



„COGNITIVE SCIENCE AND PSYCHOLOGY” DEPARTMENT

MORAL JUDGMENT AND EMOTIONS: BIOSIGNAL BASED RESEARCH

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1. Introduction

Moral psychology is concerned with identifying certain factors that might predict tendencies in moral judgment, as well as providing explanations for the specific mechanisms of cognitive processing.

More and more researchers are becoming interested in the study of emotions, and over time, solid evidence is accumulating for their importance in a number of cognitive tasks. The topic of the influence of emotions on judgment processes becomes particularly relevant: a set of significant and interesting results are documented that demonstrate that our judgment could be influenced not only by emotions related to the specifics of the cognitive task we perform, but also from our momentary emotional state that is not directly related to the task (Constans & Mathews, 1993; Lerner et al., 2015; Mayer et al., 1992). It has been established that judgment processes are guided not only by following certain principles and their rational application. A great number of experimental studies show, for example, that the thesis of moral judgment in line with established, consciously accessible principles cannot be supported, or at least not in all cases (Cushman et al., 2006; Haidt, 2001; Hauser et al., 2007). Certain discoveries in the field and the availability of objective and precise psychophysiological measurements of various components of the emotional response mediate an increased research interest in the field of psychology of moral judgment, which is also the subject of the present thesis.

In 2001, Greene and colleagues (Greene et al., 2001) published neuroimaging data in support of their proposed dual-process theory of moral judgment, according to which judgment in many moral situations is the product of the operation of two cognitive systems: intuitive and reflective. According to the authors, in emotionally charged situations where human life is at risk, the intuitive system, which operates on the basis of emotional experiences, prevails over the reflexive system (responsible for rational reasoning and calculations) and guides judgment. This publication provoked a wave of empirical research that aims to clarify the role of emotions in moral judgment, in addition to offering approaches for methodological refinement as well as for refining possible conclusions (Cushman & Greene, 2012; Gawronski et al., 2018; Greene et al., 2009; Valdesolo & DeSteno, 2006). A large part of these studies provide data to support the thesis of a significant role of emotions, but it should be noted that the original study also provoked many criticisms, most of which are of a methodological nature.

A lot of researchers have strongly criticized these models and argued that, as a result of a misinterpretation of the available empirical data, emotions are given undue importance (Horne & Powell, 2016; Maibom, 2010). Despite active research in the field in the last 20 years, there are still controversial questions related to the role of emotions, which give rise to the need for systematic research, using objective methods and strict experimental control.

The present dissertation is motivated by current discussions in the field of moral judgment, which indicate that further research as well as methodological improvements are needed to enable a systematic study of the role of emotions. Strictly-controlled stimuli and methods are used which allow for tracking the temporal unfolding of the moral judgment process.

The presented dissertation has the following structure:

Chapters 2, 3 and 4 are an overview of different approaches used to study moral judgment. Research supporting the significant role of emotions and influential theories that provide explanations for the cognitive mechanisms involved in moral judgment are reviewed. A broad review of the factors identified in the literature that influence judgment is undertaken in order to address possible methodological problems in earlier research. Current debates in the field and currently unresolved research questions are reviewed.

In Chapter 5, a summary of basic theories and factors in moral judgment research is presented and a plan of experiments is presented - some unclear and methodologically problematic weaknesses in previous research are discussed; the objectives of the empirical studies included in the dissertation are presented.

In chapters 6, 7 and 8, three experiments are successively presented. The research presented in the dissertation aims to establish whether the intensity of the emotion accompanying the moral judgment is predetermined by various factors. Experiment 1 and Experiment 2 examine the physical contact factor, widely studied in the context of emotions in moral judgment. Two other factors that have been found to influence moral judgment but have been understudied in the context of emotions (*instrumentality of harm* and *inevitability of death*) are also explored. In Experiment 1, the perspective is *from the first person*, and in Experiment 2, dilemmas are framed in *a third person perspective*. In both experiments, biomarker recording equipment was used and skin conductance data were analyzed to examine emotional responses. In Experiment 3, in order to examine the influence of momentary emotional state on moral judgment, the effects of a set of systematically manipulated emotions (amusement/disgust/fear/sadness) were examined. Using eye-tracking equipment, information processing during reading is explored in order to rule out alternative explanations for the influence of momentary emotional states on judgement.

In Chapter 9, the obtained results are summarized and discussed in the context of the debates presented in the beginning. Research limitations and possible perspectives for future research are discussed.

Chapter 10 presents the dissertation contributions.

2. Moral dilemmas. Factors affecting moral judgment.

2.1. Approaches to the study of moral judgment. Moral dilemmas

Experimental psychologists who work in the field of moral psychology aim to learn more about the cognitive processes and mechanisms that are involved in moral judgment. To this end, they manipulate various factors that might influence judgment and look for specific trends in participants' responses. . Despite the variety of methods used, the most commonly used approach to study moral judgment is by presenting research participants with a series of moral dilemmas. The task performed by the participants implies that they "weigh" two moral principles that are opposed in the dilemma and make a choice in accordance with one of them, which automatically entails the violation of the other. An example of a dilemma widely used in a number of experiments is the so-called *trolley problem* (after Greene et al., 2001). The dilemma is illustrated by the following scenario: "You are near railroad tracks. A trolley is traveling on the tracks that has lost control and is about to kill five people who are on the tracks and unable to react. The only way to save the five people is to pull a lever near the tracks. That way, you're going to divert the car onto another rail line where there's only one person, and that person will die." (Greene et al., 2001). Participants must answer whether, if they found themselves in a similar situation, it would be morally permissible to act in the suggested way. Currently, such moral dilemmas are widely used in the field of experimental psychology (Greene et al., 2001, 2009; McGuire et al., 2009; Moretto et al., 2010), but the idea of their use is borrowed from the field of philosophy. For the first time such a dilemma was described in a philosophical article by Foot (1967) and received its popular name "*Trolley problem*" or *the trolley dilemma* in another philosophical paper (Thomson, 1986). In the context of normative philosophical theories, in such conflicts, there are two diametrically opposed principles that must be followed in resolving such moral conflicts. According to deontological theories of morality, actions should not be morally condemned based on the consequences they lead to. Whether a certain action is morally right or wrong depends on the principle that the action follows. According to Kant, a principle that can justify a particular action must be applicable as a universal law that operates without exception (Kant, 1785/1988). That is, if harming is considered morally wrong in a particular situation, such an act could not be justified in different circumstances, or if it led to different consequences. In this sense, in a situation of a moral dilemma such as the trolley dilemma, killing one person in order to save five people is morally impermissible, regardless of whether the killing results in a benefit to a larger number of people or not. Bentham (1781/2000) defends a completely opposite position and claims that what is important from a moral point of view is precisely the consequences of a certain action and when it leads to the maximization of the common good, that action is morally right. This position underlies the utilitarian theory of moral judgment, according to which, in a moral dilemma situation such as the trolley dilemma, it is morally right to kill one person in order to save five people (in this case the lives

of five people are considered more valuable than that of a single person). In the psychology of moral judgment field, the terms "deontological judgment" and "utilitarian judgment" are used in a narrower sense to denote the conformity of the judgment made with one of two principles, without necessarily claiming that these principles are consciously followed in the judgment process.

A number of experimental studies show that in moral dilemmas such as the trolley dilemma, most people are more inclined to make a utilitarian judgment (Greene et al., 2001, 2009; Moore et al., 2008; Waldmann & Dieterich, 2007; Wong & Ng, 2018). On the other hand, when people reason about an alternative scenario whose only difference from the original one is that the killing that could lead to the rescue of the five is done with personal contact, they are more likely to make a deontological judgment. This version of the trolley dilemma, in which the killing is carried out with personal contact, is known in the literature as the "Footbridge dilemma". What is interesting about this case is that the two scenarios are exactly the same in terms of consequences, as in both cases one person must be sacrificed in order to save five. The dissociation in responses shows that moral judgment depends on contextual factors and does not always follow well-defined and universally valid principles. This result has been repeatedly replicated in different studies (Cipolletti et al., 2016; Greene et al., 2001, 2008, 2009; Hayakawa et al., 2017; Valdesolo & DeSteno, 2006).

2.2. Factors affecting moral judgment

In an attempt to explain the effects described above, many different factors have been proposed to be important in determining what is right and what is wrong. For example, Greene et al. (2001) define the footbridge dilemma as a *personal* dilemma and the trolley dilemma as an *impersonal* dilemma and establish a tendency for utilitarian judgment in other *impersonal* dilemmas as well as a tendency for deontological judgment in other *personal* dilemmas. At a later stage, Moore et al. (2008) define more precisely the difference between the two types of dilemmas by examining the factor *physical contact* - the infliction of harm is done either by physical contact, or mechanical means are used and the harm is inflicted from a distance.

At the same time, many other authors argue that judgment in a situation of moral dilemma depends on several other important factors, apart from the means of inflicting harm (*personal* or *impersonal*). The moral judgment also changes depending on the recipient of the benefit (eng. benefit recipient), depending on the *factor inevitability of death*, as well as depending on whether the harm was inflicted instrumentally or not. A systematic review can be found in Christensen et al. (2014).

The possibility for systematic manipulation of a number of factors within moral dilemmas allows for learning more about the cognitive processes involved in judgment. This is one of the main advantages of moral dilemmas in their role as a tool for the study of moral judgment, which is why they are used very widely in various experimental studies (Armbruster

& Strobel, 2022; Cushman et al., 2006; Cushman, 2013; Greene et al., 2001, 2008; Moretto et al., 2010; Navarrete et al., 2012; Royzman et al., 2011; Wong & Ng, 2018).

3. The role of emotions in moral judgment

3.1. The dual-process theory of moral judgment

Intensive research on the role of emotions in moral judgment was largely prompted by the results of Greene et al. (2001), who predicted that judgments on *personal* dilemmas (e.g., the footbridge bridge dilemma) and judgments on *impersonal* dilemmas (e.g., the trolley dilemma) would show different neural activity, which could also explain the different tendencies in the answers in both types of dilemmas. The authors obtained results that corresponded to this prediction: when judging *personal* dilemmas, activation of areas in the brain associated with emotional processing was observed, and when judging *impersonal* dilemmas, areas responsible for cognitive control were activated. Also, the authors expected differences in response times for the two types of dilemmas. They obtained the following results: when participants made judgments about *personal* dilemmas, they needed more time than when they made judgments about *impersonal* dilemmas. The more interesting effect was the interaction between the type of response they provided (morally permissible/morally unpermissible) and the type of dilemma (personal/impersonal) when measuring response time. In personal dilemmas, participants needed more time to make a utilitarian choice (evaluate killing one person in order to save five people as morally permissible) compared to the time they needed to make a deontological choice (evaluate killing one person in order to save five people as morally unpermissible). For impersonal dilemmas, no difference in response time was observed depending on the type of judgment.

Green et al. (2001) argued that their results were consistent with the dual-process theory of thinking (Evans & Frankish, 2009; Sloman, 1996; Stanovich & West, 2000). According to this theory, people process information in two fundamentally different ways (using two different cognitive systems). One system is fast, automatic, works unconsciously and effortlessly based on experience, intuition and affect (System 1), and the other is analytical, responsible for conscious reasoning and its work requires a large cognitive resource (System 2). In the first system, affect plays a central role, while in System 2 cognitive control is the leading one. According to Greene et al. (2001), in a moral dilemma situation such as the trolley dilemma, System 1 directs a quick, intuitive judgment that arises as a result of strong, negative emotion and favors individual rights. For this reason, regardless of the circumstances, harming is considered a moral violation (deontological judgment), while System 2 allows the initial quick and intuitive response to be suppressed and a rational decision made in favor of the common good (utilitarian judgment). In order to suppress this emotional reaction and make a utilitarian decision, it is necessary to exercise cognitive control with the help of System 2, which leads to a delay in making the judgment. Neuroimaging data also supports this interpretation.

Over the next two decades, Greene et al.'s dual-process theory of moral judgment. (2001) became very influential and provoked a series of studies aimed at establishing how

emotions are involved in moral judgment, focusing on differences mainly between personal and impersonal dilemmas, but also manipulating other factors related to conceptualization of the dilemma. Despite criticism of the stimulus material used in the original study, it continues to be used in new research, with some authors proposing modifications for methodological improvements and the elimination of potential contaminating variables (e.g., Moore et al., 2008; Moore et al., 2011; Greene et al. 2009; Christensen & Gomila, 2012; Christensen et al., 2014).

The dissertation provides a detailed review of research that aims to establish the role of emotions in moral judgment. Research findings are discussed in the context of the dual-process theory of moral judgment (Greene et al., 2001), as this is one of the most influential theories of the role of emotions in moral judgment, but the theory is still under current research. including the research in the current dissertation.

3.2. Dual-process theory criticism

However, there are also criticisms of the dual-process theory according to which despite the considerable number of studies supporting the dual-process theory, their results should be accepted with caution (Bostyn & Roets, 2017; Gawronski et al., 2018; Horne & Powell, 2016; McGuire et al., 2009; Moore et al., 2011).

According to these authors, a major methodological problem in research on the role of emotions stems from the lack of systematic stimulus control. Much of this research used the original battery of Greene et al. (2001), in relation to which various authors have identified a number of potential confounding variables (Bostyn & Roets, 2017; Gawronski et al., 2018; Horne & Powell, 2016; McGuire et al., 2009; Moore et al., 2011). A number of researchers have criticized the battery used on the basis of the fact that *personal* and *impersonal* dilemmas differ on other dimensions than the one previously set by the authors (personal-impersonal dilemmas) (Kahane & Shackel, 2010; McGuire et al., 2009; Moore et al., 2008; Nakamura, 2013).

McGuire et al. (2009) reanalyzed the data of Greene et al. (2001) and found that the response time effects found were due to single stimuli and they were not present for all *personal* dilemmas. Moore et al. (2008) also performed a detailed analysis of the stimulus material and found that a number of other factors varied unsystematically and likely confounded the results in the original study and others using this battery. These two publications are presented in more detail in chapter 2.3.1 of this dissertation.

Beyond the stated methodological problems, other imperfections in the research in support of the dual-process theory of moral judgment can be pointed out, which are related to the validity of the conclusions drawn. For example, much of the neuroimaging research argues that there is a difference in emotional response for the two types of dilemmas, but does not identify the specific emotions that potentially guide judgment (Horne & Powell, 2016). Also, neuroimaging studies cannot determine whether the emotional response they

record leads to the particular moral judgment or is a consequence of it, due to the poor temporal resolution of the method.

Other criticisms of the neuroimaging evidence relate to the biased approach used in interpreting the results.

A number of researchers have attempted to provide evidence in support of the causal role of emotions by conducting experiments in which they induce "irrelevant emotional states" and examine the subsequent change in judgment. Within this line of research, there is considerable evidence confirming the causal role of emotions (e.g. Wheatley & Haidt, 2005; Valdesolo & DeSteno, 2006; Strohminger et al., 2011; Inbar et al. , 2012;). On the other hand, these studies are open to criticism, as it could be speculated that the change in participants' responses could be due to the influence of emotions on the conceptualization of the content of the stimuli, the interpretation of the question asked, and also on the transformation of the response to a numerical value (when the moral judgment task requires rating of permissibility) (Huebner et al., 2009).

4. Summary and research plan

4.1. Summary

According to earlier theories of moral judgment, judgment is made on the basis of conscious reasoning (Kohlberg, 1969). According to recent theories, along with reasoning, emotions also play a significant role (Greene et al., 2001; Haidt, 2001). Major discussions in the field are focused on the causal role and temporal sequences of the involved processes. The dual-process theory of moral judgment views judgment as the result of the interaction between two processes: intuitive and reflexive, the product of the functioning of two separate systems that might operate in conflict. The intuitive process is based on quick automatic reactions and emotions, while the reflective process involves slow and conscious rational reasoning and harm-benefit analysis (Greene et al., 2001).

Interactions between the content of the induced emotion and the type of dilemma and the joint influence of these factors on moral judgment have also been investigated (Inbar et al., 2012; Strohminger et al., 2011; Valdesolo & DeSteno, 2006; Wheatley & Haidt, 2005). It has been found that the judgment could vary depending on the momentary emotional state, which means that in certain conditions, emotions perform a causal role.

Despite the considerable number of studies supporting the dual-process theory, a large number of them are also subject to serious criticism (Bostyn & Roets, 2017; Gawronski et al., 2018; Huebner et al., 2009; McGuire et al., 2009).

The literature review shows that despite the accumulated huge amount of publications in the field, many important methodological aspects have been neglected, which could lead to invalid conclusions.

4.2. Research plan

The research in this dissertation is planned based on the criticisms discussed in the text, aiming to establish whether moral judgment depends on the intensity and content of accompanying emotional experiences.

In the context of the dual-process theory of moral judgment (Greene et al., 2001), other significant factors, besides the presence of *physical contact*, have been investigated, namely, the factors of *inevitability of death* and *instrumentality of harm*. The influence of the factors *physical contact* and *inevitability of death* was examined in two different perspectives – *first-person* (in Experiment 1) and *third-person* (in Experiment 2).

All stimuli were selected in order to exercise strict control and remove potential confounding variables.

In a series of experiments, both moral judgment and emotional processing are investigated.

- Inferences about the intensity of emotional experiences during judgment are made on the basis of skin conductance measurements.

- An attempt is made to rule out alternative explanations for the role of momentary emotional state on the basis of gaze-tracking data while reading the dilemmas.
- Response time is also measured, on the basis of which inferences can be made about the presence of conflict between the two systems (intuitive and reflexive) that are supposedly involved in moral judgment (Greene et al., 2001).

Experiment 1 examined the influence of the factors *physical contact*, *inevitability of death*, and *instrumentality of harm* on moral judgment. In all dilemmas, participants have to imagine themselves in the role of the protagonist and make judgments about their own hypothetical actions in a moral dilemma situation. The goal is to determine whether the intensity of the emotional experience varies depending on the manipulated factors and how the different intensity could explain the differences in judgment. The intensity of emotion during reading the text of the dilemmas and during judgment was compared. Judgments, skin conductance data, and response times are reported.

In Experiment 2, *physical contact* and *inevitability of death* factors were manipulated. Some of the stimuli from Experiment 1 are used, but in this experiment they are reformulated in a third-person perspective and participants make judgments about the hypothetical actions of other persons. Again, the aim was to determine whether the intensity of the emotional experience varied as a function of the manipulated factors and how differences in intensity might account for differences in judgment. Judgments, skin conductance data, and response times are reported.

In Experiment 3, the influence of previously induced emotional states (amusement, disgust, fear, and sadness) on moral judgment was investigated in order to make a systematic comparison between the effects of different emotions in terms of content. In addition, eye tracking was used to rule out alternative explanations for the effect of emotions. Judgments and eye-tracking data are reported.

5. Experiment 1: Moral judgment for first-person dilemmas. Bio signal-based research.

5.1. Aims and hypotheses

Experiment 1 examined the influence of the factors *physical contact*, *inevitability of death*, and *instrumentality of harm* on moral judgment. In all dilemmas, participants have to imagine themselves in the role of the protagonist and make judgments about their own hypothetical actions in a moral dilemma situation. The goal is to determine whether the intensity of the emotional experience varies depending on the manipulated factors and how the different intensity could explain the differences in judgment. The intensity of emotion during reading the text of the dilemmas and during the judgment was compared.

According to the dual-process theory of moral judgment (Greene et al., 2001), in situations in which death is caused by *physical contact*, a stronger emotional response is expected compared to dilemmas *without physical contact*. (Hypothesis 1)

Therefore, in this type of dilemma (with *physical contact*), the action is expected to be perceived as less morally permissible, compared to dilemmas *without physical contact*. (Hypothesis 2)

Because, according to this theory, it takes time to overcome the initial emotional reaction, judgments in dilemmas *with physical contact* will be made more slowly than in dilemmas *without physical contact* (Hypothesis 3).

It is known from previous research (Moore et al., 2008) that if achieving a greater good for more people requires sacrificing a person whose death is *inevitable*, regardless of whether the action will be performed or not, then the action is perceived as more permissible compared to situations in which the same action would result in the sacrifice of a person whose death could be *avoided* (Hypothesis 4).

It is possible that this result was also due to an emotional response of varying intensity. If this is the case, a weaker emotional response would be expected in dilemmas in which the victim's death is *inevitable* (Hypothesis 5).

Also, when the death of the sacrificed person was done with the *instrumental* purpose of being used as a means of saving others, the act would be perceived as less permissible (Hypothesis 6). Again, this may be due not only to rational reasoning, but also to a stronger emotional response when death is induced with an *instrumental* aim (Hypothesis 7).

5.2. Method

5.2.1. Design and stimuli

In the present experiment, trolley-like moral dilemmas are used. In a within-group design, three factors related to the conceptualization of the dilemma are manipulated:

- *Physical contact* – the harm is inflicted through physical contact (dilemmas with physical contact), or mechanical means are used through which harm is inflicted from a distance (dilemmas without physical contact).

- *Instrumentality of harm* – the harm is inflicted *intentionally*, as a tool to save the other endangered participants in the scenario (*instrumental harm*) or it is a side effect of other actions aimed at saving the others (*incidental harm*).

- *Inevitability of death* – the damage is done to a person who will die regardless of the actions of the protagonist (*inevitable death*) or to a person who is not threatened by the situation (*avoidable death*).

Dependent measures

Moral judgment is explored, using the following measures:

- **Number of "yes" responses** to the question "Is it permissible to act in the manner described?" (Yes / No)?"

- **Permissibility ratings:** rating on a 7-point Likert scale (where "1" means prohibited, "4" means permissible, and "7" means mandatory) in response to the question "To what extent is it permissible to act in the manner described?"

The time required to answer the question "Is it permissible to act in the manner described?" (yes/no)?" measured after participants confirmed that they had read and understood the dilemma text.

The intensity of the emotional response was measured by skin conductance recording for the reading and judgment periods.

5.2.2. Aparatus

Skin conductance was recorded using a Biopac, Inc. polyphysiography system. MP 150 and GSR100C amplifier with a time resolution of 200 samples per second. The TSD203 Ag-AgCl electrodes used operate under a constant voltage of 0.5 V current. Behavioral data recorded by E-Prime 2.0 software (Psychology Software Tools, Pittsburgh, PA). Synchronization is performed according to markers that reflect the beginning and end of all occurring events.

5.2.3. Participants

A total of 73 people (55 women and 18 men), students at the New Bulgarian University, took part in the study. Participants' age ranged between 18 and 40 years ($M = 23$, $SD = 4$).

5.3. Results

5.3.1. Results for the physical contact and inevitability of death factors

5.3.1.1 Responses “Permissible”

The analysis revealed a main effect of the physical contact factor ($F(1, 72) = 24.72, p < .001, \eta^2 = .256$) and a main effect of the inevitability of death factor ($F(1, 72) = 24.72, p < .001, \eta^2 = .153$). The interaction between the two factors was not statistically significant.

When the action was performed without physical contact, participants gave more answers "permissible" ($M = .54, SD = 0.50$) compared to the dilemmas in which the action was performed with physical contact ($M = .37, SD = 0.48$). The results are presented in Figure 1.

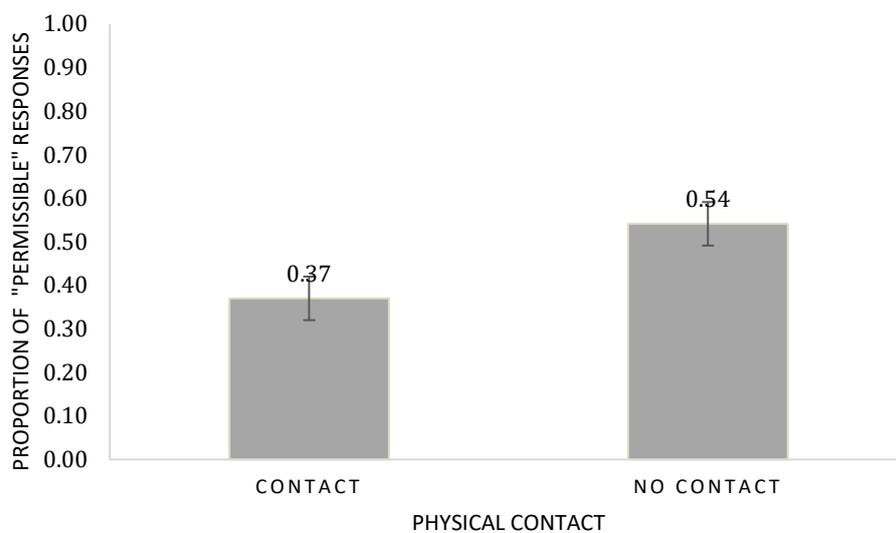


Figure 1. Proportion of “permissible” responses when the action was performed with or without physical contact. Error bars = standard error of the mean.

When death was inevitable, participants gave more “permissible” responses ($M = .50, SD = .50$) compared to dilemmas in which death could be avoided ($M = .41, SD = .49$). The results are presented in Figure 2.

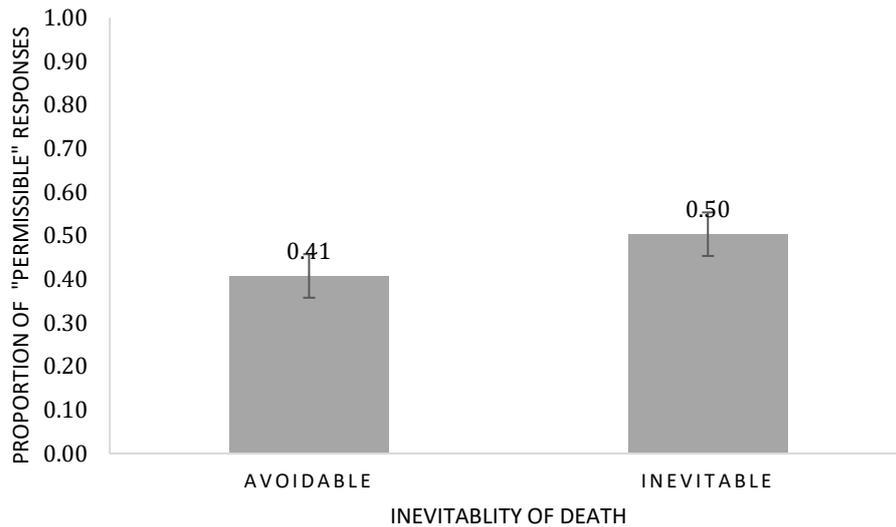


Figure 2. Proportion of “permissible” responses for avoidable and inevitable death. Error bars = standard error.

5.3.1.2 Permissibility ratings

The analysis revealed a main effect of the physical contact factor ($F(1, 72) = 29.577, p < .001, \eta^2 = .291$) and a main effect of the inevitability of death factor ($F(1, 72) = 7.696, p = .007, \eta^2 = .097$). The interaction between the two factors was not statistically significant.

When the action was performed without physical contact, participants gave higher permissibility ratings ($M = 3.0, SD = 1.65$) compared to dilemmas in which the action was performed with physical contact ($M = 2.6, SD = 1.65$). The results are presented in Figure 3.

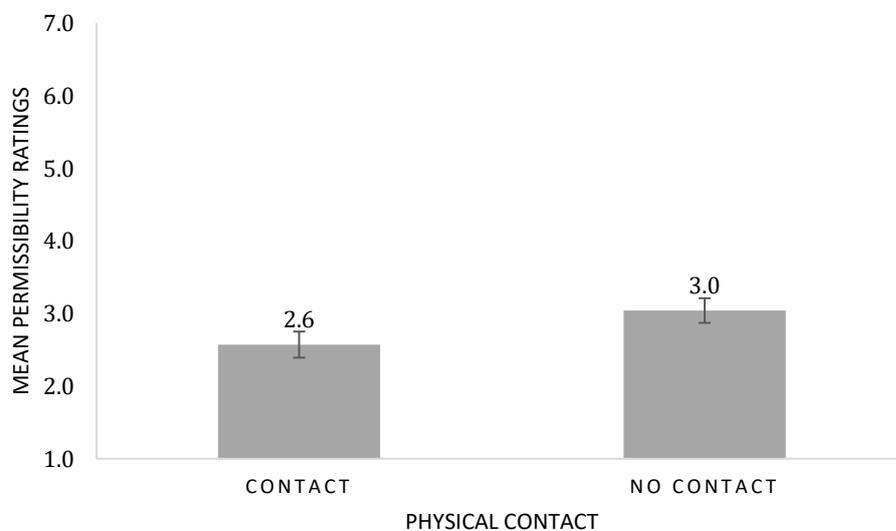


Figure 3. Mean permissibility ratings when the action was performed with or without physical contact. Ratings are on a scale from 1 = forbidden to 7 = mandatory. Error bars = standard error.

When death was inevitable, participants gave higher permissibility ratings ($M = 2.9$, $SD = 1.68$) compared to dilemmas in which death could be avoided ($M = 2.7$, $SD = 1.64$). The results are presented in Figure 4.

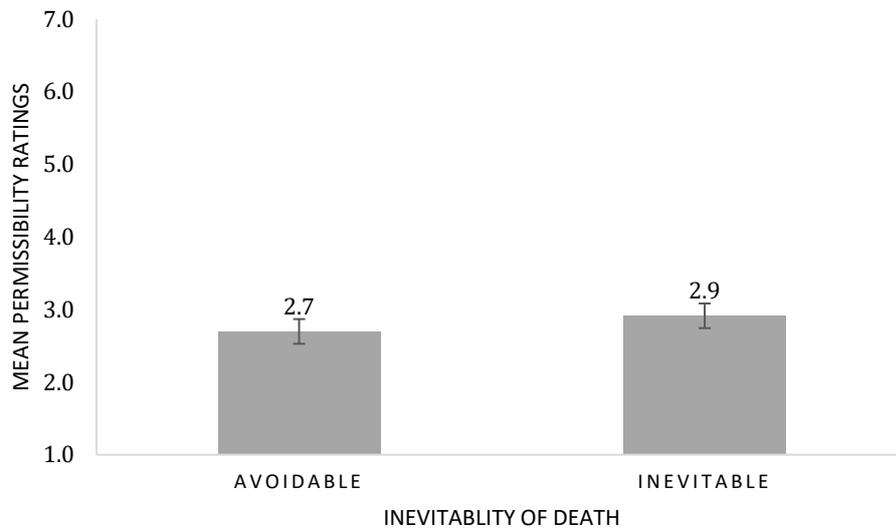


Figure 4. Mean permissibility ratings for avoidable and inevitable death. Ratings are on a scale from 1 = forbidden to 7 = mandatory. Error bars = standard error.

5.3.1.3 Skin conductance response elicited during reading of the dilemma and the possible resolution

A visual representation of a skin conductance recording is presented in Figure 5.

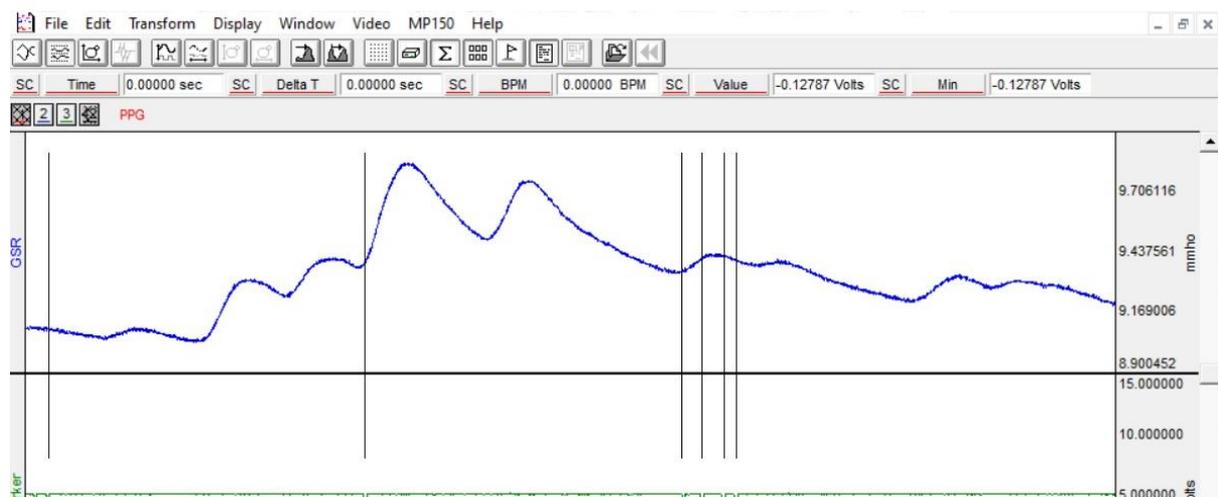


Figure 5. A visual representation of a skin conductance recording.

The analysis revealed a main effect of the physical contact factor ($F(1, 65) = 4.344$, $p = .041$, $\eta^2 = .063$) and a main effect of the inevitability of death factor ($F(1, 65) = 6.036$, $p = .017$, $\eta^2 = .085$). The interaction between the two factors was not statistically significant.

When death was inflicted without physical contact, skin conductance was higher ($M = 0.41$, $SD = 0.59$) compared to dilemmas in which death was inflicted with physical contact ($M = 0.34$, $SD = 0.57$). The results are presented in Figure 6.

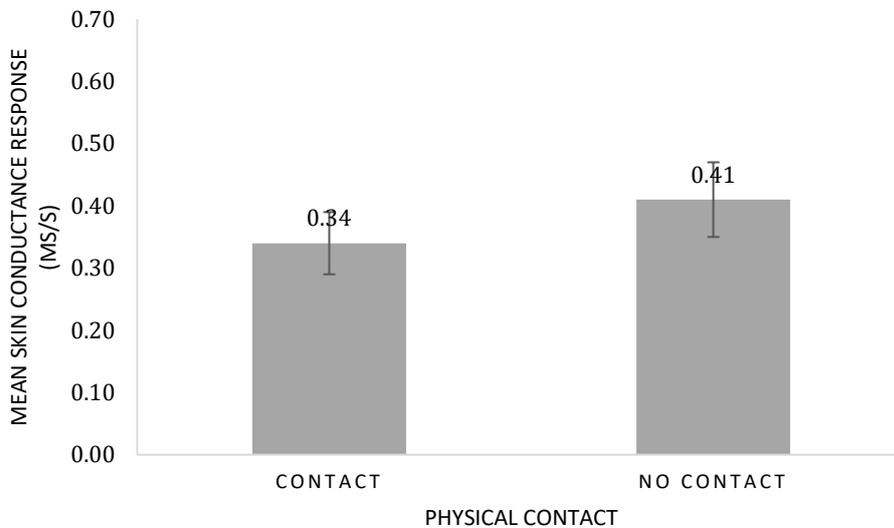


Figure 6. Mean skin conductance response elicited during reading of the dilemma and the possible resolution when death was inflicted with or without physical contact. Error bars = standard error.

When death was inevitable, skin conductance was higher ($M = .43$, $SD = 0.67$) compared to dilemmas in which death was avoidable ($M = 0.31$, $SD = 0.47$). The results are presented in Figure 7.

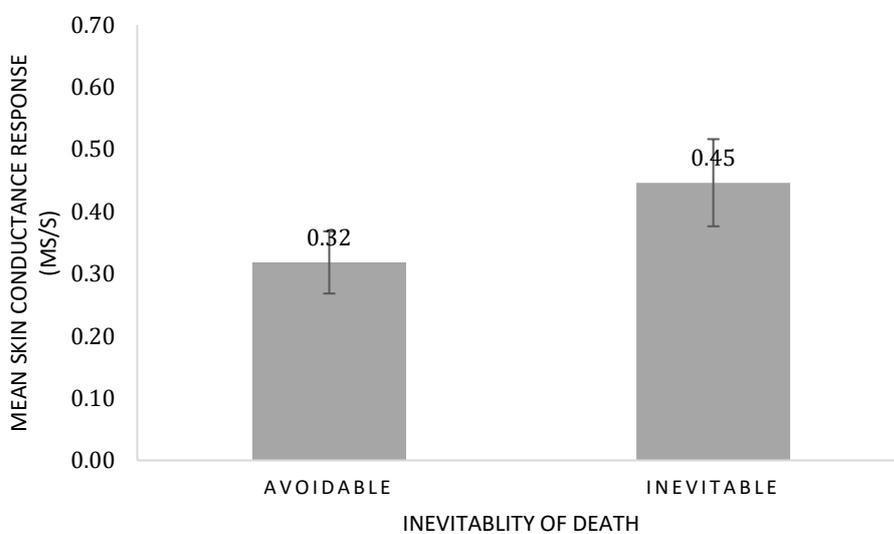


Figure 7. Mean skin conductance response elicited during reading of the dilemma and the possible resolution when death was avoidable or inevitable. Error bars = standard error.

5.3.1.3 Skin conductance response elicited during the judgment period

The analysis did not demonstrate a main effect of the physical contact factor. The interaction between the two factors was not statistically significant. The analysis revealed a main effect of the factor inevitability of death ($F(1, 68) = 5.664, p = .020, \eta^2 = .077$).

When death was inevitable, skin conductance was higher ($M = 0.25, SD = 0.44$) compared to dilemmas in which death could be avoided ($M = 0.18, SD = 0.38$). The results are presented in Figure 8.

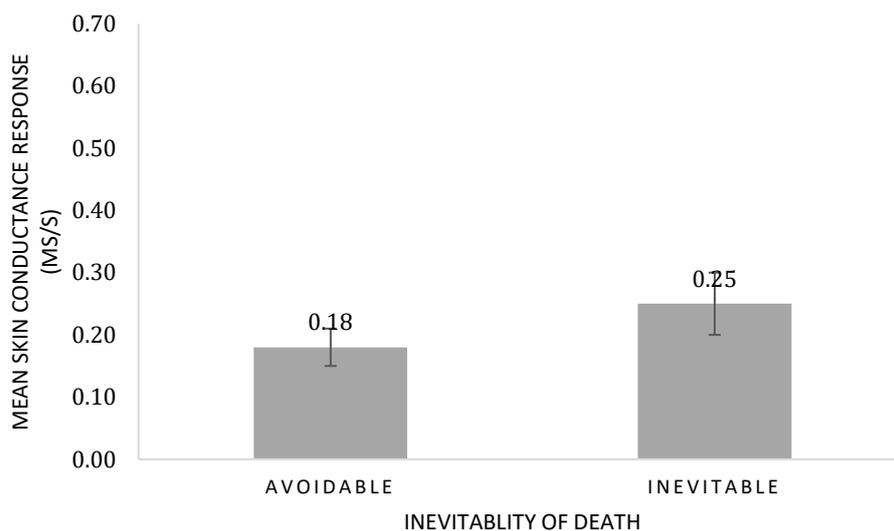


Figure 8. Mean skin conductance response elicited during judgment when death was avoidable or inevitable. Error bars = standard error.

5.3.1.4 Response time

The analysis showed no main effect of any of the factors. The interaction between the factors was also not statistically significant.

5.3.2. Results for the instrumentality of harm and the inevitability of death factors

5.3.2.1 Responses "Permissible"

The analysis demonstrated a main effect of the factor instrumentality of harm ($F(1,72) = 9.28, p = .003, \eta^2 = .114$) and a main effect of the factor inevitability of death ($F(1,72) = 11.04, p = .001, \eta^2 = .133$). The interaction between the two factors was not statistically significant.

When harm was inflicted incidentally, participants gave more answers "permissible" ($M = 0.63, SD = 0.48$) compared to dilemmas in which harm was inflicted instrumentally ($M = 0.54, SD = 0.50$). The results are presented in Figure 9.

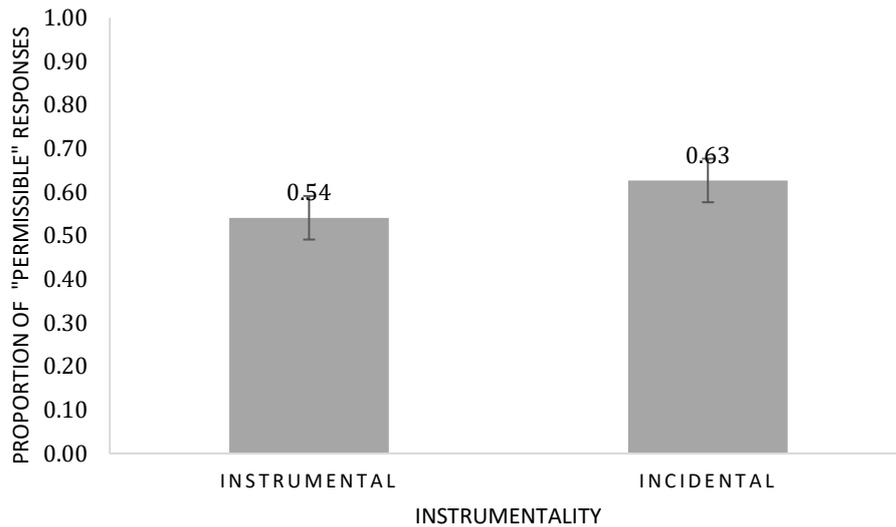


Figure 9. Proportion of "permissible" responses when the harm was inflicted instrumentally or incidentally. Error bars = standard error of the mean.

When death was inevitable, participants gave more "permissible" responses ($M = 0.64$, $SD = 0.48$) compared to avoidable dilemmas ($M = 0.53$, $SD = 0.50$). The results are presented in Figure 10.

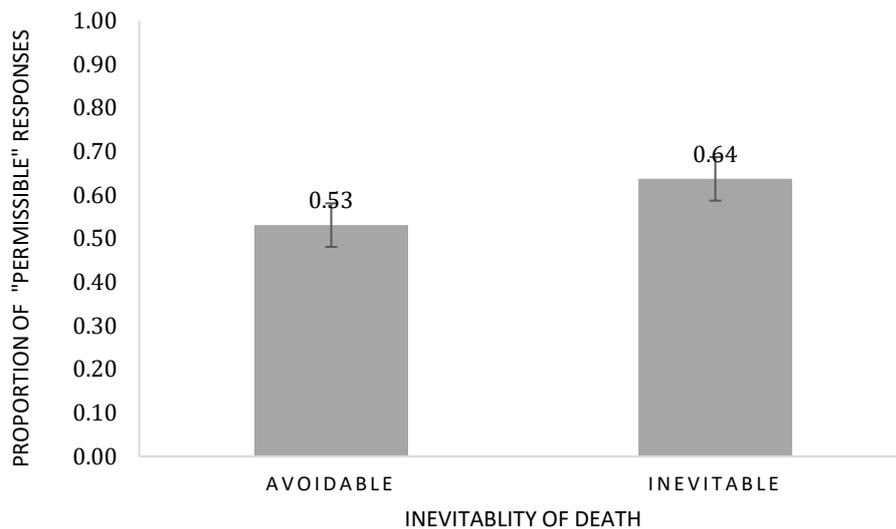


Figure 10. Proportion of "permissible" responses for avoidable and inevitable death. Error bars = standard error.

5.3.2.2 Permissibility ratings

The analysis demonstrated a main effect of the instrumentality of harm factor ($F(1, 72) = 6.92$, $p = .01$, $\eta^2 = 0.88$). The analysis showed no main effect of the inevitability of

death factor. The interaction between the two factors was statistically significant. ($F(1,72) = 4.26, p = .043, \eta^2 = .06$).

When the harm was inflicted incidentally, participants gave higher permissibility ratings ($M = 3.3, SD = 1.6$) compared to dilemmas in which the harm was inflicted instrumentally ($M = 3.0, SD = 1.6$). The results are presented in Figure 11.

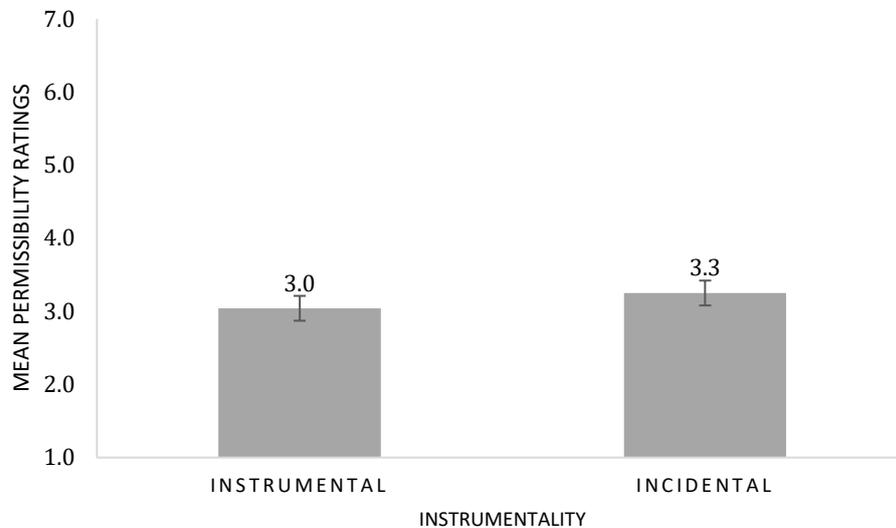


Figure 11. Mean permissibility ratings when harm was inflicted instrumentally or incidentally. Ratings are on a scale from 1 = forbidden to 7 = mandatory. Error bars = standard error.

Participants gave higher permissibility ratings for incidental harm dilemmas ($M = 3.3, SD = 1.5$) relative to instrumental harm dilemmas ($M = 2.9, SD = 1.5$) only when death was avoidable. When death was inevitable, participants gave similar permissibility ratings for the instrumental harm dilemmas ($M = 3.2, SD = 1.6$) and the incidental harm dilemmas ($M = 3.3, SD = 1.5$). The results are presented in Figure 12.

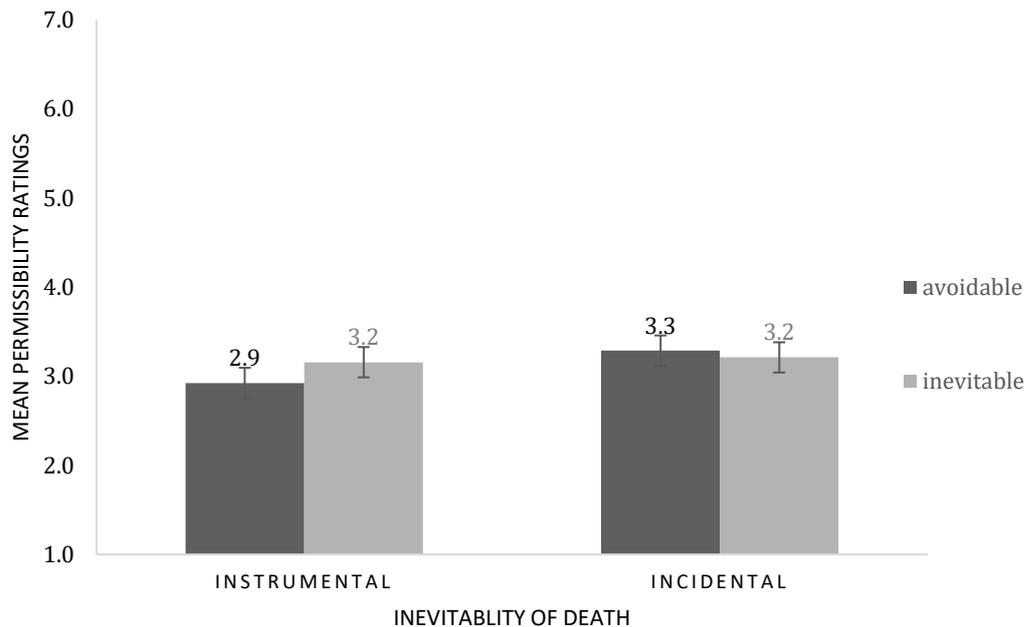


Figure 12. Mean permissibility ratings for each of the experimental conditions. Ratings are on a scale from 1 = forbidden to 7 = mandatory. Error bars = standard error.

5.3.2.3 Skin conductance response elicited during reading of the dilemma and the possible resolution

The analysis showed no main effect of the instrumentality of harm factor. The analysis showed no main effect of the inevitability of death factor. The interaction between the two factors was not statistically significant.

5.3.2.4 Skin conductance response elicited during the judgment period

The analysis showed no main effect of the instrumentality of harm factor. The analysis showed no main effect of the inevitability of death factor. The interaction between the two factors was not statistically significant.

5.3.2.5 Response time

The analysis showed no main effect of the instrumentality of harm factor. The analysis showed no main effect of the inevitability of death factor. The interaction between the two factors was not statistically significant.

5.4. Summary of results and discussion

5.4.1. Physical contact and inevitability of death

The results for the physical contact and inevitability of death factors indicate that moral judgment is influenced by both factors. Participants provided a greater number of

“permissible” responses and gave higher permissibility ratings when the harm was inflicted without physical contact compared to when the harm was inflicted with physical contact and when death was inevitable compared to when death was avoidable.

Results are consistent with the predictions of the dual-process theory of moral judgment. It is possible, however, that these effects are due to rational reasoning rather than emotional experiences of varying intensity. For this reason, it is important to make comparisons of the intensity of the emotional response. It turns out that when death was inflicted without physical contact, the intensity of the emotional response was higher compared to the dilemmas in which death was inflicted with physical contact during reading of the dilemma and the possible resolution. This means that dilemmas without physical contact, on the one hand, cause an emotional reaction with a stronger intensity, and on the other hand, receive a greater number of permissible responses and higher permissibility ratings, which contradicts the predictions of the dual-process theory. Differences in the intensity of the emotional response were also observed when reading the dilemmas with inevitable and avoidable death. Inevitable dilemmas received fewer “permissible” responses and lower permissibility ratings. This means that the emotional response during reading depends of both factors, and not of physical contact only. It is highly probable that participants made judgments while reading the dilemmas, rather than during the period provided for judgment (as they only saw the question “Is it morally permissible” but not the text of the dilemma) and that differences in the intensity of the emotion are a product of judgment, rather than reading the dilemmas. This greater intensity of the emotional response in dilemmas without physical contact and those with inevitable death may be due to the predominant utilitarian judgments for these type of dilemmas.

Differences in emotion intensity for the judgment period were significant only for the inevitability of death factor, but not for the physical contact factor. The intensity of the emotional response during judgment of dilemmas with inevitable death was higher compared to the intensity of the emotional response during judgment of avoidable dilemmas. Again, the obtained results do not correspond to the predictions of the dual-process theory.

No differences were found in response times for the different dilemmas. Based on these results, no conflict between two systems (intuitive and reflexive) can be inferred. Again, there is not enough evidence to support the dual-process theory. Rather, the current results show that it should be revised, at least in the part where it considers emotions as mediating (or moderating) the decision-making process in a moral dilemma situation.

5.4.2. Instrumentality of harm and inevitability of death

The results for the instrumentality of harm and the inevitability of death factors show that moral judgment is influenced by both factors. Participants provided a greater number of “permissible” responses when harm was incidental compared to when harm was

instrumental and when death was inevitable compared to when death was avoidable. The interaction between the two factors was not statistically significant.

There was a main effect of the instrumentality of harm factor on permissibility ratings as well, but no main effect of the inevitability of death factor. The infliction of harm was judged to be permissible to a greater extent when the harm was incidental compared to when the harm was instrumental. An analysis of permissibility ratings revealed an interesting interaction between the two factors: participants gave higher permissibility ratings for incidental harm dilemmas than for instrumental harm dilemmas only when death was avoidable. When death was inevitable, participants did not differentiate between instrumental and incidental harm and give the same permissibility ratings.

No differences in emotion intensity were found when reading incidental and instrumental harm dilemmas. No differences were found in the intensity of emotions over this period and between dilemmas with inevitable death and those with avoidable death. The intensity of emotions during judgment also did not vary according to the type of dilemma. The results show that the observed trends in judgment could not be explained by differences in the intensity of emotional experiences.

Based on the data from the response time measurement, there is no reason to infer a conflict between two systems (the intuitive and the reflexive), again, there is not enough evidence to support the dual-process theory, which was the main motivation of this experiment.

6. Experiment 2: Moral judgment for third-person dilemmas. Bio signal-based research.

6.1. Aims and hypotheses

The aim of the present experiment was to examine the effect of the factors physical contact and inevitability of death on moral judgment. In contrast to Experiment 1, the dilemmas were framed in such a way that the infliction of harm was caused by a third party. Behavioral data, skin conductance measurements, and response time are reported.

Based on the dual-process theory of moral judgment (Greene et al., 2001), we had the following hypotheses:

Stronger emotional response for physical contact dilemmas, compared to those without physical contact. (Hypothesis 1).

In situations where death is caused by physical contact, the action is expected to be perceived as less morally permissible compared to dilemmas without physical contact. (Hypothesis 2)

Judgments for dilemmas with physical contact will be slower than for those without physical contact. (Hypothesis 3).

Harm will be perceived as more permissible for inevitable dilemmas compared to avoidable dilemmas (Hypothesis 4).

A weaker emotional response is expected for inevitable dilemmas (Hypothesis 5).

6.2. Method

6.2.1. Design and stimuli

In the present experiment, trolley-like moral dilemmas are used. In a within-group design, three factors related to the conceptualization of the dilemma are manipulated:

- Physical contact – the harm is inflicted through physical contact (dilemmas with physical contact), or mechanical means are used through which harm is inflicted from a distance (dilemmas without physical contact).
- Instrumentality of harm – the harm is inflicted intentionally, as a tool to save the other endangered participants in the scenario (instrumental harm) or it is a side effect of other actions aimed at saving the others (incidental harm).

All dilemmas are instrumental and framed in a third person perspective.

Dependent measures

Moral judgment is explored, using the following measures:

- **Number of "yes" responses** to the question "Is it permissible to act in the manner described?" (Yes / No)?"

- **Permissibility ratings:** rating on a 7-point Likert scale (where "1" means prohibited, "4" means permissible, and "7" means mandatory) in response to the question "To what extent is it permissible to act in the manner described?"

The time required to answer the question "Is it permissible to act in the manner described?" (yes/no)?" measured after participants confirmed that they had read and understood the dilemma text.

The intensity of the emotional response was measured by skin conductance recording for the reading and judgment periods.

6.2.2. Participants

A total of 51 people, students at the New Bulgarian University, took part in the experiment. 11 participants were excluded because they had previously participated in another study that used the same stimulus material. Analyzes included data from 40 participants aged between 18 and 52 ($M = 23$), 13 men and 27 women.

6.3. Results

6.3.1. Responses "Permissible"

The analysis showed a main effect of the physical contact factor ($F(1,39) = 6.27$, $p = 0.017$, $\eta^2 = 0.14$) and a main effect of the inevitability of death factor ($F(1,39) = 11.4$, $p < .001$, $\eta^2 = 0.23$). The interaction between the two factors was not statistically significant. When the action was performed without physical contact, participants gave more responses "permissible" ($M = 0.49$, $SD = 0.37$) compared to the dilemmas in which the action was performed with physical contact ($M = 0.35$, $SD = 0.37$). The results are presented in Figure 13. When death was inevitable, participants gave more "permissible" responses ($M = 0.49$, $SD = 0.35$) compared to dilemmas in which death could be avoided ($M = 0.35$, $SD = 0.36$) Results are presented in Figure 14.

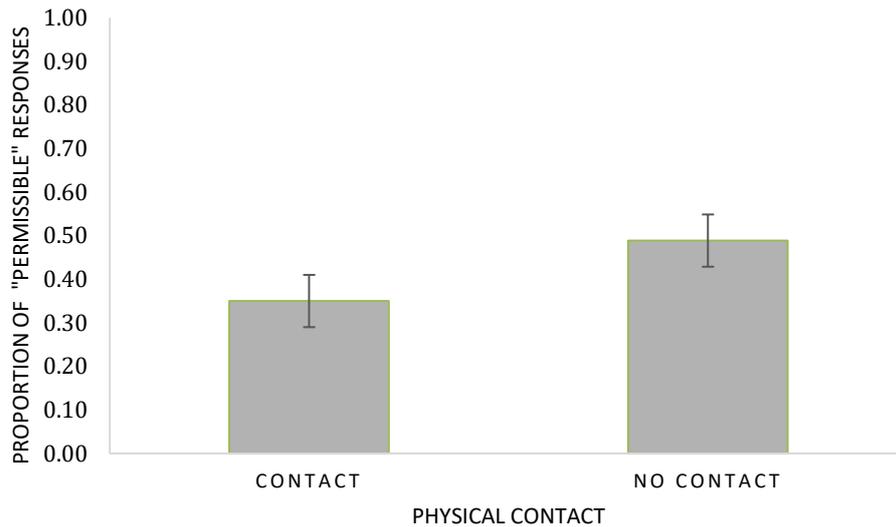


Figure 13. Proportion of “permissible” responses when the action was performed with or without physical contact. Error bars = standard error of the mean.

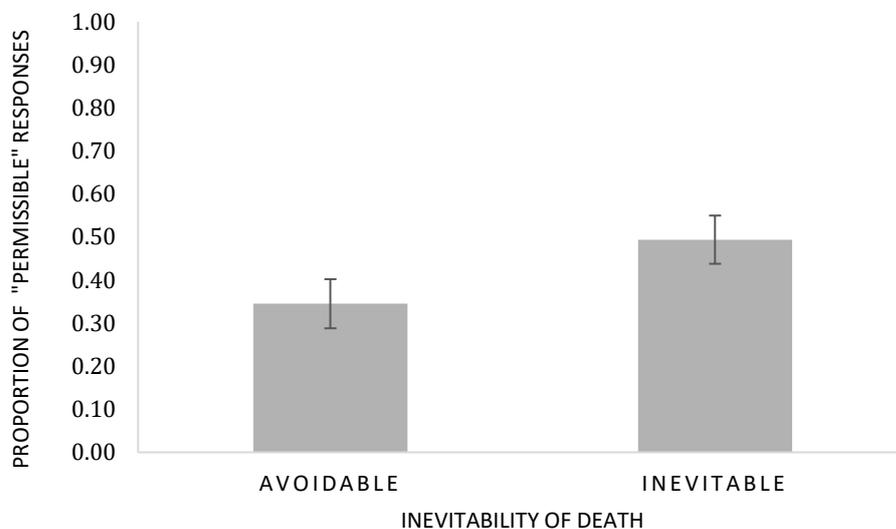


Figure 14. Proportion of “permissible” responses for avoidable and inevitable death. Error bars = standard error.

6.3.2. Permissibility ratings

The analysis demonstrated a main effect of the physical contact factor $F(1,39) = 14.7$, $p = 0$, $\eta^2 = 0.27$ and no main effect of the inevitability of death factor. The interaction between the two factors was not statistically significant. When the action was performed without physical contact, participants gave higher ratings of permissibility ($M = 3.56$, $SD = 1.39$) compared to dilemmas in which the action was performed with physical contact ($M = 3.04$, $SD = 1.42$). The results are presented in Figure 15.

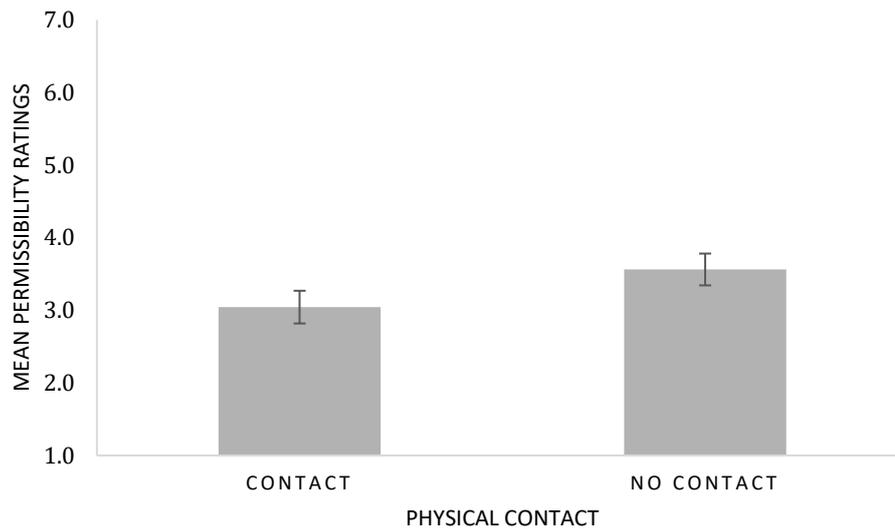


Figure 15. Average permissibility ratings when the action is performed with or without physical contact. Ratings are on a scale from 1 = forbidden to 7 = mandatory. Error bars = standard error.

6.3.3. Skin conductance response elicited during reading of the dilemma and the possible resolution

The analysis demonstrated no main effects of the factors inevitability of death and physical contact. The interaction between the factors was not statistically significant.

6.3.4. Skin conductance response elicited during the judgment period

The analysis demonstrated no main effects of the factors inevitability of death and physical contact. The interaction between the factors was not statistically significant.

6.3.5. Response time

The analysis demonstrated no main effects of the factors inevitability of death and physical contact. The interaction between the factors was not statistically significant.

6.4. Summary of results and discussion

Main effects of the physical contact factor and the inevitability of death factor on the proportion of "permissible" responses were found. Participants provided a greater number of "permissible" responses when the harm was inflicted without physical contact compared to when the harm was inflicted with physical contact; as well as when death was inevitable compared to when death was avoidable. The interaction between the factors was not statistically significant. Also, harm was rated as permissible to a greater extent when it was done without physical contact than when the harm was done with physical contact. In contrast to the results in Experiment 1, there was no main effect of the inevitability of death factor on permissibility ratings. The interaction between the factors was not statistically

significant. Analyses of skin conductance during reading dilemmas and during judgment showed no significant effects of any of the factors. The interactions between the factors were also not statistically significant. Response time analyses also showed no significant main effects and interactions.

The results for the physical contact and inevitability of death factors show that moral judgment is affected by both factors when dilemmas are framed in a third person perspective. It is interesting to note that no effects on emotion intensity were observed in this experiment, even for the reading periods. This means that the judgment can be different in different situations of moral dilemmas, without necessarily being predetermined by emotional reactions of different intensity, especially when the judgment is made in a third person perspective. Although not directly comparable, the results in the two experiments show different patterns of emotional responses to first-person versus third-person dilemmas: whereas in Experiment 1, dilemmas without physical contact elicited a higher emotional response intensity during reading compared to those with physical contact, and dilemmas with imminent death elicited higher intensity responses than those in which death could be avoided, similar effects for these factors were not observed in Experiment 2.

7. Experiment 3: Effects of momentary emotional states on moral judgment

7.1. Aims and hypotheses

In Experiment 3, effects of momentary emotional state on moral judgment is investigated in order to make a systematic comparison between the effects of different emotions on moral judgment. Amusement, disgust, fear and sadness are induced and the results are compared to a control condition where the participants are in a neutral emotional state. It also examined whether participants' tendency to visualize images related to harming or saving those threatened by the situation is related to their judgment. In addition, an eye-tracking apparatus was used in order to rule out alternative explanations of the effect of emotions related to reading. Behavioral data (number of "permissible" responses, ratings of permissibility and blame on 7-point scales) are reported, as well as data obtained with eye-tracking equipment to detect differences in the reading process depending on the momentary emotional state.

It is expected that fun will diminish the negative response elicited by personal contact dilemmas, and this will lead to more "permissible" responses, higher permissibility ratings, and lower blame ratings specific for these type of dilemmas, but not for those without physical contact (Hypothesis 1).

When disgust and fear are induced, the opposite effect is expected: an increase in the intensity of the negative response in the personal contact dilemmas, which will lead to fewer "permissible" responses, lower permissibility ratings, and higher blame ratings for these type of dilemmas, but not for those without physical contact (Hypotheses 2 and 3).

For sadness, fewer "acceptable" responses, lower acceptability ratings, and lower guilt ratings are expected. (Hypothesis 4).

It was expected that participants' tendency to visualize certain emotionally charged pictures from the scenarios would be related to judgments of whether the pictures they imagined evoked positive or negative emotions relative to the utilitarian action (Hypothesis 5). This expectation was based on the assumption that if participants imagined the one person who was going to die, it would cause a negative reaction to the utilitarian act and lead to lower ratings of permissibility. On the other hand, if participants imagined to a greater extent the five who would die as well as the five who would survive, then they would be more likely to give higher ratings of the permissibility of the utilitarian action.

7.2. Method

7.2.1. Design and stimuli

7.2.1.1 Design

In the present experiment trolley-like moral dilemmas are used. In a 5x2 between-groups design, participants' momentary emotional state (amusement, disgust, sadness, fear, neutral) and physical contact (harm inflicted with or without physical contact) are manipulated.

Dependent measurements:

- **Number of "yes" responses** to the question "Is it permissible to act in the manner described?" (Yes / No)?"
- **Permissibility ratings:** rating on a 7-point Likert scale (where "1" means prohibited, "4" means permissible, and "7" means mandatory) in response to the question "To what extent is it permissible to act in the manner described?"
- **Blame ratings:** rating on a 7-point Likert scale (where "1" means "I do not deserve to be blamed at all" and "7" means "I completely deserve to be blamed") in response to the question "If you act in the manner described, how much do you deserve to be blamed?"
- **Imagery ratings** on a 7-point Likert scale (where "1" means "I didn't visualise it at all" and 7 means "I visualised it very strongly")
- **Eye tracking data:**
 - Gaze time (in seconds)
 - Fixation count

7.2.1.2 Video Materials

The emotional state was induced using standardized video materials (Barzeva, 2015).

7.2.1.2 Video Materials

The emotional state was induced using standardized video materials (Barzeva, 2015).

7.2.1.3 Moral dilemmas

Two instrumental dilemmas formulated in the first person (1 with physical contact and 1 without physical contact) are used, with each participant making a judgment on a single avoidable moral dilemma. Stimuli were selected to exercise strict control and remove potential confounding variables, following the control principles described in Experiment 1.

7.2.2. Apparatus

Data and eye movement recording was performed using a Tobii TX300 eye tracker and Tobii Studio 3.2 software.

7.2.3. Participants

A total of 307 people (48 men and 259 women) aged between 18 and 53 (average age 24), students at the New Bulgarian University, took part in the study. The rest participated on a completely voluntary basis, without remuneration.

7.3. Results

7.3.1. Eye tracking data

Six areas of interest were defined. The analysis showed a main effect of the physical contact factor only for the textual description of the possible outcome ($F(1, 226) = 8.77, p = .003, \eta^2 = .04$). Participants read longer the dilemmas without physical contact ($M = 16.2, SD = 5.8$) compared to the same text for the physical contact dilemmas ($M = 13.7, SD = 6.9$), despite this text being longer in the physical contact dilemmas (55 words) compared to the text in the non-physical contact dilemmas (50 words). For the rest of the areas, no main effects of the physical contact factor were found. No main effects of emotional state were found for any of the areas of interest and no statistically significant interactions. The results are presented in Figure 17.

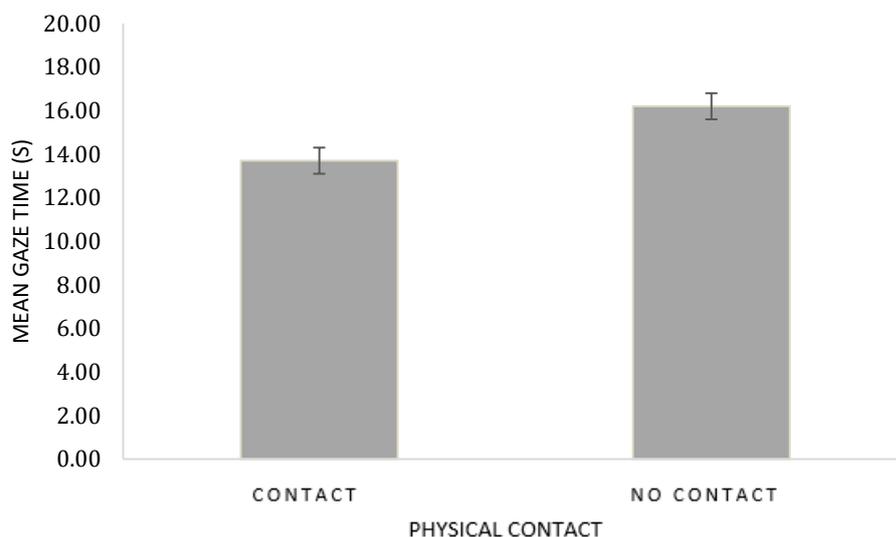


Figure 17. Mean gaze time for the area of interest containing a textual description of the possible outcome (Area 3). Error bars = standard error.

7.3.1.1 Fixation count

The analysis revealed a main effect of the physical contact factor only for the area in which the textual description of the possible outcome of the situation was placed (zone 3) ($F(1,226) = 19.61, p < 0.001, \eta^2 = .08$). The text that described the possible outcome of the situation in the dilemmas without physical contact received more fixations ($M = 66.4, SD =$

20.7), compared to the text that described the possible outcome of the situation in the dilemmas with physical contact ($M = 53.8$, $SD = 21.4$), despite this text being longer in the physical contact dilemmas (55 words) compared to the text in the non-physical contact dilemmas (50 words). For the rest of the areas, no main effects of the physical contact factor were found. No main effects of emotional state were found for any of the areas of interest. There were also no statistically significant interactions. The results are presented in Figure 18.

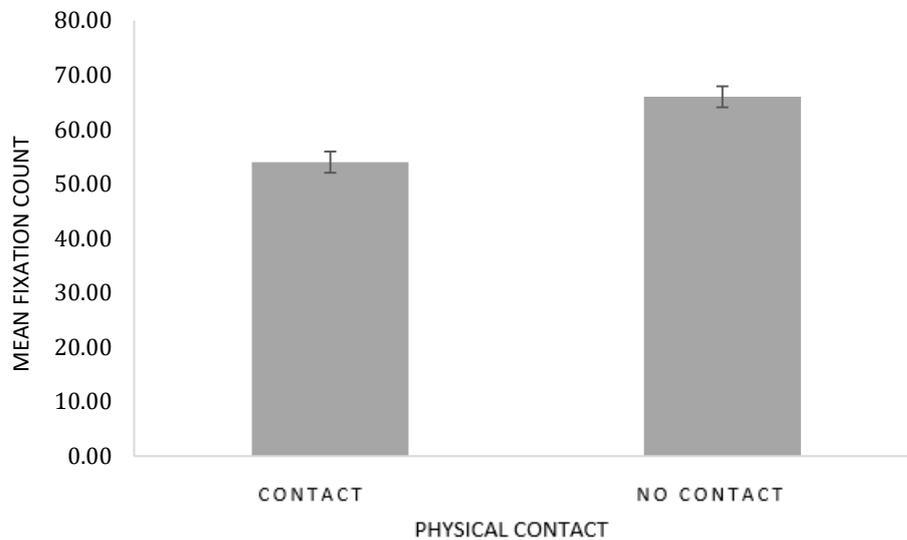


Figure 18. Mean fixation count for the area of interest containing a textual description of the possible outcome (Area 3). Error bars = standard error.

7.3.2. Behavioral data

7.3.2.1 Responses permissible

In order to determine whether response depended on the physical contact factor, the association between the physical contact factor (contact/no contact) and the type of response (yes/no) was examined using a χ^2 -test for association. No significant association was found between the physical contact factor and the type of response.

In order to determine whether response depended on the emotional state, the association between the emotional state factor (amusement/disgust/sadness/neutral) and the type of response (yes/no), the percentage of responses (yes/no) for each of experimental conditions was compared with the percentage of responses (yes/no) in the neutral condition using a χ^2 goodness of fit test. Test results showed a statistically significant difference in the yes and no responses and the neutral condition only for the amusement condition ($\chi^2(1) = 6.55$, $p = .011$). When participants were in an amused state, they were more likely to answer "no" (not morally acceptable) (84%) compared to when they were in a neutral emotional state (69%). The results are presented in Figure 19.

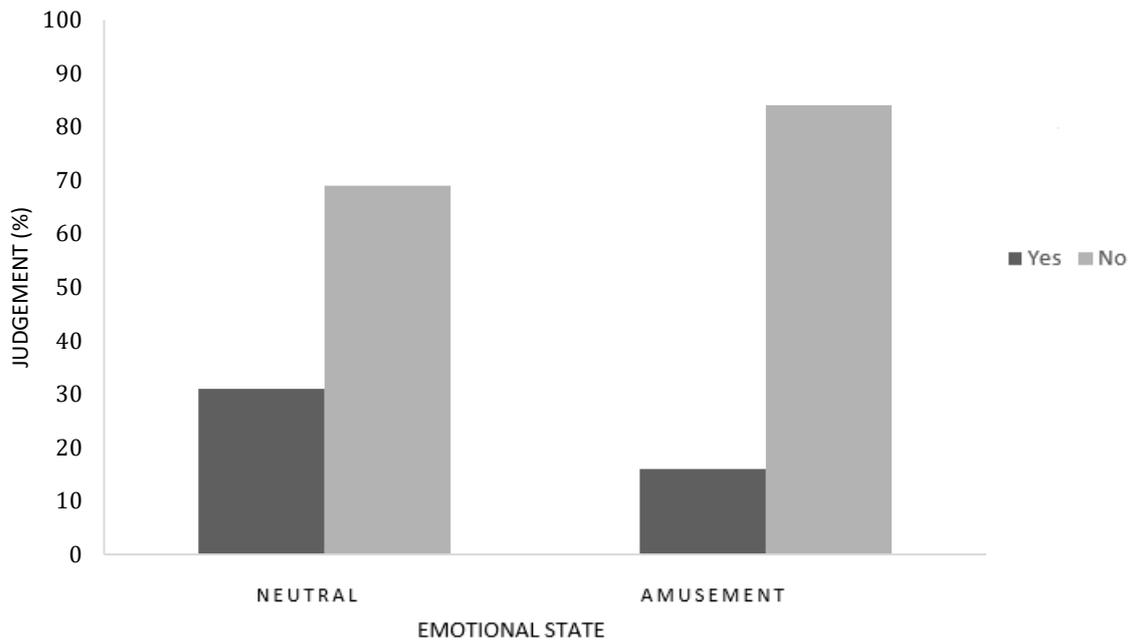


Figure 19. Proportion of yes and no responses in the amusement condition compared to the neutral condition.

7.3.2.2 Permissibility ratings

Mean permissibility ratings were analyzed with a two-factor analysis of variance with physical contact (contact/no contact) and emotional state (amusement/disgust/sadness/neutral) as between-group factors. The analysis showed no main effects of any of the factors. The interaction between the two factors was also not statistically significant.

7.3.2.3 Blame ratings

The analysis showed a main effect of the physical contact factor ($F(1,226) = 4.35, p = .038, \eta^2 = .018$). When the harm was inflicted with physical contact, participants gave higher blame ratings ($M = 5.2, SD = 1.8$) than when the harm was inflicted without physical contact ($M = 4.7, SD = 1.9$).

7.3.2.4 Association between mental imagery and judgment

In order to explore whether response type could be predicted by mental imagery, data were analyzed with binary logistic regression. Mental imagery ratings were treated in the analysis as predictors of response type (yes/no). The model was statistically significant ($\chi^2(4) = 30.90, p < .001$) and explained 21.1% of the variance in responses. Participants who imagined the one who would die were more likely to answer “no”. Those who imagined the five who would die were more likely to answer “yes.” Participants who imagined the five persons saved were also more likely to answer “yes” .

7.4. Summary of results and discussion

The results of the manipulation check demonstrated that it was successful for all emotional states except for the fear condition. For this reason, data from this experimental condition were excluded from subsequent analyses and interpretations.

Eye-tracking data showed no differences in reading time and total number of fixations depending on the induced emotion. This means that, at least within the framework of the present study, the differences in judgment depending on the emotional state cannot be explained by differences in the reading processes. On the other hand, dilemmas without physical contact received a greater number of fixations and were read longer than dilemmas with physical contact.

Contrary to expectations, no statistically significant differences were found in the proportions of “permissible” responses and permissibility ratings, although the tendency for a utilitarian judgment was more pronounced for the no physical contact dilemmas. The absence of a statistically significant difference is likely due to the between-group design, which introduces additional variance due to individual differences, as well as the use of a single stimulus in an experimental condition.

In this sense, it is possible that the differences in the number of fixations and looking time are related to the response provided. It is likely that participants want to be sure that they are making a “correct” judgment when they are about to answer positively, so they read the content of the non-personal dilemmas longer. This would mean that if there is an emotional reaction that creates conflict and delay in judgment, it is more likely to arise from the judgment already made before the answer is stated, rather than from the dilemma itself.

Dilemmas without physical contact received lower blame ratings than dilemmas with contact. This result again points to possible explanations related to the consequences of inflicting harm, rather than the emotion elicited by reasoning about different ways of inflicting harm, as it is traditionally claimed.

Contrary to expectations, the results showed that emotional state did not affect permissibility ratings, guilt ratings, and none of the mental imagery ratings.

The only significant difference in the proportions of “permissible” responses, compared to the neutral condition was observed for amusement. This result also contradicts predictions: on the one hand, because it leads to a lower number of “permissible” responses compared to the neutral condition, and on the other hand, because the effect is observed for both types of dilemmas. It is possible that this result is due to the excessive contrast between the amusement content of the video material and the negative content of the dilemmas, making the cognitive evaluation of harming even more negative and leading to a lower number of responses permissible in this experimental condition. .

The results for mental imagery were in line with expectations: when participants clearly imagined the one who was going to die, they were more likely to answer no. When they clearly visualize the five who will die or the five saved, they were more likely to answer yes. It

is possible that these imageries evoked emotional responses guiding the subsequent judgment, but it should be noted that because the representativeness questions were asked after participants had made their judgment, it is quite possible that they stated mental imagery scores as a result of their response, but not the opposite.

8. General discussion

8.1. Summary and interpretation of main findings

Experiment 1 examined whether conceptually different moral dilemmas elicit emotional responses of different intensity and a different tendency for utilitarian judgment. It was also explored whether differences in the intensity of emotional experiences would explain judgment differences. Physical contact, inevitability of death and instrumentality of harm were manipulated. All moral dilemmas were formulated in a first person perspective, participants were in the role of the protagonist and made judgments about their own actions. The stimuli used were subjected to strict experimental control. The number of "permissible" responses, permissibility ratings, response time, and skin conductance during reading and judgment were measured. First, the results for the physical contact and inevitability of death factors were analyzed. Analyses showed that both factors influence moral judgment. Dilemmas without physical contact receive a greater number of "permissible" responses, higher ratings of permissibility, and the reading period for them was accompanied by an emotional response of greater intensity compared to dilemmas with physical contact. The two types of dilemmas did not differ in the time participants needed to make a judgment, nor in the intensity of the emotional response during the response. The results of the behavioral data analysis were consistent with expectations and with results in the literature (Greene et al., 2001, 2009; Koenigs et al., 2007; Moore et al., 2008; Moretto et al., 2010). However, the results of the skin conductance and response time measurements did not meet expectations and did not match the predictions of the dual-process theory. During judgment, participants' emotional experiences were of similar intensity regardless of whether they were reflecting on dilemmas with physical contact or dilemmas without physical contact. Judgment times also did not differ for the two types of dilemmas, meaning that no inferences could be made about a conflict between a fast, intuitive system and a slow, reflective system. Here the results contradict those obtained by Greene et al., (2001), Koenigs et al., (2007), Moretto et al. (2010) who used the original battery of Greene et al., (2001).

It is interesting to note that the two types of dilemmas differ in the intensity of the emotional response for the reading period. Contrary to expectations, while reading the dilemmas without physical contact, participants experienced an emotional response with higher intensity compared to when they read the dilemmas with physical contact. It is possible that participants were still making judgments while reading the dilemmas, and that the high intensity in no contact dilemmas was due to the predominant utilitarian solutions to this type of dilemma, rather than to considerations of harm that distinguished the two types of dilemmas.

Based on these results, one could conclude that emotional experiences are a product of judgment rather than a driver of judgment. Given that no differences can be established

on an emotional level, it is highly likely that differences in behavioral data are due to rational reasoning and conscious adherence to moral principles that prohibit physical harm. Although such an explanation cannot be directly confirmed by the present study, there is research showing that when making a utilitarian judgment in favor of no contact dilemmas, the majority of participants do so by following principles that are consciously accessible, as the results show that they are able to verbalize them (Cushman et al., 2006).

Inevitable dilemmas received a greater number of "permissible" responses and higher permissibility ratings than avoidable dilemmas. Also, for inevitable dilemmas, the reading and response periods were accompanied by emotional reactions of greater intensity than in avoidable dilemmas. The two types of dilemmas did not differ in terms of response times. The results of the behavioral data analysis were consistent with expectations and results in the literature (Moore et al., 2008). The results of the response time analyses here also show that no inferences can be made about a conflict between an intuitive and a reflexive system. The results of the skin conductance analyses are interesting because when comparing the measured values for the dilemmas with inevitable death and those in which death could be avoided, differences in the intensity of emotion were observed both during reading the dilemmas and while giving the answer. In both cases, dilemmas with inevitable death were accompanied by an emotional response of higher intensity than avoidable dilemmas. Again, these are the dilemmas that receive a greater number of "permissible" responses. Based on this result, it can also be argued that the change in the intensity of the emotional response is related to the utilitarian judgment itself but not to the type of dilemma. With respect to the inevitability of death factor, the more likely explanation for the differences in behavioral responses is that they are a product of rational reasoning in accordance with consciously accessible principles. From a rational point of view, when death is inevitable anyway, the moral choice is in favor of the survival of the greater number of people.

The factors instrumentality of the harm and inevitability of death are then analyzed. Dilemmas in which harm is incidental receive a greater number of "permissible" responses than dilemmas in which harm is instrumental. Dilemmas in which death is inevitable receive a greater number of "permissible" responses than avoidable dilemmas. The results are consistent with expectations and those found in the literature (Cushman et al., 2006; Moore et al., 2008). Regarding the permissibility scores, the analysis showed a main effect of the instrumentality of harm factor but not of the inevitability of death factor. It is likely that the lack of a main effect of this factor is related to the observed interaction between the two factors: Incidental harm dilemmas receive higher permissibility ratings than instrumental harm dilemmas only when death is avoidable. When death is inevitable, the incidental and instrumental harm dilemmas receive equal permissibility scores. The interaction between these factors indicates that they must be carefully controlled when research is planned, as neglecting their significance may lead to invalid conclusions. Regarding the intensity of the emotional reaction during reading and judgment, no differences were observed between the different types of dilemmas. Since no significant differences are found in these measurements, there are also no grounds for conclusions in support of the dual-process

theory. It remains an open question why there are no statistically significant differences when comparing skin conductance in instrumental and incidental harm dilemmas, as well as when comparing inevitable and avoidable death dilemmas, despite the prevailing utilitarian judgment of incidental versus instrumental dilemmas, and despite the prevailing utilitarian judgment for inevitable dilemmas compared to avoidable ones. It is important to note that only dilemmas without physical contact were included in this analysis, meaning that these results may be due to an interaction between the three factors examined (physical contact, instrumentality of harm, and inevitability of death). Unfortunately, the interaction between the three factors could not be directly investigated because the design did not cover all possible combinations of the levels of the studied factors (accidental harm with physical contact is not realistic). For this reason, data were first analyzed and results presented for the physical contact and inevitability of death factors, followed by the instrumentality of harm and inevitability of death. In the second analysis, all dilemmas were without physical contact. Based on the results of the analyses for the instrumentality of harm and inevitability of death factors, we again have no reason to claim that judgment was driven by highly intense emotional reactions.

Experiment 2 also tested whether conceptually different moral dilemmas elicit emotional responses of different intensity and a different tendency for utilitarian judgment. Also, it was explored whether differences in the intensity of emotional experiences could explain differences in judgment when utilitarian acts are performed in a third person perspective. Some of the stimuli from Experiment 1 were used, reformulated in the third person, manipulating (within-group) only two of the factors (physical contact and inevitability of death). The number of "permissible" responses, permissibility ratings, response time, and skin conductance during reading the dilemmas and during the judgment were measured. The importance of the physical contact and the inevitability of death factors was confirmed, as they were found to influence moral judgment. Dilemmas with physical contact received a greater number of "permissible" responses and higher permissibility ratings compared to dilemmas without contact. The observed tendency for judgments and permissibility ratings was the same as in Experiment 1, in which dilemmas were framed in a first person perspective. Regarding skin conductance, no significant effects of any of the factors were observed. Based on the results of Experiment 2, no conclusions can be drawn about the leading role of emotions in moral judgment.

Experiment 3 aimed to test whether emotions play a causal role in moral judgment. Amusement, disgust, fear and sadness were systematically induced and it was investigated whether these emotional states change moral judgment compared to a control condition in which the participants are in a neutral emotional state. The physical contact factor was also manipulated using 2 first-person dilemmas, which were again carefully selected for strict experimental control. The number of "permissible" responses, permissibility scores, blame ratings, and mental imagery are measured. Gaze-tracking equipment was used to measure the time spent looking at different areas of interest, as well as the total number of fixations.

The presence of physical contact factor in this experiment had an effect on guilt ratings, looking time, and number of fixations but not on number of “permissible” responses and permissibility ratings. The physical contact dilemma received higher blame ratings, fewer fixations, and was viewed for a shorter time than the no physical contact dilemma. Regardless of whether participants judged the dilemma with or without physical contact, the proportions of "permissible" responses and mean permissibility ratings were similar. The absence of a statistically significant difference for these variables is certainly unexpected, given both the established effects of the physical contact factor in Experiments 1 and 2 and the effects of this factor repeatedly found in the literature (Cushman et al., 2006; J. D. Greene et al. al., 2001b, 2009b; Moretto et al., 2010). It is interesting to note that dilemmas without personal contact receive an atypically low number of permissible responses (27%). It is possible that this effect is due to the fact that the design of this experiment was between-groups and participants saw a single moral dilemma. This deprives them of the opportunity to compare different ways of inflicting harm (contact/non-contact) and to explain principles on the basis of which to make a different judgment. Certainly, this result is interesting, as it can be speculated that in the first two experiments, where participants saw different situations, the possibility for making comparisons between them facilitated the identification of moral principles to follow in the judgment. Again, these results suggest that judgment is more likely to be guided by conscious adherence to certain principles than by various emotional responses. Otherwise, the physical contact dilemma should receive a significantly higher number of “permissible” responses than the no physical contact dilemma.

Only the amusement condition changed the number of "permissible" responses relative to the neutral condition (reduced the proportion of "permissible" responses), with no specific effects observed for either dilemma type. The expected interactions between dilemma type and emotional state, namely a specific influence of pre-induced emotions on physical contact dilemmas, were not observed. The amusement effect is probably due to the excessive contrast of this emotional state with the conceptual content of the dilemma. Perhaps, rather than extinguishing the negative reactions elicited by the dilemma, the entertainment condition heightened participants' sensitivity to the negative experience elicited by the contemplation of harm. Emotional state did not affect permissibility, guilt, and mental imagery.

An association was established between the type of response and the intensity of the mental imagery. When participants clearly imagined the one who would die, they were more likely to answer no. When they clearly visualize the five who will die or the five saved, they were more likely to answer yes. These results should be interpreted with caution because participants gave their mental imagery ratings only after they had made a judgment, and it is quite possible that mental imagery ratings resulted from judgment rather than the other way around.

In conclusion, the results of the three experiments fail to provide evidence in support of the dual-process theory. On the contrary, they show that participants rather rationally follow

certain principles to make a judgment, and if differences in emotional experiences are present, they are most likely a product of judgment.

9. Contributions

9.1. Methodological contributions:

1) Stimuli subjected to strict experimental control were used in order to address one of the most serious methodological problems among studies supporting the dual-process theory (Experiments 1,2,3). In addition to the physical contact factor, which has been widely studied in the literature, the inevitability of death and instrumentality of harm factors, which are rarely studied in the context of dual-process theory, were systematically manipulated. Manipulation of these factors provides an opportunity to also examine differences in emotional experiences potentially determined by them and by their interactions (Experiments 1 and 2). The physical contact and inevitability of death factors were examined in different perspectives of the protagonist (Experiments 1 and 2).

2) The intensity of the emotional responses was directly measured by recording the skin conductance, both during reading of the stimuli and during judgment. (Experiments 1 and 2).

3) A set of several emotional states of different valence was systematically induced using consistently selected, standardized video materials, allowing direct comparison of several different emotions (Experiment 3).

4) An eye-tracking apparatus was used to rule out alternative explanations for the influence of emotions on dilemma reading processes (Experiment 3).

9.2. Empirical contributions:

1) No physical contact dilemmas were found to elicit a stronger emotional response during reading compared to physical contact dilemmas, contrary to the predictions of dual-process theory. (Experiments 1 and 2)

2) Differences were found in the intensity of the emotional response when reading the dilemmas with inevitable death and those in which death could be avoided. Higher skin conductance was measured during reading of the inevitable death dilemmas compared to the avoidable death dilemmas. This means that the emotional response also depends on the factor of inevitability of death, and not on the physical contact factor. (Experiment 1).

9.3. Theoretical contributions:

1) Research findings call into question the dual-process theory of moral judgment proposed by Greene et al. (2001). The observed differences in emotion intensity contradict the

predictions of the theory, according to which physical contact dilemmas are expected to elicit a stronger emotional response and slower judgment, resulting from a conflict between the two systems involved. In the present study, a stronger emotional reaction was found in the dilemmas without physical contact, which is probably a consequence of the utilitarian judgment rather than the cause of this type of judgment.

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