Moral decision-making in trolley problems and variants: how do participants' perspectives, borderline personality traits, and empathy predict choices?

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Abstract

The present study aimed to demonstrate a causal effect of participants' perspectives on moral decision-making by using Trolley problems and variants. Furthermore, we investigated whether empathy and borderline personality traits (BDL traits) significantly predicted participants' choices in those perspectives. We used a classical Trolley problem (a *causing harm*

scenario) and an everyday trolley-like problem (a *causing inconvenience* scenario). Participants ($N = 427$, women: 54%) fulfilled BDL traits and empathy questionnaires and randomly completed the two types of Trolley problems, presenting both three perspectives. The study provided strong evidence that participants' perspectives on trolley problems and variants caused significant changes in their moral decision-making. Additionally, affective empathy and BDL traits significantly predicted participants' decisions in the causing inconvenience scenario, while only BDL traits predicted choices in the causing harm scenario. This study addressed several originalities by providing new experimental materials, causal results, and the significant influence of BDL traits and affective empathy on moral decision-making. These findings raised fundamental questions that are developed in the discussion.

Keywords

Borderline Personality Disorders; Empathy; Trolley Problems; Moral decision-making; Utilitarianism.

Introduction

Moral dilemmas have been studied by social psychology, philosophy, and economics for decades, notably because they have several societal implications (e.g., in public health or politics). Recently, they were at the heart of preoccupations during the sars-cov2 Mondial pandemic, given that many health centers were overwhelmed and had to make some unusual ethical choices (e.g., choosing who would benefit from a respirator).

One of the most famous moral dilemmas is the Trolley problem. Initially, Foot (1967) and, a few years later, Thomson (1976) developed a problem presented as follows: imagine that you are a driver of a runaway tram that can only steer from one track to another. Five workers

are standing on one track and one workman on the other. The only option is to divert a lever to switch the tramway from one track to another, which leads to choosing between killing five people and saving one; or killing the one to save the five (Foot, 1967). On the other hand, Thomson's variant puts the participant on a bridge where s/he has to choose between pushing an obese man on the track to stop the runaway tram and save the five; or s/he can do nothing and let the five get killed.

Greene and collaborators popularized these problems in 2001 with their publication in *Nature*. Several studies demonstrated that participants' choices were mainly group-oriented decisions. Indeed, around 90% of people decided to kill the one to save the five in Foot's version. However, this tendency decreased drastically in Thomson's variant (roughly 10% decided to push the obese worker: Hauser et al., 2007). Greene and collaborators considered Foot's version an *impersonal* scenario and Thomson's variant a *personal* scenario (2001; 2004; Greene, 2007). They have argued that impersonal moral scenarios involve more cognitive processes and fewer social-emotional responses, leading to higher group-oriented decisions (also called *utilitarian* choices). However, personal scenarios involve the opposite processes (i.e., it elicits higher social-emotional responses and lower cognitive processes), leading to fewer group-oriented decisions. The authors called this communicating vessel model the *Dual-Process Model* (DPM, Greene et al., 2001).

Based on this model, several authors focused on the role of emotional processes. For instance, Choe and Min (2011) showed that anger, disgust, and empathy significantly predict utilitarian judgments. Indeed, anger increased GOD levels, while empathy and disgust decreased these levels. Other authors (Greene et al., 2004; Decety & Cowell, 2014; Patil & Silani, 2014; Burghart & Mier, 2021) hypothesized that clinical populations presenting emotional blunting, like psychopaths, should present greater levels of group-oriented decisions in Trolley Problems. These authors precisely found the expected results, which has empowered the DPM. In line with

these findings, some authors target empathy as a predictor of moral decision-making in Trolley Problems.

Empathy has been defined as “*an innate ability to perceive and be sensitive to the emotional states of others, coupled with a motivation to care for their well-being*” (Smith et al., 2017, p.2). Empathy is usually composed of two domains: affective and cognitive empathy. The former describes the ability to feel what others feel, and the latter refers to the capacity to comprehend others’ perspectives and put oneself in someone’s shoes. Several authors found that (1) a lack of affective empathy characterized psychopathic traits (Burghart & Mier, 2021) and (2) that this affective empathy depletion predicted group-oriented choices significantly in Trolley Problems (Greene et al., 2004; Gleichgerrcht & Young, 2013; Decety & Cowell, 2014; Patil & Silani, 2014; Takamatsu, 2018).

Compared to psychopaths, we aimed to investigate the clinical population presenting salient divergences in affective empathy and emotional functioning (i.e., borderline personality disorder) to determine whether they would present a reversed pattern of decision-making in social dilemmas. Borderline personality disorder (BPD) is characterized by a pervasive pattern of instability of affects, interpersonal relationships, self-image, and marked impulsivity. This personality disorder is a severe and persistent psychiatric disorder with a lifetime prevalence estimated to be between 1 and 3% in the general population (Leichsenring et al., 2011).

Therefore, despite some shared symptoms (e.g., marked impulsivity), psychopathy and BPD are fundamentally different in their emotional semiology: while psychopathy is characterized by emotional callousness (Hare, 1996; Hare & Neumann, 2009) and emotional hyporesponsiveness compared to BPD (Herpertz et al., 2001), BPD is instead marked by heightened emotional reactivity (Crowell et al., 2009). Several authors considered that affective and emotional intensity and lability are highly central symptoms in BPD (Richetin et al., 2017;

Southward & Cheavens, 2018), regardless of age (Peckham et al., 2020). Furthermore, in comparison with healthy control populations, a recent systematic review showed that people with BPD present higher affective empathy levels and a deficiency in perspective-taking (Salgado et al., 2020), while another review (Burghart & Mier, 2021) showed that psychopaths display a lack of emotional/affective empathy (as sustained by several findings: Blair, 2005; Hare, 1993; Robinson & Rogers, 2015; Sandoval et al., 2000; van Dongen, 2020) and a deficiency in perspective-taking as well.

Based on these differences and the importance given by the DPM to emotional functioning in moral-decision making, we sought to investigate whether subclinical BPD traits would significantly predict choices in trolley problems and variants in the opposite way than psychopathic traits did.

Critics of classical trolley problems

Bauman and collaborators (2014) raised several limits on trolley problems. They reported that participants tend to be amused rather than concerned and described trolley problems as neither immersive nor realistic, too far from daily-life activities. Indeed, killing someone is fortunately far from daily-life activities (Nasello et al., 2021a), and several authors have attempted to overcome these trolley problems' limits. For instance, Navarette et al. (2012) proposed a virtual reality study of the trolley problem, immersing participants in a virtual environment. More recently, authors proposed to overcome Bauman et al.'s limits (2014) by using some everyday trolley-like problems that are more realistic and plausible (Vyas et al., 2017; Lotto et al., 2014; Pletti et al., 2017; Takamatsu, 2019; Nasello et al., 2021a). These variants are ecologically valid and showed more generalizable findings, which is of substantial interest when studying psychopathological populations. Therefore, to display choice differences in both

scenario types, this study used an everyday trolley-like problem and a classical variant proposed by Thomson in 1976 (i.e., the transplant dilemma).

Participant's perspective on trolley problems

A recent study demonstrated a causal effect of participants' perspectives in everyday trolley-like problems (Nasello et al., 2021a). The authors created two versions of a similar trolley-like problem and invited participants to be alternatively two different protagonists of these scenarios. In one scenario, the participant was asked to be a driver of a university tramway who had to decide to stop or not to board one tardy student. This scenario is comparable to impersonal scenarios from classic trolley problems (they called it "*a no-direct impact scenario*" because the participant's decision will not impact him/her directly). In the other one, the participant was the tardy student (they called it "*a direct impact scenario*" because the participant's decision will impact him/her directly: attending or not the lecture). As expected, the authors showed a higher ratio of group-oriented decisions in the driver's perspective (75-25), and this proportion decreased when the participant was the tardy student (50-50). Based on these results, we had targeted a missing element by inviting the participant to enroll a protagonist in a third perspective: we: the one among the five. Hence, we aimed to replicate Nasello et al.'s experimental design (2021a) and test whether an additional perspective (i.e., Perspective C, see Figure 1) would impact moral decision-making to deepen the results previously obtained.

[Insert Figure 1 here]

Objectives and hypotheses

There were two principal purposes related to this study. First, as previously shown by Nasello et al. (2021a), we aimed to demonstrate that participants' perspectives in trolley scenarios cause significant changes in their moral decision-making. In the present study, we introduce a third perspective (i.e., Perspective C) to complement perspectives A & B (see Figure 1) already

used by Nasello et al. (2021a). To demonstrate the generalization of this causal impact, we used two types of scenarios: a *causing harm* scenario (i.e., one or five protagonist(s) will die according to the participant's decision) and a *causing inconvenience* scenario (i.e., one or five protagonist(s) will get fired according to the participant's decision). Following the predictions made from the DPM (Greene et al., 2001), the *causing harm* scenario should display lower GOD¹ levels than the *causing inconvenience* scenario.

More specifically, in the company's dilemma (i.e., the causing inconvenience scenario), we hypothesized that Perspective A would present higher GOD levels (around 75%, like Nasello et al.'s findings, 2021) and Perspective C even higher GOD levels. However, Perspective B would present lower GOD levels (around 50%, like Nasello et al.'s findings, 2021a). In the transplant dilemma², we expected around 10% of group-oriented decisions (GOD) in Perspective A, as found by Hauser et al. (2007) and as predicted by the DPM (Greene et al., 2001). Note that Perspective A is the only perspective tested in trolley dilemmas' scientific literature. For other perspectives, we hypothesized that Perspective B would present lower GOD and Perspective C the highest GOD levels: depending on which perspective the participant is, s/he will tend to favor his/her position if the consequences of the decision will directly impact him/her.

Second, based on the predictions made from the DPM (Greene et al., 2001; i.e., higher social-emotional responses elicited by dilemmas lead to lower GOD levels), we hypothesize that higher affective empathy and higher BDL traits will predict lower GOD levels in trolley problems and variants. The prediction made for BDL traits lies on two main assumptions: (1) BDL people are characterized by higher affective empathy levels, according to a recent systematic review (Salgado et al., 2020), and higher levels of affective empathy are expected to decrease GOD

¹ Note that all perspectives were binary coded ("1" for GOD and "0" for other types of decisions). Therefore, less GOD involved more individual-oriented decisions or self-oriented decisions, and vice versa. We chose GOD as a reference because it was the common option in the three perspectives.

² Bruers and Breackman (2014) considered the bridge trolley variant and the transplant dilemma as similar.

levels on decision-making. (2) BDL people are known to present the opposite emotional semiology compared to psychopaths (a population displaying higher GOD levels). Therefore, because BDL people are more prone to experience intense and unstable emotions, we sought to determine whether higher BDL traits (and affective empathy) would significantly predict less GOD in trolley problems and variants. Based on the DPM, we can speculate that higher affective empathy and BDL traits would significantly predict lower GOD levels in Perspectives B and C than in Perspective A.

Several originalities are proposed in this study. The first was to introduce a third perspective in trolley scenarios and variants to extend the causal effect of perspective on moral decision-making. Furthermore, we tested whether the causal effect of perspective obtained in everyday trolley-like problems is also present in classical trolley problems. The second originality was to investigate whether BPD traits significantly predict participants' choices in trolley problems and variants for the first time. Finally, the third was to create an original everyday trolley-like problem to study moral decision-making.

Method

Participants & procedure

Four hundred and twenty-seven participants voluntarily took part in our study ($N = 427$; $n_{women} = 231$; $M_{age} = 25.3$; $SD_{age} = 5.10$). Most participants were Caucasians (88%), their marital status was predominantly “single” (77%), and most participants were graduated (60% have a Bachelor's degree or more). They were recruited online (no financial retribution was offered) and were asked to fulfill three questionnaires (i.e., a demographic questionnaire, the Basic Empathy Scale, and the Five-Factor Borderline Inventory, Short Form). Then, two kinds of trolley problems were presented to them (in a random distribution), each containing three perspectives (i.e., A, B, and C, see Figure 1). As explained earlier, we used one *causing harm*

scenario (i.e., the transplant dilemma) and one *causing inconvenience* scenario (i.e., the company's dilemma). G*Power 3.1.9.7 (Faul et al., 2007) determined we needed at least a sample of 372 participants by settling standard criteria ($\alpha = 0.05$; power = 0.80).

The Research Ethics Committee of the Psychology Department at the University of - CITY- (-COUNTRY-) approved this research, Ref.: #NUMBER#.

Materials

Empathy. The Basic Empathy Scale (Jolliffe & Farrington, 2006; French version: D'Ambrosio et al., 2009) is a 20-item scale assessing two empathy components (i.e., affective and cognitive empathy) and four basic emotions (i.e., anger, fear, happiness, and sadness). Affective empathy refers to *the capacity to experience the emotions of another* (Bryant, 1982) and is composed of 11 items (e.g., *I get caught up in other people's feelings easily*). On the other hand, cognitive empathy is defined as *the capacity to comprehend the emotions of another* (Hogan, 1969) and is composed of 9 items (e.g., *I can often understand how people are feeling even before they tell me*). Items are rated on a 5-point Likert scale from 1 (*It does not describe me very well*) to 5 (*It describes me very well*). The scale displays good internal reliability (present study: affective empathy: $\omega = .81$; cognitive empathy: $\omega = .81$; total empathy: $\omega = .85$).

BDL traits. We used the 48-item self-rated Five Factor Borderline Inventory, Short Form (FFBI-SF, DeShong et al., 2016; French version: Nasello et al., 2021b) to measure subclinical borderline traits. Each item is rated on a 5-point Likert scale, from 1 (*Strongly disagree*) to 5 (*Strongly agree*) (e.g., *"I often conflict with people that are close to me"* or *"My emotions can get out of control"*). In this study, we based our analyses on the total BDL score. Nasello et al. (2021b) reported that people scoring ≥ 162 could be considered as presenting salient BPD traits. The FFBI-SF displays good internal reliability (present study: $\omega = .94$).

Trolley Problems and variants. Two kinds of trolley problems, using both three perspectives, were used to assess moral decision-making (i.e., Perspectives A and C³: GOD *versus* Individual-Oriented Decisions [IOD], Perspective B: GOD *versus* Self-Oriented Decisions [SOD]). As a classical trolley problem, the transplant dilemma is a *causing harm* scenario. In this scenario, a brilliant surgeon has five patients suffering from a specific organ failure, and if they do not receive their transplant, they will die. Another patient enters the hospital because s/he needs urgent but benign surgery. This brilliant doctor notices that the organs of this new patient are all compatible with the five dying patients. Two options are proposed to the participant: (1) performing a lethal maneuver on this new patient during his/her surgery to save the other five patients (the new patient will die, but the other five will live); (2) performing the new patient's surgery in the rules of art to save him/her (the new patient will live, but the other five will die). The participant is invited to be (randomly) the doctor, the new patient, or one of the five dying patients.

The second dilemma was a *causing inconvenience* scenario named the company's dilemma. The general parameters of this everyday trolley-like problem are that the participant is a worker of a small company (i.e., the boss, the spokesperson, or one of the five employees) and, because of the current pandemic situation, this company has to downsize its workforce. Panicked, the six employees have decided to strike out to claim employment security and termination indemnity in case of layoff. To calm down the situation, the boss called the spokesperson of the employees for a meeting. In this meeting, this boss tries to understand the spokesperson's situation and explains that s/he does not have several options. In the three perspectives, the boss proposes a two-option arrangement behind closed doors (with immediate effects and no concertation meeting with the other employees). The first option is to protect the spokesperson's job contractually but lay off the other five employees without termination indemnity. The other

³ Perspective C involves a mixed decision between GOD and SOD.

option is laying off the spokesperson without any termination indemnity but to contractually protect the other five employees' jobs⁴.

Note that in all scenarios, the decision-maker is the sole person that makes the decision: there is no joint decision between the participant and other protagonists.

Both scenarios were primed using the COVID-19 pandemic to make them more immersive (see *Supplementary materials* for a complete description). Lastly, in perspectives A and C, participants received some same-gender scenarios: the target was a man when the participant was a man and a woman when the participant was a woman.

Data analyses and experimental design

The principal analyses were performed using a Generalized Mixed Model (GMM) to determine whether perspectives, empathy, and BDL traits significantly predict moral decision-making in trolley problems and variants. For this purpose, we run separately two GMMs: one for *causing harm* scenarios and one for *causing inconvenience* scenarios. There were three continuous independent variables (i.e., BDL traits, affective and cognitive empathy) and Perspective as predictors of the binary choices (GOD vs. IOD or GOD vs. SOD; GOD were coded "1" and other choices "0"). Intercept and ID were entered as random effects, and all continuous predictors were centered. See Gallucci (2019) for a complete description of the GMM procedure. Because of significant differences between men and women, gender was introduced in the GMM for *causing harm* scenarios, but not for *causing inconvenience* scenarios. As

⁴ We ran a pilot experiment ($N = 24$; 17 women; $M_{age} = 26.5$; $SD = 5.32$) to pretest four everyday trolley-like problems (i.e., the dilemmas of the company, the inheritance, the university, and the roommates) and retained the company's dilemma because: (1) it was rated as adequately immersive and realistic; (2) participants felt it as strongly distressful, and their choices get them tormented/concerned; (3) participants rated it as presenting low levels of escape (i.e., elements in the scenario that facilitates one option over the other one). Batson et al. (1981) showed that the ease of escape influences helping behaviors in specific empathic conditions. Moreover, (4) participants described feeling a wide range of emotions during the reading (i.e., they reported being ashamed, anxious, frustrated, disgusted, nervous, and attentive); and (5) they did not get amused at all by the reading. Together, these elements alleviated the critics raised by Bauman et al. (2014).

descriptive statistics, chi-square tests highlighted choice differences in the two types of scenarios (x 3 perspectives).

The analyses were run on JAMOVİ computer software, version 1.6.23 (The Jamovi Project, 2019). Find the raw data file in the following DOI link: #NUMBER#.

Results

Descriptive statistics

Causing inconvenience scenarios. Participants made high GOD levels (i.e., laying off the spokesperson) in Perspectives A and C ($\mathbf{P_A}$: 92% of GOD vs. 8% of IOD; $\mathbf{P_C}$: 94% of GOD vs. 6% of IOD; see Figure 2a). There was no significant choice difference between these two perspectives ($\chi^2_{(1)} = 0.081$; $p = .776$). However, the GOD frequency significantly dropped down in Perspective B (i.e., participants made 54% of GOD and 46% of SOD) compared to Perspectives A and C ($\mathbf{P_{Avs.B}}$: $\chi^2_{(1)} = 41.03$; $p < .001$; $\mathbf{P_{Cvs.B}}$: $\chi^2_{(1)} = 44.7$; $p < .001$). There was no difference between men and women in the three perspectives ($\mathbf{P_A}$: $\chi^2_{(1)} = 1.08$; $p = .299$; $\mathbf{P_B}$: $\chi^2_{(1)} = 0.087$; $p = .769$; $\mathbf{P_C}$: $\chi^2_{(1)} = 3.38$; $p = .066$).

Causing harm scenarios. The GOD levels (i.e., killing the new patient) were low in the three perspectives ($\mathbf{P_A}$: 9% of GOD vs. 91% of IOD; $\mathbf{P_B}$: 13% of GOD vs. 87% of SOD; $\mathbf{P_C}$: 18% of GOD vs. 82% of IOD; see Figure 2b). Furthermore, there were significant differences between the three perspectives: Perspectives B and C ($\mathbf{P_{Cvs.B}}$: $\chi^2_{(1)} = 4.36$; $p = .037$) and Perspectives A and C ($\mathbf{P_{Avs.C}}$: $\chi^2_{(1)} = 13$; $p < .001$) significantly differed, but we did not found any significant difference between Perspectives A and B ($\mathbf{P_{Avs.B}}$: $\chi^2_{(1)} = 2.42$; $p = .120$). Lastly, we found significant gender differences in Perspectives A and C ($\mathbf{P_A}$: $\chi^2_{(1)} = 7.45$; $p = .006$; $\phi = .132$; $\mathbf{P_C}$: $\chi^2_{(1)} = 7.92$; $p = .005$; $\phi = .136$). In Perspective A, men made 13% of GOD and women 6% and,

men made 24% of GOD and women 13% in Perspective C. In both perspectives, men made more twice as many GOD than women.

[Insert Table 1 here]

[Insert Figure 2 here]

Generalized Mixed Model analyses

A correlation matrix has been displayed in Table 2.

[Insert Table 2 here]

Causing inconvenience scenarios. The GMM ($\chi^2/df = 0.836$; $R^2_{Marg.} = .308$; $R^2_{Cond.} = 0.373$) showed that the variable “Perspective” was a strong significant predictor of decision-making ($\mathbf{P_{C-B}}$: $B = 2.709$; $exp(B) = 15.02$; $p < .001$; $\mathbf{P_{A-B}}$: $B = 2.42$; $exp(B) = 11.25$; $p < .001$; see Table 2). Indeed, moving from Perspective B to C multiplied by 15 the odd to make a GOD and by 11.3 when moving from Perspective B to A. Overall, when all other parameters are equal to their means, BDL traits significantly and negatively predicted GOD ($B = -0.01$; $exp(B) = 0.992$; $p = .009$; see Table 2): each additional point of BDL traits decreased of 1% the odd to make a GOD. Lastly, affective empathy was a positive and significant predictor of GOD ($B = 0.037$; $exp(B) = 1.038$; $p = .006$; see Table 2): each additional affective empathy point increase of 4% the odd to make a GOD.

Graphical plots showed significant predictive effects of affective empathy and BDL traits in Perspective B (see Figure 3 A&B). Cognitive empathy was not a significant predictor of GOD ($B = 0.013$; $p = .567$; see Table 2).

[Insert Figure 3 here]

Causing harm scenarios. The GMM ($\chi^2/df = 0.381$; $R^2_{Marg.} = .0896$; $R^2_{Cond.} = 0.583$) displayed a significant predictive effect of perspective on GOD ($\mathbf{P_{C-B}}$: $B = 1.15$; $exp(B) = 3.15$; $p = < .001$; see Table 2): changing from Perspective B to C multiplied by 3.2 the probability to make a GOD (i.e., killing the new patient to save the five). BDL traits was also a significant and positive predictor of GOD ($B = 0.013$; $exp(B) = 1.013$; $p = .022$; see Table 2), meaning that each additional point on the FFBI-SF increased of 1% the odd to make a GOD (when all other parameters are equal to their means). This effect was especially true for Perspective C (i.e., when the participant is one of the five dying patient; see Figure 4). Gender showed a significant predictive effect on GOD ($B = -0.835$; $exp(B) = 0.434$; $p = .013$; see Table 2). Indeed, being a woman decreased around 57% the probability to make a GOD. Surprisingly, neither affective empathy ($B = -0.007$; $p = .776$) nor cognitive empathy ($B = -0.062$; $p = .102$; see Table 2) showed a significant predictive effect on GOD.

[Insert Figure 4 here]

[Insert Table 3 here]

Discussion

The role of participant's perspective in trolley problems and variants

In the current study, we have replicated Nasello et al.'s findings (2021a) and demonstrated that the participant's perspective has a causal effect on moral decision-making in causing harm and inconvenience scenarios. For causing inconvenience scenarios, we replicate Nasello et al.'s (2021a) findings for perspective B, but we found higher GOD levels for perspective A (> 90% vs. 75%). This discrepancy might be explained by introducing a notion of probabilities to get the lecture for a certain amount of passengers in Nasello et al.'s findings (2021a). The notion of uncertainty affecting a few protagonists seems to lower down the propensity to make some GOD.

For instance, Kahneman (2013) and Kahneman and Tversky (1982) showed that uncertain events influence the outcome of decisions.

Further concerning *causing inconvenience* scenarios, we found that Perspectives A and C presented the same GOD levels, suggesting that when participants embody the boss' perspective, they seem to put themselves more in Perspective C (i.e., the five employees) than in perspective B (i.e., the spokesperson). However, this was not the case for *causing harm* scenarios. We did not find any difference between A and B perspectives, showing that when participants are the surgeon, they seem to represent themselves more in Perspective B (i.e., the new patient) than in Perspective C (i.e., the five dying patients). Instead, Perspective C significantly differed from Perspectives A and B.

We also replicated the GOD rate (around 10%) obtained by Hauser et al. (2007) but showed that participants' perspectives and gender significantly influenced moral decision-making. Contrary to our expectations, we did not find the lowest GOD rate in Perspective B compared to Perspectives A and C. This result is surprising because, compared to other perspectives, a substantial number of people would sacrifice themselves to save the five dying patients. On the other hand, the highest GOD levels were found in Perspective C, according to our expectations. As mentioned, we found gender differences concerning their decision-making: men were twice as likely to make GOD than women in Perspectives A and C. These gender differences were already displayed in the scientific literature (Fumagalli et al., 2010a; Fumagalli et al., 2010b; Friesdorf et al., 2015; Armstrong et al., 2019), but are nuanced when men and women embodied the new patient's perspective (i.e., Perspective B; in this perspective, men and women showed similar GOD levels). As Nasello et al. (2021a) mentioned, these differences are presumably due to stronger affective responses to harming someone for women and more cognitive evaluations of outcomes for men.

Overall, we replicate some findings from previous studies, and the current results were well explained by the DPM (Greene et al., 2001). Furthermore, our results showed that introducing a third perspective (and more generally taking into account the variable *Perspective*) in trolley problems and variants has deep theoretical involvement in the moral decision-making field.

BDL traits and empathy as predictors of GOD levels

We assumed that higher levels of affective empathy and BDL traits (which were expected to be characterized by higher affective empathy levels) would predict less GOD, according to the predictions made from the DPM (Greene et al., 2001). The present study's findings partly confirmed this assumption, but some findings were unexpected. Indeed, contrary to our expectations and previous findings (Salgado et al., 2020), BDL traits and affective empathy were not significantly correlated (see Table 2): BDL traits were rather significantly and negatively correlated with cognitive empathy, joining other authors' findings (Grzegorzewski et al., 2019; Harari et al., 2010; Bujalski et al., 2019). This discrepancy might suggest that the empathy differences in BDL populations are probably scale-dependent.

Nevertheless, our findings showed that affective empathy and BDL traits significantly predict GOD under specific conditions. For instance, they were significant GOD predictors in Perspective B for *causing inconvenience* scenarios, while only BDL traits significantly predict GOD in Perspective C for *causing harm* scenarios. Furthermore, contrary to our expectations, BDL traits and affective empathy did not predict GOD in the same way for causing inconvenience scenarios: when the participant was the spokesman, the more affective empathy, the more GOD; inversely, the more BDL traits, the less GOD. Lastly, in causing harm scenarios, participants with higher BDL traits were more inclined to make GOD when they were among the dying patients.

These findings suggest subtle egocentric choices for people presenting higher BDL traits. More precisely, GOD increased as a function of BDL traits for *causing inconvenience* scenarios: people with lower levels of BDL traits had around 75% chance to make a GOD, while people with higher BDL levels had around 25% chance to make a GOD in perspective B (see Figure 3). Furthermore, higher BDL traits increased the odds of making a GOD in *causing harm* scenarios when participants were one of the five dying patients. These results join Saunders et al.'s findings (2015), showing that people suffering from BDL present selectively impaired altruism and, as suggested, this might be characterized by a subtle higher propensity to make egocentric choices in specific situations⁵. Furthermore, this subtle propensity for egocentric choices can potentially play a role in their interpersonal difficulties and unstable relationships. It is important to note that this is a subtle tendency because (1) participants' decisions were made in contexts where other protagonists cannot determine who has decided (see Supplementary Materials for a complete description); and (2) because, as mentioned earlier, Perspective C of *causing harm* scenarios is a mixed decision between GOD and SOD.

Interestingly, affective empathy played the exact opposite predictive effect in Perspective B of *causing inconvenience* scenarios (compared to BDL traits). This result was unexpected, following the predictions made from the DPM (Greene et al., 2001). Indeed, the theory hypothesized that when people are more involved in emotional processes (like in *personal*, *direct-impact* scenarios, or Perspectives B and C), they make less GOD (and this propensity was expected to be even higher for people presenting higher levels of affective empathy). However, we found that affective empathy linearly predicted GOD in Perspective B of *causing inconvenience* scenarios: at lower levels, there was around 25% chance to make a GOD, and this

⁵ Important note. For the three perspectives on both scenarios, it should not be considered that favoring the group (GOD) is the 'good' decision. From perspective B, we can claim that a GOD is an altruistic decision because participants favor the group instead of themselves. However, a GOD is not especially the right decision or the decision that should be prone. Like in classical Trolley Problems, we find the same underlying question in this perspective: Why would five coworkers' jobs be necessarily more valuable than yours, and vice versa?

propensity raised up to 75% at higher affective empathy levels (see Figure 3). This result was rather supported by the Empathy-Altruism Hypothesis (EAH; Batson, 1987; 2011). The EAH assumes that empathic concern (an affective empathy domain) produces altruistic motivation; this hypothesis was supported by a 35-year review of empirical research (Batson, Lishner, and Stocks, 2015). The authors demonstrated that empathy leads to more sensitive and constant help toward others (Batson et al., 2015), and this appears to be especially true when people are directly involved in causing inconvenience situations, like in Perspective B.

However, our results highlighted that the overall predictive effects of affective and/or BDL traits were slight. These findings raised two fundamental questions: (1) Do emotional processes substantially affect moral decision-making as proposed by the DPM (Greene et al., 2001)? (2) Why did cognitive processes such as cognitive empathy not significantly predict moral decision-making in regression models?

Conclusion

As displayed by our results, the DPM (Greene et al., 2001) well explains most results but appears (1) to overestimate the role played by emotional processes and (2) to produce some predictions that do not fit perfectly with the reality of the data (as also displayed by Smillie et al., 2020).

Given the weak role of affective empathy as a predictor of decision-making in this research and previous findings (e.g., Nasello et al., 2021a), we joined Horne and Powell's argument (2016), claiming that the presumed strong connection between emotion and moral judgment or decision-making is probably overestimated. However, it is still intriguing to not find a significant predictive effect of cognitive empathy on moral decision-making. There were weak correlations between cognitive empathy and decisions, but these associations disappeared in regression models. As mentioned, the DPM correctly predicts several outputs, but some puzzle

pieces seem to be missing. In other words, additional features not present in the DPM would probably explain the gaps between theories and empirical data.

Moral decision-making is a dynamic process influenced by several parameters. Besides, we claim that deciding is ending a sequential deliberation process. Therefore, another possibility is that both empathy domains interact on specific features of this sequential process at different moments. Then, when assessing the output (i.e., the final decision), some effects may have disappeared, and others have been reduced.

The cardinal result of this study was the causal impact of the participants' perspectives on moral decision-making. This result highlights the strong influence of this variable in moral dilemmas and stresses the necessity to consider this parameter in future research on trolley problems and variants.

In conclusion, several new directions were investigated in this research: (1) we confirmed the causal effect of participant's perspective in trolley scenarios and extended this effect by adding a third perspective (Perspective C); (2) we extended that this causal effect also occurred in classical trolley problems (initially, it was tested on causing inconvenience scenarios); (3) we showed that using everyday trolley-like problems is of significant interest: it revealed inter-individual differences and display how empathy and BDL traits differently predict moral decision-making; (4) to our knowledge, it is the first research investigating the role played by BDL traits in moral decision-making.

By studying three perspectives on social dilemmas, the trolley problems and variants have become powerful tools to assess under which circumstances individuals sometimes favor themselves, the community, or the minority. These tools propose major interests in clinical psychology and psychiatry. Indeed, it would allow clinicians to point out specific discrepancies

between clinical and healthy control populations to identify associations with impaired social mechanisms and offer adequate treatment and support.

Limitations

There were three main limitations in this study. First, like in previous studies (e.g., Nasello et al., 2021a; Gleichgerrcht & Young, 2013; Decety & Cowell, 2014; Patil & Silani, 2014; Takamatsu, 2018), a part of the experimental design was correlational. Indeed, affective empathy and BDL traits significantly predict but do not cause moral decision-making. For instance, a proposal to overcome this limit would be to create conditions eliciting different degrees of affective empathy and test whether or not it significantly impacts moral decision-making. Second, as already mentioned, we used a subclinical measure of borderline traits. Therefore, it would be interesting to test clinical populations to confirm our findings. Finally, we did not perform analyses of moral decision-making in a cross-gender way (men received men scenarios, and women received women scenarios). Thus, we cannot claim that these results are generalizable regardless of the target's gender. For instance, it might be interesting to investigate whether the gender differences obtained in the causing harm scenarios would be modulated by performing a cross-gender design.

Disclosure statement

The authors report that there are no competing interests to declare.

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Ethical Approval

All procedures performed in this study were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments, and the American Psychological Association's Ethical Principles in the Conduct of Research with Human Participants (2010). The Research Ethics Committee of the Psychology Department at the University of Liège (Belgium) approved this research, Ref.: 2021-087.

Informed Consent

Informed consent was obtained online from all participants included in the study.

Online data

The online data file is available on the following DOI link: 10.17605/OSF.IO/T4H7F.

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Figure 1. Perspectives in trolley problems and variants

Note. This figure depicts the three perspectives enrolled by the participant for both types of scenarios (i.e., the causing harm and inconvenience scenarios).

Figure 2a. Causing inconvenience scenarios.

Figure 2b. Causing harm scenarios.

Note. Diagrams displaying men and women's choices were represented when a significant gender difference was found. *Abbreviations:* GOD = Group-oriented decision; SOD = Self-oriented decision; IOD = Individual-oriented decision.

Figure 3. GMM effect plots for causing inconvenience scenarios.

Note. The X-axis displays BDL traits (left) and affective empathy (right), while the Y-axis depicts participants' choices (the closer to 1, the more GOD). Each separate line represents the three perspectives.

Figure 4. GMM effect plots for causing harm scenarios.

Note. The X-axis displays BDL traits, while the Y-axis depicts participants' choices (the closer to 1, the more GOD). Each separate line represents the three perspectives.

Table 1. Descriptive statistics

Variables	<i>N</i>	<i>Mean</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>	<i>ω</i>
Age	427	25.3	5.10	18	38	
Women	231	25.4	4.84	18	38	
Men	196	25.3	5.40	18	38	
Empathy						.85
<i>Affective empathy</i>	427	41.3	7.27	14	55	.81
Women	231	44.4	6.13	17	55	
Men	196	37.6	6.75	14	55	
<i>Cognitive empathy</i>	427	36.8	4.51	20	45	.81
Women	231	37.9	4.05	22	45	
Men	196	35.5	4.67	20	45	
Borderline traits						
<i>Total</i>	427	110	27.7	54	188	.94
Women	231	112	27.7	54	188	
Men	196	109	27.8	54	186	

Table 2. Correlation matrix

Names	1	2	3	4	5	6	7	8	9
1. BDL traits	-								
2. AE	.08	-							
3. CE	-.17***	.47***	-						
4. CI - PA	-.08	.05	.03	-					
5. CI - PB	-.10*	.15**	.13**	.04	-				
6. CI - PC	.01	.04	.03	.31***	-.05	-			
7. CH - PA	.13**	-.09	-.11*	-.11*	-.02	.05	-		
8. CH - PB	.08	-.03	-.08	-.14**	.05	-.19***	.34***	-	
9. CH - PC	.10*	-.16**	-.16**	-.10*	-.15**	-.002	.42***	.13	-

Note. *: $p < .05$; **: $p < .01$; ***: $p < .001$. Abbreviations: BDL traits = Borderline traits; AE = Affective Empathy; CE = Cognitive Empathy; CI – PA = Causing Inconvenience, Perspective A; CI – PB = Causing Inconvenience, Perspective B; CI – PC = Causing Inconvenience, Perspective C; CH – PA = Causing harm, Perspective A; CI – PB = Causing harm, Perspective B; CI – PC = Causing harm, Perspective C.

Table 3. Coefficients of the General Mixed Model analysis

				95% Exp(B) CI		z	p
Names	E	SE	Exp(B)	Lower	Upper		
CI	Intercept	1.902	0.130	6.70	5.20	8.64	14.7 <.001
	Perspective _{C-B}	2.71	0.251	15.02	9.19	24.6	10.8 <.001
	Perspective _{A-B}	2.42	0.231	11.3	7.15	17.7	10.5 <.001
	Affective empathy	0.037	0.014	1.038	1.01	1.07	2.74 0.006
	Cognitive empathy	0.013	0.022	1.013	0.970	1.06	0.573 0.567
	BDL Traits	-0.008	0.003	0.992	0.985	0.998	-2.61 0.009
CH	Intercept	-3.11	0.298	0.045	0.001	0.071	-10.5 <.001
	Gender	-0.835	0.337	0.434	0.165	0.961	-2.48 0.013
	Perspective _{C-B}	1.15	0.261	3.151	1.83	10.2	4.40 <.001
	Perspective _{A-B}	0.514	0.266	1.673	1.053	5.35	1.94 0.053
	Affective empathy	-0.007	0.025	0.993	0.924	1.06	-0.284 0.776
	Cognitive empathy	-0.062	0.038	0.940	0.872	1.03	-1.63 0.102
	BDL Traits	0.013	0.006	1.013	1.001	1.02	2.29 0.022

Abbreviations: CI = Causing Inconvenience; CH = Causing Harm; BDL Traits = Borderline Traits.