MORAL JUDGMENT COMPETENCE

A re-evaluation of the Dual Aspect Theory based on recent neuroscientific research

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Abstract

Developments in cognitive neuroscience are providing powerful tools to investigate which processes are involved when people make moral judgments. Recent neuroimaging studies have identified a functional network of brain regions that contribute to both emotional and cognitive information processing. After reviewing these studies and some methodological issues, I will present a neuroimaging study investigating the neural correlates of individual differences in moral judgment competence. This study shows that neural activity in the right dorsolateral prefrontal cortex was inversely correlated with moral judgment competence during a simple moral judgment task. My article, thus, provides neuroscientific support for the Dual Aspect Theory by Lind. This theory suggests that morality can be considered in terms of an ability to apply certain moral orientations in a consistent and differentiated manner in varying social situations.

Acknowledgment

I thank S. Myrda for encouragement, useful comments and discussions on earlier versions of this manuscript.

Moral judgment is defined as the evaluation of one's own or someone else's behavior with respect to social norms and values considered to be virtuous by a culture or subculture, such as not stealing or being an honest citizen (definition adapted from Haidt, 2001, p. 817) [1].

Judging whether actions are good or bad (or rather, harmful for individuals or the society as a whole) is very central to everyday social life because it guides people's behavior in a community. Therefore, exploring how humans think about "right" and "wrong" has been a recurring interest over the centuries in many disciplines including philosophy, arts, religion, or law studies (cf., Goodenough & Prehn, 2004; Prehn & Heekeren, 2009). Since the advent of new neuroscientific methods, questions about how moral judgments are made and which processes are involved has also triggered much research in cognitive neuroscience. Key issues comprise the question to what extent the processes involved are open to conscious deliberation and whether our moral sense is a product of education (i.e., the acquisition of knowledge on social norms and values) or rather a result of innate mechanisms activated during childhood. In particular, the issue whether moral judgments are caused by emotional or cognitive processes and whether emotional responses make moral judgments better or worse has caused much controversy and debate.

[1]For the sake of simplicity, I will not distinguish here between dilemmatic moral judgment (i.e., choosing the lesser of two evils) and moral decision making or socio-normative judgment (terms that refer to more simple tasks like the making of a decision whether a presented behavior is violating a social norm or not) and will use these terms synonymously. I will also not distinguish between moral and socio-conventional judgments. In the literature (e.g., Blair, 1995; Nichols, 2002; Turiel, 1983), this distinction is used to differentiate cases where harm is caused to a person (= moral transgressions) from cases where only socio-conventional norms are violated (= conventional transgressions) without necessarily causing harm (e.g., spitting in a glass of vine at a dinner party).

In the following, I will first give a brief overview of current psychological models on morality (1.). Second, I will introduce the neuroscientific approach to the study of morality (2.), and finally, I will present my own work comprising a neuroimaging study on moral judgment using Prof. Lind's concept of moral judgment competence.

1. Psychological models on moral judgment

Psychological research on moral judgment has long been dominated by a developmental approach, investigating the maturation of moral reasoning and its underlying moral orientations and principles (Kohlberg, 1969; Piaget, 1965).

In his empirical studies, Lawrence Kohlberg presented child and adolescent participants with moral dilemmas and asked the participants to argue why it could be justified to chose a certain action. In one of his best known dilemmas, for instance, a man has to decide if he should break into a drugstore to steal a medicine that would save the life of his dying wife. Based on how children and adolescents argued, Kohlberg established his widely cited *six-stage model of the cognitive development of moral reasoning*. Humans progress, he stated, through these six stages as their cognitive abilities mature and get to a more sophisticated understanding of social relationships. For instance, it is suggested that people on higher stages of moral reasoning come to see situations not only from their own perspective but also from the perspectives of all the other people involved in the conflict. Finally, moral reasoning is assumed to be based on abstract and universal principles of justice, on the reciprocity and equality of human rights, and on respect for the dignity of human beings as individual persons (Kohlberg, 1969).

The relevance of this theory can be seen in the idea that morality does not only rely on the acquisition of social knowledge and moral values, but also on the way individuals understand

and think about social situations. This way qualitatively changes as a result of an active interaction of the individual and his or her social environment. Additionally, Kohlberg defined morality for the first time in terms of an ability, as “the capacity to make decisions and judgments which are moral (i.e., based on internal moral principles) and to act in accordance with such judgments” (Kohlberg, 1964, p. 425).

More recent theories and models question the assumption that moral judgment is primarily reached by rational reasoning and emphasize the role of intuitive feelings as well as automatic emotional responses (e.g., Blair, 1995; Haidt, 2001, 2003, 2007; Hauser, 2006; Huebner, Dwyer, & Hauser, 2009; Mikhail, 2007).

The *social intuitionist model* by Haidt (2001), for instance, posits that fast and automatic intuitions (like gut feelings or aesthetic judgments) are the primary source of moral judgments, whereas conscious deliberations are only used to construct post hoc justifications for judgments that have already occurred. Moral intuition is defined as the sudden appearance of a moral judgment in consciousness including a strong affective valence (good vs. bad, like vs. dislike). This would mean that rational reasoning is less relevant to moral judgment and behavior than Kohlberg's theory suggests and implies that people often make moral judgments without weighing concerns such as fairness, law, human rights and abstract ethical values. Haidt describes the minor role of rational reasoning in moral judgment provocatively as the “rational tail of the emotional dog” and provided some striking examples of “moral dumbfounding” in which participants were unable to generate adequate reasons for an intuitively given moral judgment. When presented with the case of consensual sex between adult siblings, for instance, almost everyone reports a strong emotional response and a feeling that it is wrong, even though he or she cannot articulate reasons for this opinion.

While most people commonly agree upon moral orientations and intuitions that are held to be virtuous in their culture or subculture, it seems evident that some people sometimes are *not able* to decide or behave accordingly. Referring to Kohlberg's notion of morality as an ability, Lind defines morality in a different theoretical framework as consisting of two inseparable, yet distinguishable aspects: a) a person's *moral orientations and principles* and b) a person's *competence* to act accordingly. Following this Dual Aspect Theory, moral judgment competence is the ability to apply certain moral orientations in a consistent and differentiated manner in varying social situations. Thus, social norms and values represented as affect-laden moral orientations are linked by means of moral judgment competence with everyday behavior and decision making (Lind, 2008).

2. The neuroscientific approach investigating moral judgment

In recent years, cognitive neuroscientists have taken great advantage of methods that make it possible to identify and image brain regions associated with certain tasks (e.g., judging a behavior in terms of being good or bad), for instance, by using functional magnetic resonance imaging (fMRI).

FMRI was first used in humans in 1991 (Belliveau et al., 1991). It measures cerebral changes of local hemoglobin oxygenation in response to a certain task. The execution of a task, such as deciding whether a presented behavior is violating a social norm, leads to increased neuronal activity in some brain regions preoccupied with processing of this task. Increased neuronal activity is accompanied by a depolarization of neuron membrane potentials. Maintaining and re-establishing these potentials in groups of neurons requires an increased supply of energy and oxygen. This, in turn, leads to an increase in blood flow and blood volume in the capillaries of the activated brain tissue (commonly referred to as "neurovascular

coupling") resulting in an increase of oxygenated hemoglobin which overcompensates both the actual supply of oxygen and a concomitant decrease in deoxyhemoglobin concentration in this brain region. The changes of the local blood flow and blood volume and the relative change of deoxyhemoglobin in the blood concentration determine the so-called blood-oxygen dependent (BOLD) signal which can be detected by an MRI scanner with a very powerful magnet (1.5 or 3.0 Tesla) due to the paramagnetic properties of deoxyhemoglobin.

For a non-specialist faced with imaging data, however, it is important to know that the colorful pictures of brains "lighting up" and showing a map of brain regions activated during a specific task are actually artifacts of extensive analysis and selective presentation. Most fMRI experiments are using subtraction logic pioneered by the Dutch physiologist Donders in reaction time experiments (see Donders, 1969, first published in 1868). This logic relies on the a priori assumption that one (cognitive) process can be added to a pre-existing set of processes without affecting them and asserts that there are no interactions among the different components of a task. Although this assumption has not been validated in any physiological sense (cf., Friston et al., 1996), it is applied due to the fact that during the performance of a complex task (e.g., judging whether a behavior is violating a social norm) many if not all parts of the brain are activated to some degree. A way to identify brain regions which are *specifically* related to the moral judgment process is to compare neural activity during a moral judgment task with neural activity elicited by another judgment task, which shares all sub-processes with the moral judgment task but the moral component. In the laboratory where I conducted my neuroimaging studies (see Prehn et al., 2008), for instance, neural activity during a moral judgment task was compared with activity during a grammatical judgment task (for an example of such a task and material, see **Table 1**). During both tasks, the moral and the grammatical judgment task, participants had to read sentences on a screen, to judge whether the actions described are "correct" or not (morally or grammatically), and then

respond as quickly and correctly with a button press. The grammatical judgment task, here, controls for visual input, language processing, decision making, and motor output.

[Please insert **Table 1** here.]

To be able to interpret a certain pattern of brain activity as a response to a specific task, one also needs very clear hypotheses about the involved mental processes. These can be derived from psychological theories and hypotheses about the underlying neuronal mechanisms, for instance, resulting from lesion data or electrophysiology in monkeys (Henson, 2006).

Moreover, as far as it is known to date, we cannot expect any complex representation such as morality to be located in a specific and distinct brain area (i.e., in "a moral center"). Our current brain model is the interconnected networking model of information processing. Complex tasks, such as judging whether a presented behavior is wrong in regard to social norms or conventions or not, comprise numerous cognitive and emotional processes even when compared with a control task. These are represented by a distributed network of brain regions. Additionally, different complex tasks often show highly overlapping neural networks. For instance -- and in contrast to common belief -- even cognition and emotion are not subserved by separate and independent circuits.

Having these limitations in mind, a number of neuroimaging studies have been conducted in recent years to discover which brain regions contribute to moral judgment. Although these studies used different tasks ranging from simple moral decisions (e.g., Heekeren et al., 2005; Heekeren, Wartenburger, Schmidt, Schwintowski, & Villringer, 2003; Moll et al., 2002; Moll, Eslinger, & Oliveira-Souza, 2001; Moll, de Oliveira-Souza, Bramati, & Grafman, 2002) to complex dilemmatic moral judgments (Greene, Nystrom, Engell, Darley, & Cohen, 2004; Greene, Sommerville, Nystrom, Darley, & Cohen, 2001; Schaich Borg, Hynes, Van Horn, Grafton, & Sinnott-Armstrong, 2006), the results are remarkably consistent and revealed a

functional network of brain regions including the ventromedial prefrontal (VMPFC) and orbitofrontal cortex (OFC), the temporal poles, the amygdala, the posterior cingulate cortex (PCC), and the posterior superior temporal sulcus (PSTS), that is, brain regions which are involved in emotional as well as in cognitive information processing (see **Figure 1** and for reviews and an overview of the possible functions of these brain regions during moral judgment: Casebeer, 2003; Greene & Haidt, 2002; Moll, Zahn, de Oliveira-Souza, Krueger, & Grafman, 2005; Moll, de Oliveira-Souza, & Eslinger, 2003; Prehn & Heekeren, 2009; Young & Koenigs, 2007).

[Please insert **Figure 1** here]

3. An fMRI study investigating individual differences in moral judgment competence

The studies on the neural correlates of moral judgment revealed neural activity in brain regions associated with cognitive and emotional processing, probably both reflecting mental representations of the depicted social situation and social norms retrieved from long-term memory and a comparison process on whether a social norm has been violated or not. However, Lind's Dual Aspect Theory on morality suggests that moral decision making does not only rely on the internalized understanding of social norms that are represented as virtuous moral orientations, but also on the ability to apply them in a consistent and differentiated manner in varying social situations. Relating individual differences in moral judgment competence to brain imaging data, thus, may lead to a more comprehensive understanding of the neural mechanisms involved in moral judgment.

To investigate the neural correlates of moral judgment competence, we scanned 23 female participants while presented with a moral and a grammatical judgment task (see **Table 1**) and

related neural activity during moral judgment contrasted with grammatical judgment with individual scores in moral judgment competence assessed with the Moral Judgment Test (MJT; Lind, 1998; Lind & Wakenut, 1980).

The MJT confronts a participant with two moral dilemmas. After presenting the short dilemma stories, the participant is required to indicate to which degree he or she agrees with the protagonist's solution and is presented with six arguments in support of (pro-arguments) and six arguments rejecting (counter-arguments) it. The participant has to rate these arguments regarding their acceptability on a nine point rating scale ranging from –4 (highly unacceptable) to +4 (highly acceptable). Each argument represents a certain level of moral orientations according to the six Kohlbergian stages. The moral judgment competence score (C-score) is calculated as a person's total response variation concerning the underlying moral orientations of the given arguments. A highly competent person (indicated by a high C-score close to 100) will consistently appreciate all arguments referring to a certain socio-moral perspective, irrespective of whether these arguments are pro- or counter-arguments. In contrast, a person with low moral judgment competence will appreciate all arguments which support his or her own opinion, irrespective of whether these arguments are better or worse[2].

In line with the literature, our sample showed a distinct moral judgment competence; C-scores were normally distributed with a reasonably wide range ($n = 23$, $M = 36.93$, $SD = 16.67$).

[2]To my knowledge, the MJT is the only available test that provides a measure of moral judgment *competence* independently of a person's moral orientation and thus differs from other instruments such as Kohlberg's Moral Judgment Interview (Colby et al., 1987), the Defining Issue Test (Rest, 1974), or the Sociomoral Reflection Measure (Gibbs, Basinger, & Fuller, 1992), which rather assess individual moral attitudes. The MJT has proved to be a valid and reliable psychometric test. Translated in many languages, it also has been successfully used in scientific research (i.e., testing theoretical assumptions on moral development) and in evaluation of educational programs (Lind, 2006; Lind, 2008).

Contrasting activity during moral judgments with grammatical judgments, we found in line with the literature activation in the left VMPFC, the left OFC, the temporal poles, and the left PSTS. Moreover, we provided first evidence that neural activity during moral judgment is modulated by individual differences in moral judgment competence: We found that C-scores correlated with changes in BOLD activity in right dorsolateral prefrontal cortex (DLPFC, see **Figure 2**) during moral judgments contrasted with grammatical judgments. During moral judgments, participants with comparably low moral judgment competence recruited the right DLPFC more than those with greater competence. Additionally, we investigated whether individual differences in moral judgment competence also modulate BOLD activity in the cerebral network engaged in moral judgment. We found no correlation of C-scores and BOLD responses in these regions. However, an additional median split analysis revealed greater activity in the left VMPFC and the left PSTS in participants with comparably low moral judgment competence, specifically during identification of social norm violations (Prehn et al., 2008).

[Please insert **Figure 2** here.]

Finding a specific neural activation reflecting a low moral judgment competence provides strong neuroscientific support for the Dual Aspect Theory by Lind. In the literature, greater neural activity in participants with lower ability in a certain cognitive task has been associated with compensation and an increased recruitment of mental resources (e.g., Rypma et al., 2006). As described earlier, moral judgment competence assessed with the MUT represents the ability to apply individual moral orientations in a consistent and differentiated manner in varying social situations. The increased activity in right DLPFC and left VMPFC/ PSTS in participants with lower competence can thus be interpreted as higher processing demand due to a *controlled application of moral orientations* and an increased involvement of social

cognitive and affective processes (such as mentalizing, estimating the value of possible outcomes of a behavior, and the experience of moral emotions) during the decision-making process (for extended discussion of the results regarding the brain regions involved see Prehn et al., 2008, 2009).

Conclusion

In this article, I took a look at current psychological models on moral judgment from a neuroscientific point of view, specifically introducing neuroimaging as a powerful tool to investigate the underlying decision making processes in the human brain. My primary concern, though, was to show, how the use of existing theoretical models can fruitfully enrich cognitive neuroscience and to advocate well-informed neuroscientific research working in line with current psychological methods and ideas. This approach offers mutual benefits for both areas of research. In particular, the data presented strongly supports Lind's Dual Aspect Theory, suggesting that morality should indeed be considered both as a capacity and in terms of individual differences. Notably, the right DLPFC seems to play a key role in linking moral orientations to everyday decision making and behavior. Thus, the question is not only *which processes* are involved in moral judgment, but also *how competently* a decision maker can integrate emotional responses with rational reasoning processes sensitive to the context of the particular social situation he or she faces (cf., Talmi & Frith, 2007).

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Figure Legends

Figure 1. A neural network involved in moral cognition.

Figure 2. Moral judgment competence reflected in BOLD responses in right DLPFC.

A) Covariation of C-scores with BOLD responses in right DLPFC during moral contrasted with grammatical judgments ($p < .05$, corrected).

B) Upper panel: Negative correlation of C-scores and BOLD responses in right DLPFC during moral judgments [$r = -.45$; $p = .03$; C-scores plotted against BOLD responses in arbitrary units (a.u.) with regression line]. **Lower panel:** No correlation of C-scores and BOLD responses in right DLPFC during grammatical judgments [$r = -.04$; $p = .64$].

Tables and Figures

Table 1. Examples of sentence material used in an fMRI study.

During both tasks (moral and grammatical judgment), the first sentence of a trial introduced the participants to a specific situation. Half of the second sentences contained a violation of a social norm or grammatical rule. After the appearance of the second sentence, participants were instructed to decide whether the action described in the second sentence was a social norm violation or not, or whether the sentence was grammatically correct or incorrect.

First sentence (Intro)		Moral judgment	Grammatical judgment
A uses public transportation.	Non-violation	He looks out of the window.	He looks out of the window.
[A fährt mit der S-Bahn.]		[Er sieht aus dem Fenster.]	[Er sieht aus dem Fenster.]
	Violation	He smashes the window.	He look out of the window.
		[Er wirft das Fenster ein.]	[Er sehen aus dem Fenster.]

Figure 1. A neural network involved in moral judgment.

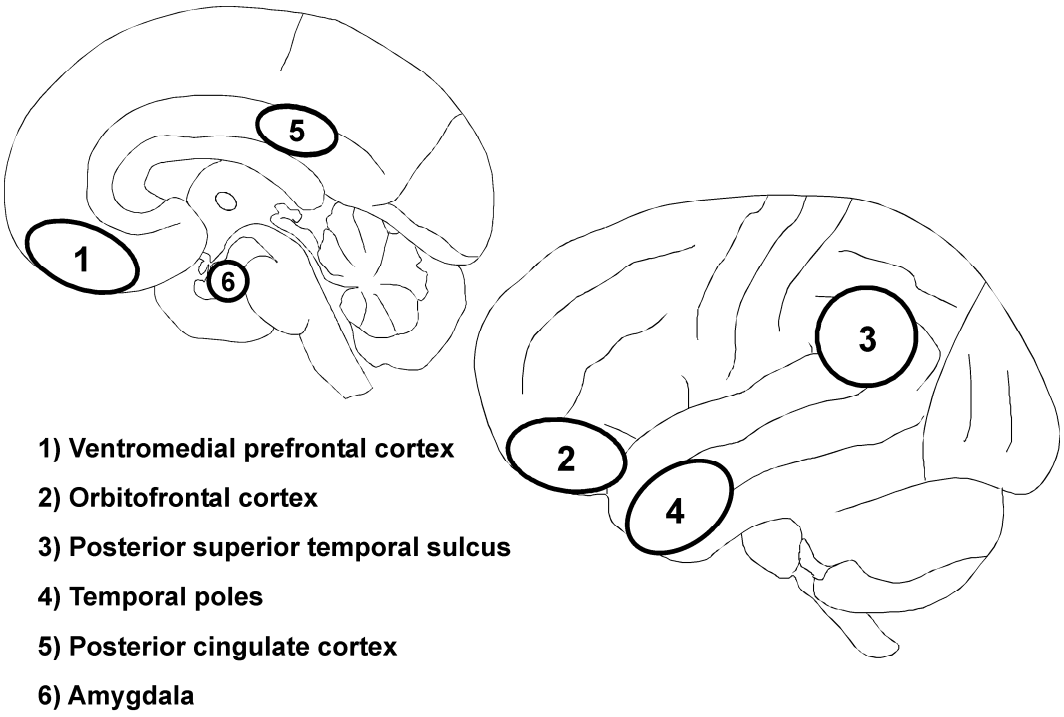

Figure 2. Moral judgment competence reflected in BOLD responses in right DLPFC (see Prehn et al., 2008).