, often, of pictures over words.

The concrete–abstract distinction in dual coding theory is relevant, but, in our view, it does not map perfectly onto the distinction between pictures and words. According to DCT, in principle, words can be as concrete as pictures (although pictures cannot be as abstract as some words). When concreteness (or abstractness) is comparable, processing is comparable according to dual coding theory. In our view, words are always more abstract than pictures; therefore, we expect to see some reliable differences between them. Concrete words, such as the word *table*, and pictures, such as an outline drawing of a table, are close relatives in dual coding theory. Both stimuli are dual-coded by both systems. Consequently, comparable performance is expected with such stimuli. In our view, there is an inevitable difference in concreteness–abstractness between the word *table* and the picture of a table, even though both items are highly imaginable. The reason is that the word *table* encompasses a larger category (innumerable individual tables), while a picture of a table represents a specific table. As a result, pictures are categorized better than words (including concrete, readily imaginable words), are less potent primes, are rendered less accurate by incidental changes, and impart a sense of proximity. All of these features go beyond those posited by the dual coding theory.

Amit, Algom, and Trope (2009) have related this difference in abstractness between visual and verbal representations to another important cognitive dimension, that of *psychological distance* (Trope & Liberman, 2010). They hypothesize that people preferentially represent items that are psychologically proximal (either spatially, temporally, or socially) in visual format and preferentially represent psychologically distal items in verbal format. This preference exists in two ways: as a tendency to represent some items visually and other items verbally, and as a processing advantage when items are represented in the preferred manner. This medium–distance hypothesis builds on construal-level theory (CLT; Trope & Liberman, 2010), according to which people prefer to represent information more abstractly when they are more distant from the target of thought.

There are two accounts for this medium–distance association. The first account is *functional*: Because words are relatively abstract, they capture the essential properties of an item, those that are likely to remain constant across changes in location, or context more generally. For example, a chair's visual appearance varies depending on lighting, the angle from which it is viewed, and whether or not it has been repainted. Yet it remains the same chair, and, conveniently,

may be referred to by the same word, *chair,* or by the same phrase, "Dana's favorite chair." After the chair is repainted, the picture may be out of date, but the word applies as well as ever. The second account of the medium–distance association is *perceptual*: Pictures are subject to perceptual analyses akin to those performed on the objects themselves (Glaser, 1992; Stenberg, 2006; see also, DeLoache, Pierroutsakos, Uttal, Rosengren, & Gottlieb, 1998; DeLoache, Pierroutsakos, & Uttal, 2003). For the most part (e.g., outside of astronomy), perception occurs only in the presence of the perceived object. Without the object present, there is nothing for photons to bounce off of, nothing to emit pressure waves or airborne molecules, and therefore nothing to impinge on our sensory surfaces and engage our perceptual faculties. Perception, then, presupposes proximity. And because pictures are perceived more or less as objects are perceived, they, too, convey a feeling of proximity. Words, in contrast, need not convey proximity. On the contrary, one of the most useful aspects of language is that it allows us to communicate and think about things that are not present. Thus, visual perceptions present objects as "here and now," whether or not they are, while words specialize in conveying information across space and time.

Thus, two related rationales—one functional and the other perceptual—invite the hypothesis that visual representations are associated with proximity, while verbal representations are associated with distance.

Recent research supports this medium–distance hypothesis (Amit, Algom, & Trope, 2009). In one experiment, participants viewed two items (e.g., an apple, a chair) either verbally or pictorially, and in apparently "distal" and "proximal" locations within a depth illusion. As predicted, participants were faster to identify pictures of objects when they were near rather than distant, but they were faster to identify words denoting those objects when they were distant rather than near. Other experiments that manipulated temporal distance (using ancient vs. modern objects; e.g., a cart vs. a car) and social distance (using domestic vs. foreign objects; e.g., a dollar vs. a euro) found similar results. Furthermore, the same pattern of results was obtained with other cognitive tasks, such as speeded categorization, selective attention (Amit, Algom, & Trope, 2009), and memory (Amit, Rim, Halbeisen, Algom, & Trope, in preparation; Amit, Algom, Trope, & Liberman, 2008). Here, we hypothesize that the association between medium (visual vs. verbal) and distance has implications for emotional responses and evaluations. Our theory begins with the idea that proximal objects–events tend to be more emotionally salient. This principle makes functional sense. Emotions are ultimately for *doing*, not just feeling, and events that are "here and now" are more likely to require an immediate response. For example, Mobbs et al. (2007) found that as a threat becomes spatially closer, brain activity shifts from the vmPFC to the periaqueductal gray, indicating a shift from general evaluative representation ("common currency") to preparation for defensive behavior. A further step connects visual representation to emotion by way of proximity: If you hear the word *lion,* you may need to act, but you may also simply be overhearing an idle conversation about lions. In contrast, if you see a lion, the odds that you need to act, or at least be on guard, are much higher. (Of course, you could be at the zoo. But zoos are recent inventions, unlike conversations.)

This argument is consistent with Kensinger and Schacter's (2006) account of the difference between pictures and words in eliciting emotional reactions, with corresponding lateralization in the amygdala.

> The specificity of the right-amygdala response (to pictures and not to words) and the generality of the left-amygdala response (to both stimulus types) may reflect their respective roles in automatic processing (perhaps more likely to occur for pictures than for words) versus elaborative, associative, or conceptual processing (which may occur for both pictures and words . . .). The latter interpretation would be consistent with recent evidence indicating that left-lateralized amygdala activity tends to be elicited across a wider range of tasks than is right-lateralized amygdala activity. (p. 121).

Consistent with this dissociation, other research indicates that visual representations, as compared to verbal representations, are more emotionally salient (Holmes & Mathews, 2005; Holmes, Mathews, Dalgleish, & Mackintosh, 2006; Holmes, Mathews, Mackintosh, & Dalgleish, 2008;

Kensinger & Schacter, 2006; De Houwer & Hermans, 1994). For example, Holmes and Mathews (2005) asked participants to read ambiguous event descriptions that were eventually resolved in a negative direction. They were asked either to imagine the situation or to focus on the meaning of the words. Holmes and Matthews found that state anxiety increased significantly over time for those in the group given imagery instructions, but not for those asked to focus on the verbal meaning. Similarly, in another study, Holmes et al. (2008), presented picture–caption pairs to participants and instructed them to produce either an image or a verbal sentence, and to integrate each picture with its caption (experimental blocks alternated between negative or benign meaning combinations). Compared with the verbal condition, state anxiety scores in the imagery group increased more across negative combination blocks, but decreased across benign blocks. Reported liking for pictures, when displayed alone at the beginning and end of the experiment, decreased for pictures that had been in negative (rather than benign) combinations, and this difference was significantly greater in the imagery group. Finally, De Houwer and Hermans (1994) used a word–picture affective Stroop task and found that emotional pictures, but not words, produced interference effects. Furthermore, naming times were shorter for negative pictures, but not for negative words. The authors concluded that pictures have privileged access to emotional information. This makes sense from an evolutionary perspective given that visual information has been triggering emotional responses for millions of years, while language is a relatively recent evolutionary development.

In summary, there is evidence that visual representations, relative to verbal representations, are more emotionally salient. This may be because things that are perceived visually—especially historically, but also today—are more likely to be "here and now" and to demand an immediate response. In contrast, verbal representations appear to have a "comparative advantage" when it comes to representing things that are distal and more abstract, and are therefore less likely to demand an immediate response.

VISUAL THINKING, VERBAL THINKING, AND MORAL JUDGMENT: SOME CONVERGENT HYPOTHESES

We may now integrate the foregoing discussion of dual-process moral cognition with the foregoing discussion of visual and verbal cognition. Putting these together suggests the following line of reasoning: If deontological moral judgments are preferentially supported by emotional responses, and visual imagery facilitates emotional responses, then perhaps visual imagery preferentially supports deontological judgments. Likewise, if utilitarian judgments are preferentially supported by less emotional forms of thinking, and if verbal processing facilitates responses that are less emotional (more abstract, distanced), then perhaps verbal processing may preferentially support utilitarian judgments.

These hypotheses are, in fact, also suggested by a related line of reasoning, emanating from cognitive neuroscience: Many of the brain regions most consistently engaged by moral judgment (Greene et al., 2001; Greene, 2009) are part of the "default network" (Gusnard & Raichle, 2001). According to one theory of default network function (Buckner, Andrews-Hanna, & Schacter, 2008), it is responsible for generating mental simulations of events that are not "here and now," such as events that are in the past, in the future, or in the minds of others. In light of this, one might suppose that moral dilemmas (and especially those that are most emotionally engaging) elicit increased activity in the default network as people imagine the events described in the dilemma, events such as a runaway trolley headed toward five innocent people and oneself reluctantly pushing an innocent person in front of that trolley in the hope of stopping it. Moreover, one might suppose that such mental simulations trigger emotional responses that guide moral judgments, such as the judgment that it is wrong to push the man off the footbridge. Finally, one might suppose that such simulations are in part *sensory* simulations, complete with visual imagery, and that this imagery plays a key role in triggering the aforementioned emotional responses.

If we are correct, such responses are not necessarily triggered by mental stimulations. On the contrary, insofar as mental simula-

tions of events are emotionally salient, it is because the events themselves are, or would be, even more emotionally salient. This hypothesis is supported by recent work by Cushman et al. (2012), who took physiological recordings from subjects while they physically simulated violent actions in the lab (e.g., smashing someone's realistic-looking false leg with a hammer). Subjects experienced heightened physiological responses (peripheral vasoconstriction) when performing these pseudoviolent actions, as compared to performing physically similar actions that are not pseudoviolent (e.g., hammering a nail), and to observing others perform the same pseudoviolent actions. Critically, for our present purposes, the strength of these physiological responses was positively correlated with deontological responses to hypothetical moral dilemmas, suggesting that emotional responses to mentally simulated violence are related to emotional responses to actual violence. (This assumes, of course, that Cushman et al.'s physical simulations of violence produce reactions similar to those produced by actual violence. See also experiments combining virtual reality and physiological recordings; Navarrete et al., 2012).

Yet another rationale for this hypothesis follows from CLT (Liberman & Trope, 2008; Trope & Liberman, 2010). Once again, according to CLT, objects and events may be represented (construed) at multiple levels of abstraction. (See also action identification theory; Vallacher & Wegner, 1985). High-level construals are relatively abstract, reflecting overarching goals ("I'm moving to a new house"). Low-level construals, in contrast, are relatively concrete, reflecting the means employed to achieve overarching goals ("I'm loading boxes into a truck"). If, as suggested earlier, words are more abstract representations than pictures, then words and pictures may respectively map onto high and low levels of construal (Amit, Algom, & Trope, 2009; Amit, Algom, Trope, & Liberman, 2009). Indeed, the former researchers have shown that verbal representations facilitate more abstract, high-level construals, while visual representations facilitate more concrete, low-level construals. For example, participants in one experiment organized items associated with a camping trip into groups. In one condition, the items were presented as words. In the other condition, they were presented as pictures. When the items were presented as words, participants grouped them into a smaller number of more abstract categories. When the items were presented as pictures, participants grouped them into a larger number of more concrete categories.

Notably, utilitarian judgments give precedence to ends ("Better to save more lives . . . "). Deontological judgments, in contrast, famously give precedence to concerns about means ("But it's simply wrong to kill an innocent person, even for a good cause"). This suggests that utilitarian judgments may be facilitated by high-level construals, while deontological judgments may be facilitated by low-level construals.

Putting the foregoing ideas together suggests yet another line of reasoning that leads to our central prediction: Visual imagery is inherently concrete, depicting specific objects, actions, and other events. When one visualizes a purposeful action, the means employed to achieve the desired end will most likely be visualized in a concrete way. For example, if one visualizes someone baking bread, one is very likely to visualize the tools used to bake the bread (rolling pin, oven, etc.). Thus, we hypothesize that visual imagery naturally facilitates low-level construals of actions, whereby the means to the end of the action is represented as a concrete chain of physical events. And, thus, by highlighting the concrete means by which ends are achieved, visual imagery facilitates deontological moral judgments (at least in contexts in which the harmful action is a means to a greater good, as in the case of pushing the man off the footbridge). Along parallel lines, we hypothesize that verbal processing facilitates more abstract representations, and that these more abstract representations promote higher-level construals that emphasize the ends to be achieved over the means used to achieve them. Thus, according to this hypothesis, verbal thinking will facilitate utilitarian judgment.

Thus, we have three related rationales—from dual-process moral cognition, from the cognitive neuroscience of the default network, and from CLT—all pointing toward the same hypotheses: Visual thinking facilitates deontological moral judgment, and verbal thinking facilitates utilitarian judgment.

VISUAL IMAGERY AND MORAL JUDGMENT: EVIDENCE

We have conducted three experiments that test these ideas (Amit & Greene, 2012). In the first of these, we employed a measure of visual versus verbal cognitive style adapted from Kraemer, Rosenberg, and Thompson-Schill (2009). Subjects completed two matched working memory tasks, one visual and the other verbal. In the visual version, subjects saw a target shape, then had to identify one of two subsequently presented shapes as having more attributes in common with the target. In the verbal version, the visual attributes were replaced by words (e.g., *striped, red*). The visual and verbal tasks were matched for difficulty. Our index of cognitive style (visual vs. verbal) was the difference in accuracy between the visual and verbal versions of the working memory task. After completing the memory tasks, subjects responded to a set of moral dilemmas, including the footbridge dilemma, along with other, similar "high-conflict personal" dilemmas (Koenigs et al., 2007) in which one can kill one person in order to save the lives of several others. As predicted, we found that participants with relatively higher visual scores, indicating a more visual cognitive style, made more deontological judgments. That is, they were less approving of violating the rights of one person in order to produce a greater good for others.

In our second experiment we used an experimental manipulation to test for a causal relationship between cognitive style and moral judgment. In each experimental trial, the participant read a moral dilemma and deliberated while engaging in a 2-back working memory task (Kirchner, 1958). In the visual version, subjects saw a series of shapes (e.g., triangle, circle) and were asked to indicate by button press whether the present shape was identical to the shape presented two items previously. In the verbal version, visual shapes were replaced by words naming shapes. Thus, subjects were exposed to either visual interference or verbal interference while making moral judgments. We also included a no-interference control condition. As predicted, visual interference made judgments more utilitarian, both in comparison to verbal interference and no interference. Given what we know about the role of emotion in deontological judgment (discussed earlier), this suggests that visual imagery plays a role in triggering the emotional responses that drive deontological judgments. We note that we did not observe a parallel effect with verbal interference. That is, verbal interference did not decrease utilitarian judgment, despite our prediction, and despite the fact that other forms of cognitive load have this effect (Greene et al., 2008, Trémolière et al., 2012).

A third experiment examined more closely the contents of these morally salient visualizations. A natural hypothesis is that visual imagery preferentially supports deontological judgment, because people tend to visualize the harm caused as a means more than harm to be avoided as an end. For example, in the footbridge dilemma, people tend to visualize the harm to the person who is pushed more than they visualize the harm that will befall the five other people if nothing is done. We tested this hypothesis using self-reports concerning the contents of people's visual imagery. In a between-subjects design, people responded to either the footbridge dilemma or the trolley dilemma, in which one can save the five other people by turning the trolley onto a side track, killing one person instead. In these two dilemmas, the consequences are identical but the nature of the action is different. In the footbridge case, the harm is causally necessary to achieve the goal (a means to an end), while the harm is incidental (a side effect) in the trolley dilemma. These dilemmas also differ in whether the agent applies "personal force" to the victim (Greene et al., 2009), essentially the difference between directly pushing the victim or harming the victim in a more indirect, mechanically mediated way, such as hitting a switch (see also Royzman & Baron, 2002; Cushman et al., 2006; and Moore et al., 2008). As predicted, people responding to the footbridge dilemma reported more vividly imaging the person to be sacrificed, as compared to the five to be saved. We saw no such effect for the trolley case, and this difference in who gets visualized partially mediated the relationship between dilemma and judgment. In summary, it seems that we say "no" to pushing the man off the footbridge (at least partly), because we tend to

visualize this violent event more than other morally consequential events, and because we tend to respond emotionally to that visualization. Convergent evidence comes from Conway and Gawronski (2013), who show that presenting visual displays of the potential victims in such dilemmas selectively enhances deontological inclinations.

VISUAL VERSUS VERBAL THINKING AND PRIMARY VERSUS SECONDARY EMOTIONS

Many researchers distinguish between *primary emotions* (e.g., anger and happiness) and *secondary emotions* (e.g., shame and pride). Primary emotions are thought of as being discrete and evolutionarily conserved, as relatively independent of cultural influence, as requiring less conceptual cognition, as having relatively short typical duration, and as evoking universally recognized facial expressions (Demoulin & Teixeira, 2010, Ekman, Friesen, & Ellsworth, 1972). Secondary emotions, in contrast, are thought of as being uniquely human (Gaunt, Leyens, & Demoulin, 2002; Leyens et al., 2001), as involving complex conceptual cognition, as having relatively long typical durations, and as being less readily observable (Demoulin et al., 2004). Some theorists have characterized secondary emotions as "self-conscious" (Tracy, Robins, & Tangney, 2007) or "moral" emotions (Haidt, 2003).

To summarize the previous points in a rough (and somewhat contentious) way, the primary emotions are thought to be more "primitive." One can say with more precision and confidence that vision is more primitive than language: Our ancestors have been seeing for hundreds of millions of years, whereas language is a relatively recent evolutionary development. If vision and primary emotion are both more primitive, operating in tandem for many millions of years, one might suppose further that there are more direct connections between visual processing and primary emotion. Likewise, one might suppose that secondary emotions are more dependent on language. Here we wish to be clear: We are by no means denying that visual thinking can cause secondary emotion. Nor are we claiming that verbal thinking cannot cause primary emotion. Our more modest hypothesis is that there may yet be a tighter relationship between visual thinking and primary emotion on the one hand, and between verbal thinking and secondary emotion on the other.

Preliminary data support this hypothesis. In one experiment (Amit, Chakroff, & Greene, in preparation), we had participants think about times when they experienced either primary or secondary emotions. At the same time, participants performed a 2-back visual or verbal working memory task, similar to the one used in the interference experiment described earlier. We found that performance on the visual task was worse when people recalled experiencing a primary emotion and that performance on the verbal task was worse when people recalled experiencing a secondary emotion. This pattern of interference is consistent with the idea that visual thinking preferentially supports the experience of primary emotion, while verbal thinking preferentially supports the experience of secondary emotions.[3]

If these preliminary data hold, they may have interesting implications for our understanding of emotion particularly and of complex, multimodal cognition more generally. First, they would provide further evidence for the controversial distinction between primary and secondary emotions. Second, the tendency to think more visually than verbally, and vice versa, may explain variation among emotional responses across individuals and situations. For example, some clinical disorders, such as phobia of spiders (which are concrete targets), seem to be more closely related to primary emotions, whereas others, such as generalized anxiety disorder (which has no specific, concrete target), seem to be more closely related to secondary emotions. If there is a preferential connection between visual cognition and primary emotions, or a preferential connection between verbal cognition and secondary emotions, understanding these connections may prove useful in understanding the causes of these disorders and possible avenues for treatment. Finally, one might wonder about the connection between visual processing and deontological judgment in light of the previous discussion of primary versus secondary emotions. This discussion suggests that deontological judg-

ments may be preferentially supported by one or more primary emotions. However, it is not clear which primary emotion or emotions would be involved. Fear? Disgust? Or perhaps such judgments are driven by emotions that are in some ways like primary emotions but less well understood. This is an interesting avenue for future research.

CONCLUDING THOUGHTS

Dual-process theories are both powerful and pervasive, making sense of a wide range of phenomena in social judgment and decision making. In particular, the dual-process framework has deepened our understanding of moral psychology and provided a bridge between moral psychology and cognitive neuroscience. But this framework leaves open many questions, including the causes and representational nature of the automatic and controlled processes that (typically) put the "dual" in dual process. Here, we have attempted to integrate several widely used cognitive distinctions: deontological versus utilitarian, concrete versus abstract, proximal versus distal, visual versus verbal, and primary versus secondary. Construal level theory (Trope & Liberman, 2010) connects the abstract–concrete distinction to the proximal–distal distinction. Research by Amit (Amit, Algom, & Trope, 2009; Amit, Wakslak, & Trope, 2013) connects these two distinctions to the visual–verbal distinction. Research we have done together (Amit & Greene, 2012) connects the visual–verbal distinction to the deontological–utilitarian distinction, a connection suggested in at least two distinct ways: (1) Deontological judgments and visual representations both tend to be more emotional (perhaps specifically primary emotions); (2) deontological judgments are focused on means rather than ends, suggesting a low level of construal, which is associated with psychological proximity, which is associated with visual representation. Our research (Amit et al., in preparation) also (tentatively) connects the visual–verbal distinction to the distinction between primary and secondary emotions. As noted earlier, some or all of the distinctions may have analogs in the domain of neural mechanisms (e.g., default network vs. other large-scale networks) and evolutionary history (ancient widespread adaptations vs. recent and uniquely human adaptations).

Thus, we have in this chapter attempted to connect many dots. We acknowledge that the connections we have drawn do not yet form a clear picture, but we nevertheless strongly suspect that these connections are not random. If forced to identify a central node in this conceptual network, we would put our finger on the abstract–concrete distinction: Over evolutionary time, our brains evolved the capacity for increasingly abstract representation. In the moral domain, this enables us to judge actions by their consequences ("How many lives were saved?"), which may vary dramatically from context to context, rather than by observable features of the acts themselves ("Does it involve intentional pushing?"). Abstraction allows us to think about things that are far away in space and in time (next year's trip to London), glossing over unknown or irrelevant details (the outbound flight number). Likewise, abstraction allows us to set and pursue high-level goals (visiting London), independent of the specific concrete means that we may use to achieve them (taking Flight 228 to Heathrow). Abstraction allows us to represent things as good or bad, not merely because of their immediate value ("Tasty food makes me feel happy") but because of the value they take on in their social contexts ("Providing food for others makes me feel pride"). And words enable us to represent abstract concepts that can be represented imperfectly, or perhaps not at all, with visual (or otherwise sensory) representations. In light of the previous discussion, one might think that there is a deep connection between our capacity for abstraction and our capacity for dual-process cognition, and perhaps that is true. However, we suspect that there is no simple mapping here. In particular, some automatic processing seems to involve representations that are very abstract, such as the mathematical intuitions of mathematicians or, more prosaically, the use of abstract social categories to make dispositional attributions (Nussbaum, Trope, & Liberman, 2003). Thus, many puzzles remain concerning the relationships among abstract versus concrete thinking, visual versus verbal thinking, and the two sides of dual-process cognition. We hope that this discussion has provided some useful clues.

NOTES

1. Exceptions include abstract art.
2. Exceptions include onomatopoeia.
3. We emphasize that these data are preliminary. We had also predicted that the visual memory task would decrease intensity ratings for the recalled primary emotion and that the verbal task would decrease intensity ratings for the recalled secondary emotion. Neither of these predictions held. We are in the process of attempting to replicate the results described here to understand why some of our predicted results have held but others have not.

REFERENCES

Amit, E., Algom, D., & Trope, Y. (2009). Distance-dependent processing of pictures and words. *Journal of Experimental Psychology: General*, *138*, 400–415.

Amit, E., Algom, D., Trope, Y., & Liberman, N. (2008). "Thou shalt not make unto thee any graven image": The distance-dependence of representation. In K. D. Markman, W. M. P. Klein, & J. A. Suhr (Eds.), *The handbook of imagination and mental simulation* (pp. 53–68). New York: Psychology Press.

Amit, E., Chakroff, A., & Greene, J. D. (in preparation). *Primary and secondary emotions rely on visual and verbal processing.*

Amit, E., & Greene, J. D. (2012). You see, the ends don't justify the means: Visual imagery and moral judgment. *Psychological Science*, *23*(8), 861–868.

Amit, E., Rim, S., Halbeisen, G., Algom, D., & Trope, Y. (in preparation). *Distance-dependent memory for pictures and words.*

Amit, E., Wakslak, C., & Trope, Y. (2013). The use of visual and verbal means of communication across psychological distance. *Personality and Social Psychology Bulletin*, *39*(1), 43–56.

Bartels, D. (2008). Principled moral sentiment and the flexibility of moral judgment and decision making. *Cognition*, 108, 381–417.

Bartels, D. M., & Pizarro, D. A. (2011). The mismeasure of morals: Antisocial personality traits predict utilitarian responses to moral dilemmas. *Cognition*, *121*(1), 154–161.

Buckner, R. L., Andrews-Hanna, J. R., & Schacter, D. L. (2008). The brain's default network. *Annals of the New York Academy of Sciences*, *1124*(1), 1–38.

Cacioppo, J. T., & Petty, R. E. (1982). The need for cognition. *Journal of Personality and Social Psychology*, *42*(1), 116–131.

Chaiken, S., & Trope, Y. (Eds.). (1999). *Dual-process theories in social psychology.* New York: Guilford Press.

Chib, V. S., Rangel, A., Shimojo, S., & O'Doherty, J. P. (2009). Evidence for a common representation of decision values for dissimilar goods in human ventromedial prefrontal cortex. *Journal of Neuroscience, 29*(39), 12315–12320.

Ciaramelli, E., Muccioli, M., Ladavas, E., & di Pellegrino, G. (2007). Selective deficit in personal moral judgment following damage to ventromedial prefrontal cortex. *Social Cognitive and Affective Neuroscience*, *2*, 84–92.

Conway, P., & Gawronski, B. (2013). Deontological and utilitarian inclinations in moral decision making: A process dissociation approach. *Journal of Personality and Social Psychology, 104*(2), 216–235.

Crockett, M. J., Clark, L., Hauser, M. D., & Robbins, T. W. (2010). Reply to Harris and Chan: Moral judgment is more than rational deliberation. *Proceedings of the National Academy of Sciences USA*, *107*(50), 184.

Cushman, F., Gray, K., Gaffey, A., & Mendes, W. B. (2012). Simulating murder: The aversion to harmful action. *Emotion*, *12*(1), 2–7.

Cushman, F. A., & Greene, J. D. (2012). Finding faults: How moral dilemmas reveal cognitive structure. *Social Neuroscience, 7*(3), 269–279.

Cushman, F. A., Young, L., & Hauser, M. D. (2006). The role of reasoning and intuition in moral judgments: Testing three principles of harm. *Psychological Science, 17*(12), 1082–1089.

De Houwer, J., & Hermans, D. (1994). Differences in the affective processing of words and pictures. *Cognition and Emotion*, *8*, 1–20.

DeLoache, J. S., Pierroutsakos, S. L., & Uttal, D. H. (2003). The origins of pictorial competence. *Current Directions in Psychological Science, 12,* 114–118.

DeLoache, J. S., Pierroutsakos, S. L., Uttal, D. H., Rosengren, K. S., & Gottlieb, A. (1998). Grasping the nature of pictures. *Psychological Science, 9,* 205–210.

Demoulin, S., Leyens, J. P., Paladino, M. P., Rodriguez-Torres, R., Rodriguez-Perez, A., & Dovidio, J. (2004). Dimensions of "uniquely" and "non-uniquely" human emotions. *Cognition and Emotion*, *18*(1), 71–96.

Demoulin, S., & Teixeira, C. P. (2010). Social categorization in interpersonal negotiation:

How social structural factors shape negotiations. *Group Processes and Intergroup Relations*, *13*(6), 765–777.

Ekman, P., Friesen, W. V., & Ellsworth, P. (1972). *Emotion in the human face: Guidelines for research and an integration of findings*. Oxford, UK: Pergamon Press.

Evans, J. S. B. (2008). Dual-processing accounts of reasoning, judgment, and social cognition. *Annual Review of Psychology*, *59*, 255–278.

Gaunt, R., Leyens, J. P., & Demoulin, S. (2002). Intergroup relations and the attribution of emotions: Control over memory for secondary emotions associated with the ingroup and outgroup. *Journal of Experimental Social Psychology*, *38*(5), 508–514.

Glaser, W. R. (1992). Picture naming. *Cognition, 42,* 61–105.

Goodman, N. (1976). *Languages of art: An approach to a theory of symbols*. Cambridge, MA: Hackett.

Greene, J. D. (2007). The secret joke of Kant's soul. In W. Sinnott-Armstrong (Ed.), *Moral psychology: Vol. 3. The neuroscience of morality*: *emotion, disease, and development* (pp. 59–66). Cambridge, MA: MIT Press.

Greene, J. D., Cushman, F. A., Stewart, L. E., Lowenberg, K., Nystrom, L. E., & Cohen, J. D. (2009). Pushing moral buttons: The interaction between personal force and intention in moral judgment. *Cognition*, *111*(3), 364–371.

Greene, J. D., Morelli, S. A., Lowenberg, K., Nystrom, L. E., & Cohen, J. D. (2008). Cognitive load selectively interferes with utilitarian moral judgment. *Cognition*, *107,* 1144–1154.

Greene, J. D., Nystrom, L. E., Engell, A. D., Darley, J. M., & Cohen, J. D. (2004). The neural bases of cognitive conflict and control in moral judgment. *Neuron*, *44,* 389–400.

Greene, J. D., Sommerville, R. B., Nystrom, L. E., Darley, J. M., & Cohen, J. D. (2001). An fMRI investigation of emotional engagement in moral judgment. *Science*, *293,* 2105–2108.

Gusnard, D. A., & Raichle, M. E. (2001). Searching for a baseline: Functional imaging and the resting human brain. *Nature Reviews Neuroscience*, *2*(10), 685–694.

Haidt, J. (2003). The moral emotions. In R. J. Davidson, K. R. Scherer, & H. H. Goldsmith (Eds.), *Handbook of affective sciences* (pp. 852–870). New York: Oxford University Press.

Hauser, M. D. (2006). The liver and the moral organ. *Social Cognitive and Affective Neuroscience*, *1*(3), 214–220.

Holmes, E. A., & Mathews, A. (2005). Mental imagery and emotion: A special relationship? *Emotion*, *5*, 489–497.

Holmes, E. A., Mathews, A., Dalgleish, T., & Mackintosh, B. (2006). Positive interpretation training: Effects of mental imagery versus verbal training on positive mood. *Behavior Therapy*, *37*(3), 237–247.

Holmes, E. A., Mathews, A., Mackintosh, B., & Dalgleish, T. (2008). The causal effect of mental imagery on emotion assessed using picture–word cues. *Emotion*, *8*, 395–409.

Jacoby, L. L. (1991). A process dissociation framework: Separating automatic from intentional uses of memory. *Journal of Memory and Language*, *30*(5), 513–541.

Kahneman, D. (2003). A perspective on judgment and choice: Mapping bounded rationality. *American Psychology, 58*, 697–720.

Kahneman, D. (2011). *Thinking fast and slow.* New York: Farrar, Straus & Giroux.

Kensinger, E. A., & Schacter, D. L. (2006). Processing emotional pictures and words: Effects of valence and arousal. *Cognitive, Affective, and Behavioral Neuroscience*, *6*, 110–126.

Kirchner, W. K. (1958). Age differences in short-term retention of rapidly changing information. *Journal of Experimental Psychology*, *55*, 352–358.

Knutson, B., Taylor, J., Kaufman, M., Peterson, R., & Glover, G. (2005). Distributed neural representation of expected value. *Journal of Neuroscience*, *25*(19), 4806–4812.

Koenigs, M., Young, L., Adolphs, R., Tranel, D., Cushman, F., Hauser, M., et al. (2007). Damage to the prefrontal cortex increases utilitarian moral judgments. *Nature*, *446*, 908–911.

Koven, N. S. (2011). Specificity of meta-emotion effects on moral decision-making. *Emotion, 11*(5), 1255–1261.

Kraemer, D. J., Rosenberg, L. M., & Thompson-Schill, S. L. (2009). The neural correlates of visual and verbal cognitive styles. *Journal of Neuroscience*, *29*(12), 3792–3798.

Leyens, J. P., Rodriguez-Perez, A., Rodriguez-Torres, R., Gaunt, R., Paladino, M. P., Vaes, J., et al. (2001). Psychological essentialism and the differential attribution of uniquely human emotions to ingroups and outgroups. *European Journal of Social Psychology*, *31*(4), 395–411.

Liberman, N., & Trope, Y. (2008). The psychology of transcending the here and now. *Science*, *322*, 1201–1205.

Lieberman, M. D., Gaunt, R., Gilbert, D. T., & Trope, Y. (2002). Reflection and reflexion: A social cognitive neuroscience approach to attributional interference. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (pp. 199–249). San Diego: Academic Press.

Loewenstein, G. (1996). Out of control: Visceral influences on behavior. *Organizational Behavior and Human Decision Processes, 65*(3), 272–292.

Mendez, M. F., Anderson, E., & Shapira, J. S. (2005). An investigation of moral judgment in frontotemporal dementia. *Cognitive and Behavioral Neurology*, *18*, 193–197.

Metcalfe, J., & Mischel, W. (1999). A hot/cool-system analysis of delay of gratification: Dynamics of willpower. *Psychological Review, 106,* 3–19.

Mikhail, J. (2000). *Rawls' linguistic analogy: A study of the "generative grammar" model of moral theory described by John Rawls in* A Theory of Justice. Unpublished doctoral dissertation, Cornell University, Ithaca, NY.

Mikhail, J. (2011). *Elements of moral cognition: Rawls' linguistic analogy and the cognitive science of moral and legal judgment*. Cambridge, UK: Cambridge University Press.

Miller, E. K., & Cohen, J. D. (2001). An integrative theory of prefrontal cortex function. *Annual Review of Neuroscience*, *24*(1), 167–202.

Mobbs, D., Petrovic, P., Marchant, J. L., Hassabis, D., Weiskopf, N., Seymour, B., et al. (2007). When fear is near: Threat imminence elicits prefrontal-periaqueductal gray shifts in humans. *Science*, *317*(5841), 1079–1083.

Moore, A., Clark, B., & Kane, M. (2008). Who shalt not kill?: Individual differences in working memory capacity, executive control, and moral judgment. *Psychological Science, 19*(6), 549–557.

Moretto, G., Ladavas, E., Mattioli, F., & di Pellegrino, G. (2010). A psychophysiological investigation of moral judgment after ventromedial prefrontal damage. *Journal of Cognitive Neuroscience, 22,* 1888–1899.

Navarrete, C. D., McDonald, M. M., Mott, M. L., & Asher, B. (2012). Virtual morality: Emotion and action in a simulated three-dimensional "trolley problem." *Emotion, 12*(2), 364–370.

Nussbaum, S., Trope, Y., & Liberman, N. (2003). Creeping dispositionism: The temporal dynamics of behavior prediction. *Journal of Personality and Social Psychology*, *84*(3), 485–497.

Paivio, A. (1986). *Mental representations*. New York: Oxford University Press.

Paxton, J. M., Bruni, T., & Greene, J. D. (2013). Are "counter-intuitive" deontological judgments really counter-intuitive?: An empirical reply to Kahane et al. (2012). *Social Cognitive and Affective Neuroscience*, *102*.

Paxton, J. M., Ungar, L., & Greene, J. D. (2011). Reflection and reasoning in moral judgment. *Cognitive Science, 36*(1), 163–177.

Perkins, A. M., Leonard, A. M., Weaver, K., Dalton, J. A., Mehta, M. A., Kumari, V., et al. (2012). A dose of ruthlessness: Interpersonal moral judgment is hardened by the anti-anxiety drug lorazepam. *Journal of Experimental Psychology: General, 142*(3), 612–620.

Petrinovich, L., O'Neill, P., & Jorgensen, M. (1993). An empirical study of moral intuitions: Toward and evolutionary ethics. *Journal of Personality and Social Psychology*, *64*(3), 467–478.

Royzman, E. B., & Baron, J. (2002). The preference for indirect harm. *Social Justice Research, 15,* 165–184.

Schaich Borg, J., Hynes, C., Van Horn, J., Grafton, S., & Sinnott-Armstrong, W. (2006). Consequences, action, and intention as factors in moral judgments: An fMRI investigation. *Journal of Cognitive Neuroscience,18*(5), 803–817.

Shenhav, A., & Greene, J. D. (2010). Moral judgments recruit domain-general valuation mechanisms to integrate representations of probability and magnitude. *Neuron*, *67,* 667–677.

Shiffrin, R. M. & Schneider, W. (1977). Controlled and automatic human information processing: Perceptual learning, automatic attending, and a general theory. *Psychological Review*, *84*(2), 127–190.

Sloman, S. A. (1996). The empirical case for two systems of reasoning. *Psychological Bulletin, 119,* 3–22.

Stanovich, K. E., & West, R. F. (2000). Individual differences in reasoning: Implications for the rationality debate. *Behavioral and Brain Sciences*, *23,* 645–665.

Stenberg, G. (2006). Conceptual and perceptual factors in the picture superiority effect. *European Journal of Cognitive Psychology, 18,* 813–847.

Strohminger, N., Lewis, R. L., & Meyer, D. E. (2011). Divergent effects of different positive emotions on moral judgment. *Cognition*, *119*(2), 295–300.

Suter, R. S., & Hertwig, R. (2011). Time and moral judgment. *Cognition*, *119*(3), 454–458.

Tangney, J. P., & Fischer, K. W. (1995). *Self-conscious emotions: The psychology of shame, guilt, embarrassment, and pride*. New York: Guilford Press.

Thomas, B. C., Croft, K. E., & Tranel, D.(2011). Harming kin to save strangers: Further evidence for abnormally utilitarian moral judgments after ventromedial prefrontal damage. *Journal of Cognitive Neuroscience, 23*(9), 2186–2196.

Thomson, J. (1985). The trolley problem. *Yale Law Journal*, *94*, 1395–1415.

Tracy, J. L., Robins, R. W., & Tangney, J. P. (Eds.). (2007). *The self-conscious emotions: Theory and research*. New York: Guilford Press.

Trémolière, B., Neys, W. D., & Bonnefon, J. F. (2012). Mortality salience and morality: Thinking about death makes people less utilitarian. *Cognition*, *124*(3), 379–384.

Trope, Y., & Liberman, N. (2010). Construal level theory of psychological distance. *Psychological Review*, *117*, 440–463.

Valdesolo, P., & DeSteno, D. (2006). Manipulations of emotional context shape moral judgment. *Psychological Science*, *17*(6), 476–477.

Vallacher, R., & Wegner, D. M. (1985). *A theory of action identification*. Hillsdale, NJ: Erlbaum.