Moral dilemmas and moral principles: When emotion and cognition unite

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Moral dilemmas and moral principles: When emotion and cognition unite

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Traditional studies on moral judgement used resolutions of moral dilemmas that were framed in terms of acceptability of the consequentialist action promoting a greater good, thus overlooking the deontological implications (choices cannot be justified by their consequences). Recently, some authors have suggested a parallelism between automatic, unreflective emotional responses and deontological moral judgements. In this study, we developed a novel experimental paradigm in which participants were required to choose between two resolutions of a moral dilemma (consequentialist and deontological). To assess whether emotions are engaged in each of the two resolutions, we asked participants to evaluate their emotional experience through the ratings of valence and arousal. Results showed that emotion is involved not only in deontological but also in consequentialist resolutions. Moreover, response times pointed out a different interplay between emotion and cognition in determining a conflict in the dilemma’s resolution. In particular, when people were faced with trolley-like dilemmas we found that decisions leading to deontological resolutions were slower than decisions leading to consequentialist resolutions. We propose that this finding reflects the special (but not accepted) permission provided by the doctrine of the double effect for incidentally causing death for the sake of a good end.

Keywords: Moral dilemmas; Judgement and decision making; Emotions; Intentionality; Doctrine of the double effect.

The fMRI studies that Greene and colleagues have conducted on moral judgement (Greene, Nystrom, Engell, Darley, & Cohen, 2004; Greene, Sommerville, Nystrom, Darley, & Cohen, 2001) deserve the considerable attention they have received from the community of ethicists and psychologists, because they have opened a rich discussion on the neural activity associated with different types of moral reasoning. The main point of Greene’s studies was the identification of two different brain processes, each associated with a particular type of moral thinking. In the fMRI studies (Greene et al., 2001, 2004), participants were presented with a set of moral
dilemmas that was classified as personal and another set that was classified as impersonal. Moral dilemmas were considered personal if the moral violation met three criteria: first, the violation must be likely to cause serious bodily harm or death; second, this harm must happen to a person or group of persons; and third, the harm must not result from the deflection of an existing threat onto another person (the footbridge dilemma resembles these criteria). Otherwise, if dilemmas caused non-serious physical harm to a person or a set of people, or only required diverting some pre-existing physical harm to a different party rather than initiating the harm oneself, the dilemmas were classified as impersonal (the trolley dilemma resembles these criteria). The results revealed that when participants considered personal dilemmas, they showed increased activity in brain areas associated with emotion and social cognition and decreased activity in areas associated with working memory and abstract reasoning than when they considered impersonal dilemmas or non-moral dilemmas (i.e., dilemmas where there are no moral implications for the agent). On the contrary, impersonal dilemmas elicited less emotional activity and more activity in the cognitive areas of the brain, as compared to personal dilemmas and non-moral dilemmas.

The behavioural and neuroimaging results allowed Greene et al. (2001, 2004) to propose a dual process theory in which two different patterns of neural activity are involved in moral judgement: a fast, unconscious, and effortless emotional system, and a slow, conscious, and effortful cognitive system. In this view, the emotional system refers to a class of processes that are valenced, quick, and automatic, though not necessarily conscious. The cognitive system, in contrast, refers to controlled processes that are important for reasoning, planning, manipulating information in working memory, controlling impulses or, more generally, to higher executive functions (Greene, 2008).

On these bases, Greene (2008) suggested a parallelism between automatic, unreflective emotional responses and deontological moral judgements. More precisely, Greene claimed that the prepotent negative emotional response that drives people to disapprove the personally harmful actions proposed in cases like the footbridge dilemma are characteristic of deontology but not of consequentialism, and that the consequentialist judgements are those most closely associated with higher cognitive functions, such as executive control (Greene, 2008). From a consequentialist point of view, actions are wrong because of their harmful consequences, but the harm could be acceptable for the sake of promoting a greater good. In other terms, whether an act is morally right depends only on the consequences of that act or of something related to that act. On the contrary, from a deontological point of view, it is wrong to perform harmful actions even though performing them will maximise good consequences, i.e., some choices are morally forbidden no matter how morally good their consequences are. From this perspective, what makes a choice right is its conformity with a moral norm: the Right has priority over the Good. Greene (2008) recognised deontology as a natural cognitive expression of our deepest moral emotions. He believed that the deontological theory is a post hoc rationalisation of emotional reactions: “essentially, [deontology] is an attempt to produce rational justifications for emotionally driven moral judgements, and not an attempt to reach moral conclusions on the basis of moral reasoning” (Greene, 2008, p. 39).

In our view, Greene’s account for a deontological moral theory is controversial, because it is unclear whether his argument counts against deontology on the whole or only against some aspects of a deontological theory (see also Dean, 2010). Furthermore, even though there are many studies targeting the non-consequentialist elements of moral behaviour (Baron, 1994; Damasio, 1994; Haidt, 2001; Schweder & Haidt, 1993), in the traditional studies on moral judgement that have used moral dilemmas participants were asked to evaluate the moral acceptability of a particular situation that was always framed as the consequentialist resolution of the moral dilemma,
overlooking the deontological implications. Indeed, when people evaluated the situation as inappropriate or morally unacceptable (especially in the personal dilemmas), then the experimenter inferred that people were endorsing a deontological ethic and that they had chosen a deontological resolution of the moral dilemma. Here, we would like to turn to some evidence that this conclusion is too strong. First, if people judge as inappropriate or morally unacceptable a state of affairs that sub- tend a consequentialist ethic, we cannot infer that people would choose the deontological resolution of the moral dilemma or that they considered a deontological perspective acceptable. For example, people could consider pushing one person onto train tracks in order to save the five workmen in the footbridge dilemma as inappropriate, because they would evaluate the trade-off 1 versus 5 as “unsatisfactory” from an utilitarian point of view, and not because of a deontological ethic. In fact, it is possible that the same participants could evaluate the trade-off 1 versus 1,000 as satisfactory and, accordingly, the consequentialist resolution as appropriate (Nichols & Mallon, 2006).

Second, although Greene (2008) claims that deontology is more emotional while consequentialism is more cognitive, it is plausible to assume that deontological judgements, in addition to emotional responses, also implicate a set of cognitive processes, such as representations of rules and cost-benefit analyses (Nichols & Mallon, 2006). As stated by Dean (2010), not all deontological duties are associated with strong emotional reactions. Indeed, Borg, Hynes, Van Horn, Grafton, and Sinnott-Armstrong (2006) found that the activation of the emotion-related areas of the paralimbic system was not associated with a higher frequency of characteristically deontological resolutions, and that some deontological responses were associated both with cognitive and emotional-related neural activity.

In the most recent formulation of his theory (Cushman, Young, & Greene, 2010), Greene recognises that the association between emotion and deontology, on the one hand, and consequentialism and controlled cognition, on the other, is overly simple. In order to capture the difference between deontological intuitions and consequentialist reasoning, Cushman et al. (2010) have proposed a distinction between alarm-bell emotions and currency emotions. The former are designed to bypass reasoning and are aimed to dominate the decision rather than to merely influence it: such an emotional response is like an alarm bell because it makes a clear demand that is extremely difficult to ignore. The currency emotions are designed to participate in the process of practical reasoning and are aimed to provide a more “cognitive” way to decide, perhaps contributing to a cost-benefit analysis. The “currency versus alarm-bell” proposal seems an elaboration of what was asserted in Greene (2008) and although this is just one of the hypotheses that are considered by Cushman et al. (2010), the authors are committed to the view that these emotional processes are fundamentally different and the emotions underlying deontological judgements stronger. However, as far as we know, there are no studies investigating the cognitive/emotional responses associated with consequentialist as compared with deontological judgements.

In the present study, we developed a novel different experimental paradigm in which participants were explicitly required to choose between two possible resolutions of a moral dilemma, one deontological and the other consequentialist. As another novel feature of the present study, we asked participants to rate their emotional experience during moral decision making. Past studies have inferred emotion from the activation of brain areas commonly associated with emotional processing (Borg et al., 2006; Greene et al., 2001, 2004) or by using an a priori criterion for considering some dilemmas as “putatively more emotional” than others (Greene et al., 2001, 2004). In the present study, we assessed self-reported emotional experience by collecting valence and arousal ratings through the process of the dilemma’s resolution. According to the circumplex model of affect (Posner, Russell, & Peterson, 2005; Russell, 1980; Russell, Weiss, & Mendelson, 1989), all emotional experiences derive from a combination of these two basic underlying...
dimensions. Valence refers to the hedonic tone of the experienced emotion, which may range from highly unpleasant to extremely pleasant. Arousal reflects a subjective state ranging from activated to deactivated, thus referring to a sense of mobilisation or energy. This conceptual framework has been adopted in a variety of research contexts, with increasing evidence across different domains of psychology, psychophysiology and neuroscience supporting the hypothesis that “core” affect, as defined by the degrees of valence and arousal, is a basic component of emotional experience and responding (Duncan & Barrett, 2007; Lang, Greenwald, Bradley, & Hamm, 1993; Russell, 2003). In other words, “core affect is what makes any event ‘hot’ (i.e., emotional)” (Russell, 2003, p. 148). On these bases, we believed that such an approach to the study of emotion would be particularly suited for capturing the subjective affective state associated with the emotional responses invoked by Greene and colleagues in the context of moral judgement, as no discrete categories of emotional states have been hypothesised. In this way, we could assess whether and to what extent conscious emotion is engaged during the process of decision that will lead to the choice of one of the two resolutions (consequentialist or deontological).

Furthermore, as in previous studies on moral judgement, we measured participants’ response times to dilemmas. The new paradigm allowed us to collect response times for both consequentialist and deontological resolutions, thus clarifying the interplay between cognitive and emotional processes. In the literature, slower response times have been interpreted as reflecting a conflict between negative emotional responses and cognitive processes (Greene et al., 2001, 2004). Indeed, Greene et al. (2001) showed that judgements approving of “personal” harmful actions took longer than judgements disapproving of those actions, arguing that the utilitarian resolution requires the engagement of cognitive control in order to inhibit the intuitive emotional response. However, McGuire, Langdon, Coltheart, and Mackenzie (2009) have cast doubt on this interpretation based on their reanalysis of Greene et al.’s (2001) data, showing that the effect reported by Greene et al. (2001) was an artefact, being driven only by a few particular dilemmas. For these reasons, McGuire et al. (2009) recommended the use of a more rigorously controlled set of stimuli.

In light of this suggestion, we designed a new set of dilemmas in which the role of intentionality was highlighted. The ascription of intentionality to an agent and its relation with moral judgement has been extensively debated in ethics and moral psychology (Borg et al., 2006; Cushman, Young, & Hauser, 2006; Hauser, Cushman, Young, Jin, & Mikhail, 2007; Mikhail, 2002; Sinnott-Armstrong, Mallon, McCoy, & Hull, 2008). One of the traditional issues is whether moral judgements of an act are affected by whether the act involves intentional harm rather than only foreseen harm, and whether it is permissible to bring about as a merely foreseen side effect a harmful event that it would be impermissible to bring about intentionally. The doctrine of double effect (DDE) was often invoked while trying to explain these issues (Aquinas, 1265–1272/1947). In the trolley versus footbridge dilemmas, the DDE integrates a “permission” for accidentally causing death for the sake of a good end (when it occurs as a side effect of one’s pursuit of that end) with a prohibition of instrumentally causing death for the sake of a good end (when it occurs as a part of one’s means to pursue that end). Many experimental studies have shown that the DDE affects people’s moral judgements (Borg et al., 2006; Cushman et al., 2006; Greene et al., 2009; Hauser et al., 2007; Mikhail, 2002; but see also Moore, Clark, & Kane, 2008; Scanlon, 2008; Waldmann & Dieterich, 2007, for a different perspective).

To sum up, the aims of the present study were twofold. First, we aimed to investigate to what extent emotional engagement is involved in consequentialist and deontological resolutions. By measuring emotional experience through its core independent dimensions (valence and arousal), it was possible for us to carefully explore the subjective feeling side of the emotional state associated with decision making leading to both types of resolutions. In footbridge-like dilemmas, we expected that decisions leading to consequentialist
resolutions would be rated as more unpleasant and arousing than those leading to deontological resolutions. Indeed, on the basis of Greene’s (2008) and Cushman et al.’s (2010) proposals, the consequentialist resolutions have to override the intuitive emotional response that says “No! This action is wrong!”, thus evoking higher emotional responses associated with decisions leading to consequentialist judgements in comparison with deontological ones. By contrast, we expected no differences between consequentialist and deontological resolutions in trolley-like dilemmas. In these cases, in fact, the DDE allows people to cause the death of a human being as a side effect of promoting some good end. Therefore, whatever the decision, emotional responses associated to either consequentialist or deontological resolutions should not differ between them. Finally, we expected higher emotional responses associated with footbridge-like dilemmas in comparison with trolley-like dilemmas.

Our second aim was to clarify the interplay between emotion and cognition in determining a conflict in the dilemmas’ resolutions, as indexed by the participants’ slower response times. According to Greene’s (2008) perspective, when decision making is characterised by a higher emotional engagement (as in footbridge-like dilemmas) slower response times for consequentialist resolutions would be expected as compared to deontological resolutions. Indeed, if Greene’s conclusion is correct, utilitarian judgements would be driven by controlled cognitive processes, the engagements of which would result in longer response times. As for trolley-like dilemmas, although Greene (2008) stated that there are no reasons to predict differences in response times between deontological and consequentialist choices because there is no emotional response to override in such cases, we hypothesised slower response times for deontological resolutions as result of the interfering effect of the DDE. In cases like the trolley dilemma, in fact, it is permissible to cause a serious harm to a human being as a side effect, but in those cases in which people do not avail themselves of this special permission, a slowdown in response times should be observed when compared with consequentialist judgements. By collecting response times for both consequentialist and deontological resolutions, it was also possible to clarify the role of DDE within a deontological perspective. Indeed, previous studies (Borg et al., 2006; Cushman et al., 2006; Greene et al., 2009; Hauser et al., 2007; Mikhail, 2002) have not sufficiently considered that the DDE concerns only a deontological perspective and has nothing to do with the consequentialism. In fact, if the permissibility of an action depended only on the consequences of the action itself (as in consequentialism), then the distinction that grounds double effect would not have the moral significance claimed for it. For these reasons, we hypothesised no significant difference in response times between incidental and instrumental dilemmas for consequentialist resolution, because consequentialism considers only the consequences and does not take into account the way in which these consequences are achieved.

METHOD

Subjects

Thirty-six undergraduates (16 males) were recruited from the University of Padova. Participants were aged 19–28 years (M_age = 23.7 years, SD = 1.9). The study was approved by the local Ethics Committee and all volunteers gave written consent prior to participation.

Design, materials and procedure

We created dilemmas based on the “inner” structure exemplified by the trolley and footbridge scenarios that have been discussed in contemporary moral philosophy (Foot, 1967; Thomson, 1986) and in the well-known psychological studies on moral judgement (Greene et al., 2001, 2009). In this study, we adapted some dilemmas from Greene et al. (2001) and Cushman et al. (2006), but for the most part, we invented new dilemmas in order to overcome some confounds that affected the original material used by Greene and colleagues (e.g., several dilemmas were “non-dilemmas” because there were no conflicts.
between two actions or two obligations). All the scenarios captured the distinction between instrumental dilemmas and incidental dilemmas. In particular, the instrumental dilemmas require the decision to kill a person as a means to save more people, whereas in the incidental dilemmas, killing one person to save more people was a foreseen but unintended consequence of the action (for examples, see Table 1).

Participants were presented with 60 experimental dilemmas: 30 instrumental dilemmas and 30 incidental dilemmas. The subject was the protagonist in all dilemmas. Instrumental and incidental dilemmas were matched for numerical consequences (i.e., the number of people to save or let die) and self-involvement (i.e., to save or let oneself die besides other people). Furthermore, in order to avoid automaticity in responding to conceptually similar issues, participants were presented with 12 filler dilemmas, which were similar to the experimental dilemmas except that they involved no deaths. The mean number of words and number of text characters were fully balanced between instrumental and incidental dilemmas (see Table 1).

Table 1. Text of sample dilemmas (text translated from Italian)

<table>
<thead>
<tr>
<th>Condition</th>
<th>Scenario</th>
<th>Resolution A</th>
<th>Resolution B</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Incidental</strong></td>
<td>You are the commander of a group of five astronauts in a space station orbiting the earth. Because of a breakdown, you have discovered a serious loss of pressurisation which in a short time will lead to the explosion of the space station. The emergency system is broken down and cannot be repaired immediately.</td>
<td>You let the loss of pressurisation lead in a short time to the explosion of the entire station, causing all six to die.</td>
<td>You activate the bulkheads manually to isolate the depressurisation to just one cabin. You know that there is one astronaut there, and he will suffocate from a lack of oxygen, but you and the other four will be saved.</td>
</tr>
<tr>
<td>(self-involvement)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Incidental</strong></td>
<td>You are the late-night watchman of a ward, where there are five patients. Due to an accident in the laboratory, there are deadly fumes flowing through the ventilation system into a room containing five patients. In another room, there is only one patient.</td>
<td>You let the deadly fumes flow into the room containing the five patients, which causes their deaths.</td>
<td>You hit a switch that permits the fumes to bypass the room with five patients. You know that the fumes will enter the room with the single patient, causing his death, but the other five patients will be saved.</td>
</tr>
<tr>
<td>(no self-involvement)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Instrumental</strong></td>
<td>You are the pilot of a helicopter taking four people on a sightseeing trip in the French Alps, at an altitude of about 2,000 metres. At a certain point, the helicopter loses altitude and no longer responds to the commands. You send out a mayday signal and try various manoeuvres, but the helicopter continues to fall and risks crashing into a rock face.</td>
<td>Not recovering altitude due to the failure of the control, let the helicopter precipitate. You and the four people will die on impact.</td>
<td>To gain altitude, you push the person next to you out of the helicopter. You know that this person will plummet to the ground and will die, but you and the other three will be saved.</td>
</tr>
<tr>
<td>(self-involvement)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Instrumental</strong></td>
<td>You are a young doctor working in the emergency surgery ward of your local hospital. Four of the patients under your care in your ward are dying from grave injury to vital organs as a result of a serious car accident. You have another patient in the ward, who is now in good health and ready to be sent home.</td>
<td>Lacking a list of compatible donors, you let the four patients die.</td>
<td>You anaesthetise the patient in good health and remove his vital organs to transplant them in the patients who are dying. You know that he will die, but the other four can be saved.</td>
</tr>
<tr>
<td>(no self-involvement)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: Mean number of words and number of text characters were fully balanced between Instrumental and Incidental scenarios ($M_{\text{words}} = 59.13$ and 59.13); $t(58) = 0.00, p = 1.00$; ($M_{\text{characters}} = 352.10$ and 352.57); $t(58) = -0.09, p = .93$; options A ($M_{\text{words}} = 19.13$ and 19.13); $t(58) = 0.89, p = .38$; ($M_{\text{characters}} = 115.17$ and 113.17); $t(58) = 0.98, p = .33$; options B ($M_{\text{words}} = 30.87$ and 30.87); $t(58) = 0.00, p = 1.00$; ($M_{\text{characters}} = 172.77$ and 178.97); $t(58) = -1.52, p = .13$. 
We tested all participants individually. Dilemmas were presented on a computer monitor and consisted of an introductory paragraph that appeared alone until subjects pressed the spacebar, which then revealed to them two successive slides with the two possible resolution sentences: a deontological (DEO) resolution of the dilemma (labelled with the letter A) and a consequentialist (CON) resolution of the dilemma (labelled with the letter B). After option B offset, the letters A and B were presented vertically aligned at the centre of the screen, separated by a fixation cross (decision slide). Participants’ task was to choose one of the two resolutions for each moral dilemma by pressing one of the two keys (A or B) by using the same hand. We recorded participants’ response choices and response times at the onset of the decision slide (see Figure 1). In order to discriminate the reading time of the two options from the time of the subjects’ decision, each slide remained on the screen for a fixed time determined by the length (in words) of the two options and by the average reading times of the two options recorded in a pilot study. Specifically, option A remained on the screen for 4,500 ms, and option B for 6,500 ms. Note that options A were always shorter than options B. After each response, we collected ratings of valence and arousal experienced during decision making by using two bipolar-scales (ranging from 1 to 9) of the Self-Assessment Manikin (SAM; Lang, 1980). Participants were required to rate how they felt while they were deciding. Two practice dilemmas were completed before beginning the experimental trials. The order in which dilemmas were presented to each participant was randomised. After the experiment, participants completed a debriefing questionnaire and were informed about the hypotheses of the study.

Data analyses

Since we used many novel stimuli in the set of the experimental dilemmas, we ran an item analysis ($F_2$) in addition to a subject analysis ($F_1$), as suggested by McGuire et al. (2009), in order to ensure that the results obtained in the subject analysis were generalisable to the populations of

Figure 1. Sequence of events in the experiment. Participants had to decide between options A and B by pressing the corresponding key during the presentation of the decision slide (in grey). SAM = Self-Assessment Manikin; ITI = inter-trial interval.
incidental and instrumental dilemmas under investigation.

At first, we analysed the distribution of deontological and consequentialist resolutions for the two type of dilemmas, incidental and instrumental. Next, for both the subject and item analyses, we ran three separate analyses of variance (ANOVAs) on response times (RTs), valence, and arousal ratings. Type of Resolution (deontological vs. consequentialist) and Type of Dilemma (incidental vs. instrumental) were within-subjects factors in the analysis by subjects ($F_1$), while in the analysis by item ($F_2$) a Type of Response was a within-subjects factor and Type of Dilemma was a between-subjects factor. In the subject analysis, we considered only those subjects who gave at least one response in all cells of the experimental design ($N = 34$).

RESULTS

Distribution of deontological and consequentialist responses

As expected (see Figure 2), the incidental dilemmas elicited a significantly higher number of CON responses than DEO responses, $\chi^2(1) = 379.259$, $p < .001$ (860 vs. 220, respectively). On the contrary, in the instrumental dilemmas the number of DEO responses were higher than CON responses, $\chi^2(1) = 43.200$, $p < .001$ (648 vs. 432, respectively).

Response times

Type of Dilemma was significant, with deciding on incidental dilemmas slower than on instrumental dilemmas, $F_1(1, 33) = 5.451$, $p = .026$, $\eta^2 = .142$; $F_2(1, 58) = 7.567$, $p = .008$, $\eta^2 = .115$. Type of Resolution was significant only in the item analysis, $F_1(1, 33) = 0.693$, $p = .411$, $\eta^2 = .021$; $F_2(1, 58) = 6.261$, $p = .015$, $\eta^2 = .097$, with decision times for deontological resolutions slower than for consequentialist resolutions. The analyses also showed a significant interaction between the two factors, $F_1(1, 33) = 8.283$, $p = .007$, $\eta^2 = .201$; $F_2(1, 58) = 16.818$, $p < .001$, $\eta^2 = .225$ (see Figure 3). Response times to incidental dilemmas were slower when participants chose the deontological resolution than when they chose the consequentialist resolution ($M$s = 2,978 ms vs. 2,574 ms, respectively; Tukey
post hoc, $p = .05$). In contrast, instrumental dilemmas yielded no significant difference in RTs between deontological and consequentialist resolutions ($M_s = 2,676$ ms vs. $2,460$ ms, respectively). When focusing on type of resolution, we found that deontological resolutions were faster with the instrumental dilemmas than with the incidental dilemmas ($M_s = 2,460$ ms vs. $2,978$ ms, respectively; Tukey post hoc, $p = .009$), whereas consequentialist resolutions yielded no significant difference in RTs between instrumental and incidental dilemmas ($M_s = 2,676$ ms vs. $2,574$ ms, respectively).

Valence and arousal

The analysis of valence showed a significant effect of Type of Dilemma, $F_1(1, 33) = 11.355$, $p = .002$, $\eta^2 = .256$; $F_2(1, 58) = 8.914$, $p < .004$, $\eta^2 = .133$, with decisions for the instrumental dilemmas rated as more unpleasant than decisions for the incidental dilemmas (2.32 vs. 2.53, respectively). The Type of Resolution did not reach significance in the subject or in the item analysis (see Table 2), $F_1(1, 33) = 0.111$, $p = .741$, $\eta^2 = .003$; $F_2(1, 58) = 0.459$, $p = .501$, $\eta^2 = .008$, with the valence ratings that not significantly differ in decisions for consequentialist and deontological resolutions (2.41 vs. 2.44, respectively). It is worth noting that all mean values were clearly at the unpleasantness end of the scale (i.e., they were largely lower than the neutral midpoint, ranging from 4.5 to 5.5; e.g., Bradley & Lang, 2000).

The analysis of arousal showed a significant effect of Type of Resolution only for the item analysis (see Table 2), $F_1(1, 33) = 1.666$, $p = .206$, $\eta^2 = .048$; $F_2(1, 58) = 5.253$, $p = .026$, $\eta^2 = .083$, with decisions for consequentialist resolutions evaluated as more arousing than decisions for deontological resolutions (6.20 vs. 5.95, respectively).

Table 2. Means (and standard errors) of valence and arousal ratings for deontological and consequentialist resolutions

<table>
<thead>
<tr>
<th></th>
<th>Deontological resolutions</th>
<th>Consequentialist resolutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valence ratings</td>
<td>2.44 (0.22)</td>
<td>2.41 (0.22)</td>
</tr>
<tr>
<td>Arousal ratings</td>
<td>5.95 (0.10)</td>
<td>6.20 (0.06)</td>
</tr>
</tbody>
</table>
DISCUSSION

The aim of the present study was to introduce a different experimental paradigm in which participants had the opportunity to choose between a consequentialist and a deontological resolution of a moral dilemma, in order to investigate to what extent emotional engagement is involved in both resolutions and clarify the interplay between emotion and cognition in moral conflicts.

At a more general level, our results showed that instrumental dilemmas elicited a lower number of consequentialist responses than incidental dilemmas, indicating that for participants it was less permissible to kill one individual as an intended means to save others than as a foreseen but unintended consequence of saving others. Conversely, instrumental dilemmas elicited a higher number of deontological responses than incidental dilemmas. Instrumental and incidental dilemmas differ in the agent’s intention, which allows people to evaluate the causes and consequences of their actions. Such intentions define what people set out to achieve through their actions, and their intended ends and their intended means are the factors that principally define moral actions (Mikhail, 2002).

At a more specific level, the results of the present study generated two central conclusions: (1) emotion, as measured by its core affective feelings, is involved in decision making leading not only to the deontological but also to the consequentialist resolutions of moral dilemmas; and (2) results on response times pointed out a different interplay between emotion and cognition in determining a conflict in the dilemma’s resolution.

Regarding the first conclusion, an interesting novel feature of the present study was the measurement of the self-reported emotional state experienced when deciding between the two dilemmas’ resolutions. We assessed the emotional experience along the two dimensions of valence (pleasantness/unpleasantness) and arousal (activation/deactivation), which, according to the circumplex model of affect, represent the core affective features defining the subjective emotional states, typically accounting for most of the variance in emotional judgements (Bradley & Lang, 1994; Lang et al., 1993; Russell, 2003). As for type of dilemmas, our results showed that: (i) both instrumental and incidental dilemmas elicited negative affect; and (ii) decisions on instrumental dilemmas were rated as significantly more unpleasant than those on incidental dilemmas. We could surmise that participants perceived making decisions on instrumental dilemmas as particularly aversive because these dilemmas required the use of a person as a means to an end, in contradiction with the Kantian categorical imperative (“Act in such a way that you treat humanity, whether in your own person or in the person of any other, always at the same time as an end and never merely as a means to an end”; Kant, 1785/1959). On the contrary, we could infer that participants perceived decisions to incidental dilemmas as less unpleasant than decision to instrumental dilemmas probably because they perceived the sacrifice of a person as an unintended consequence of their actions. These results seem in accordance with Cushman et al.’s (2010) alarm bell hypothesis, in which the primary motivation not to “intentionally” harm is ultimately derived from the alarm bell emotional system that objects to actions like using an individual’s death as a means to an end. These findings are also consistent with the evidence provided by Koenigs et al. (2007) on the rated emotional salience of personal versus impersonal moral dilemmas.

The comparison between the affective ratings obtained as a function of the two types of resolutions showed that both consequentialist and deontological resolutions were associated with negative affect experienced during decision making. Therefore, our predictions were partially confirmed. Unexpectedly, decisions leading to consequentialist resolutions were rated as unpleasant as those leading to deontological resolutions not only in incidental but also in instrumental dilemmas. We expected a different pattern of results for instrumental and incidental dilemmas, with decisions leading to consequentialist resolutions being rated as more unpleasant than those leading to deontological resolutions in the instrumental dilemmas. It could be argued that a floor
effect was operating for both types of dilemmas, given that both their mean values were markedly in the unpleasantness end of the scale. It could also be suggested that whatever decision is taken, instrumental dilemmas elicit a strong negative emotional response, as in these dilemmas a person is intentionally used as a mean to an end. Finally, independent from type of dilemma, decisions leading to consequentialist resolutions were found to be rated as more arousing than those leading to deontological resolutions. As this finding was significant only in the item analysis, it should be viewed with caution. However, as the lack of significance in the subject analysis could be due to the lower number of observations as compared with the item analysis, we believe that this finding deserves our attention.

Taken together, the results on valence and arousal provide further evidence on the role of emotions in moral judgement. Although Greene (2008) and Cushman et al.’s (2010) claims that deontological judgement is affective at its core while consequentialist judgement is essentially cognitive, they are also inclined to agree, in a Humean vein, that consequentialist moral judgements must have some affective components, and that the consequentialist weighing of costs and benefits is an emotional process (Greene, 2008). Our results provide empirical support to this claim, showing that decisions leading to consequentialist resolutions were rated as more arousing than those leading to deontological resolutions, with both decisions rated as highly unpleasant. Thus, affective processes seem to play a relevant role in defining not only deontological but also consequentialist perspectives. Further investigations are needed to better characterise the emotional processes involved in both deontological and consequentialist decisions. Here, we are not in the position to provide an unambiguous explanation for these interesting results regarding emotional experience, or to suggest a causal relationship to resolution choices. However, we would like to suggest a possible interpretation. Given that moral dilemmas are formally undecidable by definition, an agent “forced” to choose between two possible resolutions perceives them as highly conflicting and unpleasant, independently of which decision s/he will choose and independently of the trade-off between cost and benefit associated with the two resolutions (Brink, 1994; Macintyre, 1990). The agent experiences the formal impossibility of resolving the dilemma, and s/he recognises that the two obligations (not killing and helping others) are both “right”, but s/he is forced to choose one while still considering the rejected alternative as valuable, thus reaffirming the impossibility of resolving the dilemma (Brink, 1994). On the other hand, when people choose a consequentialist resolution they might consider the consequences of an act as relevant in determining its morality, but they most likely feel that this resolution could undermine their moral integrity, thus evoking an unpleasant emotional feeling characterised by a sense of higher mobilisation and energy. If the consequentialist judgement engages controlled reasoning processes to construct a set of practical principles for our moral behaviour (Cushman et al., 2010), then the whole process might have a high emotional cost that yields to a feeling of displeasure and high energy expenditure. As an alternative explanation, we might suggest that decisions leading to consequentialist judgements evoke higher emotional arousal in comparison to deontological judgements because in the former a person is required to actively intervene by performing a difficult action, whereas in the latter the events follow their natural course.

Regarding the second conclusion, our results may clarify the interaction between emotional and cognitive processes in determining a conflict in the dilemma’s resolution. Greene (2008) and Cushman et al. (2010) claimed that people’s moral judgements appear to be the result of at least two different kinds of psychological processes. In addition to brain imaging results, Greene et al. (2001) provided data on response times, showing a slowdown in the response times when people considered as morally acceptable personal, intentionally harmful violations characterised by a higher emotional engagement (i.e., instrumental dilemmas). However, Greene et al.’s (2001) results on response times were based on the
YES/NO responses to a question that only investigated the moral appropriateness of a consequentialist resolution. They deduced the conflict between emotion and cognition in resolving the moral dilemma only according to the response times of those people who chose, with large deployment of cognitive resources and time, to sacrifice a person in order to save many other lives. But, by making the two dilemma resolutions explicit (deontological and consequentialist) in our study, a different pattern of cognitive–emotion interplay did emerge. In fact, our results showed that there were no significant differences in decisions times between consequentialist and deontological resolutions when people are faced with instrumental dilemmas. This result is somewhat unexpected and contrary to Greene’s (2008) predictions. What we expected (and what Greene et al., 2001, and Greene, Morelli, Lowenberg, Nystrom, & Cohen, 2008, found) was significantly slower response times for consequentialist resolutions because people are required to perform an extremely affectively difficult action, and they have to override the intuitive emotional response that say “No!” However, although our data did trend in this direction, no significant differences in response times emerged between consequentialist and deontological resolutions. These results provide contrary evidence for the hypothesised asymmetry (Greene et al., 2008) between consequentialist and deontological judgements, with the former driven by controlled cognitive processes and the latter driven by more automatic processes. On the other hand, our results are in line with McGuire et al.’s (2009) study, in which it was shown that the interaction between dilemma type and response in the subject analysis of Greene et al. (2001) was due to some specific personal dilemmas. In other words, once those dilemmas were removed, personal dilemmas showed the same pattern as impersonal dilemmas, with no difference between appropriated and not appropriated responses. As stated by McGuire and colleagues (2009), rather than longer RTs for responses of appropriate to personal dilemmas, it was the extremely fast responses of inappropriate for a small set of personal dilemmas that produced the interaction.

Further evidence against Greene’s (2008) predictions also came from the pattern of results obtained in incidental dilemmas. As in such cases there is no emotional response to override, Greene (2008) had hypothesised no difference in response times between deontological and consequentialist choices. By contrast, our results showed participants’ slower response times in choosing the deontological resolution. Furthermore, we found a significant difference in response times between incidental and instrumental dilemmas when the deontological resolution was chosen. In fact, people were slower when deciding in incidental than instrumental dilemmas. Taken together, these results could suggest that, contrary to Greene (2008) and Greene et al.’s (2008) predictions, controlled reasoning is required to account also for deontological judgements, specifically in circumstances where it is possible to apply the DDE, as in the incidental dilemmas.

To explain these findings, it is relevant to highlight the differences between consequentialist and deontological perspectives. For a consequentialist what counts is the greatest happiness for the greatest number, and whether some consequences are better than others does not depend on the way in which these consequences are achieved. In fact, no significant differences in response times were found between incidental and instrumental dilemmas for consequentialist resolutions, possibly because the distinction between intended and merely foreseen consequences has no moral significance for the consequentialism. Instead, for a deontological account of morality, agents cannot make certain wrongful choices. Roughly speaking, deontologists hold that it is our intended ends and intended means that define our agency. Such intentions mark out what it is set out to achieve through our actions. If we intended something bad as an end, or even as a means to some more beneficent end, we are said to have set ourselves at evil (Aquinas, 1265–1272/1947), something we are categorically forbidden to do. But the DDE provides a “special permission” for incidentally causing death for the sake of good end. This might
suggest that for people that continue to have a strong deontological attitude also when faced with the incidental dilemmas, the special permission for incidentally causing death provided by the DDE is probably taken into account but it is believed, all things considered, a wrongful choice. For this reason, we suggest that for those people who consider the incidental death a wrongful and a forbidden choice that can’t be justified by its effect, considering (but not accepting) the special permission provided by the DDE slows the choice for the deontological resolution of the dilemma. One of the principal characteristics of the deontological perspective is the idea that morality is agent-centred and that intention constitute the morally relevant agency of people. For a deontologist, to invoke double effect is to make a comparative judgement: it is to assert that a harm that might permissibly be brought about as a side effect in promoting a good end, could not permissibly be brought about as a means to the same good end. In other words, we propose that this comparative judgement has a cognitive cost, and that the slowdown in the response times when participants choose a deontological resolution in the incidental dilemmas is the result of an interfering effect of the special permission, provided by the DDE, but not accepted, for incidentally causing death for the sake of good end. For this reason, we believe that the DDE concerns only the deontological perspective, and that an engagement of cognitive processes is plausible also for non-consequentialist moral deliberation. Although further studies are needed to substantiate this finding, we believe that our results may contribute to a more comprehensive understanding of the mechanisms involved in moral judgement.

It is worth pointing out that a different relationship between moral judgement and intentionality could be considered. In this paper, we are committed to the DDE that is supposed to show that there is a moral difference between effects that are brought intentionally and those that are merely foreseen. Actions often have consequences that draw forth moral judgement, and whether an action is judged intentional or not influences that moral judgement. However, in a recent study Knobe (2003a) has shown that such connection can also run in the opposite direction, and that people’s moral judgement can affect their intuitions as to whether or not an action or a behaviour was performed intentionally (Knobe, 2003a, 2003b, 2006; Pettit & Knobe, 2009). This phenomenon has come to be known as the “Knobe effect”: people determine intentionality based on the moral consideration of whether a side effect is good or bad. The Knobe effect represents an obvious challenge for the DDE. In fact, the judgement of moral permissibility of an action doesn’t seem the output of the doctrine, and the DDE seems to generate a judgement of moral permissibility only because of a prior assessment of the moral acceptability of the action. What appears to be controversial is our process of attributing intentions. According to the DDE, an action is permissible if the bad side effects are foreseen but not intended. According to the Knobe effect, a foreseen side effect is judged to be unintended if the action is judged to be permissible. Therefore, it seems that the DDE reflects the moral intuitions of people who believe in DDE. It should be noted that there are many controversies about the Knobe effect. The main question is in what sense we could say that an unintended side effect is intentional. For example, Guglielmo and Malle (2010) have shown that people rarely see an unintended side effect as intentional when they have a chance to express their interpretation of the events with multiple descriptions to choose from, and their results cast serious doubt on the hypothesis that judgements of intentionality are guided by moral considerations. Although it would be premature to regard the Knobe effect as a refutation of the DDE, further studies will be required to settle this controversy.

Some limitations of the present study are worth mentioning. First, by measuring the “core” affective feelings we have chosen to focus on the basic conscious experience that can be described by the two psychological properties of hedonic valence and arousal. Thus, we acknowledge that this approach does not fully account for all the various components of emotion and the
complexity of the phenomenon. Second, in our task participants were instructed to report how they actually felt when they were deciding, i.e., before the behavioural choice between the deontological and the consequentialist resolution was made. Therefore, we cannot disentangle what process(es) developing during decision making the affective ratings have been referred to by the participants. During the different stages of decision making, emotion might be caused by the conflict in choosing between the two undesirable resolutions, by a differential assessment of the available resolutions, or by the formation of preference and the selection of one of the two resolutions. It is also possible that the reported emotional experience reflected the global affective feeling emerging from the whole process. However, despite these limitations, we believe that our data might contribute to provide useful information on the role of emotional processes in moral judgement. Our paradigm might also be applied to better characterise moral judgement in patients with ventromedial prefrontal lesions and, in turn, to shed light on the possible causal role of emotion. When presented with Greene et al.’s (2001, 2004) personal dilemmas, these patients have been found to provide a higher number of utilitarian judgements than healthy controls, suggesting that emotional processing depending on the integrity of the ventromedial prefrontal cortex is necessary for deontological resolutions to be provided (Ciaramelli, Muccioli, Ladavas, & di Pellegrino, 2007; Koenigs et al., 2007). In the light of our findings, using a paradigm allowing the assessment of response choices, affective ratings, and response times as a function of the two types of resolutions, would make it possible to directly test the differential effects of neural emotional impairment on deontological and consequentialist resolutions.

In conclusion, our results support the view that cognitive and emotional processes participate in both deontological and consequentialist moral judgements. More importantly, our results suggest that, contrary to Greene (2008) and Greene et al.’s (2008) predictions, controlled reasoning is required to account not only for consequentialist judgements, but also for deontological judgements, specifically in circumstances where it is possible to apply the DDE, as in the incidental dilemmas. Indeed, as stated by Cushman et al. (2010), it no longer makes sense to engage in debate over whether moral judgement is accomplished exclusively by reason as opposed to emotion. Rather, moral judgement is the product of complex interactions between emotional and cognitive mechanisms.

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