

RETHINKING MORAL JUDGMENT: AFTER DUAL-PROCESS THEORY

JULIA F. CHRISTENSEN

Max Planck Institute for Empirical Aesthetics, GERMANY

julia.christensen@ae.mpg.de

<https://orcid.org/0000-0003-0381-5101>

ANTONI GOMILA

University of the Balearic Islands, SPAIN

antonigomila@gmail.com

<https://orcid.org/0000-0001-7325-961X>

Abstract. The Dual Process Hypothesis of Moral Judgment (DPHMJ) posits that some moral judgments (*deontological* moral judgments) are fast and emotion-based, while others (*utilitarian* moral judgments) are slow, as a result of deliberate reasoning processes. This hypothesis contraposes reason and emotion as the building blocks of our moral judgment. In her books *Braintrust* (2011) and *Conscience* (2020), Patricia Churchland addressed the issue of the neural bases of morality and vindicated the Aristotelian view of virtue ethics against the rule-based view of moral judgment assumed by the DPHMJ. In this paper, we discuss recent evidence obtained in experimental work with moral dilemmas that points in the same direction. Multiple factors influence moral judgments, such as (i) arousal properties of the situation (triggered by who is involved, where it is happening, etc), (ii) the motivational direction of the emotions triggered by the situation (eg withdrawal vs approach), (iii) the associated cognitive appraisal mechanisms (potentially influenced by enculturation and education), and (iv) biological variables such as homeostatic and biochemical states of the body, which are also motivators of behavior. The view of moral judgment that emerges is not one that contraposes reason and emotion, but one in which it is conflict that triggers moral reasoning. In so doing, we follow the naturalistic, neuroscientific, path Patricia Churchland so intensely opened for philosophy by demonstrating its relevance and value.

Keywords: moral judgement • dual process hypothesis • moral dilemmas • Patricia Churchland

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1. Introduction

On the 27th of September 2002, the 11-year-old schoolboy Jacob von Metzler was abducted. The kidnapper, Magnus Gäfgen, demanded 1 million Euros in ransom. Three days after the abduction, the police arrested Mr Gäfgen. However, there was no trace of Jacob. From what they learnt during the endless interrogations, it appeared



obvious that Jacob is hidden somewhere in a wood, alone, without food and water. The risk he might freeze to death was imminent. But Mr Gäfgen refused to cooperate. At this point assistant chief constable Wolfgang Daschner faced a ‘moral dilemma’. After days of feverish search – as a last resort – he gave the order to express a *threat* of torture during the next interrogation of Gäfgen. Criminal high commissioner Ortwin Ennigkeit subsequently threatened Gäfgen verbally in a one-to-one interrogation and obtained the crucial piece of evidence that allowed the agents to find the child. Dead. It turned out Gäfgen had killed the boy on the very day of the abduction. Hopes had been, obviously, that the boy was still alive. Gäfgen reported the threat of torture and the case was brought to court. Daschner and Ennigkeit were found guilty of assault.

Moral dilemmas, such as this one, are situations that rise to a conflict between two reasons for action that pull the individual in opposite directions. Such conflicts may arise because two moral principles of equal value are triggered by the content of the situation, as in the previous story: the policemen wanted to save the kidnapped boy from further harm, and the only way to achieve this was to threaten the kidnapper with torture. At the same time, threat of torture implies harm as well (to the kidnapper). Of course, they were also aware that from the point of view of the legal system of their society, torture (or threat thereof) is illegal. They deliberated for a long time before deciding. Finally, in their decision, the first consideration had more weight than the second, even if implied a legal transgression. The above dilemma is a real-life dilemma, a situation that has indeed happened, as all too often happen for most agents.

Inspired by such real-life dilemmas, moral philosophy has resorted to hypothetical dilemmas, devised as thought experiments (Foot 1967; Thomson 1991; Gomila 1991), as intuition pumps to test our moral intuitions and develop our understanding of morality. While the dilemmatic situations appear sometimes alienated from our experience, they also allow for control of the factors and subtleties that influence our judgmental processes. Therefore, hypothetical dilemmas were a natural starting point for Cognitive Neuroscience to study the neural process underlying moral judgment. Moral dilemmas are now a validated method in Cognitive Neuroscience and related empirical fields to study the neural and psychological mechanisms underlying moral judgment (Christensen et al. 2014; Greene et al. 2002; Greene et al. 2004; Nichols & Mallon 2006). They are short stories that present a “ticking bomb” scenario for which only two action options exist, each supported by a reason or moral principle. The individual is invited to make a choice between these two options (‘moral judgment’), which requires weighting these principles and making a choice of precedence. Thence the difficulty of the choice. In the kidnapping case above the final decision gave precedence to the consideration of saving the child and not to the welfare of the kidnapper, and it was against the wrongness of a torture threat.

However, the initial example of the moral dilemma faced by chief constable Daschner regarding the abduction of Jakob von Metzler illustrates that the contribution of *both* reason and affect to moral judgment is more a question of degree than of nature. The immediate affective reaction people have to this dilemma shows itself independently from the rules and laws there may be in the society concerning the dilemmatic situation and it is something that modulates an individual's judgment about it. This "something" is an affective response that may not necessarily concur with the rationalizations that appeal to norms or laws, and therefore may lead to a conflict in the individual.

Using this dilemma-based methodology, considerable research effort has been undertaken studying all kinds of groups and conditions to find out which factors of a situation trigger what moral intuitions and contribute most decisively to the outcome: the moral judgment the person makes about this situation in the end (Greene, 2013). One particularly influential theory on moral judgment is the Dual Process Hypothesis of Moral Judgment (DPHMJ) (Greene 2005; 2008; Greene & Haidt 2002). This view holds that a moral judgment can be reached through two different psychological processes: one which is fast and "hot", which involves brain circuits of affective processing (such as the ventromedial prefrontal cortex), and which supposedly are responsible for deontic judgments; and another which is slow and "cold", involving cortical areas which are commonly associated with rule-based reasoning processes (such as the dorsolateral prefrontal cortex).

As a matter of fact, some of the most outspoken defenders of this view contend that the second process, for which the moral judgment is the conclusion of a moral reasoning, is superior to the first, and should be given precedence in our moral lives (Greene 2014; Haidt 2007). In so doing, they paradoxically become defenders of consequentialism, a moral theory well-known to be counterintuitive and alien to our human moral experience (Williams 1973). In this paper we don't want to take issue with this move, but rather to challenge the claim that there is sufficient evidence to support the Dual-Process theory. For example, results from our lab (Christensen et al. 2014; Christensen & Gomila 2012) suggest that the involvement of affective circuits may be related, not so much to a distinct kind of judgment, but to the experience of conflict that we face in some variations of the dilemmatic situations.

After introducing the DPHMJ in the next section (section 2), in section 3 we present results which we suggest challenge the assumptions of the DPHMJ. In section 4 we suggest alternative ways to go beyond the Dual Process framework. Finally, section 5 concludes and wraps up the argument.

2. The Dual Process Hypothesis of Moral Judgment

Ever since the beginnings of moral thinking, it has been an issue how moral norms and values are applied to particular cases, and how it is that we feel obliged to follow them. Rationalists view moral judgment as a matter of reasoning and inference, but they have a hard time explaining the motivating power of reason, while they view emotions and affects as potential interference, roadblocks to moral rightness. Sentimentalists, on the contrary, deny that reasons can motivate, and emphasize accordingly that motivation has to be grounded in affect, which is viewed as a source of moral intuition. The Dual Process view of moral judgment is heir to this traditional dualistic thinking.

This contraposition of reason and affect in the discussion of moral judgment has been revived by research in Cognitive Neuroscience in the form of the DPHMJ (Greene 2005; Greene 2013). According to this hypothesis, some moral judgments (such as refraining from harming others in any circumstance; i.e. *deontological* moral judgments) are fast and emotion-based, while others (those that take the overall consequences into account; i.e. *utilitarian* moral judgments) are slow, ie the result of deliberate reasoning processes. Thus, the DPHMJ contraposes reason and emotion as the building blocks of our moral judgment. The novelty is that it is now supposed to be grounded in empirical neuroscientific evidence. In particular, Greene et al. (2002; 2004) described a relation between the dependent variables measured: RT (fast vs. slow), cortical areas (ventromedial vs. prefrontal), and kind of moral judgment (deontological vs. utilitarian). Deontological moral judgments (when a person decides to refrain from harm out of a norm that unconditionally forbids it) are supposedly fast and ‘emotion’-based, while utilitarian moral judgments (when the person decides to commit the harm out of a conviction that the benefits outweigh the costs) are said to be slow and a result of ‘deliberate reasoning processes’.

To test this hypothesis, Greene and colleagues first prepared a large list of dilemmatic situations, each of them presenting two options – whether to do or not an evil to order to produce a lesser evil –, under two conditions: a Personal and an Impersonal one (Greene et al. 2002). This distinction was inspired by the versions of the trolley dilemma found in the philosophical literature, developed as intuition pumps to show the inadequacy of utilitarianism (Foot 1967; Thomson 1976). While in an impersonal version of the dilemma, people tend to accept the utilitarian conclusion that it is correct to kill one to save five, in the personal version – when it is required that the killing be carried out by pushing with one’s hands –, people tend to shy away from the action, just as established by the norm that says that killing is always wrong.

Greene and colleagues found an interaction between the *Type of Response* given (deontological vs. utilitarian) and the *Personal Force* (Personal vs. Impersonal). When harm was consented in a *Personal Moral Dilemma* (utilitarian response), RT was sig-

nificantly longer than when harm was not consented (deontological response). No such difference in response time was found for *Impersonal* Moral Dilemmas. In addition, a higher activation of the ventromedial prefrontal cortex was found in these cases in which the judgment was faster and deontic. Together, this evidence is taken to support such a Dual Process view of moral judgment: personal versions of the dilemmas are more emotional and this makes it fast and intuitive the judgment that causing the harm is not allowed, because a personal involvement in the production of the harm.

It was soon clear that this difference could be explained, not in terms of the emotional arousal induced by the Personal version of the dilemma, but the other factors involved in the description of the situation. Particularly influential was the proposal by Hauser and colleagues (Hauser 2006; Mikhail 2013) of a ‘moral grammar’, conceived as a set of hierarchical rules which focus on the intentions and ways of production of the action. According to this proposal, the different judgments found could be due, not to the personal/impersonal variation, but to the intention of the agent depicted in the dilemma (with participants accepting the harm as a side-effect, for instance, but not as intentionally willed).

However, further evidence was found to support the original dual-process account. Thus, neuropsychological participants with a lesion in the ventromedial prefrontal cortex showed no differential moral judgments to personal and impersonal versions of the dilemmas, and mostly made utilitarian judgments (i.e., that a harm is acceptable if the benefits it gives rise to are sufficiently higher than the costs incurred; Koenigs et al. 2007).

Greene and colleagues have provided further evidential support for their view, using more indirect measures. Thus, for instance, the lab of Greene and colleagues provided two complementary data points that back-up their initial position of a dual system. When participants had to solve a *Cognitive Reasoning Task* (CRT) just before carrying out a moral judgment task, this made their moral judgments more utilitarian (Paxton et al. 2012). This was interpreted as an indicator that utilitarian moral judgments are cognitive and reasoning-based. Subsequently, Amit and Greene (2012) showed how people with a preferentially *visual* cognitive style (that is, a cognitive style based primarily on *visual* imagery, as opposed to a *verbal* cognitive style) made more deontological moral judgments. As visual imagery has been said to strongly engage emotional responses in individuals, the authors concluded from their own data (more deontological moral judgments from individuals with a *visual* cognitive style) that deontological responding is emotion-based. Again from this rationale it could be understood that Greene and colleagues posit a very strongly separated dual system underlying moral judgment (cognition vs. emotion). While Greene et al. (2004, p. 398) conceded that moral judgment may not be the result of a clear-cut dichotomy, but one of a matter of degree, the simplistic contraposition has taken hold in the

literature, as if there were indeed two different independent processes.

In an elegant experiment, Ugazio et al. (2012) provided further evidence against a clear-cut dichotomy, by showing that both deontological *and* utilitarian responding could actually be triggered by *different emotions* with different motivational tendencies. In their study, disgust induction (an emotion that triggers *withdrawal* tendencies) resulted in more deontological moral judgments (i.e. refraining from harm), while anger induction (an emotion that triggers *approach* tendencies) resulted in more utilitarian moral judgments (i.e. committing harm). This finding cannot be explained with a Dual Process account, as it here has been shown that different *emotional* phenomena trigger both deontological *and* utilitarian moral judgment tendencies.

3. Another look at the evidence

While the Dual Process view has become highly influential, there were also discrepant voices in the field. A string of evidence shows that not only the factor personal-impersonal, but also other factors induce systematic variations in people's moral judgment. Importantly, none of these other factors were assessed in the original dilemma set, and when inspected, it can be observed that these variables vary unsystematically across that dilemma set. This may have induced biases in the data. Such other factor is, for example, (i) the intention with which the harm is done, (ii) whether or not the harm is inevitable, and (iii) whether the agent benefits herself from the harm (Borg et al. 2006; Moore et al. 2008). In addition, McGuire et al. (2009) showed in their reanalysis of the data sets by Greene and colleagues, the removal of "poorly endorsed items" – dilemmas that were not designed carefully enough –, the key effect personal/impersonal disappeared from the data.

In our previous work in this area, we reviewed studies that had used the original set of dilemmas prepared by Greene and colleagues (Christensen & Gomila 2012). Subsequently, we modified the original set in order to take into account and control more of these factors known to influence moral judgment. We controlled for intentionality (whether the harm is done intentionally or instrumentally), evitability (whether the harm was avoidable or not), and benefit recipient (whether the target character was to benefit from the harm or not), in addition to the personal-impersonal distinction. This new set of dilemmas was then validated, confirming the sensitivity of the new set to these conceptual factors (Christensen et al. 2014). Eight different versions of dilemma were possible, one for each possible combination of the four factors and their two levels (personal vs impersonal; avoidable vs inevitable; accidental vs instrumental; self-beneficial vs other-beneficial; see Christensen & Gomila 2014, Supplementary Material). Participants were asked to judge the new set of dilemmas

on a 7-point Likert scale, from 1 = “I don’t do it” to 7 = “I do it”. We also recorded the time required to reach this judgment.

With this optimized dilemma set, we failed to find Greene et al.’s key effect, the interaction between *Response Type* (deontic vs. utilitarian) and *Personal Force* (personal vs. impersonal). Contrary to previous findings, we found that participants were faster both when they judged as extremely inappropriate the action under consideration (Likert ratings towards 1), and when they found it highly acceptable (Likert ratings towards 7), while participants were slower when making intermediate moral judgments (Likert ratings around 4). In other words, both clearly deontic and utilitarian judgments were equally fast. Importantly, this relationship was *independent* of whether the dilemma involved personal or impersonal harm. This inverted U-shaped relation is illustrated in Figure 1. The inverted U-shaped relation between reaction time and the extremeness of the moral judgment in our study means that RT is fast when very deontic moral judgments are elicited (in accordance with the Dual Processing approach) *but also* when clearly utilitarian moral judgments are reached (contrary to the Dual Processing account, which would posit that these judgments should be slower due to the increased amount of reasoning involved, particularly when the moral dilemma is a personal one).

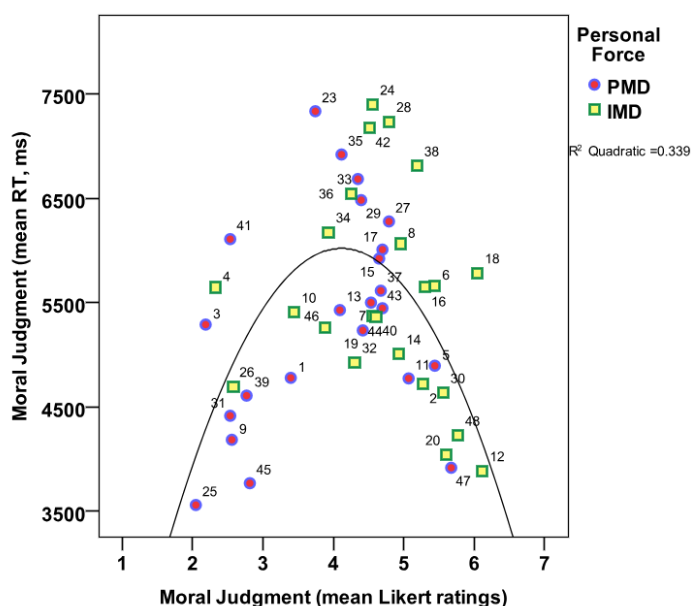


Figure 1: Curvilinear relationship between *Moral Judgment* and RT. Color coding: *Personal Moral Dilemmas* (Blue/Red, circles); *Impersonal Moral Dilemmas* (Green/Yellow, squares). Mean Likert scale responses: 1 = No, I don’t do it, i.e. *deontic* moral judgment; 7 = Yes, I do it, i.e. *utilitarian* moral judgment. RT is in milliseconds (ms). PMD = Personal Moral Dilemmas; IMD = Impersonal Moral Dilemmas. Reproduced with permission (Christensen et al. 2014).

This means that response time does not seem to depend on the way the harm is produced (personal vs impersonal). This is against the contention of the Dual Process theory. There seem to be dilemmas for which people have fast and clear intuitions (which elicit extreme ratings) and other dilemmas (those people judge around '4' on the 7-point scale) for which people require longer to reach a judgment. Which ones are judged faster and which ones require more time is not related to the personal vs impersonal factor, nor to the type of judgment made (deontological versus utilitarian). Both utilitarian and deontic judgments can be fast and slow, and both personal and impersonal conditions can be fast and slow.

This evidence gives rise to the question what – then – triggers these differential reaction times, if it is not about deontic versus utilitarian judgments to personal dilemmas? We asked another group of participants to report the affective arousal and valence they felt while reading each dilemma of our new set (Likert scales were used; valence: 1 = very negative, 7 = very positive; arousal: 1 = low arousal, 7 = high arousal). While all conditions induce strong negative affect, some combinations of the basic factors induced higher levels of arousal than others. Contrary to predictions of the DPHMJ, personal and impersonal moral dilemmas were equally arousal-inducing. Differences in reported arousal were found between dilemmas which were personal, self-beneficial, intentional, and dilemmas which were evitable; and lower for impersonal, inevitable side effect, and other beneficial – the latter receiving lower ratings than the former. The rest of dilemma types ranked in between. In relation to moral judgment and perceived arousal, we found that the more arousing a dilemma was, the more deontological the judgments were (see Figure 2).

This means, on the one hand, that the association between deontological judgments, higher arousal and personal force, claimed by the Dual Process account, does not hold; and on the other, that longer reaction times are better viewed, not as evidence necessarily of reasoning about consequences, but as an indication of conflict, of the difficulty to settle on one of the two options. When this conflict has to do with the higher emotional charge of the situation, because of the combination of factors involved (personal force, but also self-beneficial effect, evitability and intentionality), it is most likely that the judgment will be obviously deontological, thus rejecting the acceptability of the proposed harm. We can say that based on the finding that at the behavioral level, higher arousal correlates with more deontological judgments. This is also in line with research showing this correlation between deontological moral judgment and heightened *objective* arousal (galvanic skin response) (Moretto et al. 2010). On the contrary, when the situation is not arousing, the judgment is likely to be utilitarian.

Thus, longer RT are more likely due to a conflict, triggered the combination of factors in the situation. Importantly, both deontological and utilitarian moral judgments can be fast. The speed probably indicates that the intuition about the dilemma

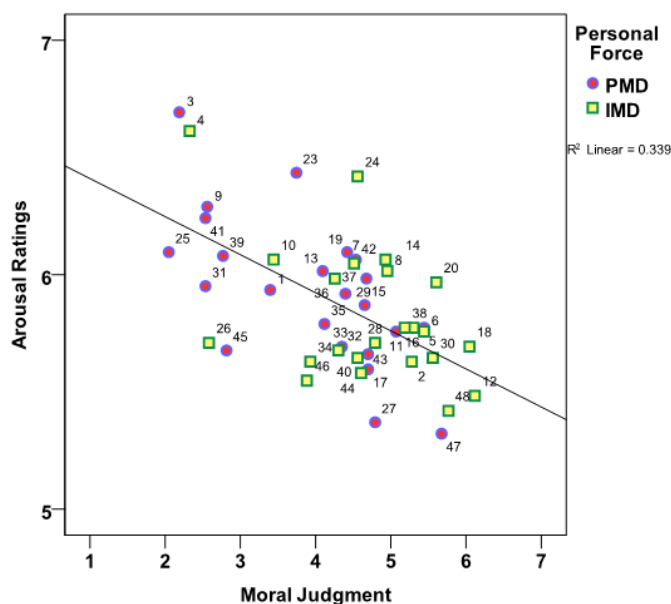


Figure 2: Relationship between level of arousal of a dilemma and the moral judgment made to that dilemma. Color coding: *Personal Moral Dilemmas* (Blue/Red, circles); *Impersonal Moral Dilemmas* (Green/Yellow, squares). Mean Likert scale responses: 1 = No, I don't do it, i.e. *deontological* moral judgment; 7 = Yes, I do it, i.e. *utilitarian* moral judgment. Mean Arousal scale responses: 1 = Not arousing, calm; 7 = Very arousing. The numbers in the graph correspond to the dilemma numbers in the used dilemma set. Reproduced with permission (Christensen et al. 2014).

is clear-cut and does not give rise to a conflict. There is however, no evidence to indicate that fast responses would be less emotion-based.

4. Towards a more sophisticated view of how emotions influence judgment

A part from the two opposing views of reason-based and subjectivist approaches, there is a third option, pioneered by Aristotle's Theory of Virtue, according to which emotions can be rational, and motivate the individual to judge and do good. It is this view that Patricia Churchland has recommended in the books on the neural bases of morality (Churchland 2011; 2020). What follows is our way to unpack this complex view of the continuity of reason and emotion in judgment.

The first thing to notice is that the empirical evidence is certainly congruent with well-known arguments against an algorithmic view of reasoning, according to which a judgment is a rule-based deductive conclusion from universal moral norms and how they are instantiated by the presented situation. The fact that both deontolog-

ical and utilitarian judgments can be reached quickly suggest that moral judgment is not reasoning-based but involves a sort of pattern matching (Thagard 2012). This has led some to propose a heuristics approach to moral judgment. For example, the ADC framework of moral judgment (Dubljevic & Racine 2014) holds that people follow a type of heuristics about the Agents, Deeds and Consequences of a dilemmatic situation in order to make their judgment which is based on their own prior life experience. However, this approach overlooks the affective involvement in moral judgment. The DPHMJ rightly vindicates a role for emotions in moral judgment – a role which needs to be clarified, as its connection with cognitive processes.

Physiologically speaking, ‘emotions’ are arousal states, induced by relevant ‘external’ stimuli in the environment or by ‘internal triggers’ in the individual such as homeostatic states of the body or thoughts with emotional content (James 1896; Lang & Bradley 2010; Levenson 2014; Niedenthal 2007). On a basic level, emotional states are positively or negatively valenced (indicating whether pleasure or displeasure is anticipated), and induce a behavioral motivational tendency to prepare the individual for the optimal behavioral reaction in a given moment (withdraw vs approach) (Lang & Bradley 2010). However, when both options available are equally negative (displeasure), and trigger the behavioral tendency to withdraw (eg from producing harm), the primacy of emotion over cognition or cognition over emotion does not hold as an explanation for people’s choices. Emotions are the conscious qualities of our body’s state and they guide behavior. In what follows we will discuss some affective factors that may modulate people’s choices in a dilemmatic situation.

Emotions we are experiencing are importantly related to the homeostatic needs of the body in a given moment (Levenson 2014). To make clear why this matters, consider the following example. An experiment by Shiv & Fedorikhin (1999) confronted participants with a dilemma to choose healthy vs. “fun” food. They showed that, while there are cognitive aspects involved in the decision, emotional arousal involved, as an indicator of the conflict experienced between blind preference and prudential preference. Interestingly, they found an effect of cognitive load, which suggests that the conflict could be overcome by modifying the relevant information to consider and the current needs experienced. While this is not an instance of a moral judgment, it clearly shows that a single process of decision is taking place, that can be differentially modulated depending on the demands of the tasks and the state of the body, in which cognition and emotion interact differently, sometimes producing easy, quick decisions, sometimes conflict arising.

Participants in this study were offered chocolate cake or fruit salad. When the offer was made to them, half of the participants were additionally involved in a ‘high’ cognitive load task (memorizing 7 digits), while the other half was only memorizing 2 digits (low cognitive load condition). The ‘high cognitive load’ participants chose the chocolate cake, while the ‘low cognitive load’ participants chose the fruit salad. The

result could be interpreted, following a dual-process approach, by saying that when processing resources are limited (high load condition), people go with their affective response (because the ‘cognitive’ part is busy), while if their cognitive resources are ‘free’, they sensibly choose the healthier fruit salad.

However, the differential homeostatic state of the body in the two conditions (memorize 7 digits vs only 2 digits) offers a much more parsimonious explanation of this effect. Physiologically speaking, being in a cognitively high demanding situation requires higher levels of glucose than a low cognitive load situation (Kennedy & Scholey 2000). In fact glucose improves memory function (Messier 2004; Smith et al. 2011). The homeostatic demands of the body are translated into a behavioral tendency: a motivation to ingest glucose if available. The biologically ‘right’ choice would in this case be the more sugary chocolate cake. Likewise, the ‘high cognitive load’ condition is stressful to the participant, so that the hormone cortisol is released into the blood stream to mobilize energy resources to prepare the body to face the stressor (the task demands in this case). Through gluconeogenesis, cortisol will increase blood sugar levels, which again means that glucose ingestion is needed (Adam & Epel 2007; Groesz et al. 2012; Sinha & Jastreboff 2013). The behavioral consequence is again: seek glucose! Thence the choice of chocolate cake.

The insight we can gain from this is that there is no need to postulate two different processes, one for each kind of choice, but just one which is finely tuned to the demands of the situation – in this case, the body’s homeostasis. The human body is a finely tuned biological system. Our conscious decisions are infused by the homeostatic and broader biochemical state of the body; ‘emotions’ and ‘cognitions’ are part of these systems, and are not, independent entities (Pessoa 2014; Damasio 2000).

In the same vein, the mere fact that dilemmas involve harm is likely to induce strong emotional reactions. We shy away from blood and harm. The empathy circuits of our brain make us experience the distress and pain of another person almost first hand and will motivate us to help (Singer & Frith 2005; Singer et al. 2004; Singer et al. 2006; Singer et al. 2008; Singer & Lamm, 2009). Thence a possible conflict is lurking whenever a person is asked to make a judgment about a moral dilemma where both the motivation to refrain from harm and to help to care feature strongly. Conflict appears when we lack a way to choose among equally valuable dimensions of the situation, and dimensions for which we lack a way to establish priorities.

Another element to consider is the type of negative emotions involved in a dilemmatic situation. Moral dilemmas induce strong negative affect (Christensen et al. 2014) which is likely the source of conflict in the individual in their attempt to give precedence to one of two options. However, what participants may be experiencing has been only scarcely measured. Could it be anger, fear, disgust, surprise? They are all negative emotions. However, they induce different behavioral tendencies. For example, anger is a syndrome of relatively specific feelings, cognitions and physio-

logical reactions linked associatively with an urge to injure some target (Berkowitz & Harmon-Jones 2004). Fear is a nonsubjective physiological state that intervenes between stimuli and responses (Ledoux 2014). Both emotional states engage the low level amygdalin circuits in the first instance. However, in terms of the projections from this basic limbic structure to other brain regions important for action preparation, these two states differ considerably, so that the ‘fear circuit’ relies more on structures that trigger automatic withdrawal behaviors, while anger engages brain areas implied in conscious behavioral control (Whalen et al. 2001). Thus, if some dilemmas anger participants, while others scare them, in fact this can be the cause for the differential moral judgments. Fear and anger are neurally rather different entities in terms of action consequences.

This is also why a careful control of dilemma variables regarding for instance the ‘to be sacrificed character’ of the dilemma are so important (Christensen & Gomila 2012). For instance, if that character is described as negative or blameworthy, this will influence participants’ responses to her being harmed, as they have been angered by that character’s behavior (Singer et al. 2004; Singer et al. 2006). They may either react to the option (of the two) that angers them (because the behavioral motivation of anger is approach) than to the option that scares them (which has the behavioral reaction of withdrawal). For example, individuals may choose to throw the ‘irresponsible plant manager’ to the rods to save ‘innocent others’, because the other option (not doing so) scares them (the motivational tendency of fear is withdrawal). Thus both outcome options are highly emotional, however, the reason for choosing one or the other can be related to the differential negative emotions that are triggered by the situation. Likewise, they may have been more scared than angered when judging the situation of sacrificing a ‘crying baby’ – where most people refrain from harm. In fact, Szekely and Miu (2015) found that the emotions most frequently experienced by individuals judging trolley-like moral dilemmas were fear and sadness. Furthermore, the results of these authors showed that the level of associated arousal which participants reported when also reporting fear or sadness, correlated positively with a more deontological response style (refrain from harm). Similarly, Ugazio et al. (2012) elegantly showed that both deontological *and* utilitarian responding could actually be triggered by *different emotions* with different motivational tendencies: In their study, disgust induction (an emotion that triggers *withdrawal* tendencies) resulted in more deontological moral judgments (i.e. refraining from harm), while anger induction (an emotion that triggers *approach* tendencies) resulted in more utilitarian moral judgments (i.e. committing harm). This finding cannot be explained with a Dual Process account, as it here has been shown that different *emotional* phenomena trigger both deontological *and* utilitarian moral judgment tendencies.

Therefore, a model that clarifies how emotions influence decisions, such as the Affect Infusion Model (AIM) by Forgas (1995), offers a better explanation of our moral

judgments in dilemmatic situations. This model posits that (i) arousal properties of the situation (triggered by who is involved, where it is happening, etc); (ii) the motivational tendencies of the emotions triggered by it (eg withdrawal vs approach); and (iii) the associated cognitive appraisal mechanisms (potentially influenced by enculturation and education), all play a crucial role in every judgment. For Forgas *affect infusion* in our judgments is a matter of degree: Any judgment is also dependent on previous knowledge of the individual about the event or situation he or she is about to judge.

We suggest that also biological variables such as homeostatic motivators of behavior might also play a role. But further work needs to be done to find out whether this is so and to what extent. The discipline of psychoneuroendocrinology studies the bidirectional interactions between behavior, brain, endocrine and immune systems of the body (Lutgendorf & Costanzo 2003; Maier et al. 1994). It has become clear that all the biological systems are related, even if the relationships may not be fully available for conscious modulation.

5. Conclusion

In this paper we have developed Patricia Churchland's defense of an Aristotelian view of morality in which emotion is not the enemy of reason, but a rational way to make fast valuations and address conflict situations. And we have done so following her "brainwise" philosophical naturalism.

Of course, this alternative is less neat and clear cut. Any judgment will be infused by prior experience, which always involves both cognitive and emotional learning, providing guidance. In some cases, though, a conflict may arise, so that we need longer to reach a judgment. But these differences do not correspond to different processes, but to more demanding situations to keep our virtues intact. According to the approach we have put forth, then, dualisms that separate reason and emotion are misleading. They represent something like extreme positions within what is in fact a continuum; a position, which interestingly was already outlined by Aristoteles in his Theory of Virtue.

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