



## Cortisol and moral decisions among young men: The moderating role of motivation toward closure☆



Małgorzata Kossowska\*, Aneta Czernatowicz-Kukuczka, Ewa Szumowska, Anna Czarna

Jagiellonian University, Poland

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### ABSTRACT

Previous research has demonstrated that under stress people make more deontological than utilitarian judgments. We however suggest that the relationship between stress and moral decisions may differ depending on which goals are accessible. In this study we focused on the goal to achieve certainty and individual differences in its importance, expressed as the need for closure. In particular, we examined whether the effects of individual variation in stress levels, measured by cortisol level, on moral decisions depended on individual differences in certainty importance, i.e., the need for closure. Male participants completed the Need for Closure scale and performed a moral decision making task. Saliva samples from these participants were collected. We found that cortisol level was associated with more utilitarian than deontological judgments when achieving certainty was a focal goal (i.e., high need for closure level) but only when ingroup was involved. When certainty reduction is not of such importance (i.e., low need for closure level), groups are not a crucial aid when navigating the social world. In this case, high cortisol levels were associated with more deontological than utilitarian decisions. This was true only for dilemmas in which ingroup was not involved.

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Stress influences moral decision making in everyday life (e.g., Källemark, Höglund, Hansson, Westerholm, & Arnetz, 2004; Youssef et al., 2011). It is because acute stress leads to an activation of the sympathetic nervous system [SNS] (Rohleder & Nater, 2009) and a release of cortisol through the activation of the hypothalamus pituitary adrenal axis [HPA], what causes elevated levels of noradrenaline and cortisol in the blood stream (Kirschbaum & Hellhammer, 2000). Cortisol impacts functions related to the frontal lobe, such as selective attention, working memory and cognitive control (see: Lupien, Maheu, Tu, Fiocco, & Schramek, 2007). Some research has also demonstrated that cortisol leads to more habitual than goal-directed behavior (Schwabe, Tegenthoff, Höffken, & Wolf, 2012) and that it causes a shift from reflective to intuitive processing (Margittai et al., 2016). Thus, it is claimed that under stress people alter their moral decisions toward intuitive and emotionally driven, i.e., deontological ones.

Indeed, previous research indicated that under stress people intuitively feel what is good or bad, and as a result they favor rights or duties of the individual over the greater good (Starcke, Ludwig, & Brand, 2012; Youssef et al., 2011). In other words, they make more intuitive, i.e.,

deontological, than cognitively demanding, i.e., utilitarian, judgments. There are some findings, however, showing that under stress the needs of an individual may at times be best served by helping others, and sometimes by harming them. For example, Sollberger, Bernauer, and Ehler (2016) demonstrated that the influence of acute stress on environmental donation behavior is moderated by preexisting beliefs regarding this issue. They showed positive effects of stress on the decision to donate, which was driven by the intention to regulate stress-induced negative affect. In contrast, they found that stress reduced the amount of money donated when there was an increase in self-interested motivation. Further, they found that both of these effects are weaker for participants with a highly pro-environmental orientation, since their beliefs strongly influence their behavior regardless of the circumstances.

Thus, in the present study we aimed to test the assumption that individual variation in stress levels, measured by the level of cortisol, is associated with the tendency to make deontological (i.e., favoring individual over the group), but also utilitarian moral decisions (i.e., favoring group over individual), depending on important goals and needs. We focused on one specific motivational mechanism – the motivation to seek and preserve certainty and to avoid uncertainty, which is expressed by the Need for Cognitive Closure (Kruglanski, 2004). This motivation has been described as the tendency to reduce the feeling of discomfort experienced in the face of cognitive uncertainty through formulating judgments and decisions that are predictable, secure,

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\* Corresponding author at: Institute of Psychology, ul. Ingardena 6, 30-060 Kraków, Poland.

E-mail address: [malgorzata.kossowska@uj.edu.pl](mailto:malgorzata.kossowska@uj.edu.pl) (M. Kossowska).

stable, reliable across circumstances and unchallenged by exceptions. Thus the focal, chronically accessible goal related to need for closure level is uncertainty reduction (see: Kruglanski & Webster, 1996).

Given that individuals high in the need for closure tend to seek out certainty and clarity, we might expect them to place a greater emphasis than others on the concerns embodied in moral decisions. However, not all moral decisions are equal in epistemic terms. Because the need for closure predisposes individuals to seek out and maintain a shared social reality in the context of cohesive groups (Kruglanski, Pierro, Mannetti, & De Grada, 2006), we predict that it will be most closely associated with decisions that reaffirm the ingroup over the other group or the individual. Moreover, the need for closure is also related to group-centrism (Kruglanski et al., 2006; Shah, Kruglanski, & Thompson, 1998). That is because ingroup offers useful guidelines with which individuals can navigate the social world, and they provide useful cues for understanding others, deciding how to behave in particular situations, and establishing one's own identity (Allport, 1954; Hogg, 2007). Thus, one may expect that when the goal to reduce uncertainty is salient, need for closure is related to more utilitarian decisions but only when ingroup is involved (favoring ingroup over individual) than deontological ones (favoring individual over ingroup or no-ingroup).

Utilitarian decisions, however, are cognitively demanding (Green et al., 2001). Built on Cognitive Energetics Theory (CET) (Kruglanski et al., 2012), we argue that the more important a given goal is to a person, the more likely s/he is to invest effort in attaining that goal. However, certain goals are more important for some people than for others. Dealing with uncertainty has been argued to be a main cognitive goal driving the behavior of high need for closure individuals. Hence, we suggest that, due to their intolerance of uncertainty and aversion toward ambiguity, high need for closure individuals have a stronger motivation to reduce this state than individuals low in that need. Therefore, they may choose more demanding means if they perceive them to be more instrumental for a goal.

We claim that stress makes uncertainty reduction especially important for high (vs. low) need for closure people, hence justifies putting greater effort in resolving a moral dilemma. Therefore, we assume that stress is associated with utilitarian decision making at high (vs. low) need for closure levels, but only when ingroup is involved. As we stated earlier, due to their group-centrism, for people high in the need for closure utilitarian moral decisions (i.e., favoring interests or good of ingroup versus no-ingroup or individual) will be more effective in reducing uncertainty, as they sustain the well-being of the ingroup, which is essential for their sense of certainty.

## 1. Overview of the study

In previous studies stress was induced experimentally and measured by level of cortisol release (e.g., Starcke, Polzer, Wolf, & Brand, 2011). In this study, however, we simply assessed whether individual variations in stress measured by cortisol level is associated with a particular approach to moral decision-making. We believe that this is an important extension of previous work as this variation in stress levels can lead to at least temporal dysfunction of the hypothalamic-pituitary-adrenal axis (HPA), the main neuroendocrine stress regulatory system. Thus, this variation in cortisol levels may predict everyday moral decision making.

Previous studies also proved that stress and anxiety differently influence the process of decision making in men and women (e.g., van den Bos, Harteveld, & Stoop, 2009). As we were interested in the interaction between the need for closure and cortisol levels, we decided to use a sex-homogenous sample, which is common practice in cortisol studies (e.g., Putman, Antypa, Crysovergi, & van der Does, 2010). Only male participants were included in our study. It was expected that this would provide us with clearer pattern of results, unaffected by gender differences (which was not a point of interest here). We have also decided to use only personal moral dilemmas, as across previous studies they

were the only ones that yielded systematic differences with regard to the level of stress. In our study participants were asked to decide whether it was appropriate to sacrifice the life of an innocent person for the sake of the greater good, i.e., five lives (utilitarian decision) or whether it was appropriate to do the opposite (deontological decision) (e.g., Greene, Sommerville, Nystrom, Darley, & Cohen, 2001; Bartels & Pizarro, 2011). In half of the dilemmas described groups were ingroups, whereas in the other half they were not.

If our reasoning is correct and high NFC individuals value ingroups, the hypothesized NFC  $\times$  cortisol effects should appear for the ingroup but not no-ingroup dilemmas. We expected that higher stress, expressed in cortisol levels, makes the goal of reducing uncertainty salient but only among high in need for closure individuals uncertainty reduction is important and justifies effort exerted in more effortful decision making process. Thus, high need for closure is associated with utilitarian, that is cognitively demanding, decision making when ingroup is involved as in this case utilitarian judgements serve the goal of achieving certainty best. By contrast, for low need for closure levels, as uncertainty reduction is not so important, the most adaptive behavior under stress is to rely on an easy and default option, which is intuitive thinking, i.e., favoring individual over group. It is consistent with the findings that in general, when there is no important goal activated, deontological decisions are more automatic and driven by the emotional system (e.g., Starcke et al., 2012).

## 2. Method

### 2.1. Participants

Seventy men aged between 20–33 ( $M = 23.20$ ,  $SD = 2.24$ ) took part in the study. All of the participants were university students or graduates. They were recruited via community advertisement and given a monetary compensation for participation in the study. None of the participants reported using psychotropic, glucocorticoid or any other medications. Smoking status and intensity as well as the body mass indices of all participants were recorded ( $M_{BMI} = 22.57$ ,  $SD_{BMI} = 3.05$ ;  $Min_{BMI} = 16.41$ ,  $Max_{BMI} = 32.77$ ; 80% of the sample were nonsmokers; the remaining 20% smoked on average  $M_{cig} = 5.00$  cigarettes per day,  $SD_{cig} = 3.47$ ,  $Min_{cig} = 1$ ,  $Max_{cig} = 10$ ). The study was carried out in the afternoon to minimize morning circadian variations in cortisol levels.

All subjects gave their written informed consent. The study was approved by the Bioethical Committee.

### 2.2. Procedure

Participants were asked to fill in the online version of the Need for Closure Scale one day before coming to the laboratory. Participants were informed that eating, drinking, chewing gums or brushing teeth should be avoided for 30 min before coming to the laboratory for testing. On arrival to the laboratory participants were presented with a set of questionnaires which took approximately half an hour to complete. The questionnaires were used to make sure that participants did not eat or drink anything for at least 30 min before the cortisol sample collection. These questionnaires were also included in order to assure similar baseline conditions and compliance with saliva sampling protocol (concerning eating, drinking, etc.) for all participants (regardless of what activities they performed before coming to the laboratory). Participants were excluded if they had psychological or physical medical problems that could influence their hormonal or psychological response (e.g., depression or the use of corticosteroids; Granger, Hibel, Fortunato, & Kapelewski, 2009). After a one hour break the saliva sample was collected. Then they completed the moral dilemma tasks. All testing sessions took place in afternoon hours. After completion of the study subjects were debriefed and thanked.

### 2.3. Measures

#### 2.3.1. Need for closure

The need for closure was measured with the short version of the Need for Cognitive Closure Scale (Kossowska, Hanusz, & Trejtowicz, 2012). The scale consists of 15 items divided into five facet scales: preference for order and structure in the environment, predictability of future contexts, affective discomfort occasioned by ambiguity, closed-mindedness, and decisiveness of judgments and choices. Example items: *I don't like situations that are uncertain or I don't like to be with people who are capable of unexpected actions*. The answers are given on a 6-point Likert scale from *definitely disagree* to *definitely agree*. Higher scores indicate higher need for closure (Cronbach's  $\alpha = 0.80$ ,  $M = 3.53$ ,  $SD = 0.66$ , ranging from 1.58 to 5.25).

#### 2.3.2. Moral dilemmas

Moral decisions were measured with the use of four moral dilemmas (see Supplementary materials). Each dilemma depicted participants as actors who must decide whether it was appropriate to sacrifice the life of an innocent person for the sake of the greater good, e.g. the “trolley dilemma” in which one needs to decide whether it is appropriate to kill a person by flipping the switch, thus redirecting the trolley, in order to save five other people who would otherwise be killed by the trolley; or a “crying baby dilemma” in which a person needs to decide whether to smother a baby in order to save themselves and other people hiding out in the cellar (the same or similar dilemmas were used in numerous studies on moral judgment, such as Bartels & Pizarro, 2011; Greene et al., 2001; Glenn, Koleva, Iyer, Graham, & Ditto, 2010). In the two of the dilemmas we used the groups described were explicitly mentioned to be ingroups (the *Spelunkers* dilemma and the *Crying baby* dilemma, further referred to as ingroup dilemmas) and the other two were not (the *Trolley* and the *Surgery* dilemmas, further referred to as no-ingroup dilemmas). After reading each scenario, participants were asked to answer a Yes/No question, e.g. “In this situation, would you flip the switch?” or “In this situation, would you smother the baby?” Subsequently, participants were asked to rate how certain they felt about their answer on a 7-point response scale from *extremely uncertain* (coded as 0) to *extremely certain* (coded as 6). As in Glenn et al. (2010), we combined the response data (Yes/No answers) and the certainty data into a composite variable by coding “yes” responses as 1 and “no” responses as  $-1$ , and multiplying by the certainty ratings (0–6). We calculated the average for all dilemmas. Higher scores indicate more utilitarian moral judgments, whereas lower scores indicate more deontological moral judgments.

On average participants decided it was appropriate to sacrifice a person's life for the greater good in  $M = 62.14\%$  ( $SD = 39.41$ ) of cases when ingroup was involved and in  $M = 41.43\%$  ( $SD = 22.47$ ) of cases when there was no ingroup involved. The mean of the composite moral dilemmas score (answers and certainty combined) was  $M = 0.80$  ( $SD = 3.94$ ) for the ingroup dilemmas and  $M = -1.51$  ( $SD = 2.72$ ) for no-ingroup dilemmas.

#### 2.3.3. Salivary cortisol

Participants were asked to collect their saliva samples with the use of special saliva sampling devices (vial and straw; SALI-TUBES, DRG Instruments GmbH, Germany). Immediately following collection samples were stored at  $-20^\circ\text{C}$ . The time of sample collection was recorded. In order to run biochemical analysis, the samples were thawed and centrifuged for 10 min at 2000 g and  $4^\circ\text{C}$ . The fraction of free cortisol in saliva was determined by a biochemist with the use of commercially available enzyme immunoassay (Salivary Cortisol ELISA, DRG Instruments GmbH, Germany). The sensitivity of the assay is reported at 0.537 ng/mL at the 95% confidence limit. Intra-assay coefficients of variance are reported at 1.8–4.5% and inter-assay coefficients at 5.8–7.5%. The level of cortisol ranged from 0 to 30.63  $\mu\text{g/dL}$  with the mean of 2.35 ( $SD = 4.22$ ).

### 3. Results

To test our hypothesis, we run a regression analyses separately for the two types of dilemmas (ingroup and no-ingroup) in which cortisol level was the independent variable and the need for closure score was the moderator. The time of the sample collection (i.e. the number of hours past noon) was included as a statistical control. Prior to the analysis, due to the highly skewed distribution, the cortisol level variable was log-transformed. All predictor variables were mean-centered. We used the Process macro for SPSS version 2.13 with 10,000 bootstrap samples for bias corrected bootstrap confidence intervals to run the analysis (Hayes, 2013). Simple slopes analysis was used to calculate the effect of our IV on the DV for low, medium, and high values ( $-1$  SD, mean,  $+1$  SD) of the moderator.

In both cases there were no significant main effects of cortisol level ( $F < 1$ ) and the need for closure ( $F < 1$ ). The hypothesized interaction was significant for the ingroup dilemmas,  $b = 1.90$ ,  $SE = 0.81$ ,  $t = 2.36$ ,  $p = 0.02$ , 95% CI [0.29, 3.51] (see Fig. 1). The slope was significant at high need for closure levels,  $b = 1.57$ ,  $SE = 0.75$ ,  $t = 2.10$ ,  $p = 0.04$ , 95% CI [0.07, 3.06]. At low need for closure levels the effect was negative but not significant,  $b = -0.97$ ,  $SE = 0.71$ ,  $t = -1.36$ ,  $p = 0.18$ , 95% CI  $[-2.40, 0.45]$ . As predicted, for the other two dilemmas (no-ingroup involved) the effect was nonsignificant,  $b = 0.98$ ,  $SE = 0.52$ ,  $t = 1.87$ ,  $p = 0.07$ , 95% CI  $[-0.06, 2.03]$  (see Fig. 2). Although the interaction was not significant, it is worth noticing that the slope for low need for closure levels was negative and significant,  $b = -1.08$ ,  $SE = 0.46$ ,  $t = -2.32$ ,  $p = 0.02$ , 95% CI  $[-2.01, -0.15]$ . The slope for high need for closure levels was non-significant,  $b = 0.23$ ,  $SE = 0.48$ ,  $t = 0.48$ ,  $p = 0.63$ , 95% CI  $[-0.74, 1.20]$ . The results thus show that when the need for cognitive closure is high, higher cortisol levels are associated with more utilitarian moral judgments only when ingroup was involved.

### 4. Discussion

Previous research has demonstrated that, in the face of moral decisions, stress facilitates favoring individual rights or duties over the overall collective good. However, the main findings presented in this paper show that the effects of stress expressed by cortisol levels are associated with both utilitarian and deontological decisions, depending on the focal goal of achieving certainty. Thus, our study provides preliminary

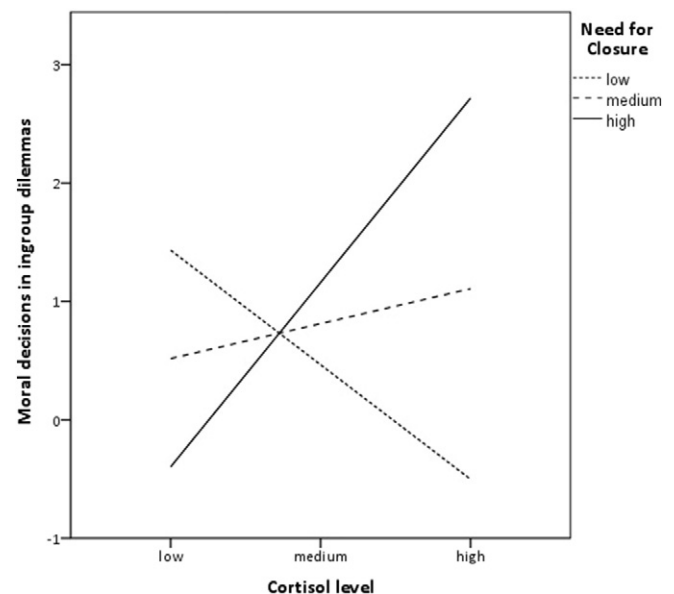


Fig. 1. Regression lines of the relationship between cortisol level and moral decisions in ingroup dilemmas (utilitarian versus deontological) at low, medium, and high ( $-1$  SD, mean,  $+1$  SD) need for closure.

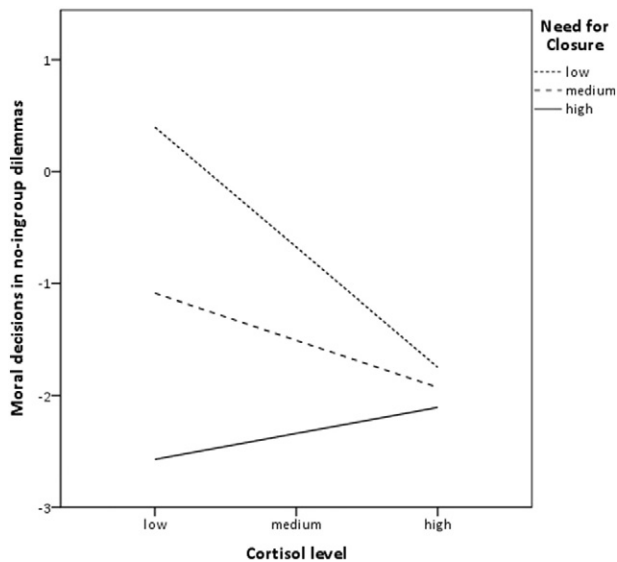


Fig. 2. Regression lines of the relationship between cortisol level and moral decisions in no-ingroup dilemmas (utilitarian versus deontological) at low, medium, and high ( $-1$  SD, mean,  $+1$  SD) need for closure.

evidence that under stress goals or needs may be served both via utilitarian as well as deontological decisions. We believe that our results open intriguing research avenue for testing the link between stress and moral decision-making.

In this study, however, we focused exclusively on variations in the importance of the goal to achieve certainty, i.e., need for cognitive closure. We found that individual variations in level of stress, expressed in cortisol level, is associated with utilitarian decisions when the goal to achieve certainty is of high importance (i.e., high need for closure). Thus, it is possible that our study provides initial evidence that stress may be associated with utilitarian decisions through the mechanism of uncertainty reduction. We also demonstrated that need for closure, which is usually associated with reducing uncertainty via simple and effortless information processing styles, with higher stress levels predicts more demanding utilitarian decisions, but only when ingroup was involved. Built on CET (Kruglanski et al., 2012) we claimed that stress made the goal of reaching certainty salient, but only for high in need for closure people uncertainty reduction becomes important. Thus, given the availability of cognitive resources, with increase in importance of the goal to achieve closure, high need for closure individuals are more willing to choose more demanding means if they perceive them to be more instrumental for a goal, i.e., uncertainty reduction. However, the utilitarian path is an effective way of reaching certainty by people high in the need for closure only when ingroup was involved, as they are group-centric (Kruglanski et al., 2006; Shah et al., 1998). Thus, it is the ingroup, but not no-ingroup or the individual, that offers certainty, security and identity. The role of the ingroup in reducing uncertainty was confirmed in other studies as well. For example, research by Hogg and Grieve (Grieve & Hogg, 1999; Hogg & Grieve, 1999) demonstrated that people in minimal group settings demonstrated ingroup bias in the face of subjective uncertainty. Similarly, research by Jetten, Hogg, and Mullin (2000) showed that people who are uncertain are more likely to identify with a more than less homogeneous group. It means that ingroup is treated as a source of certainty under the situations that make uncertainty reduction important. Consequently, the decision to preserve an group of one's own people over harming the individual would seem to serve the goal of achieving certainty. Therefore, need for closure is associated with utilitarian decision making when ingroup is involved, which better serves the goal of uncertainty reduction. However, it is true only under stress, when the uncertainty reduction

becomes especially important, which justifies putting greater effort in resolving moral dilemma.

At the same time, for individuals low in the need for closure stress drove more intuitive or emotional responses, something that is consistent with previous findings (e.g., Starcke et al., 2012). These participants tended to make more deontological than utilitarian decisions, as they did not need to reduce uncertainty. What is more, for such individuals, groups are not sources of security and certainty and thus they are not inclined to favor the ingroup over the group or the individual. These results are congruent with previous studies, which investigated the effect of acute stress or cognitive demand on moral judgments and that found an inhibition of cognitive control to be required in order to make utilitarian decisions (Starcke et al., 2012).

Although some studies demonstrated that stress appears to preferentially activate regions involved in emotional processing at the expense of areas responsible for executive control and controlled cognitive reasoning (Valentino & Van Bockstaele, 2008), our study suggests that under certain circumstances this shift from deliberative to intuitive processing may not always occur. Previous studies have demonstrated that the pharmacological blockade of a receptor for cortisol abolishes the stress-induced shift from cognitive to habit memory in spatial and classification learning, pointing also to a crucial role of cortisol in the modulation of flexible cognition (Schwabe et al., 2012). Our study demonstrates that the increased motivation to reduce uncertainty may prevent loss in cognitive control and thus influence moral decisions as well. This issue calls for further research.

Finally, our results are intriguing from a societal perspective, as it is unclear whether individual sensitivity to uncertainty (high in need for closure) is helpful or harmful. We observed higher cortisol enhancing more cognitively demanding moral decisions among people high (vs. low) in the need for closure, suggests that strong HPA activation during decision making tasks can be helpful by heightening individual's sensitivity to potential conflicting perspectives (i.e., harm individual or group or ingroup). Akinola and Mendes (2012) demonstrated that police officers who had larger cortisol increases to the social-stress task subsequently made fewer errors when deciding to shoot armed Black targets relative to armed White targets, suggesting that hypothalamic pituitary adrenal (HPA) activation may exacerbate vigilance for threat cues. This issue is worth further investigation.

In considering the results of this study it is worth stressing some important limitations. One of the limitations of our research concerns the exclusively male sample. Considering earlier findings of gender differences in how stress affects decision making (Van den Bos et al., 2009), future studies should examine the effects of stress on moral decisions among female participants, notably with a view to fluctuating hormonal levels over the course of the menstrual cycle. Furthermore, one has to keep in mind that we measured cortisol levels assuming it to be a good marker of individual variation in stress levels (Kirschbaum & Hellhammer, 2000). We did not focus on individual differences in cortisol levels as an index of chronic stress. We also did not elevate cortisol levels by stress induction procedures in a laboratory, something that may be interpreted as situational reaction to the stressor. Finally, we did not make use of any behavioral measures but relied solely on the cortisol sampling to determine the level of stress. Despite these limitations we believe our results add to the growing body of data seeking to understand the neurobiological mechanisms involved in moral judgments.

Overall, our findings reveal an important moderating factor in the relationship between stress and moral decisions, and provide novel insights into the underlying motivational mechanisms.

#### Appendix A. Supplementary data

Supplementary data to this article can be found online at <http://dx.doi.org/10.1016/j.paid.2016.06.017>.

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