Many heads are more utilitarian than one

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ABSTRACT

Moral judgments have a very prominent social nature, and in everyday life, they are continually shaped by discussions with others. Psychological investigations of these judgments, however, have rarely addressed the impact of social interactions. To examine the role of social interaction on moral judgments within small groups, we had groups of 4 to 5 participants judge moral dilemmas first individually and privately, then collectively and interactively, and finally individually a second time. We employed both real-life and sacrificial moral dilemmas in which the character's action or inaction violated a moral principle to benefit the greatest number of people. Participants decided if these utilitarian decisions were morally acceptable or not. In Experiment 1, we found that collective judgments in face-to-face interactions were more utilitarian than the statistical aggregate of their members compared to both first and second individual judgments. This observation supported the hypothesis that deliberation and consensus within a group transiently reduce the emotional burden of norm violation. In Experiment 2, we tested this hypothesis more directly: measuring participants' state anxiety in addition to their moral judgments before, during, and after online interactions, we found again that collectives were more utilitarian than those of individuals and that state anxiety level was reduced during and after social interaction. The utilitarian boost in collective moral judgments is probably due to the reduction of stress in the social setting.

1. Introduction

Moral judgments are often collective. We discuss our individual opinions about the moral actions of friends, institutions, celebrities, and authorities within our social network. In fact, we spend most of our social conversations discussing others' moral failures (Dunbar, 2004). However, often different people have different moral opinions about the same moral issue. Consider the following scenario:

"After a violent murder in Germany, a journalist who investigates the case found evidence that the government of a foreign country ordered the murder. That country is a long-time trade partner of Germany, with which the German state is about to conclude a large trade agreement. This agreement will create 10,000 new jobs in Germany. If the journalist blows the whistle, the trade deal will collapse. The journalist decides to ignore the evidence. The trade deal goes through successfully, bringing wealth and employment to thousands of people. Was the journalist's

decision morally acceptable?"

Here, one might argue that upholding the principles of justice and journalistic duty requires pursuing and revealing the truth at any cost. This line of argument would conclude that what the journalist did was morally wrong. Others, who prefer to look at the outcome, may approve of the decision because it brought so much benefit and prosperity to many people.

Although fictional, these kinds of scenarios are not far from reality. Many decisions and actions involve breaking a norm, a promise, a rule, or a moral code to increase the utility for a larger group (e.g., active and passive euthanasia, abortion, white lies, restricting children's education to protect the elderly in the time of a global pandemic, discontinuing life support in comatose patients, etc.). The moral permissibility of such decisions may raise strong disputes in different people and lead to public and private discussions. In reality, however, within a group, a panel, among friends, or in families, when people discuss these decisions, how

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do they collectively decide about these moral issues? More generally, how collective moral judgments are shaped by individual members' opinions? Conversely, do group interactions change the individual's private moral judgments?

Previous works have extensively examined the philosophical, social, cognitive, and neurobiological substrates of individual moral judgments and decisions (e.g., Greene, Nystrom, Engell, Darley, & Cohen, 2004; Greene, Sommerville, Nystrom, Darley, & Cohen, 2001; Haidt, 2001; Mallon & Nichols, 2011; Moll, De Oliveira-Souza, & Zahn, 2008). However, most of the previous theories in moral psychology explain morality at the individual level. Several recent works have underscored this *overwhelming* focus on examining *individuals* making decisions or judgments *in isolation* (Bloom, 2010; Ellemers, 2017; Ellemers, Van Der Toorn, Paunov, & Van Leeuwen, 2019; Fedyk, 2019; Gert, 2005; Haidt, 2007; Leach, Bilali, & Pagliaro, 2015). Here we set out to examine this overlooked but fundamental role of *social interaction* among individuals in groups that engage in moral discussions.

The relationship between the individual and the collective morality has been at the heart of some of the most influential works of the post-war 20th-century philosophy (Arendt, 1987) and social psychology (Festinger & Carlsmith, 1959; Milgram, 1963; Myers & Bishop, 1970; Myers & Kaplan, 1976; Myers & Lamm, 1976; Wallach & Kogan, 1965; Wallach, Kogan, & Bem, 1964). Our questions – posed above – invite the reader to evaluate the reciprocal interactive relationship between the group and individual moral judgments in the light of those previous influential works.

We first provide a brief overview of the literature on moral judgments in individuals. Rather than being exhaustive, we highlight the contextual or psychological factors that have been shown to drive moral judgments towards or away from one moral theory or another in individuals and in isolation. Then we turn to the literature on social interaction and majority influence to examine the effect of interaction on the same contextual and psychological factors that modulate moral judgments. Putting our review of the two fields together, we provide our theoretical synthesis, which is then tested empirically.

1.1. Moral dilemmas

Moral dilemmas describe situations where it is necessary to choose between alternative actions, each of which violates a moral principle (e. g., holding on to a secret or informing a happily-married friend that his/her partner has been cheating on them). Moral dilemmas are difficult to resolve because they admit two incompatible moral actions. Often each of these conflicting actions is related to a different moral theory. For instance, according to a broad family of *utilitarian* moral theories, an action is acceptable if it maximizes the utility for the greatest number of people (Mill, 1863; Rosen, 2006) even if securing that utility entails violating moral rules like disregarding promises, duties, norms, etc. *Utilitarianism*, therefore, is a consequentialist moral theory; because, in its moral evaluation of a given action, it primarily cares about the consequences of that action. In contrast, *deontological* moral theories care primarily about upholding universal moral principles - what Kant (1948) called categorical imperatives- and give consequences a lower priority. These principles often make direct, inflexible, universal, and unequivocal moral rules such as 'Do not lie,' 'Do not kill' or 'Do not break a promise' (Kant, 1948; Scruton, 2001).

Borrowed from philosophy, a class of moral dilemmas known as 'sacrificial dilemmas' are commonly used in moral psychology, which entails instrumental harm to some in order to save others (see "Trolley Problem"; Foot, 1967; Thomson, 1976 for a review, see Christensen, Flexas, Calabrese, Gut, & Gomila, 2014). In these dilemmas a utilitarian moral agent (whose does not benefit personally from the consequences) would harm one innocent person if the harm benefits many. Conversely, harming an innocent person is wrong for deontology regardless of the number of lives that the inflicted harm might save.

To study the psychological and neural processes underlying these conflicting motives in individuals, experimenters often have participants read scenarios that include different sacrificial dilemmas (or, more recently, experience the scenario in virtual reality), imagine themselves in the situation, and decide what they would choose to do. Similarly, moral judgments are measured by having the participant evaluate a scenario in which an action was taken by a protagonist and see if (or how much) the participant would endorse the protagonist's decision.

1.1.1. Moral dilemmas and deliberation

Over the last two decades, this research line has shown that moral judgments are not fixed in stone and can be modulated in individuals. For instance, several converging pieces of evidence support the effect of deliberation and reasoning in utilitarian judgments. Across diverse measurements, reasoning and deliberation led to more utilitarian responses (Patil et al., 2020). Reflection and deliberation encouraged more utilitarian views (Paxton, Ungar, & Greene, 2012). Giving participants analytical mathematical puzzles before reading the moral scenarios made them more utilitarian by 'activating their thinking mode' (Kvaran, Nichols, & Sanfey, 2013). Asking participants to be more deliberative and analytical had a similar effect (Li, Xia, Wu, & Chen, 2018). Better performance in the cognitive reflection test (CRT) predicted more utilitarian decisions (Byrd & Conway, 2019). Conversely, increasing cognitive load decreased the utilitarian choices (Greene, Morelli, Lowenberg, Nystrom, & Cohen, 2008). Participants who experienced cognitive fatigue showed a similar result (Timmons & Byrne, 2019). Contrariwise, decreasing cognitive load by showing the ratio of 'killed' vs. 'saved' people in sacrificial scenarios increased utilitarian decisions (Trémolière & Bonnefon, 2014). Restricting the response time reduced the utilitarian responses in some studies as well (Cummins & Cummins, 2012; Suter & Hertwig, 2011).

1.1.2. Moral dilemmas and emotions

Moral judgments have not only been attributed to increased deliberation and reasoning but to emotional factors. Both the nature and intensity of the feelings that one experiences when contemplating these dilemmas modulate moral judgments. For instance, difficulties in emotion regulation (Zhang, Kong, & Li, 2017) and emotional reappraisal (Feinberg, Willer, Antonenko, & John, 2012) decreased deontological responses. Similarly, presenting the dilemmas in foreign languages increased the reported emotional distance and reduced deontological choices (Hayakawa, Tannenbaum, Costa, Corey, & Keysar, 2017). Active suppression of emotions (Lee & Gino, 2015) and administration of anti-anxiety drugs (i.e., Lorazepam) in normal participants increased utilitarian judgments (Perkins et al., 2013; but also see Zhao, Harris, & Vigo, 2016), and so did the induction of some (but not all) positive emotions (Strohminger, Lewis, & Meyer, 2011; Valdesolo & Desteno, 2006). On the other hand, negative and aversive emotions reduced utilitarian preferences. For instance, socially induced physiological stress (e.g., by having the participants anticipate a rigorous social evaluation such as public speaking) which elevates the stress hormone Cortisol in humans (Kirschbaum, Pirke, & Hellhammer, 1993), decreased utilitarian responses (Starcke, Ludwig, & Brand, 2012; Youssef et al., 2012; Zhang, Kong, Li, Zhao, & Gao, 2018).

1.1.3. Moral dilemmas and aversive feelings towards norm violations

One hypothesis for these complex links between emotions and moral judgments points to people having aversive feelings towards norm violations associated with the utilitarian branch of moral dilemmas. Since utilitarian actions in moral dilemmas entail norm violations such as instrumental harm in sacrificial dilemmas, it has been hypothesized that moral judgments are shaped by our sensitivity to norm violation and aversive emotional reaction to harm. In line with this hypothesis, reduced emotional responsiveness to the aversive nature of harm was associated with more utilitarian responses (Cushman & Greene, 2012; Greene, 2007). In fact, utilitarian judgments have been frequently found in patient groups who purportedly demonstrate hampered emotional

responses, such as patients with ventromedial prefrontal cortex brain lesions (an area related to socio-emotional processing) (Ciaramelli, Muccioli, Làdavas, & Di Pellegrino, 2007; Koenigs et al., 2007) fronto-temporal dementia (Mendez, Anderson, & Shapira, 2005), and psycho-paths (Koenigs, Kruepke, Zeier, & Newman, 2012). In healthy individuals, utilitarian judgments have been more frequently found in antisocial personality traits (Bartels & Pizarro, 2011) and psychopathy (Paytas, 2014; Pletti, Lotto, Buodo, & Sarlo, 2017). A recent model that disentangled sensitivity to Consequence (or utilitarianism), Norm (or deontology), and Inaction showed that psychopaths had a weaker sensitivity to moral norms and therefore were less deontological in their moral decisions (Gawronski, Armstrong, Conway, Friesdorf, & Hütter, 2017). Therefore, the previously reported utilitarian boost in psycho-paths was probably not related to the higher-order reasoning or their concern for the greater good but less acceptance of norms (see Everett & Kahane, 2020; Kahane, 2015). Two interventional studies showed that experimentally increasing sensitivity to norm violation by induction of stress (Li, Gao, Zhao, & Li, 2019) or by exogenously enhancing serotonin level (i.e., Citalopram administration) (Crockett, Clark, Hauser, & Robbins, 2010) decreased utilitarian responses.

1.1.4. Moral dilemmas and post-decisional emotions

The role of emotional valence in moral judgments has also been linked to post-decisional emotions such as regret. In fact, participants not only minimized their current distress at the time of the moral de-cision, but they also tried to minimize the post-decisional negative emotions such as regret (Tasso, Sarlo, & Lotto, 2017). Supporting this idea, one study showed that experiencing higher regret was negatively correlated with utilitarian choices (Szekely & Miu, 2015). Another work found that endorsing the utilitarian (vs. deontological) judgments induced more affective (rather than cognitive) regret (Goldstein-Greenwood, Conway, Summerville, & Johnson, 2020). Experiencing other post-decisional negative emotions such as guilt, shame, anger, and disgust have also been reported in sacrificial moral dilemmas (Pletti, Lotto, Tasso, & Sarlo, 2016).

1.1.5. Emotion vs. deliberation in moral dilemmas: dual process models

The role of emotion vs. deliberation has been has been at the heart of *understanding moral behavior*. For instance, the extensive body of empirical evidence for the role of emotions in moral judgments was preceded by much earlier works of Unamuno (1954), the Spanish philosopher who passionately argued that '*moral reasoning*' is nothing but the conscious, *ex-post*, phenomenal experience of some underlying, (emotional) unconscious process that has already made the agent's mind about the issue at hand before the agent starts to consider the reasons for or against it (Unamuno, 1954). Later, inspired by Unamuno's views, Blasi (1980) argued that moral decisions and actions motivate moral reasoning, not the other way around (Blasi, 1980). In line with this view, the social intuitionist account of morality (Haidt, 2001) described moral reasoning as post-hoc justifications of the unconscious, automatic and emotional processes that are only suitable for communicating one's moral position. The intuitionist account would argue that objective (e.g., less emotionally driven) moral reasoning might be possible but is very rare and happens under specific circumstances in which emotions and intuitions are kept under control such as in social interactions (Haidt, 2001).

Inspired by the dual-process models of cognition (Evans & Stanovich, 2013; Sloman, 1996; Stanovich, 2009, among others), dual-process ap-proaches to morality framed the evaluation of moral dilemmas neither as purely automatic/emotional nor purely deliberative but as a competition between a. fast, intuitive processes that involve emotions and b. slower deliberative processes that involve reasoning. Dual-process models suggest that deontological judgments arise when the emotional-intuitive process overrides the cognitive system. Conversely, the more 'intellectual' utilitarian judgment is favored when the slower deliberative cognitive system overrides the emotional-intuitive one

(Greene et al., 2001; Greene et al., 2008, 2004). Therefore, in deonto-logical judgments, the emotional-intuitive system shapes the in-dividual's conscious narrative of "why" they came to the deontological judgment. In the case of utilitarian judgments, the deliberated cost-benefit analysis of the cognitive system is communicated.

Put together, the above theoretical and empirical works show the role of emotions alongside deliberation and reasoning in moral judg-ments. They also suggest that moral judgments are not rigid. Rather than having to choose between moral rationalists (e.g., Kohlberg, 1973), who claimed that moral judgments are the outcome of pure rational delib-eration on the one hand, and the moral intuitionists (e.g., Blasi, 1980; Haidt, 2001; Unamuno, 1954), who prioritized emotions and intuitions exclusively on the other, more recent theories such as dual-process models (discussed above) suggest that the outcome of moral judg-ments in a specific situation is the inevitable result of the interplay be-tween the deliberative and the emotional systems that are simultaneously present in human mental processes and lead the moral agent towards or away from utilitarian (or deontological) moral judgments.

1.2. Social interaction and modulators of moral judgment

In the previous section, we highlighted a number of factors that could modulate moral judgment. Next, we examine the existing evidence from social cognition about how these modulators may be affected by social interaction.

1.2.1. Social interaction and group deliberation

Interpersonal communication of information in social contexts al-lows groups of people to surpass what each individual could have ach-ieved in decision-making under uncertainty in sensory domains (Bahrami et al., 2016; Sorkin, Hays, & West, 2001) in numerical cognition (Bahrami et al., 2012) and in problem-solving (Mason & Watts, 2012). Studies have shown that when people talk to one another, they could calibrate their uncertainty (Bang & Frith, 2017; Fusaroli et al., 2012), produce diverse arguments (Mercier & Sperber, 2011), understand the same problem from various viewpoints, and arrive at solutions that had not been available to any single member of the group (Smith & Collins, 2009). These studies strongly suggest that group in-teractions are likely to increase conscious deliberation, reasoning, and analytical thinking. We previously reviewed that deliberation could lead to more utilitarian decisions.

1.2.2. Social interaction and group norm violation

Utilitarian decisions are also often operationalized by breaking different norms, and individuals seem to break norms more often when they decide together. Niebuhr, in 1932, found the 'limitations of human nature' responsible for the moral failure of individuals in social groups to the extent that he thought man's collective moral behavior could never be dominated by reason. Thus groups always remain more immoral than their members (Niebuhr, 1932). Although Niebuhr's ideas about individuals being more immoral in groups were related to social groups, different studies confirmed his predictions, even in informal groups. In fact, in diverse moral domains, immoral actions in forms of norm violations were more probable in groups: people lied more in groups (Conrads, Irlenbusch, Rilke, & Walkowitz, 2013); communica-tion within groups increased this group level dishonesty (Kocher, Schudy, & Spantig, 2018); collaboration made individuals excessively more lying (Weisel & Shalvi, 2015), free-riding and social loafing were more probable in groups (Heuzé & Brunel, 2003; Latane et al., 1979), groups showed less compliance to defined norms than individuals (Fochmann, Fochmann, Kocher, Müller, & Wolf, 2021), and people tended to be less generous in groups. Bornstein and Yaniv (1998) and later, El Zein, Seikus, De-Wit, and Bahrami (2020) showed that people violated the fairness norm more often when they are in groups of three, compared to when they were alone.

More recently, this increased incidence of norm violation in groups has been attributed to shared responsibility (Conrads et al., 2016; El Zein et al., 2020; El Zein & Bahrami, 2020; El Zein, Bahrami, & Hertwig, 2019). For instance, when participants were asked to provide reasons for being dishonest in groups, their arguments were based on 'feeling less responsible' rather than 'benefiting other group members by their lies' (Conrad et al., 2017). One clear demonstration of the role of this collectively shared responsibility in moral decision-making is the bystander effect: when several observers witnessed a norm violation, it was less likely that any one of them would intervene (Darley & Latane, 1968; Forsyth, Zyzniewski, & Giammanco, 2002; Wallach et al., 1964). In a group, the responsibility for an action is not focused on anyone but is rather shared among all present (see El Zein et al., 2019). Norm violation (Wilson & O'Gorman, 2003) and their corresponding feeling of responsibility (Bell, 1982, 1985; Giorgetta, Zeelenberg, Ferlazzo, & D'Olimpio, 2012; Loomes & Sugden, 1982; Zeelenberg, 1999) both are associated with a diverse range of negative emotions such as distress, disappointment, and regret. Sharing responsibility among members of a group decreases these emotions, such as feelings of anticipated regret in group economic decisions (El Zein & Bahrami, 2020). It also helped mitigate the negative emotions such as stress that accompanies difficult choices that may have long-lasting emotional repercussions (Botti, Orfali, & Iyengar, 2009; Frey & Tropp, 2006; Wiech et al., 2013). Together, these studies span a diverse range of situations in which social context can reduce the emotional burdens of norm violation, both at the time of the decisions (e.g., stress) and the predicted emotions in future states (e.g., anticipated regret) in individuals.

1.3. Current study: Moral judgment and social interactions

1.3.1. Study overview

In the current study, we asked three questions: how are collective moral judgments different from individual ones? How are individual moral judgments different before and after a discussion? And finally, what is the underlying mechanism at work in collective moral judgment which explains these differences? To address these questions, we had small groups of interacting individuals, individually (in private) and collectively (after short discussions), rate the moral permissibility of actions (or inactions) described in different scenarios. In each scenario, a character's decision violated a moral norm to increase some utility for a greater number of people. For instance, in one scenario, the character had to lie to collect money for people in need. In another, he had to kill someone to prevent more deaths or had to stay silent about the infidelity of a friend's partner to avoid disturbing a happy relationship. Examining these scenarios one at a time, participants started by reading each scenario privately and rated the acceptability of the character's choice in the scenario (First individual judgment). Then, for half of the scenarios, they proceeded to discuss the case with their fellow group members and rate the acceptability of choice as a group (Collective judgment). Finally, participants revisited all scenarios privately once again and rated the moral acceptability of what the character had done (Second individual judgment).

1.3.2. Moral domain: emergent properties related to interaction

Earlier, we discussed some of the factors that modulate moral judgments and how those factors are affected by social context as examined by prior researchers. Here, we also note that collective deliberation is not equivalent to the aggregation of many individuals that deliberate independently. The interaction may shape the content and quality of deliberations producing emergent phenomena at the collective level that would not have been observed if many individuals' opinions were aggregated statistically (Karpowitz & Mendelberg, 2007). We focus on the interactions to see how their emergent properties differ from statistically aggregated groups.

### 1.3.3. Virtue signaling via interaction

One such emergent effect is the adaptive utility of taking a deontological position in public: previous research has shown that people who expressed deontological judgments were valued more, chosen more often as social partners (Capraro et al., 2018), and were perceived to be more prosocial in economic games (Everett, Pizarro, & Crockett, 2016). In a social context, people may express deontological judgments to advertise virtues and curate their social images by promoting perceptions of trust and likeability (Sacco, Brown, Lustgraaf, & Hugenberg, 2017). In line with this view, utilitarians were often regarded as lacking integrity, empathy, and moral character (Uhlmann, Zhu, & Tannenbaum, 2013). Conversely, it has been reported that utilitarian agents sometimes are regarded positively as well (as logical, competent, deliberative and intelligent, and leader-like; Uhlmann et al., 2013). However, in previous research, strategic self-presentation has been found more consistently in the deontological rather than utilitarian direction (Everett et al., 2016; Sacco et al., 2017). For instance, participants who were socially observed by a third person (Lee, Sul, & Kim, 2018) or even by themselves in the mirror (Reynolds, Knighten, & Conway, 2019) preferred deontological judgments. By contrast, there is hardly any evidence to show that people may actually *practice* utilitarianism as a reputation management tactic. Therefore, we hypothesize that virtue signaling (VS) in groups may decrease collective utilitarian consensus. However, due to its social signaling function, we do not expect individuals to change their minds privately. Virtue Signaling hypothesis (VS) would also predict that group deliberation would not change individual (private) judgments (see Fig. 1).

1.3.4. Deliberation via interaction

The second emergent effect of social interaction is the deliberative role of social discussions. Social discussion promotes deliberation and analytical reasoning, permitting participants to spend more time, provide and hear more arguments, combine their perspectives, and share resources to reason about moral issues. One study that compared group vs. individual moral judgments showed that groups displayed more advanced moral reasoning than individuals (Nichols & Day, 1982). In addition, the discussion provides the participants with more pieces of information and arguments than individual deliberation. More deliberation and reasoning increase utilitarian judgments (Paxton et al., 2012; Paxton & Greene, 2010). Based on these findings, we offer our Social Deliberation (SD) hypothesis: collective judgments would be more utilitarian because they happen after social deliberation. Importantly, this utilitarian boost would be expected to permeate to the second individual judgment because deliberation facilitates better reasoning and sharing of information, helping to convince the individual participants to change their minds. In addition, in the second individual judgment, participants read the moral scenarios for the third time, allowing them to deliberate individually after the first and the collective social deliberations. This hypothesis, therefore, predicts that the second individual judgments would also be more utilitarian than the first individual judgments, but specifically for the scenarios discussed collectively. Indeed, a recent work that investigated moral reasoning in groups of students (Curşeu, Fodor, Pavelea, & A., & Meslec, N., 2020) found that discussion in groups led to more utilitarian decisions. This study evaluated majority influence, minority influence, and normative deviance as mechanisms that explain the association between individual and group level moral preferences using mediation analysis. However, it did not measure individual opinions after the discussion, leaving open any conclusions about the change of mind as the result of social deliberation in moral judgments. Myers and Kaplan (1976) previously examined the impact of social interactions on private opinions. They measured individual opinions after the discussion but did not include a consensus decision-making stage.

1.3.5. Stress reduction via interaction

A third hypothesis for how interactions may impact collective
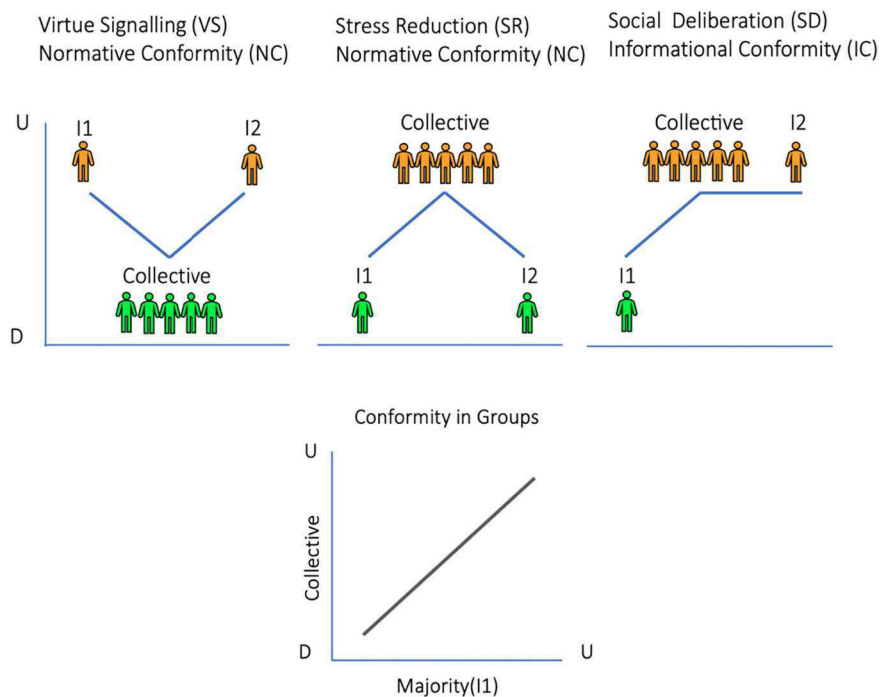
Fig. 1. Top left: Virtue Signaling hypothesis (VS) predicts a deontological boost in collective judgments (i.e., fewer utilitarian judgments in collective condition). However, this deontological boost is not expected to change individual judgments (i.e., no difference between I1 and I2), compatible with normative conformity (NC). Middle: Conversely, the Stress Reduction hypothesis (SR) predicts a utilitarian boost in collective judgments (i.e., less deontological judgments in collective condition), but similar to VS, this boost is not expected to change the individual judgments (i.e., no difference between I1 and I2), compatible with normative conformity (NC). Right: Similar to SR, the Social Deliberation hypothesis (SD) predicts a utilitarian boost in collective judgments. However, unlike in SR, this boost is expected to be followed by private individual judgments after the discussion (i.e., I2), compatible with informative conformity (IC). Bottom, conformity (both normative and informational) predicts that the collective judgments should correlate with the majority of the first individual opinions (i.e., before the discussion).

judgments is the reduction of negative feelings in groups. Group discussion decreased negative feelings in individuals on their decisions even when these negative feelings were artificially induced (Kaplan & Miller, 1978). We also saw earlier that social context could reduce the negative emotions associated with norm violation and facilitate the violation of different norms in groups. Previous research showed that reducing negative current emotions (e. g., stress) or future negative emotions (e.g., anticipated regret) could both increase utilitarian judgments. Therefore, once in the group, individuals may find it easier to endorse utilitarian actions that involve trading off violations of a norm such as "do not harm anyone" with the greater good for a larger number of people. Thus, this Stress Reduction (SR) hypothesis makes a similar prediction to Social Deliberation (SD). However, if more utilitarian collective judgments arise from the transient regulation of emotional responses and temporary reduction of negative emotions such as stress and regret in groups, then SR would expect that when participants decide a second time individually, then group-induced stress reduction would no longer be available. SR hypothesis diverges from SD here and predicts that the second individual judgments would be no more utilitarian than the first. In the interest of transparency, we clarify here that in our OSF pre-registration, VS and SD hypotheses (but not SR) were included.

1.3.6. Conformity via interaction

The role of the conformity effect must be carefully considered and clearly separated from interactions when trying to understand moral judgments in a social context. By conformity, we refer to opinion changes that follow from (merely) knowing other people's judgments. Conformity, therefore, does not involve any bilateral social interactive elements, and our group-interaction hypotheses discussed above (VS, SD, and SR) do not apply to it. However, previous conformity literature does offer important clues for drawing some testable predictions for our experiments. Those for whom the majority supported the utilitarian option did not differ from control. Using a social conformity paradigm similar to Asch's (1956), one study showed that conformity increased both permissible and impermissible moral actions depending on the majority opinion (Kundu & Cummins, 2013). In another study, participants who judged moral dilemmas were simultaneously presented with

information about the percentage of other people favoring the deontological or utilitarian option. Those for whom the majority supported the deontological option deviated from the control condition (i.e., no social information) (Bostyn & Roets, 2017). Another study showed that conformity to publicly announced majority opinion was generally followed by a change of private attitudes (Cornwell, Jago, & Higgins, 2019). In yet another study, participants shifted their public (but not private) responses towards more or less utilitarian judgments depending on what a hypothetical, observing evaluator favored (Rom & Conway, 2018). Thus, although all four studies do show that conformity could indeed affect moral judgments, the latter two studies disagree on whether individual moral cognition could be genuinely susceptible to conformity. Whereas one study (Cornwell et al., 2019) showed evidence for change of private opinion in line with 'informational' conformity, the other (Rom & Conway, 2018) suggested that individual moral judgments are likely to superficially conform and demonstrate 'normative' influence without any change of private attitude (see Cialdini & Goldstein, 2004; See also Deutsch & Gerard, 1955).

Based on these findings, we propose two additional hypotheses. First, we expect that collective judgments would be different from individual judgments, and the direction of this change would follow the majority opinion of the group's individual members. Second, examining the individual opinions after discussion would allow us to distinguish between normative and informational conformity. If people only conform normatively, they change their opinion in public but hold on to their original individual judgments even after the discussion (Cialdini & Goldstein, 2004). If, on the other hand, informational conformity is at work, one would predict that the collective judgment should pull the second private judgment towards itself.

To sum up, we put forward two complementary sets of predictions to examine the possible psychological substrates of social interactive moral judgments (see Fig. 1). Our conformity hypotheses do not make any directional predictions about whether groups favor utilitarian or deontological judgments, but the three interaction hypotheses (VS, SD, and SR) do. On the other hand, interaction hypotheses – but not conformity – are silent about any relationship between the distribution of individual opinions (e.g., the majority) and group consensus. Finally, both sets of theories make overlapping predictions about the change of second

individual opinion: Informational Conformity and Social Deliberation hypotheses predict that second individual opinions would follow the consensus, but Normative Conformity, Virtue Signaling, and Stress Reduction hypotheses predict that individual opinions will not be affected by the consensus.

2. Experiment 1

2.1. Material and method

2.1.1. Participants

Our sample size estimation was based on Myers and Kaplan (1976) c. f., pre-registration at https://osf.io/jmkx5/. We initially aimed for 12 groups with 5 participants. Due to a technical error, some collective responses were not recorded in groups 1 to 5 and not properly recorded in group 6. We, therefore, collected another 6 groups. Wherever possible, we have provided the analysis of all data together. We have also provided separate analyses in the Supplementary Material (Section **A**. Part 7.1, Table 6), showing no significant difference in the results when excluding the initial groups with missing data points, indicating that the results are not driven by missing values. One group's responses were removed because screening analysis prior to hypothesis testing proved their data to be gross outliers confirmed by the convergence of several different outlier detection methods (see Supplementary Material; Section **A**, Part 6). The final sample consisted of 73 participants (38 females; mean age 25.72, range: 18–56; SD = 8.42) in 16 mixed-gender groups, each including 4 or 5 members. All participants were native Germans recruited via MELESSA (Munich Experimental Laboratory for Economic and Social Science). The study was approved by the School of Advanced Study, University of London Ethics committee (SASREC_1819–313).

2.1.2. Scenarios

To contrast utilitarian vs. deontological judgments, we adopted sacrificial moral scenarios used in previous research (Greene et al., 2001) in addition to our independently validated scenarios (see Supplementary Material, Section **D**). It is important to note that moral judgments' complexity is far from contrasting deontology vs. utilitarianism in hypothetical scenarios (Everett & Kahane, 2020; Kahane, 2015; Kahane, Everett, Earp, Farias, & Savulescu, 2015). Utilitarianism and deontology depend more on moral reasoning than on individual responses (Hennig & Hütter, 2020). Due to these limitations, we tried to overcome two important caveats which the sacrificial moral dilemmas suffer from:

1. Sacrificial moral dilemmas used in the previous literature (e.g., Greene et al., 2001) consist of utilitarian actions, but they miss utilitarian inactions (or omissions). Therefore, any tendency towards utilitarianism in these scenarios could be alternatively interpreted as a preference for action rather than inaction (Crone & Laham, 2017).

2. Sacrificial dilemmas operationalize utilitarianism exclusively by approving to 'kill' someone to prevent other people's death, which can be far from real-life situations, jeopardizing the external validity (Bauman, Mcgraw, Bartels, & Warren, 2014; Schein, 2020) and the essence of utilitarian philosophy (Everett & Kahane, 2020; Kahane, 2015; Kahane et al., 2015).

Therefore, in addition to the sacrificial scenarios conventionally used in the literature, we constructed and validated our vignettes which **a.** included cases of omissions that maximized the greater good for many, **b.** were related to real-life situations, **c.** no direct instrumental harm such as killing was needed for utility maximization and **d.** the protagonist (or his/her family) would not generally benefit from the outcome of the utilitarian decision.

We used these scenarios to examine the role of discussion in the change of mind by answering three questions 1. Whether the collective judgment would differ from an average of individual judgments and, if so, in which direction 2. Whether discussion would change the

individual moral judgments, and 3. To disentangle different mechanisms at play by taking into account the First individual private judgments before the discussion, the second individual judgments after the discussion, and the differences between these two. We used 8 scenarios adopted from Greene et al. (2001) in addition to our 8 scenarios (independently validated, see Supplementary Material, Section **A**, Part 4). All 16 items were translated to German. The translation was done by two German native speakers, back (double) translated by AI Assistance for Language ("DeepL") GmbH (Cologne, Germany). Later, the texts were also checked by Munich Experimental Laboratory for Economic and Social Sciences.

Each scenario included: (1) A situation: a protagonist was in a situation that required her decision. She had two mutually exclusive options **a.** to act according to a moral duty or an accepted norm although they are against a higher utility **b.** to break a norm to maximize the utility for the greater number (2) The decision: the protagonist always decided in favor of the utilitarian option at the expense of violating a norm (3) An outcome: the vignette confirmed that the outcome took place, with the expected greater utility.

Utilitarian Score: participants had to rate the moral acceptability of the protagonist's decision on the scale of 1 (not acceptable at all) to 7 (totally acceptable). As all decisions in the scenarios were utilitarian, we refer to this rating as 'utilitarian score'. The 'utilitarian score' is only an experimental label, and the fact that these decisions were utilitarian (or not) was never made explicit to participants.

2.2. Procedure

The procedure and the design of this study were adopted from Myers and Kaplan (1976). Participants were invited to the lab in groups of 4–5 in separate sessions. Once the participants were seated, general instructions were presented to them orally in English. Then, each participant received a tablet (Surface Pro). The experiment was programmed in Testable (https://testable.org). On the tablet, the instructions were repeated in German and followed by one practice round. Throughout the experiment, a timer on top of the screen always showed the remaining time for each scenario's ratings. For a demo in German, see here.

The experiment started with each participant going through the 16 scenarios individually (First individual judgment; see Fig. 2). The order of the scenarios was randomized across participants. Participants had 90 s to read each scenario privately and judge the moral acceptability of the action (or inaction) described in the scenario. When the last participant rated the last scenario, the first part of the experiment was completed.

Next, in the collective judgment stage (see Fig. 2), the participants were asked to read 8 of the 16 scenarios (pseudo-randomly selected, see Supplementary Material: Section **A**, Part 5) with other group members in the room. Each scenario was projected on a screen for everyone to see. Participants were given 3 min to discuss each scenario and arrive at a collective judgment. They all had to enter their collective agreement on their tablets. Discussed vs. Non-discussed scenarios were randomized and counterbalanced across groups. All discussions were conducted in German (i.e., the participant's native language).

Finally, each participant went through all 16 scenarios privately for 30 s in the Second individual judgment stage.

We used a repeated measure design with three levels for our main independent variable (Condition: First individual, Collective, Second individual). When examining the individual judgments, we had one additional factor (Type: Discussed, Undiscussed). The dependent variable (Utilitarian Score) was a Likert scale ranging from 1 (Not acceptable at all) to 7 (Totally acceptable), and the middle point was defined as 'morally neutral' in the instructions.

Data availability statement: experiment's pre-registration, materials, data, and analysis can be accessed at https://osf.io/jmkx5/
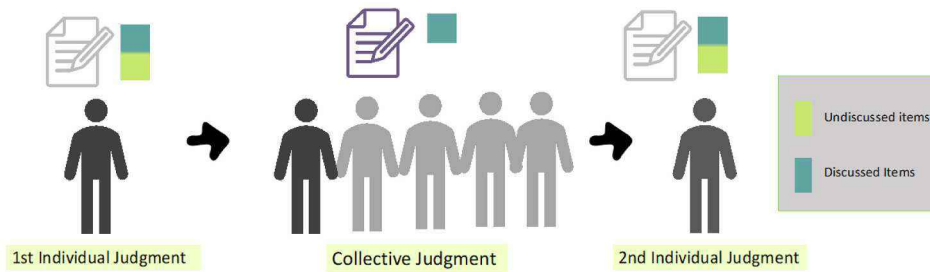
Fig. 2. Design of the experiment. Participants read each scenario alone and responded individually to all items (1st individual judgments), then were asked to discuss half of the items in groups to provide a collective judgment (collective judgments) and finally responded again to all of the items alone (2nd individual judgments).

2.3. Result

Statistical analysis was conducted using R programming language (https://www.r-project.org/), employing generalized ordinal mixed-effects models appropriate for our design's hierarchical structure. Since our dependent variable was in the Likert scale, we employed ordinal mixed-effect models using the package 'ordinal' designed for ordinal logistic mixed models (Christensen, 2019). In addition, we adopt a Bayesian approach in the mixed-effect model using brms package in R (Bürkner, 2018).

We began by examining how collective and individual judgments differ (see the hypotheses illustrated schematically in Fig. 1 top row). An ordinal logistic mixed-effect model was employed with one fixed factor of Condition (Collective, First individual, Second individual) while accounting for random effects of items (different scenarios) as well as participants within groups (as a random nested effect; see Supplementary Material Section **A** - Part 7.1 - Table 3, for model comparisons). Collective judgments were significantly more utilitarian than individual judgments ($z = 3.688$, $b = 0.3689$, $SE = 0.100$, $p = .0002$) both when comparing the Collective judgments to the First ($z = 3.688$, $b = 0.3689$, $SE = 0.1$, $p = .0007$) as well as the Second individual judgment ($z = 3.657$, $b = 0.3630$, $SE = 0.0993$, $p = .0007$), both in Action and Inaction scenarios (see Supplementary Material, Section **A**, Fig. S2 and Table 8). In addition to this frequentist approach, a Bayesian mixed-effect model was performed which showed similar results ($BF_{01} = 0.0005$, $b = 0.35$, $SE = 0.09$, $CI_{95} = [0.18, 0.52]$; see Supplementary Material, Section **A**, Fig. S3.a and Table 12). For individual responses, we included all items, both discussed and undiscussed. However, a separate analysis only for the discussed items also confirmed the same results and is provided in

the Supplementary Material (Section **A**, Part 7.1, Table 7).

Having demonstrated more utilitarian collective judgments conclusively, we then proceeded to examine if individual judgments before and after the discussion were different. In a second model, we excluded the collective judgments from the analysis and only considered the individual conditions (First individual, Second individual) and type (Discussed, Undiscussed) as fixed factors. Random factors were similar to the previous model described earlier. We did not observe any difference between individual judgments before and after the discussion in the previous model ($z = 0.079$, $b = 0.006$, $p = .996$, Fig. 3a). This model, in addition, showed that there is no difference between the discussed and the undiscussed items in the first and the second individual condition (see Supplementary Material, Section **A**, Part 7.1, Table 10). In addition to this frequentist approach, a Bayesian mixed model as well showed the similar results ($BF_{01} = 15.57$, $b = 0.01$, $SE = 0.06$, $CI_{95} = [-0.13, 0.12]$; see Supplementary Material, Section **A**, Fig. S3.b and Table 12).

Together, these results supported the Stress Reduction hypothesis (compare Fig. 1 to Fig. 3a). On the one hand, significantly more utilitarian Collective judgments (vs. the First condition) rejected the Virtue Signaling hypothesis. On the other hand, the significant reduction of utilitarian judgments in the Second condition (vs. Collective) and the lack of any difference between First and Second were inconsistent with the Social Deliberation hypothesis.

We then proceeded to test our conformity hypotheses by first noting that the lack of a difference between First and Second (described above) was already more supportive of the normative (vs. informational) conformity hypothesis. We then set out to examine the effect of the group majority opinion on the collective judgment (Fig. 1 bottom row). Note that the majority opinion was not experimentally manipulated or
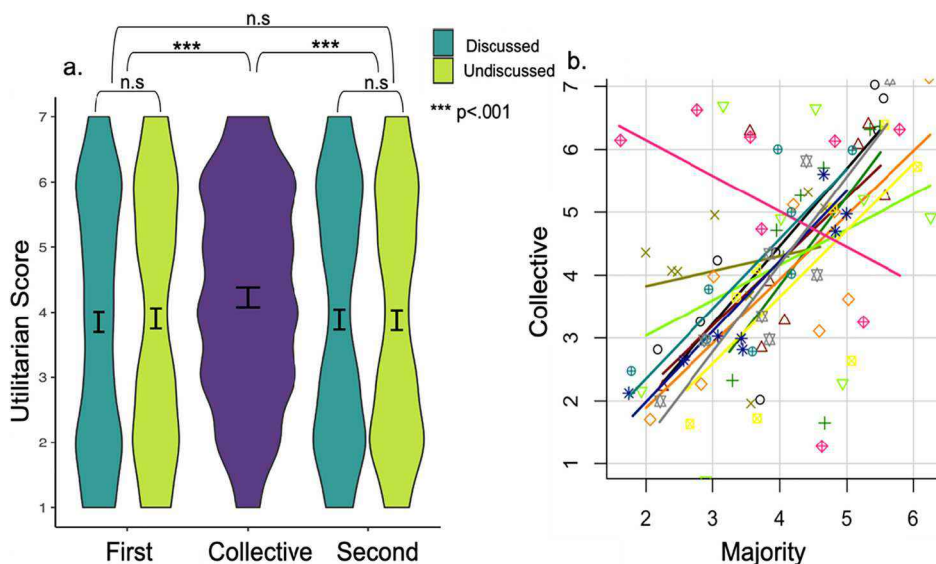

Fig. 3. a. Distribution of responses over conditions. Collective judgments (in purple) are more utilitarian (higher utilitarian score) than individual judgments in the first and the second condition, but there is no difference between individual judgments before and after the discussion for discussed (dark green) and undiscussed (light green) items. Error bars: 95% confidence interval. **b.** There is a correlation between collective and majority (Discussed items before the discussion) at the level of groups. To illustrate the effect observed in the mixed-model results, the correlation between different items within each group is separated and presented with different colors and symbols for each group (excluding the groups with missing data points). Data points with the same colour and symbol refer to the same group. Lines are least-squares fits to the data within each group. Each group has 8 data points corresponding to the 8 discussed questions. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

controlled in our study. However, given that we had elicited private individual opinions before discussions (First judgments), we could assess the group majority by averaging group members' individual judgments for each item before the discussion and examine the correlation between this metric and collective judgment to test our conformity hypothesis (Fig. 1, bottom row). We describe conformity here as the relation between First judgments (before the discussion) and Collective judgments (in the ordinal logistic model; while controlling for the random effects of items and participants within each group). Consistent with our first conformity hypothesis, individual ratings prior to the discussion within each group were significantly correlated with the collective judgments ($z = 2.987$, $b = 0.2920$, $SE = 0.1016$, $p = .004$; see Fig. 3b). See Supplementary Material, Section **A**, Part 8, Table 13, for details of the mixed-effect model.

We also examined the same hypothesis using a more intuitive definition of the majority vote. We first categorized the individual judgments by comparing them to a criterion based on the mean of the ratings of all First individual judgments over our entire sample across all to-be-discussed scenarios (Mean = 3.994) and classified each opinion as Utilitarian-inclined and Deontologically-inclined before the discussion. We then counted these opinions within each group for each to-be-discussed scenario and categorized each group as majority utilitarian or majority deontological for that item. In a new mixed-effect model with collective judgment as the dependent variable, we used this classification as a fixed factor (Majority) with two levels (Utilitarian, Deontological) while controlling for random effects of groups and items. We observed a significant main effect of majority ($z = 4.145$, $b = 1.62$, $SE = 0.392$, $p < .0001$; See Supplementary Material, Section **A**, Part 8 for details and extra analysis).

2.4. Discussion

In Experiment 1, we discovered that groups, in comparison to individuals, are more utilitarian in their moral judgments. Importantly, this utilitarian boost was only observed at the collective level and not when participants rated the same questions privately later again. If the collective utilitarian boost was the result of deliberation and reasoning or due to conscious application of utilitarian principles with genuine concern for the greater good, we expected that the effect would remain in the second private judgment. Consequently, our findings are inconsistent with the Social Deliberation (SD) and Virtue-Signaling (VS) hypotheses and in favor of the Stress Reduction (SR) hypothesis (Compare Figure3a to Fig. 1).

3. Experiment 2

In order to examine the Stress Reduction (SR) hypothesis more directly, we performed Experiment 2, in which, in addition to moral judgments, we measured the *stress level* of each participant in each condition after responding to moral dilemmas.

3.1. Material and method

3.1.1. Participants

The target sample size estimation was predetermined using a Monte Carlo simulation via the SIMR package (Green & MacLeod, 2016) to have 90% power (fixed factor effect size of Collective condition: 0.296). The final sample consisted of 70 participants (33 females, age: $M = 25$ years, $SD = 4.9$, range: 19 to 58) in 15 mixed-gender groups, each including 4 or 5 members (one group had 3 members). Due to the internet connection issue of two participants, two groups were excluded. All participants were native Germans recruited via MELESSA (Munich Experimental Laboratory for Economic and Social Science). The study was approved by the School of Advanced Study, University of London Ethics committee (SASREC_1819–313).

3.1.2. Scenarios

8 scenarios were chosen from Experiment 1 (Sacrificial Dilemmas and Real-life Dilemmas) based on their effect sizes. Utilitarian Scores were measured as in Experiment 1.

3.2. Procedure

The procedure and the design of this study were similar to Experiment 1, albeit performed online via Zoom (*Zoom.us*) due to the COVID19 pandemic. Participants were invited to separate Zoom sessions in small groups, their names were removed and replaced with experimental ID (given by the experimenter). General instructions were presented to them orally and written in English via screen share. Then, each participant received the internet link of the experiment via chat. The experiment has been programmed through the online software ('Qualtrics') (for a demo, see here; password: CMD2021).

After filling out a consent form, participants were requested to shut their phones off, close all of the windows on their computers (except Zoom), disable all notifications, mute their sound on Zoom, and start video sharing while hiding their own videos to not be seen by themselves (by turning the 'Self-view' function off and use 'Gallery View' afterward). This was done to exclude confounding factors such as the 'mirror' effect on moral dilemmas (see Reynolds et al., 2019).

Participants were then presented with the instruction in German via the questionnaire and asked to read and respond to 8 fully randomized moral scenarios chosen. This stage was followed by 10 questions measuring participants' affective states by the short version of the State-Trait Anxiety Inventory (STAI) validated for the German language (Grimm, 2009). At this point, the First Individual stage was finished. The experimenter unmuted the participants and presented the same 8 scenarios – one at a time - via Screen Share in Zoom. In Collective condition, the order of presentation of the scenarios was fully randomized across groups via the 'randomizeR' (Uschner, Schindler, Hilgers, & Heussen, 2018) package in R. In this stage, after reading each scenario, participants were asked to discuss the scenario with other participants at the Zoom session to reach a consensus. After this short discussion, they were asked to enter their consensus judgment in the questionnaire individually. Once all collective scenarios were discussed, participants answered the 10-item STAI individually once again. The experimenter muted all participants and instructed them to go through all 8 scenarios privately in the Second individual judgment stage. Similarly, after responding to the scenarios individually for the second time, STAI were presented to measure their stress level for one last time. The time limit of each condition was identical to Experiment 1.

To exclude other confounding factors in social settings, two sets of questions were asked at the end of the survey. The first set was employed to assess whether participants had a self-presentation strategy in mind in the collective stage. In this part, participants' metaethical perceptions were directly measured to evaluate how they thought they had *been seen by others* in their groups during the discussions. We measured the *warmth* and *competence* index using items adapted from Fiske et al. (2002) and Rom and Conway (2018). We measured *coming across as logical, competent, intelligent, confident, and as a good leader* during group discussions to measure *competence* and as warm, moral, good, tolerant, and trustworthy to measure *warmth* (items were translated to German; Questionnaires in the Supplementary Material Section **E**).

The second set assessed if participants felt socially connected to other members during the discussions. Previous research showed that feeling socially connected to others increases the utilitarian tendency in dyads. For instance, one study showed that participants endorsed utilitarian resolutions more often if they were more socially connected (Lucas & Livingston, 2014). In order to examine this possibility, adopted from Lucas and Livingston (2014), feeling socially connected, loneliness, and feeling of being accepted by others during discussions were also measured. Two items of Affective Regret adopted from Goldstein-Greenwood et al. (2020) were also measured for exploratory analysis.

Similar to Experiment 1, we used a repeated measure design with three levels for the main independent variable (Condition: First individual, Collective, Second individual). The dependent variable (Utilitarian Score) was identical to Experiment 1. Data availability statement: experiment's pre-registration, materials, data, and analysis can be accessed at https://osf.io/jmkx5/

3.3. Result

Statistical analysis was conducted using R programming language (https://www.r-project.org/), employing generalized ordinal mixed-effects models appropriate for our design's hierarchical structure. Since our dependent variable was in the Likert scale, similar to Experiment 1, we employed ordinal mixed-effect models using the package 'ordinal' designed for ordinal logistic mixed models (Christensen, 2019). In addition, we adopt a Bayesian mixed-effect model using brms package in R (Bürkner, 2018).

We began by examining how collective and individual judgments differ. An ordinal logistic and a Bayesian mixed-effect model were employed with one fixed factor of Condition (Collective, First individual, Second individual) while accounting for random effects of items (different scenarios) as well as participants within groups (as a nested random effect). Similar to experiment 1, Collective judgments were significantly more utilitarian than individual judgments ($z = 2.437$, $b = 0.263$, $SE = 0.108$, $p = .0148$). Pairwise comparison tests corrected the p-value for multiple comparison showed that this difference was significant in the First judgments vs. Collective ($M_{Collective} = 4.11 > M_{First\ individual} = 3.87$; $z = 3.688$, $b = 0.2689$, $SE = 0.1$, $p = .035$; $BF_{01} = 1.94$, $CI_{95} = [0.425, 0.041]$). Collective judgments were also more utilitarian that Second individual judgments ($M_{Collective} = 4.11 > M_{Second\ individual} = 4.01$) but this difference did not reach the statistical significance ($z = 3.657$, $b = 0.3630$, $SE = 0.0993$, $p = .4$; $BF_{01} = 0.141$, $CI_{95} = [-0.085, 0.301]$; Power: 62.00%) (See Fig. 4.a; c.f. General Discussion for Online vs. Face-To-Face interaction; Supplementary Material Section **C**). As in Experiment 1, our observation in Experiment 2 was consistent with the Stress Reduction hypothesis (Compare Fig. 4.a to Fig. 1, SR hypothesis).

Having replicated the results of experiment 1 and demonstrated more utilitarian collective (vs. individual) judgments, we then proceeded to examine if individual judgments before and after the discussion were different. In a second model, we excluded the collective judgments from the analysis and only included the individual conditions (First individual, Second individual). Random factors were similar to the previous model described earlier. As in Experiment 1, we did not observe any difference between individual judgments before and after the discussion ($z = 1.27$, $b = 0.139$, $p = .2$, Fig. 4a), another observation consistent with SR. In addition to this frequentist approach, a Bayesian mixed model showed the similar results ($BF_{01} = 0.219$, $b = 0.12$, $SE = 0.10$, $CI_{95} = [-0.314, 0.072]$). As in Experiment 1, the lack of difference between the First and Second conditions was inconsistent with the Social Deliberation hypothesis (Compare Fig. 4.a to Fig. 1, Social Deliberation hypothesis to see the difference) and in line with SR and VS hypotheses.

Next, to test the Stress Reduction (SR) hypothesis directly, we performed a linear mixed-effect model (package lme4; Bates et al., 2015). We examined the Stress measure across different conditions in individuals within groups with a fixed factor of Condition (Collective, First individual, Second individual) while accounting for random effects of participants within groups (as a random nested effect). As expected, the Stress level in Collective condition was significantly lower than first individual judgments (pairwise comparison tests corrected for p-value ($z = 2.6$, $b = 3.71$, $SE = 0.108$, $p = .027$) (See Fig. 4b). The Stress level was even less in the Second individual condition vs. Collective condition ($z = 2.47$, $b = 3.53$, $SE = 0.108$, $p = .038$), probably due to a carry-over effect. We did not observe any correlation between Stress Level and Utilitarian score at the group level ($t_{student} = 1$, $p = .338$), probably due to the low power for such analysis.

To examine the alternative explanations, we measured the correlation between ratings of warmth and competence scale. There was no significant correlation between these ratings and utilitarian scores at the group level using both linear regression (corrected for multiple comparisons; see Supplementary Material, Section **B**, Part 15) and Bayesian regression (Smartness: $CI = [-0.902, 1.583]$, $BF_{10} = 0.749$; Reasonable: $CI = [-0.902, 1.583]$; $BF_{10} = 0.696$, Confident: $CI = [-1.302, 0.332]$,
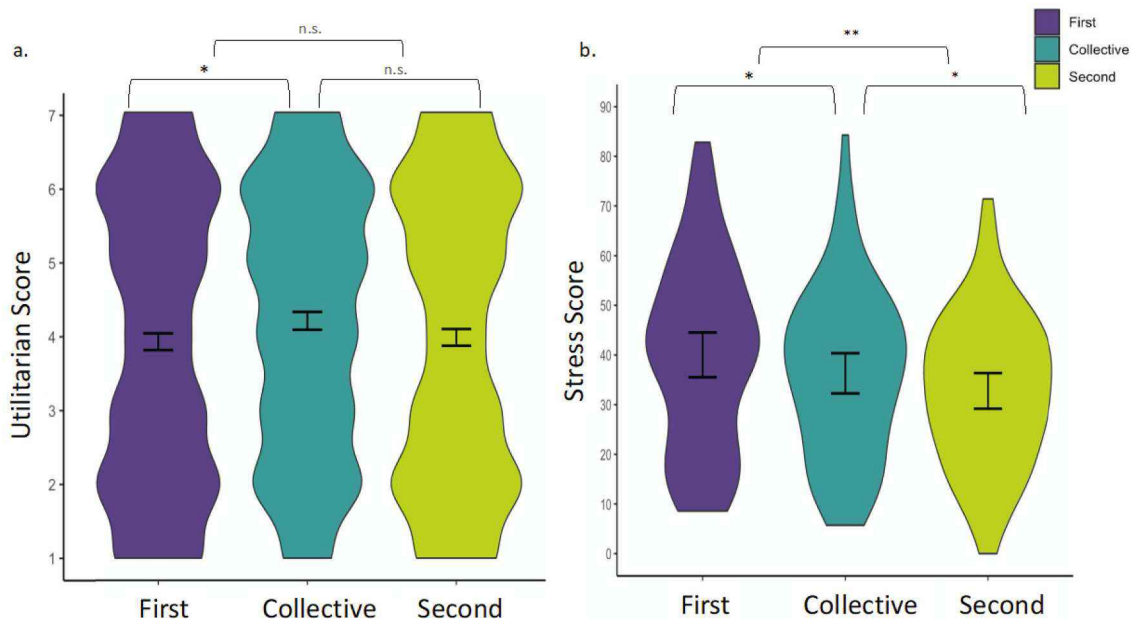
Fig. 4. a. Distribution of responses to moral dilemmas over conditions. Collective judgments (in dark green) are more utilitarian (higher utilitarian score) than individual judgments in the first condition, but there is no difference between individual judgments before (in purple) and after the discussion for discussed (in light green). **b.** Participants reported less stress after Collective conditions (in dark green) than individual judgments in the first condition (in purple), but more than the second individual condition (in light green). Error bars: 95% confidence interval. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

$BF_{10} = 0.696$, Leader-like: $CI = [-0.902, 1.583]$; $BF_{10} = 0.572$, Competent: $CI = [-1.568, 1.128]$, $BF_{10} = 0.729$). This result ruled out the possibility of *competence* signaling as an alternative explanation of our result (c.f. General Discussion).

To examine the effect of social connection, we measured the correlation between feeling lonely, accepted, and socially connected with the utilitarian score at the group level. In contrast to previous findings (Lucas & Livingston, 2014), we did not find evidence showing that feeling socially connected to others is related to more utilitarian scores at the group level using both logistic mixed effect model (corrected for multiple comparisons; see Supplementary Material, Section **B**, Part 15) as well as Bayesian analysis (Lonely: $CI = [-0.50, 0.86]$, $BF_{10} = 0.476$; Accepted: $CI = [-0.65, 0.98]$, $BF_{10} = .0.441$; Connected: $CI = [-1.88, 0.11]$, $BF_{10} = 0.2.88$) suggesting that the collective utilitarian boost has not driven by feeling socially connected. Together, these results supported the Stress Reduction hypothesis for the First vs. Collective conditions.

3.4. Discussion

In Experiment 2, with a sample size aimed at 90% power, we replicated the result of Experiment 1. Groups, in comparison to individuals, found utilitarian decisions more morally acceptable. Similar to Experiment 1, this utilitarian boost was short-lived and only observed at the collective level. We did not see this boost when participants rated the same questions privately later again. This was in line with the Stress Reduction hypothesis. To test this hypothesis more directly, we also measured the state anxiety level in each phase of the experiment. Consistent with the SR, the anxiety level was significantly reduced in the Collective phase compared to the First individual phase. Measuring the metaethical evaluations of participants as well as social connection excluded alternative explanations for this collective utilitarian boost. Hence, the findings of Experiment 2 were consistent with SR.

4. General discussion

Moral judgments are ubiquitously social affairs that take place in the public sphere and are often shaped by the consensus in this sphere. Cognitive and psychological studies of moral judgment have so far predominantly focused on individuals and examined moral choices made privately. Across two experiments ($N = 143$), we compared collective and individual moral judgments and examined the impact of face-to-face (Experiment 1) and Online (Experiment 2) interactions on these judgments. Participants, individually and collectively, examined actions (or inactions) of fictional characters that led to a higher utility for the greatest number at the expense of disregarding a moral norm in moral scenarios. We found that collective judgments are more utilitarian than individual judgments.

Utilitarian judgments are considered as the outcome of the inductive reasoning process; therefore, they entail a level of deliberation and abstraction that common-sense morality lacks. It has been argued that utilitarian decisions that necessitate certain norm violations (e.g., in moral dilemmas) require deliberation and reasoning to support utilitarian principles that entail greater happiness for the greater number of people (e.g., Greene et al., 2004). However, norm violation is emotionally aversive (as introduced above). Therefore, utilitarian choices often depend not just on cognitively costly deliberation but also on *overcoming negative aversive emotions*. Social context (e.g., group discussion) could change either of these factors, and our hypotheses (Fig. 1) outlined three ways this could occur.

Our analysis revealed that groups, in comparison to individuals, are more utilitarian in their moral judgments. Thus, our findings are inconsistent with Virtue-Signaling (VS), which proposed the opposite effect. Crucially, the collective utilitarian boost was short-lived: it was only seen at the collective level and not when participants rated the same questions individually again. Previous research shows that moral change at the individual level, as the result of social deliberation, is rather long-lived and not transient (e.g., see Ueshima et al., 2021). Thus, this collective utilitarian boost could not have resulted from deliberation and reasoning or due to conscious application of utilitarian principles with authentic reasons to maximize the total good. If this was the case, the effect would have persisted in the second individual judgment as well. That was not what we observed. Consequently, our findings are inconsistent with the Social Deliberation (SD) hypotheses. Our observation was consistent with Stress Reduction (SR), which proposed a *transient* utilitarian boost. In the second experiment, measuring the stress level to test SR more directly, in addition to replicating the previous result, we observed that the stress level was significantly lower in collective conditions compared to the first individual conditions (see Fig. 1; Fig. 4), which was in line with the Stress Reduction (SR) hypothesis. This observation partially confirmed our SR hypothesis.

We showed that groups are more utilitarian than individuals. We proposed and tested the reduction of negative emotions (i.e., stress) as the most plausible mechanism for this boost. Other possibilities, however, were also examined. For instance, one study showed that participants endorsed utilitarian resolutions more often in dyads if they were more socially connected (Lucas & Livingston, 2014). Since in our experiment the discussion might have made groups more socially connected and therefore increased collective utilitarian responses, we measured the feeling of being socially connected. We found no relationship between social connection and utilitarian score, discarding this alternative explanation.

Another alternative explanation for our result, the opposite of the 'virtue signaling', was also ruled out. This effect refers to the possibility that people may present themselves especially logical and intelligent in a group setting. For instance, Rom & Conway found that utilitarian decision-makers were viewed as especially logical, competent, deliberative, intelligent, and leader-like (Rom & Conway, 2018). People viewed scientists as more utilitarian than others (Sosa & Rios, 2019). Rom and colleagues moreover found that people were meta perceptively accurate gauging how others would view them upon making a utilitarian decision, and found that people select utilitarian decision-makers for important social roles such as running a hospital. Since it was equally plausible that people self-present strategically as more utilitarian than they privately prefer - to present themselves as logical and competent and leader-like and/or scientific - we measured the warmth and competence scale, following Rom and Conway (2018). However, no significant relation was observed between these meta-ethical perceptions and utilitarian judgments. It should be noted that the power for these correlations is very likely low as groups rather than the individuals were used as data points.

At another level of explanation, we tested the predictions of social conformity theory for the role of social context in moral judgments. At the group level, the within-group average of private utilitarian scores before discussion (as well as the majority private opinion) were positively correlated with the collective score. However, neither within-group average nor the majority of the first private opinion was correlated with the second private judgments. The combination of these two sets of results was more consistent with our normative but not informational conformity hypothesis. Importantly, we took care to set hypotheses such that they clearly separate conformity from the interaction. Conformity was defined as the majority influence which flows, unidirectionally, from the majority to the individual. The interaction effect, however, was defined as the bidirectional impact of group and individual on one another.

Some previous research shows that people in groups lie more, are less likely to offer help in urgent situations, are less generous, and more often engage in free riding and social loafing (c.f. 1. introduction). In this view, individuals are more egocentric in groups and more focused on maximizing their own utility. However, in our scenarios, the greater good for others never benefited the protagonist, let alone the participant. Therefore, the collective boost in utilitarian judgment cannot be

explained by more *egoism* in the social context: the higher utility of norm violation in moral dilemmas had no utility consequences for the participant.

Our results could be interpreted as a sign of a transient shift in moral values when people make moral judgments *in groups*, creating a temporary (but actual) moment of consensus during collective deliberation. Some previous works in social psychology (Heider, 1946) and neuroeconomics (Izuma & Adolphs, 2013) have also shown that social context can shift economic value preferences *transiently*. On the other hand, while noting that moral judgments are far from the economic value preferences examined in these studies, this collective utilitarian boost could be alternatively interpreted as a *compromise* rather than a genuine *consensus*, showing that the participants, individually, were not persuaded by the more utilitarian judgments that they rated collectively. We look forward to future works to examine this issue in depth.

Our attitude towards violating a norm consists of what we feel about the act as well as the consequences of the violation, e.g., guilt, blame, regret, empathic concern for the victim (Cushman, Gray, Gaffey, & Mendes, 2012; Miller, Hannikainen, & Cushman, 2014; Reynolds & Conway, 2018). Negative emotions towards norm violation could therefore be aversive reactions to the act (McDonald, Defever, & Navarrete, 2017) or its consequences (Miller & Cushman, 2013). The social context could trigger either of these mechanisms by diffusing responsibility related to norm violation (El Zein et al., 2019; Li et al., 2010) and thereby give rise to our observation that collectives were more utilitarian than individuals. We note here that our experimental design cannot distinguish between aversion to the norm-violating utilitarian *act* or its *consequences*. However, since we measured stress levels, we offer positive evidence that reduction of stress can contribute to this effect. We found that the stress was even more reduced in the second individual condition, probably due to a carry-over effect, which, by design, was inevitable. The question of why the reduction of stress in the second individual stage did not affect moral judgments needs further investigation.

We chose to employ a diverse range of moral scenarios, including different norms – some sacrificial and others not – to get close to the real-life heterogeneity of moral issues. To our knowledge, for the first time, we employed moral scenarios that included 'inactions' (e.g., staying silent) as well as actions that all led to a utilitarian outcome. Our participants were, correspondingly, richly heterogeneous. Contrary to the prescriptions of normative moral theories, participants showed flexibility in applying one or the other principle. This is an interesting and useful corollary of our study that previous researchers had predicted but had not been tested (Kahane, 2015). This variability of responses was evident in the distribution of scores across items (see Supplementary Material, Section **A**, Part 7). The diversity of responses across different norms calls into question the generalizability of the previous findings that operationalized utilitarianism *merely by accepting harm* which saves many in sacrificial dilemmas involving extremely unlikely (if not bizarre) conditions. Despite the heterogeneity of our scenarios and participants' responses to them, an item-based analysis confirmed that our key findings in Fig. 3 are robust across items (see Supplementary Material, Section **A**, Part 7.2). Our novel stimuli could be used in future moral psychological researches to disentangle better the effect of different norms in moral judgments with greater ecological validity.

Comparing Experiment 1 (Face to Face) and Experiment 2 (Online) reveals a remarkably high correspondence between *private* responses in the two experiments. The shape of the distributions was very similar, indicating a very high level of replication in the private responses (see Supplementary Material Section **C**, Fig. S11). Interestingly, the distribution of the consensus responses showed very different distributions between the Online and Face-to-Face versions of the experiment. This observation is in line with studies that have recently showed the differences between lab and online experiments comprising collective discussions (e.g., Hietanen, Peltola, & Hietanen, 2020; Schneider, Kerwin, Frechtling, & Vivari, 2002; Tomprou, Kim, Chikersal, Woolley, &

Dabbish, 2021). Schneider et al., 2002 for instance, showed that online group discussions entail shorter comments (sometimes just a few words of agreement) compared to face-to-face interaction. Hence, online discussions are *uniform*. Similarly, we performed several exploratory analyses to examine if the variance of the consensus responses were different across the two experiments. Multiple measures of squared rank test of homogeneity revealed a significant difference in variance between online vs. face-to-face moral judgments scores: face-to-face (but not online) interaction promoted *more diverse consensus opinions*. No difference in *variance* was observed in the First or Second *private* responses between the two studies (Supplementary Material, Section **C**, Part 16). The effect size of collective vs. individual conditions in the online experiment was also smaller than Face to Face interaction, showing a smaller utilitarian boost in online interactions. More research is needed to understand the difference between online vs. in-person interactions in the moral domain.

Given the extended limitations imposed on laboratory work by the conditions of the global pandemic and the fact that many real-life meetings and social activities have been replaced by online video conferencing, we thought this would be a good opportunity to contribute to this very timely issue comparing the results of Experiments 1 and 2 in more detail, in addition to comparing the variance. A number of studies have examined the possible differences between face-to-face and in-person interactions and web-based video conferencing in various domains (e.g., Hietanen et al., 2020; Schneider et al., 2002; Tomprou et al., 2021). Therefore, we provided a number of further exploratory analyses that we have found instructive (Needless to say, these findings were not part of the original hypothesis) – See Supplementary Material, Section **C**.

Our data speak to a number of previous studies that examined the role of group synergy in moral decision-making. The synergy here refers to the possibility that interaction between group members during deliberation may result in a consensus that - rather than convergence to an opinion *within* the range privately held by the members - exceeds the maximally utilitarian opinion of the group. One reviewer's helpful advice, we examined this hypothesis in Experiment 1, we observed that the consensus score (M = 4.25) was lower than the highest individual utilitarian score within groups (M = 4.76). Within Subject ANOVA revealed that this difference is significant ($t_{student}$(15), p = .002; d_{cohen} = 0.96; see Supplementary Material, Section **D**, Part 19, Fig. S13). A similar result was observed in Experiment 2: consensus score (M = 4.11) was lower than the highest individual utilitarian score within groups (M = 4.78). Within Subject ANOVA revealed that this difference is significant ($t_{student}$(14), p = .002; d_{cohen} = 1.01; see Supplementary Material, Section **D**, Part 19, Fig. S14). Interestingly, this pattern of results is consistent with Curşeu et al. (2013; 2020) and Meslec and Curşeu (2013).

In our experiment, participants had limited time for the discussion (i. e., three minutes) and responding to the questions. It is possible that by increasing the discussion time (or its frequency), we would have seen a different pattern in the second individual moral judgments. This is an important limitation of empirical approaches in assessing interactions in groups' judgments in the laboratory setting (for a critical review of such methods, see Weiten & Diamond, 1979). Being aware of this limitation, in two pilot groups, we had observed that participants needed around 90 s to read one dilemma (for the first time) and respond to it privately in a self-paced manner without the time pressure. In these pilot studies, we also observed that participants spent, on average, 3 min discussing each dilemma before moving on. In the final private judgment, as the participants had already seen the dilemmas and were going through them for a second or third time, self-paced responses were much quicker and did not take more than 30 s.

Another critical limitation was that our behavioral measure, conventionally, connected utilitarian and deontological judgment inextricably to one another: being less deontological or more utilitarian could not be distinguished from one another in moral dilemmas.

Therefore, whether reduction of stress affected *utilitarian* responses or change the *deontological* tendencies is unclear, as utilitarian and deontological tendencies are often measured in the opposite directions of one single measure. Recent methods such as process dissociation (Conway & Gawronski, 2013) or computational models such as CNI (Consequence, Norm, Inaction; Gawronski et al., 2017) can be used in future studies to achieve this distinction. Future research that employs methodologies such as Natural Language Processing techniques to analyze the content of the arguments could also bring about a deeper understanding of social interaction in moral judgments.

To conclude, we found that collective consensual judgments made via face-to-face and online group interactions were more utilitarian compared to private individual judgments. Group discussion did not change the individual judgments, indicating a normative conformity effect whereby individuals consented to a group judgment that they did not necessarily buy into personally. We measured stress levels and showed that participants registered less state anxiety in solving moral dilemmas in groups than individually. The results were consistent with the hypothesis that interactions reduce aversive emotions (e.g., stress) associated with violation of moral norms, leading to more utilitarian judgments.

CRediT author statement

AK: Exp 1 Conceptualization, Methodology, Formal analysis, Investigation, Coding, Visualization, Writing-Original- Draft preparation **AK: Exp2:** Conceptualization, Methodology, Coding, Formal analysis, Investigation, Visualization, Writing-Original- Draft preparation **OD**: **Exp 1**: Methodology, Funding, Supervision **BB: Exp 1:** Methodology, Writing-Review & Editing, Supervision. **BB Exp2:** Writing-Review & Editing, funding, supervision. The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper. We thank Nadine Fleischhut and Stephan Sellmaier for the helpful discussions.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.cognition.2021.104965.

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