Judging accidental harm: reasoning style modulates the weight of intention and harm severity

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Abstract

When judging a perpetrator who harmed someone accidentally, humans rely on distinct information pertaining to the perpetrator and victim. The present study investigates how reasoning style modulates the contribution of the victim's harm and the perpetrator's intention to third-party judgment of accidental harm. In two pre-registered online experiments, we simultaneously manipulated harm severity and the perpetrator's intention. Participants completed reasoning measures as well as a moral judgment task consisting of short narratives which depicted the interaction between a perpetrator and a victim. In experiment 1, we manipulated the perpetrator's intent to harm (accidental vs. intentional harm) and the victim's harm (mild vs. severe harm). In experiment 2, we aimed to manipulate intent in accidental harm scenarios exclusively, using positive or neutral intents and manipulating harm severity (mild vs. severe harm). As expected, intent and harm severity moderated participants' moral judgment of acceptability, punishment and blame. Most importantly, in both experiments, the perpetrator's intent not only interacted with outcome severity but also polarized moral judgments in participants with a more deliberative reasoning style. While moral judgments of more intuitive reasoners were less sensitive to intent, more deliberative reasoners were more forgiving of accidental harm, especially following mild harm. These findings extend previous studies by showing that reasoning style interacts with intent and harm severity to shape moral judgment of accidents.

Keywords: moral judgment; accident; reasoning; intent; outcome; dual-process

Introduction

People constantly scrutinize their own behavior as well as the moral behavior of others. Moral judgment indeed is a pivotal determinant of the regulation of social behaviors (Tomasello & Vaish, 2013). When someone breaks a moral rule, third parties are often involved in judging the transgressor, a process that requires the integration of multiple sources of information. Studies using behavioral, neuropsychological and neuroimaging methods have provided explanations about the way individuals combine information about the perpetrator, its causal responsibility, and the outcome to form a moral judgment. In what follows, we explain some of the most influential theories about moral judgment, and the predictions one of these theories makes about processing accidental harm. Next, we focus on cognitive factors that may be critical to moral judgment of accidental harm, namely executive functions and reasoning style. Finally, we develop our hypothesis about the role of reasoning style in judging accidental harm.

Intent and outcome as determinants of moral judgment

To determine whether an agent's behavior is wrong, punishable, and blameworthy, people mainly rely on two key factors: intention and outcome. First, research in moral psychology shows that judgments are harsher as the severity of harm caused to the victim increases (Bornstein, 1998; Carlsmith et al., 2002; Lowe & Medway, 1976; Robbennolt, 2000; Robinson & Darley, 1995). When participants are presented with fictitious scenarios involving a harm-doer and a victim and asked how much punishment the perpetrator deserves, their decision of punishment is mainly justified by the severity of harm inflicted to the victim (Carlsmith et al., 2002; Robbennolt, 2000). This increased judgment severity as negative outcomes get larger is in line with the retributive justice system according to which punishment of individuals should be proportional to the harm they caused.

The effect of outcome severity on moral judgment also extends to work using sacrificial moral dilemmas, where participants judge whether it is acceptable to kill someone to save many. The ratio between the deaths versus lives spared in these dilemmas orients participants' response, in such a way that the more people to be killed by an action, the less acceptable it is judged (Costa-Lopes et al.,

2021; Mata, 2019; Trémolière & Bonnefon, 2014). Besides, inflicting harm to others for the greater good is judged more acceptable if it results in mild injury as compared to death (Trémolière & De Neys, 2013). This means that participants take outcome severity into account when making their moral judgment in life-and-death situations.

Second, the intention behind an action or an action plan is of critical importance in the legal system and proves to be one of the main determinants of moral judgment (Cushman, 2008; Hauser, 2006). The notion of intentional action is based on two properties: a desire to reach and the ability to foresee an outcome (Forguson, 1989) by the means devoted to its execution (Bratman, 1989). When a moral transgression results in the same outcome, it is judged more morally wrong when the perpetrator harms intentionally as compared to accidentally (Robinson & Darley, 1995; Young et al., 2007). Even in the absence of harmful outcomes people are sensitive to negative intentions: a failed attempt to harm is sufficient to trigger moral outrage and punishment (Hauser, 2006; Nobes et al., 2009; Russell & Giner-Sorolla, 2011; Young et al., 2007, 2011). Since Piaget's seminal work about the progressive maturation of intent-based moral judgment (Piaget, 1965), other studies have also shown a shift from outcome-based to intent-based moral judgment in childhood (Cushman et al., 2013; Killen et al., 2011; Leslie et al., 2006; Zelazo et al., 1996). Recent work, however, suggests that intent can drive third-party moral judgment of young children, for example when processing demands of the task are reduced (Margoni & Surian, 2020; Van de Vondervoort & Hamlin, 2018), or when intention is more salient (Nobes et al., 2017), and even infants can recognize that a harmful action was intentional (Hamlin et al., 2010; Hamlin & Baron, 2014).

The cognitive underpinnings of third-party evaluation of moral transgressions

A few cognitive models of moral judgment have been elaborated, and we briefly mention two of the main models before elaborating more on the third one: the Culpable Control model (Alicke, 1992, 2000); the Path Model (Malle et al., 2014), and the two-process model (Cushman, 2008). The notions of intentionality, evaluation of outcome, and causal responsibility are incorporated to each model, although in different terms and with different connections between the concepts. The Culpable Control model posits that people first spontaneously evaluate the agent, the victim and the action's

outcome, before determining the extent to which the agent has exerted a control over a harmful or potentially harmful event, and whether the agent could have predicted the outcome. The Path model of blame (Malle et al., 2014) posits that people assess the outcome and the agent's causal responsibility, before determining whether the outcome was intended or not. If not, people process information about the agent's obligation and capacity to have prevented the outcome (Malle et al., 2014; Monroe & Malle, 2017). Outcome severity is thus thought to play a limited role in blame judgments.

The two-process model of moral judgment (Cushman, 2008) suggests that two cognitive processes are involved in the evaluation of wrongness and punishment following a moral transgression. On the one hand, an "outcome-based process" focuses on the consequences of moral failures. On the other hand, an "intent-based process" is thought to focus on the agent's intentions. Interestingly, the two-process model makes a distinction between different types of moral evaluations (Cushman, 2008). While punishment is thought to be dependent on both intent and outcome, wrongness is thought to be mainly dependent on intention. As for blame judgments, the two-process model posits that blameworthiness relies on both intent and outcome, just as punishment (Cushman, 2008), whereas recent evidence suggests that blame may be less dependent on outcome than punishment (Kneer & Machery, 2019; Nobes & Martin, 2021). This means that manipulating factors relevant to intent or outcome should affect judgment of wrongness and punishment/blame differently. Critically, the output of the two processes of moral judgment are sometimes antagonistic, triggering a cognitive conflict in judges (Cushman et al., 2012; Greene et al., 2004). This is especially emblematic of accidental harms in which an agent unintentionally hurts somebody. In this case, the outcome-based process focusing on the harm inflicted to the victim would increase judgment severity, and conflicts with the intent-based process examining the agent's innocent intention, which would decrease judgment severity.

In brief, these models state that moral judgment is made up of a first evaluation of the action and its outcome, as well as an evaluation of the agent's mental state, intention, or ability to have avoided the outcome. This different steps of evaluations implies that distinct cognitive factors may be involved at different stages of moral judgment. Thus, individual dispositions may differentially affect

how people process information relative to the agent's intention on the one hand, and to the outcome on the other hand. Should it be true, differences in intent-based analysis may have to do with individual differences in reasoning and cognitive control abilities.

Cognitive control, reasoning, and the conflict triggered by accidental harm

Previous studies suggest that reasoning and cognitive control affect moral judgment, an observation which has been largely documented in the study of sacrificial dilemmas (Greene et al., 2001, 2001). Many of these studies rely on dual-process theories (Evans, 2003; Stanovich & West, 2000), for which the generic model proposes that people can reason and judge by using either one of these two processes: Type 1 process, which is fast, intuitive and almost automatic, and emotionally-driven; Type 2 process, which is slower, deliberative, and greedy in cognitive resources. Many genuine tasks (and measures) have been designed to modulate or assess the use of each of these processes and explore individual differences in reasoning (for an overview of the dual-process toolbox (Trémolière et al., 2018)). Importantly, individual differences have been observed in the preferential use of one of these two systems of reasoning when solving problems (Stanovich & West, 2000). Individuals who preferentially use Type-1 process are said to be “intuitive” while individuals who preferentially use Type-2 process are said to be “deliberative”. In this paper, we use the terms “reasoning style” to refer to more intuitive versus more deliberative reasoning dispositions.

When deliberation is encouraged (Nichols & Mallon, 2006), or in contrast prevented by an interference task (Greene et al., 2008) or by a time limit imposed on participants (Suter & Hertwig, 2011), moral judgment is affected, in such a way that more (respectively less) deliberation is associated with more (respectively less) acceptability of inflicting harm to others. Moreover, at the individual level, contrasting participants with a more deliberative style to participants with a more intuitive style revealed greater cost-benefit analysis in more deliberative people, and ultimately higher utilitarian responses (Bartels, 2008; Patil et al., 2021). Cognitive resources and reasoning may thus be necessary to overcome the cognitive conflict triggered by sacrificial moral dilemmas.

Although the studies are scarcer, the contribution of executive functions and reasoning to third-party moral judgment has been documented. Buon and colleagues showed that completing an interference task in addition to a moral judgment task reversed the weight of intent and outcome in the judgment of accidental harm: participants were thus harsher towards the accidental transgressor (Buon et al., 2013). In a recent study, Martin and colleagues also manipulated cognitive load while participants had to judge the perpetrator of an accident. The higher cognitive load, the less “intent-based” moral judgment (Martin et al., 2021). Finally, other studies reported that reduced executive function skills in children with autism as compared to neurotypical peers (Margoni, Guglielmetti, et al., 2019) and in older adults as compared to younger adults (Margoni et al., 2018) explained increased judgment severity of accidental harm in these populations. Taken together, these results suggest executive functioning is critically involved in the integration of intent into moral judgment. Similarly, there is also evidence that reasoning may play a leading part in dealing with third-party judgment of accidental moral transgressions.

In a recent study which manipulated intent and harm in a 2 x 2 design (negative intent / neutral intent x harmful outcome / no harm), Patil and Trémolière (2021) explored how reasoning impacted judgment severity. Relying on a battery of measures consisting of performance tests (e.g., Cognitive Reflection Test, Belief Bias syllogisms) and self-report questionnaires (e.g., Actively Open-Minded thinking, Rational Experiential Inventory) assessing reasoning, they observed that participants who favored cognitive deliberation were more forgiving of accidental transgressors specifically. At the physiological level, judging accidental harm has been shown to recruit cortical regions known to support cognitive control (Young et al., 2007) more so than other types of harm. Conversely, individuals with executive function deficits are less sensitive to intent: patients with lesions to ventromedial prefrontal brain areas involved in cognitive control are less severe towards agents who harmed intentionally (Young et al., 2010).

Altogether, this evidence shows that the engagement of cognitive resources is related to the extent of intent-based analysis, suggesting that the intent-based process is rather effortful. This is consistent with the two-process model of moral judgment which is derived from the reasoning

literature and makes the distinction between type-1, intuitive processes, and type-2, deliberative processes (Evans, 2003; Sloman, 1996). Just as reasoning style may influence the balance between type-1 and type-2 processes when solving reasoning problems, this cognitive disposition may also modulate the balance between the intent-based and outcome-based processes when judging the perpetrator of accidental moral transgressions.

The current study

In the present study, we investigate how reasoning style modulates the contribution of intent and harm severity to third-party moral judgment. Instead of manipulating intent and outcome in a 2×2 design with intent to harm (present/absent) and harmful outcome (present/absent) as in a previous study (Patil & Trémolière, 2021), we proceeded to a subtler manipulation of outcome (mild or severe harm) in scenarios involving a negative vs. neutral intention towards the victim (experiment 1) or a positive vs. neutral intention (experiment 2). Participants also completed reasoning measures. We thus aimed to get a more comprehensive picture of the relationship between reasoning style and moral judgment, by exploring how individual differences in reasoning are expressed as a function of the perpetrator's intention and the severity of harm inflicted to the victim. The pre-registration of both experiments is available at the following links (experiment 1: <https://osf.io/jy6ud>; experiment 2: <https://osf.io/27bm3>).

We expected that people with a more deliberative reasoning style would be more sensitive to the perpetrator's intention, and less sensitive to the victim's outcome, as compared to more intuitive reasoners. In line with the literature, we predicted that both harm severity and intent will influence judgment of moral transgressions, with harsher judgment of intentional relative to accidental harm, and more lenient judgment of accidental harm when the perpetrator had a positive intention towards the victim. Finally, we expected an interaction between intent and harm severity. Specifically, we reasoned that harm severity would moderate judgment more strongly in case of accidental harm as compared to intentional harm, because of a potential ceiling effect in the judgment severity following intentional harm (experiment 1). Additionally, we reasoned that intention would moderate judgment of

accidental harm more strongly in case of severe harm (experiment 2), because the outputs of the intent-based and outcome-based processes may be more polarized in the case of severe harm preceded by a positive intention than in the case of mild harm preceded by a positive intention.”

Experiment 1: Outcome severity in the judgment of intentional and accidental harm

Method

Sample size rationale

We used G*power software to estimate the minimum sample size required for this study. We ran an a-priori power analysis for ANOVA (F test, fixed effects, special, main effects and interaction) with 2 predictors (intent, harm severity), with $\alpha = 0.05$, Power = 0.95 (we set the power threshold above what is conventionally used to maximize our chance of detecting an effect). Given that we were interested in the effect of both intent and harm severity on moral evaluations and their interaction, we ran the power analysis on the interaction. We used a medium effect size based on a prior data set which found either a small or a large effect of reasoning on moral judgment (Patil & Trémolière, 2021). We set an effect size $f = 0.25$ (medium effect size) with numerator $df = 1$ (2 predictors with 2 levels each), and number of groups = 4 (corresponding to the 4 possible combinations of intention by harm severity that was presented to each participant). The required sample size to observe such effect size under these assumptions was 210 participants.

Participants

Anticipating drop out and exclusion issues, we recruited 233 participants aged 18 or older living in the United Kingdom. Participants were invited to complete a survey on the Prolific service, provided written consent, and were paid £1 upon completion of the survey. Nine participants who were flagged as duplicates or failed attention checks were excluded from the analysis. The final sample included 224 participants (mean age = 35+-13.3, 153 females).

Material

Moral judgment task. We used 8 short stories featuring accidental and intentional moral transgressions, adapted from Young and colleagues (Young et al., 2007). The stories framed an interaction between an agent and a victim in a daily-life context, ending with the perpetrator harming the victim. The perpetrator's intention was not explicitly stated but had to be inferred by participants from the narratives (see also Patil & Trémolière, 2021). We used a 2×2 within-subject design with intent (present/absent) and outcome (mild/severe) as categorical factors. This led to 4 conditions: intentional severe, intentional mild, accidental severe, accidental mild. See Table 1 for an example of a framing that could lead to 4 possible items (full description of the scenarios and conditions is displayed in Supplementary materials S1). For each scenario, participants were asked to judge the agent's behavior on three outcome measures, using a 7-point Visual analog scale, in the following order: (1) how acceptable the agent's behavior is (from "not at all acceptable" to "very acceptable"), (2) how much punishment the agent deserves (from "not at all" to "very much"), and (3) how much blame the agent deserves (from "not at all" to "very much").

Additionally, we measured participants' reasoning style using a self-report questionnaire and a performance test. We used a short version of the Actively Open-minded Thinking questionnaire (Baron et al., 2015) which asks participants to report on a 5-point Likert scale (ranging from 1, Strongly Disagree, to 5, Strongly Agree) how much they agree with 8 statements such as "Changing your mind is a sign of weakness" (Cronbach's $\alpha = 0.73$). Participants also completed the Cognitive Reflection Test, which includes short problems which all have an appealing but incorrect response that participants have to inhibit in order to give the correct response (for example: "If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets?"). We used the 3 original items (Frederick, 2005) as well as 4 additional items (Thomson & Oppenheimer, 2016). Item scores were summed up separately for each test.

Table 1. Item sample used in experiment 1.

Background	<p>Jessica is skiing somewhere in the Alps. She sees a group of teenagers about to ski down a slope that feeds into a dangerously rocky section of the mountain. The teenagers are only novice skiers and do not know how to ski very well at all, especially on rocky terrain.</p>	
Perpetrator's intention	<p>Negative</p> <p>Jessica believes that the teenagers are only novice skiers, based on their cheap ski rentals, and that they must not know how to maneuver around the rocks. Jessica skis past the teenagers without saying anything.</p>	<p>Neutral</p> <p>Jessica believes that the teenagers must be expert skiers, based on their impressive skis and equipment, and that they must know how to maneuver around the rocks. Jessica skis past the teenagers without saying anything.</p>
Harm severity	<p>Severe</p> <p>The teenagers ski down the slope, crash into the sharp rocks, and one of them gets badly injured. He suffers a concussion and multiple breaks. He is evacuated to the nearest medical facilities via helicopter.</p>	<p>Mild</p> <p>The teenagers start to ski down the slope and quickly fall. One of them twists his ankle. They take their skis out and walk down the hill.</p>

Note: Participants saw only 1 of the 4 possible combinations for each framing.

Stimuli validation

A pilot experiment was run on 14 participants on the Amazon Mechanical Turk service in order to determine the perceived severity of harm associated with the 8 framings adapted from the literature. The pretest revealed a significant difference in judgment of harm severity between the “mild” and “severe” harm conditions across items ($F_{(1,13)} = 34, p < 0.001, \eta^2_{\text{partial}} = 0.72$). Importantly, ratings of harm severity were not influenced by intent ($F_{(1,69)} = 0.23, p = 0.64, \eta^2_{\text{partial}} = 0.003$). The descriptive statistics for the “mild” and “severe” harm conditions by item are presented in supplementary results.

Procedure

Participants completed the moral judgment task and the reasoning measures described below. Half of the participants started with the moral judgment task (the modest impact of task order on moral judgment of intentional harm is presented in supplementary results S5). In this task, participants were presented with 2 items per condition for a total of 8 items per participant. Participants’ judgments were assessed immediately following the presentation of an item. The presentation of items was pseudo-randomized: the association between framing and condition (which defines an item) varied between subjects. For example, some participants were presented with the “sandwich” framing under the “intentional-severe” condition whereas others were presented with the “sandwich” framing under the “intentional-mild” condition. Additionally, the temporal sequence of the 8 items presented to participants was fully randomized. However, question order was fixed across items and participants.

Data analysis

Statistical analysis was performed using linear mixed models using the lmerTest package (Bates et al., 2015) implemented in R. For each moral evaluation (acceptability, punishment, blame), we build a model with intent (intentional vs. accidental) and harm severity (mild vs. severe) as fixed factors and we optimized the random structure. Since the variance explained by the random effects was large

enough, we opted for the use of mixed models instead of an ANOVA. The full model was: `moral evaluation ~ intent * harm severity + (intent | subj) + (intent | item)`.

Statistical significance was determined using the Satterthwaite approximation (Satterthwaite, 1941), which is one of the methods recommended for designs including a limited number of items, as in our case. Post-hoc pairwise comparisons were conducted on fixed factors using an adaptation of Tukey tests implemented in the `lsmeans` package (Lenth & Lenth, 2018).

In preregistered exploratory analyses, we determined whether reasoning style interacted with intent or harm severity when making a moral judgment of acceptability, punishment or blame. We used a composite score of the AOT and CRT tests as a proxy for “reasoning style”. We first rescaled each AOT and CRT scores (range = 0 to 1) and then averaged the rescaled scores which led to a reasoning score (Internal consistency was high: $\alpha = 0.73$). Higher score is indicative of a more deliberative style whereas lower score reflects a more intuitive style. We added “reasoning style” as a fixed factor to the full model while using the same random structure (no convergence issues were encountered after adding this factor).

Results and discussion

Across moral evaluations, we found a significant main effect of harm severity and intent on moral acceptability. Intentional harm was rated, as expected, as less acceptable than accidental harm ($b = -2.55$, $SE = 0.27$, $p < 0.001$) and severe harm was rated as less acceptable than mild harm ($b = -0.23$, $SE = 0.082$, $p = 0.0046$) (Figure 1, left panel). Harm severity did not significantly interact with intent ($b = -0.017$, $SE = 0.12$, $p = 0.88$).

Punishment decisions were also more severe for intentional harm relative to accidental harm ($b = 1.97$, $SE = 0.30$, $p < 0.001$). Harm severity was marginally significant, with greater punishment following severe as compared to mild harm ($b = 0.14$, $SE = 0.081$, $p = 0.083$) (Figure 1, central panel). Interestingly, harm severity interacted with intent ($b = 0.28$, $SE = 0.12$, $p = 0.015$). While agents were punished more severely for severe harm than for mild harm in the case of intentional transgressions ($t_{(1330)} = 5.19$, $p < 0.001$), this was not the case for accidents ($t_{(1330)} = 1.74$, $p = 0.31$).

Finally, judgments of blame were influenced both by intent and harm severity (Figure 1, right panel). Intentional harm was judged more blameworthy than accidental harm ($b = 2.3$, $SE = 0.32$, $p < 0.001$), and blame was higher following severe as compared to mild harm ($b = 0.20$, $SE = 0.091$, $p = 0.030$). The interaction was not significant ($b = 0.092$, $SE = 0.13$, $p = 0.44$).

Figure 1. Moral judgment as a function of harm severity and intention to harm (Experiment 1).

Judgments reported on a scale from 0 to 6.

Effect of reasoning style on moral judgment

In exploratory analyses (Figure 2), we found that reasoning style modulated the role of intent and harm severity in moral judgment. First, a more deliberative style was associated with (i) higher acceptability overall ($b = 1.69$, $SE = 0.53$, $p = 0.0016$), (ii) reduced punishment overall ($b = -2.19$, $SE = 0.48$, $p < 0.001$), and (iii) reduced blame overall ($b = -1.60$, $SE = 0.52$, $p = 0.0023$). Second, reasoning style interacted with intent for judgments of acceptability, with reduced acceptability of intentional harm relative to accidental harm in participants with a more deliberative style ($b = -3.06$, $SE = 0.71$, $p < 0.001$). Reasoning style further interacted with intent and harm severity for acceptability ratings ($b = 1.58$, $SE = 0.73$, $p = 0.031$). Post-hoc Pearson's correlations revealed that a more deliberative style was associated with higher acceptability of accidents in case of both mild harm ($r =$

0.17, $p < 0.001$) and severe harm ($r = 0.12$, $p = 0.012$), while it was associated with reduced acceptability of intentional harm following mild harm ($r = -0.16$, $p < 0.001$), but not severe harm ($r = -0.046$, $p = 0.33$).

Figure 2. Contribution of reasoning style to moral judgment of intentional and accidental harm for different harm severity levels (Experiment 1). Judgments reported on a scale from 0 to 6.

In brief, the present results suggest that moral judgment was influenced by both the agent's intent and the severity of outcome. Participants were overall harsher for severe harm, and punishment

following severe harm was especially harsher when the agent had a negative intention towards the victim. Reasoning style also modulated judgments of moral wrongness and punishment. People with a more intuitive reasoning style were overall harsher than people with a more deliberative style. Importantly, judgment of acceptability in deliberative reasoners was more sensitive to the agent's intention.

Experiment 2: Outcome severity and positive intention in the judgment of accidental harm

In experiment 2, we specifically focused on accidental harm. We determined the extent to which harm severity and the perpetrator's intention towards the victim moderated moral judgment of accidental harm. While manipulating intent in experiment 1 (negative or no intent) led to contrast accidental to intentional harm scenarios, we included a positive intent (vs. neutral) in experiment 2. Based on the two-process model of moral judgment, we reasoned that the cognitive tension would be the strongest in case of severe accidental harm preceded by a positive intention towards the victim. In this case, the outputs of the intent-based and outcome-based processes may be most polarized, with more severe harm leading to harsher judgment, and a more positive intention leading to more forgiveness.

Method

Sample size rationale

Using the same a-priori power analysis as in experiment 1, the required sample size was 210 participants.

Participants

We recruited participants aged 18 or older living in the United Kingdom. Participants were invited to complete an online survey on the Prolific service and paid £1 upon completion. Four participants who

did not complete the survey or failed attention checks were excluded from analysis. The final sample included 210 participants (mean age = 34.82 ± 13.27 , 145 females).

Material

We used 4 short stories featuring accidental moral transgressions adapted from Young and colleagues (Young et al., 2007), and partially overlapping with these used in experiment 1. We used a 2×2 within-subject design with intention (positive / neutral) and outcome (mild / severe) as categorical factors. This led to 4 conditions: positive intention – severe harm; positive intention – mild harm; neutral intention – severe harm; neutral intention – mild harm (see table 2 for an example of a framing leading to 4 possible items; full description of the scenarios and conditions is displayed in Supplementary Materials S2). We also used the same reasoning measures and generated a “reasoning style” composite score as in experiment 1.

Table 2. Item sample used in experiment 2.

Background	Veronica and a friend are having lunch on Saturday. They are making sandwiches with stuff from Veronica's fridge. Veronica takes out cheese, ham, smoked salmon and veggies from her fridge. Her friend lets Veronica choose what to put in the sandwiches. The ham in the refrigerator was purchased a week ago and has since become slightly spoiled, so it's not safe to eat. Since Veronica's mom always shops for meat only on Fridays, Veronica thinks that the ham in the refrigerator is fresh and is safe to eat.	
Perpetrator's intention before the accident	Positive Veronica is a vegetarian, but she knows that her friend loves ham sandwiches, so she puts several slices of ham in her friend's sandwich.	Neutral As Veronica loves smoked salmon, she prefers a salmon sandwich for herself, and she puts several slices of ham in her friend's sandwich.
Harm severity	Severe Her friend eats the sandwich and throws up all night from food poisoning.	Mild Her friend eats the sandwich and does not digest it very well.

Note: Participants saw only 1 of the 4 possible combinations for each framing.

Stimuli validation

Pilot experiments were run on the Prolific platform in order to determine both the perceived severity of harm and the intention valence associated with each framing (descriptive statistics are included in supplementary tables S2 and S3). Participants were presented with one combination of intention by harm severity for each framing. We selected 4 of the 8 pretested items for the final experiment. The descriptive statistics, including mean ratings of harm severity, intention, and negligence of the perpetrator are presented in supplementary results. All selected items showed a significant difference in judgment of harm severity between the “mild” and “severe” harm conditions (all $T_s > 3.2$, all $p_s < 0.003$) as well as a significant difference in judgment of intention between the neutral and positive intention conditions (all $T_s > 2.27$, all $p_s < 0.03$). For the sake of completeness, we explored whether harm severity interacted with ratings of intention, and whether intention interacted with ratings of harm severity. Intention valence influenced ratings of harm severity for one item in the mild harm condition ($T = 5.16$, $p < 0.001$), with harm rated as milder in the positive intention condition as compared to the neutral intention condition, and for another item in the severe harm condition ($T = -2.48$, $p = 0.025$), with harm rated as more severe in the positive intention condition. Finally, harm severity influenced ratings of intention for one item in the positive intention condition ($T = -4.10$, $p < 0.001$), with intention rated as more positive in the mild harm condition relative to the severe harm condition.

Procedure

The procedure for experiment 2 was the same as in experiment 1, except that participants were presented with 1 item per condition for the moral judgment task of experiment 2.

Data analysis

Similar to experiment 1, we implemented linear mixed models with intent (positive vs. neutral) and harm severity (mild vs. severe) as fixed factors and we optimized the random structure. The full model

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was:moral_evaluation~ intent *harm_severity + (harm_severity | subj) + (1 | item).
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We ran the same type of exploratory analyses as in experiment 1 to determine the effect of reasoning style on moral judgment. Internal consistency among items of the “reasoning style” measure was high ($\alpha = 0.75$).

Results and discussion

Both intent and harm severity influenced judgments of acceptability, punishment and blame of accidental harm. The agent’s behavior was rated as less acceptable following severe harm relative to mild harm ($b = -0.40$, $SE = 0.15$, $p = 0.0059$), and more acceptable when the accident was preceded by a positive intention towards the victim ($b = 0.50$, $SE = 0.13$, $p < 0.001$) (Figure 3, left panel). The intent by harm interaction was marginally significant ($b = -0.37$, $SE = 0.19$, $p = 0.050$): relative to a neutral intention, a positive intention increased acceptability of mild harm ($t_{(416)} = 3.74$, $p = 0.0012$), but not severe harm ($t_{(416)} = -0.97$, $p = 0.77$).

Punishment and blame judgments were also harsher following severe harm as compared to mild harm (punishment: $b = 0.63$, $SE = 0.12$, $p < 0.001$; blame: $b = 0.54$, $SE = 0.15$, $p < 0.001$), and more lenient when harm was preceded by a good intention towards the victim (punishment: $b = -0.43$, $SE = 0.12$, $p < 0.001$; blame: $b = -0.48$, $SE = 0.15$, $p = 0.0014$) (Figure 3, central and right panels). The interaction of intent with harm severity was marginally significant for blame judgments ($b = 0.37$, $SE = 0.21$, $p = 0.074$). Post-hoc analyses revealed that mild harm was judged less blameworthy when preceded by a good intention relative to the neutral condition ($t_{(415)} = 3.21$, $p = 0.0077$), but this was not the case of severe harm ($t_{(415)} = 0.68$, $p = 0.90$).

Effect of reasoning style on moral judgment

Finally, planned exploratory analyses (Figure 4) revealed that reasoning style did not modulate acceptability of the agent’s behavior ($b = 0.33$, $SE = 0.70$, $p = 0.64$), but modulated decisions of blame

and punishment. Punishment was overall less severe in participants with a more deliberative reasoning style ($b = -1.71$, $SE = 0.62$, $p = 0.0057$). Additionally, reasoning style interacted with intent and harm severity to determine blame judgments. Participants with a more deliberative style judged the agent's behavior less blameworthy when the agent had a positive intention towards the victim relative to a neutral intention ($b = -2.44$, $SE = 0.85$, $p = 0.0044$), and the triple interaction ($b = 3.40$, $SE = 1.20$, $p = 0.0050$) revealed that this was especially the case for mild harm ($r = -0.17$, $p = 0.012$), but not severe harm ($r = 0.022$, $p = 0.75$). In absence of a positive intention towards the victim, reasoning style did not influence blame of mild harm ($r = 0.063$, $p = 0.36$), or severe harm ($r = -0.06$, $p = 0.37$).

Figure 3. Moral judgment as a function of harm severity and the agent's intention towards the victim prior to the accident (Experiment 2). Judgments reported on a scale from 0 to 6.

Figure 4. Contribution of reasoning style to moral judgment of accidental harm (Experiment 2).

Judgments reported on a scale from 0 to 6.

In sum, judgment of accidental harm was influenced both by outcome severity and the presence of a positive intention towards the victim. More specifically, more lenient judgment was observed when the agent was responsible for mild harm and when harm was preceded by a good intention towards the victim. A more deliberative style was associated with more lenient judgments of

punishment overall, and more deliberative participants were especially sensitive to the agent's intention in the case of mild harm.

General Discussion

The goal of the present study was to investigate how reasoning style (i.e., whether people are generally prone to deliberation when making decisions or by contrast make fast decisions by relying on their intuition) modulates the contribution of harm severity and intention to third-party judgment of moral transgressions. In two experiments, we manipulated harm severity (mild vs. severe) and intention (negative vs. neutral in experiment 1; positive vs. neutral in experiment 2) and determined the involvement of individual differences in reasoning style. In keeping with the literature, harm severity moderated moral judgment of intentional and accidental harm. Moreover, the behavior of the accidental transgressor was judged more acceptable, less punishment-deserving and less blameworthy when the perpetrator had a positive intention towards the victim relative to a neutral intention. The perpetrator's intention towards the victim further interacted with harm severity to shape moral judgments: Reduced harm severity was associated with less punishment when the perpetrator's intention was negative, but not neutral (experiment 1). Reduced harm severity was additionally associated with higher acceptability and lower blameworthiness when the perpetrator's intention was positive, but not neutral (experiment 2). Importantly, moral judgment was modulated by reasoning style, in the sense that a more deliberative style was associated with more forgiveness of perpetrators, especially following accidents, and even more so when mild accidental harm was preceded by a positive intention towards the victim.

Deliberative reasoners are more forgiving, especially of well-intentioned accidental transgressors

The major finding of this study is the effect of reasoning style on judgment of moral transgressions. Research using moral dilemmas has previously pointed to reasoning style as a

moderator of utilitarianism (Bartels, 2008) and others have shown that taxing cognitive resources reduces utilitarianism (Greene et al., 2008; Suter & Hertwig, 2011; Trémolière et al., 2012). Here, by simultaneously manipulating intent and harm severity, we show that reasoning style influences the processing of the perpetrator's positive and negative intentions. People with a more intuitive reasoning style were harsher than people with a more deliberative style, and the difference was more pronounced for the judgment of accidents, and when accidental harm was preceded by a positive intention. These results complement those from Patil & Trémolière (2021) by showing that the effect of reasoning style on moral judgment persists even when contextual moderators are manipulated. First, the effect of reasoning style on intent-based considerations is not limited to negative intention but applies to both positive and negative intentions. These findings are consistent with the idea that more careful deliberation is associated with more intent-based moral judgment which results in more forgiveness of accidents. It is also possible that more deliberative people are better at recognizing the perpetrator's intention implied in the scenarios. Drawing a parallel between the two-process model of moral judgment (Cushman, 2008) and dual process theories of reasoning (Evans, 2003), we could suggest from research on the psychology of reasoning (Verschuere et al., 2005) that more deliberative people may engage more in the search for alternative explanations about the occurrence of an event. In the moral judgment field, Russell & Giner-Sorolla (2011) indeed found that after reading potential explanations about the harm inflicted to a victim, participants reported less anger at agents involved in harmful moral transgressions (Russell & Giner-Sorolla, 2011). In the specific context of accidental harm, we speculate that people more prone to deliberation may engage more in the search for mitigating circumstances that can exonerate the (well-intentioned) perpetrator.

Second, the present study shows that reasoning style modulates the contribution of harm severity to moral judgment of accidental harm. We could have expected differences in reasoning style to polarize judgments of severe harm, a situation that might invoke greater cognitive tension in judges (although note that the outcome effect in the present study is smaller than in previous studies, see supplementary discussion). More specifically, more deliberative reasoners could have been more forgiving of accidental transgressors than more intuitive reasoners especially following severe harm.

Surprisingly, in Experiment 2, the increased forgiveness of accidents in more deliberative people was more pronounced for mild accidental harm, that is, for a situation that presumably generates less cognitive tension than severe accidental harm. Speculatively, we suggest that processing harm severity might start before processing intentionality. Following mild harm, people used to engage in deliberation can do so more easily and process intentionality more extensively than following accidental harm, because the emotional load generated by severe harm might limit the intent-based analysis. In other words, there might be a “harm severity threshold” beyond which reasoning style contributes less to the judgment of accidental moral transgressions. Alternatively, mild harm could be regarded as more “avoidable” or predictable than severe harm, and thus more deliberative people may attribute more blame to the perpetrator for failing to predict the negative consequences of their behavior. Another explanation would be that more deliberative people are more sensitive to mild harm, and thus a mild accidental harm can generate greater cognitive tension in these people as compared to more intuitive people. These hypotheses need to be explored directly in future research.

When innocent intentions are not enough to exculpate the perpetrator

This points us to one of the limitations of our study: we did not control for the perpetrator’s negligence in experiments 1 and 2, only controlling for negligence in the stimuli validation of experiment 2. The notion of negligence complements the notion of intentionality and is especially relevant for accidental harm (Cushman, 2015; Margoni, Geipel, et al., 2019; Mulvey et al., 2020; Shultz & Wright, 1985). The absence of negative intention towards the victim, or the presence of a positive intention preceding the accident, is not always sufficient to exculpate the perpetrator from responsibility. Higher propensity to see the perpetrator as negligent is associated with harsher punishment following accidental harm (Nobes & Martin, 2021; Shultz & Wright, 1985), and interferes with the intent-based judgment of the perpetrator. In contrast, when information is given about the carefulness of the accidental transgressor, punishment is less severe (Nobes et al., 2017; Nobes & Martin, 2021). Importantly, the victim’s negligence in case of accidental harm is also a moderator of moral judgment (Mulvey et al., 2020). Although the two-process theory does not make a clear

prediction about how people attribute negligence, the path model theory of blame judgment (Malle et al., 2014) suggests that judges determine two related elements following accidental harm: the perpetrator's obligation to foresee the negative outcome (for instance, due to its social rank) (Monroe & Malle, 2017) and the predictability of the outcome (Margoni & Surian, 2021; Monroe & Malle, 2017). Predictability of the outcome may consist in an objective probability assignment (i.e., the objective likelihood of an event) and in a subjective probability assignment (i.e., how much participants think that the agent had good reasons to believe an event would occur). Recent findings suggest that wrongness, blame, and punishment judgments of accidental harms are highly sensitive to negligence attributions (Kneer and Machery, 2019) even when the information is not explicitly stated (Nobes and Martin, 2021). An additional study revealed a more complex pattern, whereby different types of judgment were differently influenced by negligence attribution (Kneer and Skoczen, 2021). As for blame judgments, the mediating effect of negligence was found to depend on subjective probability assignment. As for punishment judgments, they were partially mediated by objective probability assignment (Kneer and Skoczen, 2021). Future studies may test whether reasoning style has an influence on the perception of obligation and predictability, and whether the tendency of more deliberative reasoners to forgive accidental transgressors more than intuitive reasoners is maintained when information about the perpetrator's and the victim's negligence and objective/subjective probability is taken into account. Note that a within-subject design aimed at fostering reflective deliberation by allowing positive and negative outcome comparisons has shown that all types of judgment remain constant (Kneer and Machery, 2019).

Intention valence impacts the weight of intent-based analysis

Interestingly, the present experiments also echo past investigations showing that the valence of the perpetrator's intention influences the weight intent has on moral judgment. It has been found that negative intentions preceding bad outcomes seem to matter more than positive intentions preceding bad outcomes (Cushman et al., 2009; Hamlin & Baron, 2014; Nobes et al., 2009). Here, information about a positive (vs. a neutral) intention seems relevant only when accidental harm was mild, while the perpetrator's positive intention did not matter in case of severe accidental harm. This result was not

modulated by reasoning style. In contrast, information about the negative (vs. neutral) intention influenced judgment of both mild harm and severe harm. This result supports the idea that knowledge about a negative intention towards the victim may orient moral judgment more markedly than knowledge about a positive intention (Knobe, 2003; Nobes et al., 2009), perhaps due to a saliency effect (Nobes et al., 2017). Harmful intentions may be more salient than positive intentions, presumably because individuals expect agents to behave with good intentions in a default world (Levine et al., 2018). Put differently, a positive intention may be seen as a norm, while a negative intention may be seen as deviating from this norm. A complementary explanation to this asymmetry may be that people are biased in their attribution of agency: negative intentionality is attributed more easily following negative outcomes than positive intentionality is following positive outcomes (Hamlin & Baron, 2014; Morewedge, 2009). More generally, these results further suggest a dynamic interaction between the intent-based and outcome-based processes of moral judgment, rather than a parallel functioning of these two processes.

Theory of mind ability, executive functions, and intent-based analysis

Our discussion underlines the complexity of intent-based analysis, which is also tightly related to the perpetrator's mental state analysis. Since we did not control for theory of mind (ToM) abilities, we cannot determine whether part of the variance explained by reasoning style was mediated by ToM abilities, or whether reasoning style can modulate the engagement of ToM for the judgment of perpetrators. However, the literature suggests that mentalizing is another individual disposition that likely contributes to intent-based analysis. Deficits in ToM abilities have been to some extent associated with atypical moral judgment of accidents. For example, individuals with autism who show socio-cognitive deficits are more severe towards the perpetrator of accidental harm than neurotypical individuals (Moran et al., 2011; Patil & Silani, 2014), although this may be more related to a reduced empathic response (Patil & Silani, 2014). In this clinical population, the neural encoding of intent in one of the key ToM brain regions, namely, the right temporo-parietal junction (Molenberghs et al., 2016) further turns out to be atypical (Koster-Hale et al., 2013). However, other work in this population suggests a more nuanced view over the ability to make intent-based moral judgments

(Dempsey et al., 2020). Another type of evidence highlighting the involvement of ToM mechanisms in moral judgment comes from brain stimulation studies in neurotypical individuals: an artificial disruption of the right temporo-parietal junction interferes with intent-based moral judgment (Young, Camprodon, et al., 2010). In addition, individual differences in the activation of the right temporo-parietal junction are associated with the attenuation of accidental harm judgment severity (Young and Saxe, 2009), suggesting that accidental harm judgment stem from integration of the reasoning on agent's innocent thoughts, beliefs, and desires about the current action.

In parallel, another line research suggests that the difficulty to integrate the agent's intention to moral judgment of accidental harm, as reported in different populations, may actually be due to executive function deficits. For example, the decline of executive functions in older adults seems to lead to less intent-based moral judgment and greater severity towards the perpetrator of accidental harm as compared to younger adults (Margoni et al., 2018). Additionally, the more "outcome-based" moral judgment of accidental harm in children with autism may be explained by deficits in executive function skills (Margoni, Guglielmetti, et al., 2019). An increase in outcome-based moral judgment of accidental harm has also been evidenced when taxing participants' cognitive resources (Buon et al., 2013; Martin et al., 2021). This set of studies highlight the contribution of executive functions, or at least cognitive resources, to intent-based moral judgment. Since the contribution of executive functions to ToM development has been evidenced (Wade et al., 2018; Zelazo et al., 1996), future studies may test whether executive function skills independently of ToM skills, or in synergy with ToM skills, allow to reach and maintain mature intent-based moral judgment.

Reasoning style and types of moral evaluations

It has been proposed that distinct moral evaluations are based on different processes. According to the two-process model, judgments of wrongness are based on intent, while judgments of blame and punishment are based on intent and outcome (Cushman, 2008). While the two-process model does not make a distinction between blame and punishment, some authors have suggested that punishment is a "social function" that is based on blame judgment (Malle, 2021). Others have found that blame judgments are less sensitive to outcome than punishment judgments (Kneer & Machery,

2019; Nobes & Martin, 2021). The present study reveals similar patterns of evaluations for acceptability (or wrongness) of the agent's behavior, punishment, and blame. In experiment 1 contrasting intentional to accidental harm, all three moral evaluations were largely influenced by intent, and less so by harm severity. In experiment 2, all three moral evaluations were influenced as much by intent (positive vs neutral) as by harm severity. Therefore, our results do not seem to support the prediction made by the two-process model that judgments of wrongness are mostly intent-based and as such differ from blame and punishment judgments (Cushman, 2008). However, the finding of a similarity across types of moral evaluations is in line with other studies (Barbosa & Jimenez-Leal, 2017; Gino et al., 2010). For example, Gino et al. (2010) found that the presence of a positive outcome reduces the perceived wrongness of an action, thus showing that wrongness judgment is not exclusively based on intent.

Investigating the role of reasoning style on moral judgment did not support the idea of a dissociation between wrongness judgment and judgments of blame or punishment. Given that more deliberative reasoners were overall more sensitive to intent, the two-process model would have predicted a stronger effect of reasoning style on acceptability judgment as compared to blame and punishment judgments. It is true that in experiment 1, judgments of acceptability were more dependent upon intent in more deliberative reasoners, while this was not the case for punishment and blame judgment, for which deliberative reasoners were overall more forgiving regardless of intent. Experiment 1 alone may have to some extent supported the two-process view. However, this did not hold in experiment 2: reasoning style modulated the effect of intent on blame (more deliberative reasoners attributed less blame to a well-intentioned perpetrator only), but reasoning style did not affect the weight of intent on acceptability judgments. Based on the present findings, we refrain from concluding that some moral evaluations are more based on intent or on outcome than others. Yet, we should mention a serious limitation with that regard: the order of moral evaluations was not manipulated between subjects, and participants always reported their rating of acceptability before punishment and blame. Since question order was not counterbalanced, we were not able to fully test the predictions made by the two-process model. It is possible that thinking about moral acceptability

increases the focus on intent, thus biasing participants' reports of punishment and blame. Similarly, thinking about deserved punishment before blame may increase the focus on outcome at the time participants are making blame judgment.

Some of the inconsistencies between studies regarding the (di)similarities between moral evaluations might be attributed to the social relationship between the agent and victim. Indeed, permissibility and obligations vary depending on the agent's and victim's identity and relationship to one another, and this might differentially influence moral evaluations. For example, it was found that wrongness judgments are more dependent upon the social relationship than punishment (Linke, 2012). The present study did not manipulate the relationship between the protagonists, which in some cases knew each other (neighbors, classmates, friends) and in some cases not (client and customer, anonymous driver and pedestrian). Future studies can inform the impact of reasoning style on distinct moral evaluations depending on contextual factors such as the protagonists' social relationship to one another. Finally, similarities or differences between the types of moral evaluations may also be influenced by outcome valence: in the present study, the outcome was always negative. Are wrongness judgments influenced by intent to the same extent as punishment judgment following a positive outcome? Future studies may test whether reasoning dispositions modulate praise judgments as much as blame or punishment judgments.

Conclusion

The present study complements the two-process view of moral judgment by providing an insight on how individuals deal with the cognitive tension triggered by accidental harm. The findings indeed demonstrate that reasoning style interacts with intent and harm severity to influence judgment of accidents. Because research on third-party moral judgment may have implications for the justice system, it seems crucial that professionals of the justice system and members of juries are aware of the potential influence of reasoning style on verdict preferences.

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Conflict of interest

The authors declare no conflict of interest.

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Supplementary Material

Supplementary material S1. Item versions used in study 1.

Motorboat:

Foreground: Alessandro is driving his motorboat in the bay, on his way home. He spots a swimmer in the far distance. The swimmer is actually exhausted and is waving frantically at Alessandro for help.

Intention (negative): Alessandro sees the swimmer waving and believes that the swimmer is waving desperately for help because his arm motions are so emphatic. Alessandro drives home, leaving the swimmer behind.

Intention (neutral): Alessandro sees the swimmer waving and believes that the swimmer is waving an enthusiastic “hello”. Alessandro drives home, leaving the swimmer behind.

Outcome (severe harm): The swimmer painfully goes back to the shore. Because he spent too long in the cold ocean, he suffers severe hypothermia. He will have troublesome after-effects.

Outcome (mild harm): The swimmer painfully goes back to the shore and his muscles are very sore.

Asthma:

Foreground: Erica is driving home when she sees a runner by the side of the road. The runner is bent over and has one hand on his chest. There is an empty asthma inhaler on the ground. [*sentence*

preceding severe harm: The runner is having a serious asthma attack and needs to get to a hospital immediately before he goes into shock. / *sentence preceding mild harm*: The runner is having an asthma attack and needs to stop exercising immediately.]

Intention (negative): Because Erica sees the inhaler and the gasping runner, she believes that the runner is having an asthma attack. Erica continues to drive, leaving the runner.

Intention (neutral): Because Erica doesn't see the inhaler, she believes that the runner has just stopped to catch his breath and will continue his jog shortly. Erica continues to drive, leaving the runner.

Outcome (severe harm): The runner faints and collapses. He wakes up in the emergency department.

Outcome (mild harm): The runner walks home alone and arrives close to exhaustion. He gets his new inhaler as soon as possible.

Ski:

Foreground: Jessica is skiing somewhere in the Alps. She sees a group of teenagers about to ski down a slope that feeds into a dangerously rocky section of the mountain. The teenagers are only novice skiers and do not know how to ski very well at all especially on rocky terrain.

Intention (negative): Jessica believes that the teenagers are only novice skiers, based on their cheap ski rentals, and that they must not know how to maneuver around the rocks. Jessica skis past the teenagers without saying anything.

Intention (neutral): Jessica believes that the teenagers must be expert skiers, based on their impressive skis and equipment, and that they must know how to maneuver around the rocks. Jessica skis past the teenagers without saying anything.

Outcome (severe harm): The teenagers ski down the slope, crash into the sharp rocks, and one of them gets badly injured. He suffers a concussion and multiple breaks. He is evacuated to the nearest medical facilities via helicopter.

Outcome (mild harm): The teenagers start to ski down the slope and quickly fall. One of them twists his ankle. They take their skis out and walk down the hill.

Iron:

Foreground: Anna and her little sister are in the bathroom doing makeovers by the sink. Anna had straightened her hair earlier in the day using a straightening iron. The iron is still on the sink. Anna's mother had just used the iron herself 5 min ago, so it is still extremely hot and could cause burns.

Intention (negative): Because the cord on the iron is still in the socket, Anna believes that it is still hot and could easily burn her sister. Anna lets her sister continue to play by the sink.

Intention (neutral): Because the cord on the iron was unplugged, Anna believes that it is no longer hot and cannot burn her sister. Anna lets her sister continue to play by the sink.

Outcome (severe harm): Her sister's arm hits the iron, and she gets badly burned. She needs to be taken to the clinic immediately and cries hysterically all the way to the emergency room.

Outcome (mild harm): Her sister's arm hits the iron, and she gets burned. The pain attenuates after a few minutes and she gets a small blister on her arm.

Wet floor:

Foreground: Maria is at the airport. She sees an elderly man with a big bag running clumsily down the terminal. The floor in the terminal has just been mopped, and there is a "Caution" sign. The man completely misses the caution sign, so he'll continue to run in order to catch his flight.

Intention (negative): Maria believes that the man has not seen the caution sign himself since he is not looking in front of him. She thinks that he'll slip and get hurt. Maria does not shout for the elderly man to slow down.

Intention (neutral): Maria believes that the man sees the sign since he is staring right at it. She thinks that he'll slow down when he reaches the wet part of the floor. Maria does not shout for the elderly man to slow down.

Outcome (severe harm): The man slips on the wet floor, falls hard and breaks his hip.

Outcome (mild harm): The man slips on the wet floor and falls on his bag. He strokes his knees several times and moans furiously before walking slowly to the gate.

Jellyfish:

Foreground: Ilaria and her neighbor are kayaking in a part of the ocean with lots of jellyfish. Ilaria's neighbor asks her if she should go for a swim. It is not safe to swim in the ocean, because the jellyfish sting and their stings can be painful.

Intention (negative): Because Ilaria read information that said the ocean's jellyfish are harmful, she believes that it is not safe to swim in the ocean. Ilaria tells her neighbor to go for a swim.

Intention (neutral): Because Ilaria read information that said the ocean's jellyfish are harmless, she believes that it is quite safe to swim in the ocean. Ilaria tells her neighbor to go for a swim.

Outcome (severe harm): Her neighbor does and gets stung by jellyfish. Her hand starts swelling and she experiences a lot of pain due to the sting. By the time they reach the beach, her hand is in a critical state and she needs to be injected drugs immediately to relieve the swelling.

Outcome (mild harm): Her neighbor does, gets stung by jellyfish, and her hand feels a bit itchy due to the sting.

Veterinarian:

Foreground: Roberto is a student working at a veterinarian's office. His friend comes to visit him and sees cookies shaped like bones laying out in the worker's lounge. His friend asks if he can eat one.

One of Roberto's co-workers had put the cookies in the lounge by accident. They are used to put dogs to sleep, so they are poisonous to eat.

Intention (negative): Roberto believes that the cookies are poisonous, because they are the shape of the cookies the veterinarian uses with special chemicals to put dogs to sleep. Roberto invites his friend to eat a dog bone-shaped cookie.

Intention (neutral): Roberto believes that the cookies are safe to eat, since they are out in the workers' lounge where people normally put food to share. Roberto invites his friend to eat a dog bone-shaped cookie.

Outcome (severe harm): His friend breaks into a sweat after several bites, stops breathing, and needs to be hospitalized.

Outcome (mild harm): His friend finds the taste terrible after the first bite, spits it out and needs to wash his mouth for five minutes.

Laptop:

Foreground: Claudio is a new computer technician at a store. A customer comes to the store to get her laptop checked out. The laptop gets very hot after only 10 min of work. The laptop is malfunctioning and heats up much more than normal. It is dangerous to use, especially on one's lap.

Intention (negative): Claudio checks with his boss and comes back believing that many laptops will catch on fire if they overheat and cause burns. Claudio returns the laptop to the customer.

Intention (neutral): Claudio checks with his boss and comes back believing it is very normal for all laptops to heat up during use. Claudio returns the laptop to the customer.

Outcome (severe harm): The customer goes home, and her laptop catches on fire. She suffers painful second-degree burns on her laps and arms.

Outcome (mild harm): The customer goes home, and her laptop overheats, causing slight burns on her laps.

Supplementary material S2. Item versions used in experiment 2.

Ham sandwich:

Foreground: Veronica and a friend are having lunch on Saturday. They are making sandwiches with stuff from Veronica's fridge. Veronica takes out cheese, ham, smoked salmon and veggies from her fridge. Her friend lets Veronica choose what to put in the sandwiches. The ham in the refrigerator was purchased a week ago and has since become slightly spoiled, so it's not safe to eat. Since Veronica's mom always shops for meats only on Fridays, Veronica thinks that the ham in the refrigerator is fresh and is safe to eat.

Intention (positive): Veronica is a vegetarian, but she knows that her friend loves ham sandwich, so she puts several slices of ham in her friend's sandwich.

Intention (neutral): As Veronica loves smoked salmon, she prefers a salmon sandwich for herself, and she puts several slices of ham in her friend's sandwich.

Outcome (severe harm): Her friend eats the sandwich and throws up all night from food poisoning.

Outcome (mild harm): Her friend eats the sandwich and does not digest it very well.

River Bridge:

Foreground: Eugenio and his girlfriend are hiking. They come across a long narrow bridge that spans a shallow river.

[*sentence preceding severe harm*: The bridge happens to be extremely unsteady and cannot carry the weight of even one very light person/ *sentence preceding mild harm*: The bridge happens to be unsteady and extremely old and anyone grabbing the hold may get splinters].

Eugenio believes that whoever walks on the bridge will cross the river quite safely because the bridge is maintained by the national park. When preparing for the hike, Eugenio did not notice that bridge on the map. Rather, he planned on a longer route to go around the river.

Intention (positive): However, Eugenio thinks his girlfriend is tired and he worries for her. Therefore, he thinks that taking the shortcut by crossing the bridge would be the best option for his girlfriend.

Intention (neutral): However, Eugenio wants to know what this alternative route looks like. Therefore, he decides to cross the bridge.

Outcome (severe harm): Eugenio lets his girlfriend start walking across the bridge. His girlfriend breaks the bridge, falls down in the river, and breaks her legs.

Outcome (mild harm): Eugenio lets his girlfriend start walking across the bridge. His girlfriend grabs the hold to keep her balance and gets a few splinters in her hands.

Jellyfish:

Intention (positive): Ilaria and her neighbor are kayaking in the ocean. They agreed to stop in a while for a break. Ilaria moves the kayak further away because she believes her neighbor will find the landscape even more beautiful and the water even warmer where they are heading. But there are lots of jellyfish over there.

Intention (neutral): Ilaria and her neighbor are kayaking in a part of the ocean with lots of jellyfish. They decided to stop in a while for a break. Ilaria moves the kayak further away. They have been paddling in the ocean for a long time and Ilaria will appreciate the break. But there are lots of jellyfish where they are heading.

Foreground: Once they arrive, Ilaria's neighbor asks her if he should go for a swim. It is not safe to swim in this part of the ocean, because the jellyfish sting and their stings can be painful. Because Ilaria read information that said the ocean's jellyfish are harmless, she believes that it is quite safe to swim in the ocean. Ilaria tells her neighbor to go for a swim.

Outcome (severe harm): Her neighbor does and gets stung by jellyfish. His hand starts swelling and he experiences a lot of pain due to the sting. By the time they reach the beach, his hand is in a critical state and he needs to be administered anti-histaminic drugs immediately to relieve the swelling.

Outcome (mild harm): Her neighbor does, gets stung by jellyfish, and his hand feels a bit itchy due to the sting.

Zoo:

Foreground: Leonardo is at the zoo with his friend. They are watching the dolphin show when the friend complains that his stomach hurts. [*sentence preceding severe harm*: Leonardo's friend is really sick. After his recent operation, his doctors had warned that stomach pain could indicate really serious complications / *sentence preceding mild harm*: Leonardo's friend has been a little sick the previous days, so he needs some time to fully recover]. Leonardo believes that his friend's stomach hurts because he ate too much chocolate and fried dough that afternoon.

Intention (positive): As Leonardo remembers that his friend likes walking, he thinks his friend will be pleased to walk across the park before watching another show. So Leonardo takes his friend to the other side of the park.

Intention (neutral): Leonardo notices that the zoo closes soon and decides to pass by the monkeys on their way out.

Outcome (severe harm): His friend starts feeling worse and soon blacks out because of severe internal bleeding.

Outcome (mild harm): His friend starts feeling tired and his stomach is hurting a bit more now.

Supplementary material S3. Actively Open-minded Thinking questionnaire (Baron, Scott, Fincher, & Metz, 2015).

Please rate your agreement or disagreement with each statement using a 5-point scale, ranging from 1 (Strongly Disagree), to 5 (Strongly Agree).

1. Allowing oneself to be convinced by an opposing argument is a sign of good character.
2. People should take into consideration evidence that goes against their beliefs.
3. People should revise their beliefs in response to new information or evidence.
4. Changing your mind is a sign of weakness (R).
5. Intuition is the best guide in making decisions (R).
6. It is important to persevere in your beliefs even when evidence is brought to bear against them (R).
7. One should disregard evidence that conflicts with one's established beliefs (R).
8. People should search actively for reasons why their beliefs might be wrong.

Supplementary material S4. Cognitive Reflection Test.

3 original items (Frederick, 2005)

1. A bat and a ball cost £1.10 in total. The bat costs a dollar more than the ball. How much does the ball cost? (*Intuitive answer 10 pence; correct answer 5 pence*).
2. If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets? (*Intuitive answer 100 minutes; correct answer 5 minutes*).
3. In a lake, there is a patch of lily pads. Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half the lake? (*Intuitive answer 24 days; correct answer 47 days*).

4 additional items (Thomson & Oppenheimer, 2016)

1. If you're running a race and you pass the person in second place, what place are you in? (*Intuitive answer 1st; correct answer 2nd*).
2. A farmer had 15 sheep and all but 8 died. How many are left? (*Intuitive answer 7; correct answer 8*).
3. Emily's father had three daughters. The first two are named April and May. What is the third daughter's name? (*Intuitive answer June; correct answer Emily*).
4. How many cubic feet of dirt are there in a hole that 3' deep x 3' wide x 3' long? (*Intuitive answer 27; correct answer none*).

Supplementary Results

Supplementary results S1. Stimuli validation : Descriptive statistics of harm severity ratings in experiment 1

item	Mild harm (mean, sd)	Severe harm (mean, sd)
Asthma	3.75 1.04	5.17 0.753
Floor	2.5 1.07	4.17 1.60
Iron*	3.5 0.837	4.38 0.744
Jellyfish	3 1.67	4.75 1.39
Laptop	3.12 2.30	5 0.632
Motorboat	3.17 1.33	5.12 0.991
Ski	3.33 0.816	4.88 2.03
veterinarian	2.88 2.03	5.5 0.837

Participants responded on a 7-point likert scale ranging from « Not at all severe » to « very severe »

*this item was improved after the pretest

Supplementary results S2. Stimuli validation : Descriptive statistics of harm severity ratings in experiment 2

item	Mild harm (mean, sd)	Severe harm (mean, sd)
Bridge	1.95 1.54	5.29 0.717
Ham	2.29 1.19	3.80 1.24
Jellyfish	1.90 1.37	4.45 0.999
Zoo	2.42 1.26	4.25 1.34

Participants responded on a 7-point likert scale ranging from « Not severe at all » to « very severe »

Supplementary results S3. Stimuli validation : Descriptive statistics of intention ratings in experiment 2

Item	Neutral intention (mean, sd)	Positive intention (mean, sd)
Bridge	1.95 0.575	1.11 0.315
Ham	1.77 0.612	1.11 0.315
Jellyfish	1.73 0.631	1.16 0.375
Zoo	1.81 0.403	1.42 0.607

Intention was assessed on a 3 points scale (1 = positive, 2 = neutral, 3 = negative).

Supplementary results S4. Stimuli validation : Descriptive statistics of negligence ratings in experiment 2

item	Neutral intention (mean, sd)	Positive intention (mean, sd)
Bridge	3.41 1.87	3.42 1.98
Ham	3.14 1.49	2.42 1.35
Jellyfish	2.95 1.89	2.79 1.44
Zoo	4.79 1.13	3.82 2.28

Participants responded on a 7-point likert scale ranging from « Not negligent at all » to « very negligent »

Supplementary results S5. Effect of task order on moral judgment

Experiment 1

In order to determine whether completing the reasoning measures before the moral judgment task affected participants' moral evaluations, we built a mixed model for each moral evaluation (acceptability, punishment, blame) with « task order » as an additional fixed factor. The model read :

```
moral_evaluation ~ intent * harm_severity * reasoning * task_order + (intent | subj) + (intent | item)
```

There was no main effect of task order on acceptability judgment ($b = 0.46$, $SE = 0.70$, $p = 0.52$). Task order preserved the main effect of reasoning ($b = 2$, $SE = 0.75$, $p = 0.0075$) and the interaction between reasoning and intent ($b = -4.73$, $SE = 0.99$, $p < 0.001$). The triple interaction between task order, intent and reasoning was significant ($b = 3.45$, $SE = 1.41$, $p = 0.015$). While reasoning style did not affect acceptability ratings of intentional moral transgressions in participants who completed the moral judgment first ($r = 0.03$, $p = 0.52$), more deliberative reasoning dispositions were associated with lower acceptability of intentional harm in participants who completed the moral judgment task after the reasoning measures ($r = -0.22$, $p < 0.001$).

Task order did not affect punishment ($b = 0.55$, $SE = 0.62$, $p = 0.38$), and preserved the main effect of reasoning ($b = -2.67$, $SE = 0.66$, $p < 0.001$), and the interaction between reasoning and intent became significant ($b = 1.87$, $SE = 0.90$, $p = 0.039$). Task order interacted with reasoning and intent ($b = 2.67$, $SE = 1.29$, $p = 0.039$). In participants who completed the reasoning measures first, punishment of intentional harm was not affected by reasoning style ($r = -0.02$, $p = 0.57$), but punishment of accidental harm decreased in more deliberative reasoners ($r = -0.31$, $p < 0.001$). In people who completed the moral judgment task first, punishment decreased in more deliberative participants following both intentional ($r = -0.16$, $p < 0.001$) and accidental harm ($r = -0.14$, $p = 0.0030$).

Task order did not affect blame judgment overall ($b = -0.22$, $SE = 0.68$, $p = 0.75$), and preserved the main effect of reasoning ($b = -1.75$, $SE = 0.73$, $p = 0.017$). The interaction between reasoning and intent became significant ($b = 2.78$, $SE = 0.99$, $p = 0.0053$). Task order interacted with reasoning and intent ($b = -3.25$, $SE = 1.43$, $p = 0.023$). Blame following intentional harm increased with a more deliberative reasoning style in participants who completed the reasoning measures first ($r = 0.10$, $p = 0.025$), but tended to decrease with a more deliberative style in people who completed the moral judgment task first ($r = -0.094$, $p = 0.057$).

Experiment 2

In order to determine whether completing the reasoning measures before the moral judgment task affected participants' moral evaluations, we built a mixed model for each moral evaluation (acceptability, punishment, blame) with « task order » as an additional fixed factor. The model read :

```
moral_evaluation ~ intent * harm_severity * reasoning * task_order + (harm | subj) + (1 | item)
```

As for acceptability ratings, there was no main effect of task order ($b = -0.80$, $SE = 0.89$, $p = 0.36$), and task order did not change the effect of reasoning ($b = -0.33$, $SE = 1.03$, $p = 0.75$), intent ($b = -0.59$, $SE = 0.72$, $p = 0.40$) and harm severity ($b = -0.74$, $SE = 0.78$, $p = 0.34$).

As for punishment, the main effect of task order was not significant ($b = -0.15$, $SE = 0.78$, $p = 0.85$). Task order attenuated the effect of reasoning ($b = -1.65$, $SE = 0.90$, $p = 0.067$) and harm severity ($b = 0.83$, $SE = 0.65$, $p = 0.20$). Task order did not interact with any factors.

As for blame, there was again no significant effect of task order ($b = 0.14$, $SE = 0.91$, $p = 0.88$) and task order did not interact with any factors. The interactions were preserved between reasoning and intent ($b = 2.64$, $SE = 1.24$, $p = 0.033$) and between reasoning, intent and harm severity ($b = 4.18$, $SE = 1.75$, $p = 0.017$).

Supplementary results S6. Exploring the effect of reasoning style as a categorical factor

To get a deeper understanding of the contribution of reasoning style to third party moral judgment in studies 1 and 2, we conducted unplanned exploratory analyses with « reasoning style » as a categorical factor.

In study 1, we included participants on the first tertile of the reasoning measure ($n = 72$) in the “intuitive” group and participants on the third tertile in the “deliberative” group ($n = 71$). First, we found that a more intuitive style was associated with lower acceptability ratings of the perpetrator’s behavior ($b = -0.64$, $SE = 0.22$, $p = 0.0034$) as well as harsher punishment ($b = 0.75$, $SE = 0.20$, $p < 0.001$) and blame ($b = 0.57$, $SE = 0.21$, $p = 0.0080$) (see Supplementary Figure 1). Second, reasoning style interacted with intent for judgments of acceptability ($b = 0.98$, $SE = 0.31$, $p = 0.0017$). While accidental harm was judged more acceptable than intentional harm in both intuitive participants ($b = 2.85$, $SE = 0.30$, $p < 0.001$) and deliberative participants ($b = 2.12$, $SE = 0.30$, $p < 0.001$), participants with a more deliberative style judged accidental harm more acceptable than participants with a more intuitive style ($b = 0.56$, $SE = 0.19$, $p = 0.017$).

Supplementary Figure 1. Contribution of reasoning style to moral judgment of accidental and intentional harm depending on harm severity.

In study 2, we included participants on the first (i.e., “intuitive, $n = 70$) and third (i.e., “deliberative”, $n = 71$) tertiles of the reasoning style measure. First, reasoning style did not modulate overall judgment of acceptability ($b = -0.025$, $SE = 0.31$, $p = 0.93$) or blame ($b = -0.37$, $SE = 0.30$, $p = 0.22$) but modulated overall punishment decisions (see Supplementary Figure 2): people with a more intuitive style were harsher than people with a more deliberative style ($b = 0.52$, $SE = 0.24$, $p = 0.036$).

Second, reasoning style interacted with intent to determine blame judgments ($b = 1.07$, $SE = 0.36$, $p = 0.0036$): while accidental harm preceded by a positive or a neutral intention was judged equally blameworthy in intuitive participants ($b = 0.12$, $SE = 0.18$, $t = 0.71$, $p = 0.89$), deliberative participants tended to judge accidental harm more leniently when it was preceded by a positive as compared to a neutral intention ($b = -0.47$, $SE = 0.19$, $t = -2.51$, $p = 0.06$). The triple interaction of reasoning style with intention and harm severity ($b = -1.45$, $SE = 0.51$, $t = -2.81$, $p = 0.0053$) revealed that deliberative participants were especially lenient with perpetrators who had a positive intention (relative to perpetrators who did not) when the accident resulted in mild harm ($b = -1.05$, $SE = 0.26$, t

= -3.98, $p = 0.0023$), but not when it resulted in severe harm ($b = 0.11$, $SE = 0.27$, $t = 0.42$, $p = 0.99$). These results suggest that judgment of blame in deliberative participants is especially sensitive to intent when outcome severity is low.

Third, reasoning style interacted with intent and harm severity to modulate punishment ($b = -0.79$, $SE = 0.41$, $t = -1.93$, $p = 0.055$): following mild harm, deliberative participants were more lenient when harm was preceded by a positive intention ($b = -0.68$, $SE = 0.21$, $t = -3.24$, $p = 0.029$), but this was not the case in intuitive participants ($b = -0.30$, $SE = 0.20$, $t = 1.51$, $p = 0.80$). Following severe harm, intention did not influence punishment, neither in intuitive participants ($b = 0.52$, $SE = 0.20$, $t = 2.66$, $p = 0.14$), nor in deliberative participants ($b = 0.11$, $SE = 0.21$, $t = 0.56$, $p = 0.99$). Finally, when the accident was not preceded by a good intention, harm severity influenced punishment decisions in intuitive participants who were harsher following severe harm ($b = 0.83$, $SE = 0.21$, $t = 3.9$, $p = 0.0028$) but this was not the case of deliberative participants ($b = 0.28$, $SE = 0.22$, $t = 1.26$, $p = 0.91$).

Altogether, these findings indicate that more intuitive people are more sensitive to outcome severity in the absence of a salient intention from the perpetrator. In parallel, outcome severity modulates the weight of intention in the judgment of more deliberative people.

Supplementary Figure 2. Contribution of reasoning style to moral judgment of accidental harm as a function of harm severity and intention towards the victim

Supplementary discussion

Cross-study comparison: mean moral evaluations as a function of intent and outcome

Study	Accidental harm			Intentional harm			Design: Intent by outcome manipulation	original scale
	Acceptability / permissibility	punishment	blame	Acceptability / permissibility	punishment	blame		
Current study experiment 1 (severe harm)	3.6	1.2	1.6	1	3.5	4	(negative, neutral intent) x (mild, severe harm)	0 to 6
Current study experiment 2 (neutral intention, severe outcome)	2.3	2.5	3.3	na	na	na	(neutral, positive intent) x (mild, severe harm)	0 to 6
Young et al. 2007	4.4	na	na	0.2	na	na	(negative, neutral intent) x (negative, neutral outcome)	1 to 4
Young et al. 2009	na	na	2.2	na	na	5.4	(negative, neutral intent) x (negative, neutral outcome)	1 to 4
Young et al. 2011			2	na	na	5.2	(negative, neutral intent) x (negative, positive outcome)	1 to 4
Baez et al. 2016*	3.5	na	na	0.2	na	na	(negative, neutral intent) x (negative, neutral outcome)	1 to 7
Patil & Trémolière unpublished (study 2a)*	1.2	3.6	na	0.2	4.4	na	(negative, neutral intent) x (negative, neutral outcome)	1 to 7

Notes : mean scores rescaled from 0 to 6 to match the current study. The standard deviation by condition was not provided in most studies. *moral evaluations of the control group only.

We compared moral acceptability/permissibility, blame and punishment attributed to perpetrators of accidental and intentional harm across several experiments that used the vignettes from Young and colleagues. We used a sample of studies which provided the mean scores by condition. The descriptive statistics overall indicate more lenient blame judgments of accidental harm in our study relative to what has been reported in other studies, an observation which can be explained by two main methodological differences. First, harm severity in our “severe harm” condition may have been perceived as less severe than in the study from Young and colleagues. Because we wanted to control for harm severity, we changed the original scenarios to let our participants know that harm was not lethal, but still had serious consequences for the victim (such as a need for emergency care or long-term after-effects). In contrast, from the original scenarios, some participant might think that harm is lethal. Participants who may have interpreted the harm as lethal may have attributed more blame to participants. Second, as our experiments were administered online while Young and colleagues and Baez and colleagues had participants come for an fMRI session, the manipulation may have been less successful than if we had conducted the experiments in the laboratory. We can assume that conducting the experiment in person could reveal larger differences between more intuitive or more deliberative reasoners in the way harm severity affects their moral judgment.

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