

Emotional arousal in moral decision making

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Abstract

In a previous study it was reported that patients with vmPFC damage had more tendency than people with no lesions to have more utilitarian responses, (i.e., deciding that is acceptable to make a harmful act in order to maximize overall utility) Moretto (2009). Our study included only healthy individuals in order to differentiate between the three types of conditions (personal moral, impersonal moral and non-moral dilemmas). The study included 21 participants that responded to personal as well as impersonal moral dilemmas while skin conductance response (SCR) was recorded as a physiological index of affective state. All participants were college students from University of Barcelona. As for gender, 11 of the subjects were female and 10 were male. Mean age of the subjects was 23.09, ranging from 18 to 30. Later, the results showed that when decisions involve more emotions like in personal moral dilemmas, healthy individuals took more time to answer (Response Time) and their SCR was high only when reading a personal dilemma but on average their responses were non-utilitarian. These findings support the hypothesis that the proportion of utilitarian responses will be lower in the personal moral situations in comparison with impersonal moral and non-moral situations and that SCR would be higher in participants exhibiting fewer utilitarian choices than in those with a higher rate of utilitarian responses.

Keywords: skin-conductance response (SCR), personal dilemmas, emotions, utilitarian responses, response time (RT).

Humans daily face all kinds of decisions which can vary between easy, average, or difficult. Sometimes, difficult decisions can reach a dilemmatic point. There are three different kinds of dilemmas, the personal moral dilemmas, impersonal moral dilemmas, and the non-moral dilemmas. Non-moral dilemmas are the most frequent dilemmas that we face in our daily life; for example, to buy a new mobile or to have your old mobile repaired for the same price, or to travel by car or train given a certain time limit. On the other hand, personal moral dilemmas are difficult to solve and to a certain extent they can block our functioning. Moreover, it is also not easy to take a decision when facing an impersonal moral dilemma but in this case the situation differs from that of a personal moral dilemma. In personal moral dilemmas more emotions are involved when seeing and taking decisions. On the other hand, in impersonal moral dilemmas people feel less involved on the emotional level.

The classic trolley problem (Foot, 1978; Thomson, 1986) displays two contradicting moral scenarios, impersonal versus personal. The impersonal version (trolley dilemma), a bystander can use a switch to redirect a runaway trolley away from five persons or onto a single person. In the personal version (footbridge dilemma), a bystander can push a man with a huge figure off of a bridge in front of a runaway trolley in order to stop it from killing the five persons. Impersonal moral scenarios commonly show higher activation in brain areas combined with problem solving and deliberate reasoning (dorsolateral prefrontal cortex and inferior lobule), whereas the personal moral scenarios show higher activation in brain areas that have been involved in emotion and social cognition (medial prefrontal cortex and posterior cingulate gyrus) (Moretto et al., 2009). Decisions taken in situations involving personal moral decisions are called utilitarian, i.e., deciding that is acceptable to make harmful act in order to maximize overall utility). On the

contrary, decisions taken in situations involving non-utilitarian decisions are called deontological, i.e., certain rights and duties must be respected, regardless of the greater good that might otherwise be achieved.

Emotions play a big role in decision making especially when it has to do with personal moral dilemmas and when taking utilitarian choices (Carmona-Perera et al. 2013, Greene et al. 2001, and Greene et al. 2004, Moretto et al. 2009, Naqvi et al. 2006,). In 2009, Moretto and colleagues found that the medial prefrontal cortex (vmPFC) area is responsible and involved in emotion and social cognition when presenting personal moral scenarios. Patients with adult-onset lesions in ventromedial prefrontal cortex are also found to make more “utilitarian choices” when presented with personal moral scenarios. One explanation of this result is that vmPFC patients lack automatic affective responses when approaching any personal moral violation. The increase of the rate of the “rationally appropriate” utilitarian choices happens when affective reactions dissolve (due to brain damage); in these cases principled reasoning aimed at maximizing benefits and minimizing costs may dominate (Greene, 2007; for a different view, see also Moll & de Oliveira-Souza, 2007). Moreover, other studies (Damasio, 2005) showed that in addition to their inability to make advantageous decisions in real life, patients with vmPFC damage in general manifested a flat affect, and their ability to react to emotional situations was somehow damaged. All these findings show that patients with vmPFC damage usually make utilitarian decisions (Koenigs et al. 2007).

Our study emphasizes the role of emotion whilst traditional theories emphasize reasoning and “higher cognition”. We will focus on healthy subjects, which is not the case in Moretto et al. (2009). The study will focus on healthy subjects in order to differentiate between the three types of dilemmas (personal moral, impersonal moral and non-moral).

The aim of this study was to assess the role of emotions regarding personal moral decisions. In particular, we will focus on the emotional arousal expressed through Skin Conductance Response (SCR) in subjects faced with different types of dilemmatic situations.

Mainly we had two hypotheses to test in our study:

1. We expected that the proportion of utilitarian responses would be lower in the personal moral situations in comparison with impersonal moral and non-moral situations.
2. We predicted that SCR would be higher in participants exhibiting fewer utilitarian choices than in those with a higher rate of utilitarian responses.

Method

Participants

A convenience sampling (using a non-probabilistic method) of twenty one graduate and undergraduate students from the University of Barcelona (UB) participated in the present study (samples of between 20 and 30 subjects are usually considered appropriate for this type of experiments). As for gender, 11 of the subjects were female and 10 were male. Mean age of the subjects was 23.09, ranging from 18 to 30. This sample can be considered half heterogeneous due to the fact that the subjects come from different majors, perspectives, and different backgrounds. On the other hand, all subjects were students from UB.

Materials

In the present study there were 15 personal moral dilemmas, 15 impersonal dilemmas, and 15 non-moral (neutral) dilemmas, randomly selected from a battery of 60 dilemmas developed by Greene et al. (2001). A Spanish Adaptation for the battery was done by Carmona-Perera et al.

(2013): For the purposes of adaptation, the original questionnaire was translated into Spanish and then back-translated into English. Both versions were compared and there were no significant differences observed and both questionnaires were considered equivalent.

It is supposed that moral dilemmas obtain moral emotions, that is, emotions that respond to moral violations, or that motivate moral behavior, like shame, guilt, compassion, and pride; Haidt (2007), when as a matter of fact non-moral dilemmas don't; Greene et al. (2001). Classic examples of non-moral dilemmas raised questions about whether to buy a new mobile or to have your old mobile repaired for the same price, or to travel by car or train given a certain time limit.

Skin-Conductance Response (SCR)

SCR is an autonomic index of emotional arousal. For each participant, prewired Ag/AgCl electrodes filled with isotonic hypo-saturated conductant were attached to the surface of the middle and index fingertip of the non-dominant hand and were fixed firmly in place with a plaster. All the changes were recorded using a DC amplifier. While subjects were performing the moral judgment task being seated in front of the computer, the SCR was collected continuously and stored for later on analysis on another computer. The session began with a resting time making sure that the participants' SCR was adjusted to the environment, and making sure that the electrodes were attached properly. Participants were asked to remain quiet and motionless as possible to avoid any confusion in later on analysis.

Procedure

The study was approved by the Ethics Committee of the University of Barcelona. The participants were asked to sign an informed consent which explained the purpose and the procedure of this study was safe and that there was no danger to their health. It was kept totally

confidential; in the records and forms the participants' information only included their initials and a code that represented each individual. Participants were paid 20 euros at the end of the session because it was a good way to motivate them to participate in the study.

The study took place at Bellvitge University Hospital because they have a well prepared lab for this study. It's a cross-sectional study since it involves the analysis of data collected from a population, or a representative subset, at one specific point in time. It is a quasi-experimental study since it has a within control cases (non-moral dilemmas) that healthy individuals are asked to give responses to; univariate analysis (within-subject ANOVA). This study was done on healthy individuals in order to differentiate between the three types of conditions (personal moral, impersonal moral and non-moral dilemmas). In this study we had a deeper insight in the topic of interest which is the role of emotions in shaping moral judgment. It is partially quantitative since SCRs were recorded for each participant and the number of utilitarian responses given by each participant was analyzed.

Before they started, participants were asked to wash thoroughly their hands with soap and water and dry them well. Subjects sat on a huge and comfortable chair that was not easily moved and in front of a computer screen in a quiet and dimly lit room away from any distraction or sounds from outside the room. Participants were told that throughout the session there will be a small camera recording set on the right side corner of the room. Moreover, there were two interphones each in a room; one where the participant was having the session and one in the experimenter's room; the interphone was easily used in case they needed anything. There were two electrodes that were fixed on the middle and the index finger of the non-dominant hand (SCR) and participants were asked to keep motionless except when answering to questions; they only used their dominant hand to choose one of the keypad buttons. Furthermore, there were

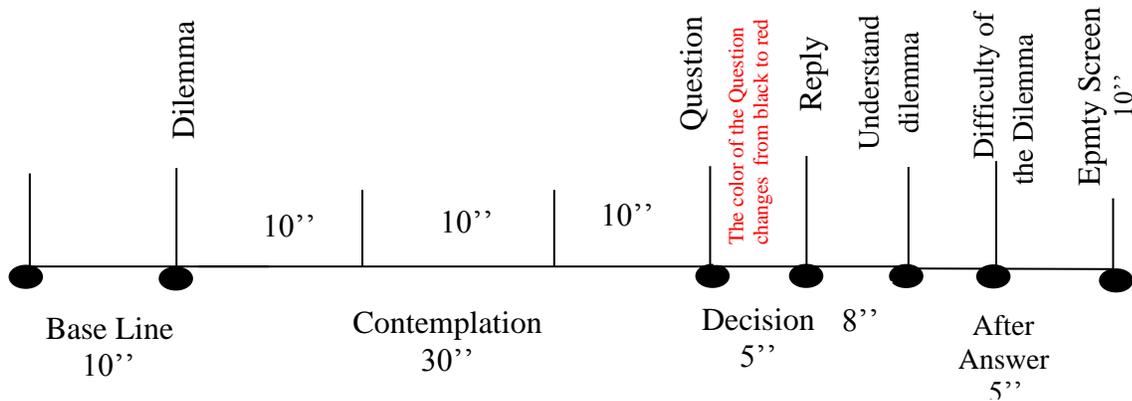
three computers, the first one was recording the session, the second screen recorded the SCR changes throughout the session, and the third screen showed randomly the selected dilemmatic scenarios simultaneously on both screens; the participant's and the experimenter's.

Instructions were well explained of how they will have to answer to the dilemmatic scenarios that will show on the screen. On the screen they faced a number of situations and when they finished reading each scenario they had to press the Spacebar to continue the task. First, a question appeared with the options of response YES/NO in black color. Second, after a few seconds, the words YES / NO appeared in red on the screen. They had to wait until the words YES / NO changed to red to make their choice. To answer they had to use their dominant hand by choosing either the left arrow for YES or the right arrow for NO. Once they had answered a question, another question appeared to check whether they understood the situation or no. Finally, they answered a question assessing the difficulty of each dilemmatic scenario by choosing the keypad numbers from 1 to 5. In total 45 scenarios were presented and after the 25th dilemmatic scenario a little pause was made (2 minutes approx.). The completion of the task took about 45-60 minutes. These 45 dilemmatic scenarios included 15 personal moral dilemmas, 15 impersonal moral dilemmas and 15 non-moral dilemmas. These scenarios were presented in a random way to prevent any bias.

Furthermore, for the analysis part, each trial was divided into four separate time periods: the baseline, the 10-sec time prior preceding each dilemma; contemplation, the 30-sec time window during which participants viewed the dilemma; note this part was modified from 45-sec to 30-sec Moretto (2009); decision, the 5-sec time period set between presenting the dilemmatic question and answering (here the color of the question changed from black to red); understanding of the dilemma question, 8-sec time post-decision; difficulty of the dilemma from 1 to 5, the 5-

sec time post last question. Finally, a blank screen appeared for 10-sec to prepare for the next dilemmatic question (Figure 1).

Figure 1. Different phases of a dilemmatic scenario.



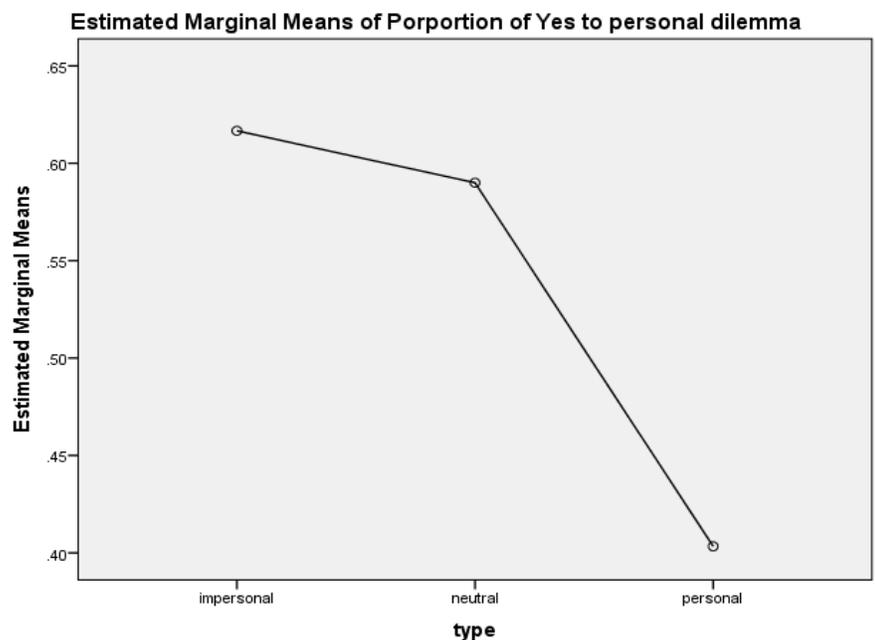
Some changes that were done in our study with respect to that of Moretto's (2009): we added the "understanding of the dilemma question" and the "difficulty of the dilemma question" in order to collect information about whether dilemmatic scenarios were relevant and easily understood. Some dilemmatic scenarios contained extreme situations and we wanted to check if the subjects had understood the situation correctly. In case they didn't get the gist of the question, then we would change the dilemmatic scenario to make it more clear and to relate it to real life situations.

Results

With respect to the first hypothesis, we expected to have less utilitarian choices for the personal moral situations in comparison with impersonal moral and non-moral (neutral)

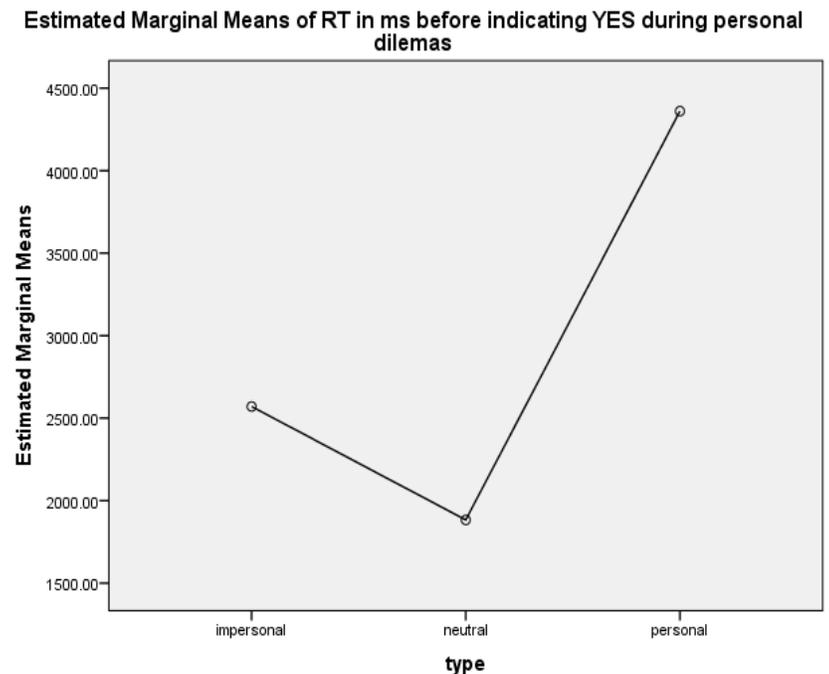
situations, results can be seen in (Figure 2). The data were subjected to a one way ANOVA for dilemma (personal, impersonal, non-moral) as a within-subject factor. Moreover, we had significant results regarding the means of utilitarian choices for the personal moral situations in comparison with impersonal moral and non-moral (neutral) situations. The results were statistically significant ($F(2, 38) = 20.079, p = .000$). Whereas, the difference between the other two situations (impersonal and neutral) was not significant ($p = .472$).

Figure 2. Means of utilitarian responses to personal, impersonal, and non-moral (neutral) dilemmas in healthy individuals



Response Time (RT) was high when taking personal choices in contrast to the other types of dilemmas the impersonal and neutral (see Figure 3). The results were significant ($F(2, 37) = 3.909, p = .029$). The results showed that the difference between the impersonal and neutral was not significant ($p = .477$), whereas the difference between the personal and the other two types of dilemmas (impersonal and neutral) was significant ($p = .011$).

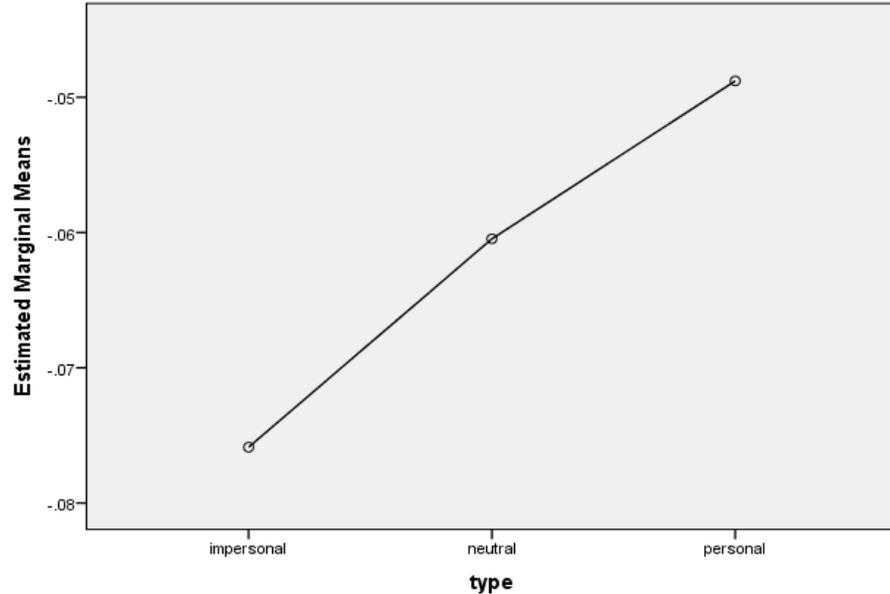
Figure 3. RT in (ms) before a utilitarian response during the three types of dilemmas (impersonal, neutral and personal).



Furthermore, during contemplation (when reading), the participants generated larger SCRs of personal moral dilemmas that were associated with utilitarian responses/judgments (Figure 4). In addition, on average individuals selected non-utilitarian choices in personal moral dilemmas. Besides the well-formed graph, our findings showed non-significant results ($F(2, 40) = 2.777$, $P = .074$). The difference between the impersonal and neutral was not significant ($p = .189$) and the difference between the personal and the other two types of dilemmas (impersonal and neutral) was not significant ($p = .059$).

Figure 4. SCR when reading the three types of dilemmas (personal, impersonal and neutral).

Estimated Marginal Means of mean SCR when reading personal dilemma (shorter window 8s, instead of 15s) (means > 2 stdvs where replaced by the mean of the subjects trials)



Discussion

A previous study (Moretto 2009) found that patients with vmPFC damage with respect to healthy individuals were more likely and had the tendency to choose moral violations in order to maximize good consequences (i.e., the utilitarian response). Our results completely agreed with the previous data regarding the point that healthy individuals had less utilitarian choices for the personal moral situations in comparison with impersonal moral and non-moral (neutral) situations; whilst in patients with vmPFC damage that case was the opposite (more utilitarian choices when encountered with personal moral situations). Response Time (RT) was higher when taking personal choices in contrast to the other types of dilemmas the impersonal and neutral. On the other hand, patients with vmPFC damage seemed to have no hesitation when

answering to personal dilemmas. Our present study was designed to test the pattern of skin-conductance changes that is used as an autonomic index of individuals' affective responses, combining personal versus impersonal moral judgments. Furthermore, during contemplation (when reading), the participants generated larger SCRs of personal moral dilemmas that were associated with utilitarian responses/judgments. In addition, on average individuals selected non-utilitarian choices in personal moral dilemmas. We can say that the SCR signal could not only aid as an affective signal that warns us to the moral consistency of a rule of violation (in some cases might be serious violent act against others), but also as a teaching signal targeted to decreasing the likelihood of moral unacceptable behaviors.

Like any other study, this research has certain limitations, including: (1) low mean scores due to a general (non-clinical) sample; (2) a small sample size. However, these limitations would have restricted, rather than enhanced, our ability to find statistically significant results in part of our findings. At all events, these limitations should not distract from the fact that we have experimentally examined that emotions are involved in making moral judgments.

In conclusion, the present results suggest that emotions play an important role in guiding moral decisions about whether deciding that it is acceptable to make harmful act in order to maximize overall utility or to accept that certain rights and duties must be respected, regardless of the greater good that might otherwise be achieved (on average healthy individuals had more non-utilitarian responses and few of which were utilitarian).

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