

Perspective-Taking Accessibility Informs Prosocial Judgments in Sacrificial Scenarios: Evidence Across Cognitive Priming Tasks

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Experimental work reveals that participants who have access to all situational perspectives in moral scenarios (full perspective-taking accessibility) are more prosocial in their moral judgments than those who receive scenarios offering only one situational perspective (partial perspective-taking accessibility; Martin, Kusev, & van Schaik, 2021). Since previous studies have only focused on decisions made directly after scenario presentation, in the present work, we have explored how perspective-taking accessibility influences moral judgments under varying cognitive priming tasks (no prime, task-relevant prime, and task-irrelevant prime). We found that with full perspective-taking accessibility, participants were consistently utilitarian in their moral judgments, regardless of the cognitive priming task employed. However, with partial perspective-taking accessibility, participants were more utilitarian in their moral judgments after undertaking a task-irrelevant prime (an anagram task) compared to a task-relevant prime or no prime. In Experiments 1 and 2, we found that placing the anagram task after the moral scenario (late prime) induced participants' utilitarian moral judgments. Moreover, in Experiment 3, we explored whether placing the anagram task before the moral scenario (early prime) would have a similar effect on participants' moral judgments. With partial perspective-taking accessibility, regardless of the anagram task placement (early or late prime), participants were more utilitarian in their moral judgments compared to participants who were not primed with an anagram task. However, crucially, the results revealed no statistically significant difference between receiving an early and late prime; the properties of the anagram task itself (and not a distraction period between the scenario and judgment task) enhance participants' utilitarian behavior.

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Datafiles for Experiments 1, 2, and 3 are available on the Open Science Framework database. The code for analysis is not included (https://osf.io/hz9fc/?view_only=e7dd3d3ee4504256bff58cf0b897e43a; Martin et al., 2025). All participants were treated in accordance with the ethical code of conduct of the British Psychological Society. All participants gave their informed consent to take part in the

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continued

The empirical study of moral decision making frequently relies on presenting participants with hypothetical moral scenarios, for which they make moral judgments and decisions (e.g., Thomson, 1984). A prominent yet overlooked feature of many hypothetical moral scenarios is the requirement for participants to engage in perspective-taking. Typically, such scenarios require participants to take on the perspective of one of the agents described (e.g., Bonnefon et al., 2016; Foot, 1967; Greene, 2016; Thomson, 1984). However, in Martin et al. (2017), Martin, Kusev, and van Schaik (2021), and Martin, Kusev, et al. (2021), we have argued and established that presenting moral scenarios with partial perspective-taking accessibility produces judgment bias. For example, empirical findings reveal that partial perspective-taking accessibility results in self-serving judgments, biased by the perspective they had taken in the moral scenario. Alternatively, when participants take on the perspective of all agents in the moral scenario, they are significantly more prosocial in their moral judgments and behaviors (Martin, Kusev, & van Schaik, 2021). However, this finding has only been observed for judgments that are made immediately after the presentation of the scenario (Bruno et al., 2024; Martin, Kusev, & van Schaik, 2021), whereas in reality, moral judgments are made under a variety of conditions.

In research studies, some judgments are made immediately after exposure to a judgment task (Haidt, 2001), others are reached after a period of task-relevant contemplation or reasoning (Corral & Rutchick, 2024; Gunia et al., 2012), and others after being distracted with an irrelevant task (Dijksterhuis & Nordgren, 2006; Ham & van den Bos, 2010). In the present work, we explored whether a difference in moral judgments is observed according to the type of judgment elicitation task associated with the three types of cognitive priming employed in the experiments (no priming, task-relevant priming, and task-irrelevant priming). Hence, in the following sections of our introduction, we provide an overview of research work that explores the independent influences of (a) perspective-taking accessibility and (b) judgment elicitation tasks on people's moral judgments.

Perspective-Taking Accessibility in Hypothetical Moral Scenarios

Numerous studies reveal that the construction of hypothetical scenarios has an impact on participants' judgments and decisions (Greene et al., 2001; Kahneman & Tversky, 1984; Kusev et al., 2009, 2016, 2020; Martin, Kusev, & van Schaik, 2021). Kahneman and Tversky's (1984) work exemplifies this with the framing effect, where people's risk preferences are dependent on whether the scenario is framed in terms of gain (saving lives) or loss (losing lives). Moreover, Kusev et al. (2016) argued that the construction of classic moral scenarios such as the trolley and footbridge dilemmas (see Thomson, 1984) presents only partial accessibility to utilitarian information. Often, only one course of action is explicitly stated, while the other is ambiguous, inducing uncertainty in participants and influencing judgment inconsistencies across moral decision-making tasks. Kusev et al.'s findings reveal that when the action and consequence of each choice option in moral scenarios are explicitly stated (fully accessible), participants are more utilitarian in their responses and apply consistent utilitarian behavior across judgment tasks. Motivated by these findings, in a commentary article, Martin et al. (2017) argued that hypothetical moral scenarios that involve perspective-taking often require participants to assume the perspective of only one agent, which biases participants' subsequent judgments in favor of the agent that they have adopted the perspective of.

To illustrate this, the autonomous vehicle crash scenario (Bonnefon et al., 2016; Greene, 2016) is a hypothetical situation where the reader is described a lone passenger inside an autonomous vehicle that is about to crash into a group of 10 pedestrians. The autonomous vehicle could stay on its path and crash into the 10 pedestrians, killing them all and in doing so preventing the lone passenger's death (i.e., the passenger-protective option). Alternatively, the autonomous vehicle could swerve to the side of the road and crash into a wall, killing the lone passenger but leaving the 10 pedestrians unharmed (i.e., the

even commercially.

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prosocial utilitarian option). Scenarios such as the one described offer partial perspective-taking accessibility. The participant is encouraged to assume one situational perspective (the passenger), while the alternative perspective is not accessible. For participants to explore alternative inaccessible perspectives, they would need to mentally simulate these. However, the simulation of inaccessible information is effortful and not guaranteed to occur spontaneously (Kahneman, 2003; Kusev et al., 2016). Accordingly, judgments made regarding autonomous vehicles are biased by the partial perspective accessible to participants. Indeed, participants judge autonomous vehicles programmed to save the greatest number of people (the pedestrians) as the most moral vehicle but would rather purchase an autonomous vehicle programmed to protect the passenger at all costs (the social dilemma of autonomous vehicles; Bonnefon et al., 2016). However, Martin, Kusev, and van Schaik (2021) demonstrated that when participants take on both situational perspectives (i.e., they could be a passenger or one of the pedestrians), not only does their approval of prosocial utilitarian vehicles increase significantly, but they would also prefer to buy and spend more money on an autonomous vehicle that is programmed to save the greatest number of people (even at their own expense). Hence, the inconsistency between their moral judgments and moral purchasing behavior is eliminated.

Offering full perspective-taking accessibility in moral scenarios has been described as a new form of *veil of ignorance* (Rawls, 1971/1999), which provides participants with even odds of being a pedestrian or passenger in crash scenarios and does not prime participants to act with self-interest (Martin, Kusev, & van Schaik, 2021). When people have full perspective-taking accessibility in moral scenarios, they do not need to mentally simulate missing perspective-taking information and, accordingly, can make informed judgments based on fully accessible perspectives.

Judgment Elicitation Tasks: The Role of Contemplation and Distraction (or Cognitive Priming?) in Utilitarian Judgments

Another common feature of experimental work based upon the use of hypothetical moral scenarios is the requirement for participants to make moral judgments directly after scenario presentation,

leaving little room for participants to contemplate the scenario and its features. In experimental studies by Suter and Hertwig (2011), the authors explored whether decision contemplation time influences participants' moral judgments. They found participants were more utilitarian (willing to sacrifice one person to save a greater number) in their responses to personal moral scenarios if they were provided with an extended time to contemplate rather than rushed to make an immediate choice. An extended period of contemplation provided participants with the opportunity to make utility calculations as opposed to following their immediate intuitive reactions.

In contrast to these findings, other theorists have argued that contemplation can sometimes lead to poor judgments (Wilson & Schooler, 1991) due to "overanalyzing" and that particularly difficult decision problems are best tackled after a period of distraction with a challenging cognitive task (Dijksterhuis & Strick, 2016). For example, a moral decision-making study conducted by Ham and van den Bos (2010) revealed that participants were more utilitarian in response to the footbridge dilemma after a period of distraction (undertaking a two-back task) compared to participants who made judgments immediately or after a period of task-relevant contemplation. In their study, Ham and van den Bos utilized the theoretical framework and experimental methods established by Dijksterhuis and Nordgren (2006): unconscious thought theory (UTT). In a typical UTT experiment, participants are presented with choice options for which they are told they will make judgments about in the near future. Some participants are then encouraged to think carefully about the alternatives for a fixed amount of time (3–4 min depending on the study), whereas others are distracted from the original decision-making task altogether with a cognitive task (e.g., a 3- to 4-min anagram task). Across a variety of studies (see Dijksterhuis & Strick, 2016, for a review), undertaking a distraction task has been found to result in optimal judgments, performing better than contemplation, but only when judgment tasks are complex (e.g., each choice option has a large number of attributes to compare, Dijksterhuis et al., 2006, or the decision tasks themselves are complicated with contextual detail, Ham & van den Bos, 2010).

One explanation for the advantage of a distraction task is that it enables participants to process decision information unconsciously, which UTT theorists

argue provides numerous decision aids including increased processing capacity, superior weighting of decision alternatives, utilization of bottom-up processing, and divergent thinking (Dijksterhuis & Nordgren, 2006). However, UTT has been criticized for its reliance on studies which lack statistical power, resulting in the overstated role of unconscious thinking (Acker, 2008; Huizenga et al., 2012; Newell & Shanks, 2014). Replicability of findings has also been called into question, with successful replications dependent on the conditions of the choice task (Nieuwenstein et al., 2015). Moreover, some theorists suggest that where UTT effects are observed, they have been misinterpreted. For example, Payne et al. (2008) proposed that UTT effects can be explained by distraction tasks reducing introspection, a process that has been found to interfere with rational decision making. Hence, Payne and colleagues argued that distraction merely prevents overanalyzing as opposed to inducing unconscious processing of decision options. However, it is also plausible that the distraction task (which is typically an irrelevant cognitive task) is rather a *cognitive prime*, which prepares participants to think analytically. Accordingly, the activation of analytical thinking may enhance performance on subsequent judgment tasks.

A substantial body of work in moral decision making has revealed the association between analytical thinking and utilitarian judgments. Notably, Greene et al.'s (2001, 2004) work on dual-process moral decision making reveals an association between working memory activation and utilitarian moral judgments. In support of this, other authors have explored how individual differences in reasoning and cognitive style impact utilitarian behavior, where higher scores on cognitive tests are positively associated with utilitarian choices and judgments (Barque-Duran & Pothos, 2021; Patil et al., 2021). Most relevant to our proposal, Paxton et al. (2012) demonstrated empirically how priming participants with cognitive reflection tests (e.g., the bat-and-ball problem) enhanced their subsequent approval of utilitarian actions relating to the hypothetical moral scenarios under consideration. Paxton and colleagues argued that successful responses to these tests, which require participants to inhibit intuition and engage in analytical thinking, drive utilitarian responses to moral dilemmas.

Accordingly, we propose that task-irrelevant cognitive priming (e.g., undertaking an anagram task that is unrelated to the moral scenario), and

not distraction, boosts participants' utilitarian moral judgments. Moreover, we further propose that participants who are required to contemplate scenario details (task-relevant prime) or make immediate judgments (no prime) are not under the influence of task-irrelevant cognitive priming. Hence, these tasks do not enhance participants' utilitarian judgments, as reported in previous research work by Ham and van den Bos (2010).

The Present Studies

In the present work, we aim to explore how perspective-taking accessibility influences moral judgments under varying cognitive priming tasks (no prime, task-relevant prime, and task-irrelevant prime). We are interested in (a) whether differences in moral judgment occur as a function of varying cognitive priming tasks and (b), if so, whether these differences are suppressed by full accessibility to perspective-taking. Accordingly, we predict that differences in moral judgment will occur across cognitive priming tasks but only under conditions of partial perspective-taking accessibility, where the scenario construction induces bias. In particular, we expect lower overall approval of utilitarian behavior in response to scenarios with partial perspective-taking accessibility, but enhanced utilitarian approval in participants who have undertaken a task-irrelevant cognitive prime (in the form of an anagram task). Under conditions of full perspective-taking accessibility, we predict no difference in moral judgments across cognitive priming tasks. With full perspective-taking accessibility, we anticipate enhanced utilitarian behavior regardless of the cognitive priming task participants have undertaken (task-relevant, task-irrelevant, and no priming). We argue that offering full perspective-taking accessibility draws participants' attention to alternative viewpoints, highlighting the overall benefit of utilitarian options. With accessible perspective-taking information that does not bias participants toward a single viewpoint, participants are capable of making informed and consistent judgments across judgment tasks (Martin, Kusev, & van Schaik, 2021).

Experiment 1

Method

Datafiles for all three experiments are available on the Open Science Framework database (the

code is not included) at https://osf.io/hz9fc/?view_only=e7dd3d3ee4504256bff58cf0b897e43a. The three experiments reported herein were not preregistered.

Participants

Participants ($N = 360$) living in the United Kingdom were recruited via PureProfile to take part in an online experiment. The sample consisted of 190 females and 170 males with a mean age of 47 ($SD = 13.59$). All participants were treated in accordance with the British Psychological Society's code of ethics and provided their informed consent to take part in the experiment, and this was the case for all experiments reported herein. A significance level of .05 was set for statistical testing. Moreover, a power analysis was conducted on the between-subjects effects of *type of perspective-taking accessibility* and *type of cognitive priming* and their interaction. A sensitivity power analysis indicated that, for a 2×3 between-subjects analysis of variance (ANOVA) with a total sample size of $N = 360$, the design had 80% power ($1 - \beta = .80$) to detect a minimum effect size of $\eta_p^2 = .02$, assuming an alpha level of $\alpha = .05$. This means the study would not be able to reliably detect effects smaller than $\eta_p^2 = .02$.

Experimental Design

A 2 (type of perspective-taking accessibility) $\times 3$ (type of cognitive priming) between-subjects design was employed. The first independent

variable, type of perspective-taking accessibility, had two levels (partial or full). The second independent variable, type of cognitive priming, had three levels (no prime, task-relevant prime, or task-irrelevant prime). Participants' judgments of moral appropriateness for each autonomous vehicle (utilitarian and nonutilitarian) were then measured on a 0–9 scale, with 0 labeled as *not at all appropriate* and 9 as *definitely appropriate*. The scale allowed noninteger responses of two decimal spaces. A utilitarian weight was calculated by subtracting participants' judgments for non-utilitarian autonomous vehicles from their judgments for utilitarian autonomous vehicles. The outcome of this calculation was the dependent variable, judgments of moral appropriateness (as implemented in Martin, Kusev, & van Schaik, 2021).

Materials and Procedure

All participants were presented with an autonomous vehicle crash scenario (hereafter, moral scenario) and visual stimuli depicting full or partial perspective-taking accessibility (random allocation). Specifically, in the partial perspective-taking accessibility condition, the moral scenario prompted participants to take on the perspective of a passenger inside the autonomous vehicle. In the full perspective-taking accessibility condition, the moral scenario prompted participants to take the perspective of both the autonomous vehicle passenger and one of the 10 pedestrians in the road (see Table 1).

Table 1

The Moral Scenarios Depicting an Autonomous Vehicle Crash Used in Experiments 1 and 2

Partial PT accessibility	Full PT accessibility
“You are the sole passenger in an autonomous self-driving vehicle travelling at the speed limit down a main road. Suddenly, 10 pedestrians appear ahead, in the direct path of the car. The car could be programmed to either SWERVE off to the side of the road, where it will impact a barrier, killing you but leaving the 10 pedestrians unharmed or STAY on its current path where it will kill the 10 pedestrians, but you will be unharmed.”	“You could be the sole passenger in an autonomous self-driving vehicle travelling at the speed limit down a main road. Or you could be one of the 10 pedestrians that have appeared ahead, in the direct path of the car. The car could be programmed to either SWERVE off to the side of the road, where it will impact a barrier, killing the passenger (that could be you) but leaving the 10 pedestrians unharmed or STAY on its current path where it will kill the 10 pedestrians (that could include you), but the passenger will be unharmed.”

Note. Scenarios are from “Autonomous Vehicles: How Perspective-Taking Accessibility Alters Moral Judgments and Consumer Purchasing Behavior,” by R. Martin, P. Kusev, and P. van Schaik, 2021, *Cognition*, 212, pp. 3–4 (<https://doi.org/10.1016/j.cognition.2021.104666>). Copyright 2021 by Elsevier. Reprinted with permission. In these scenarios, vehicles that SWERVE are “utilitarian autonomous vehicles” and vehicles that STAY are “nonutilitarian autonomous vehicles.” PT = perspective-taking.

Participants were then randomly assigned to one of three types of cognitive priming, which included no prime (where participants were invited to make their moral judgments after reading the moral scenario), task-relevant prime (where participants were instructed to carefully contemplate the moral scenario for a fixed 3 min prior to making their judgments), and task-irrelevant prime (where participants were instructed to complete an anagram task for a fixed 3 min prior to making their judgments). After the 3 min passed for the participants in the task-relevant and task-irrelevant prime conditions, they were then automatically redirected to a separate page where they provided their moral judgments. Moral judgment tasks were presented one by one and in a randomized order (see Figure 1A).

In all conditions of all experiments reported herein, judgments of moral appropriateness were made in the absence of the moral scenario and

visual stimuli. Therefore, participants had to recall scenario information. Accordingly, to ensure participants' recall accuracy of utilitarian information in the scenario, a manipulation check was included at the end of the experiment, which asked participants the following:

In the scenario, you read:

1. How many people were *inside* the car?
2. How many people were *outside* of the car?

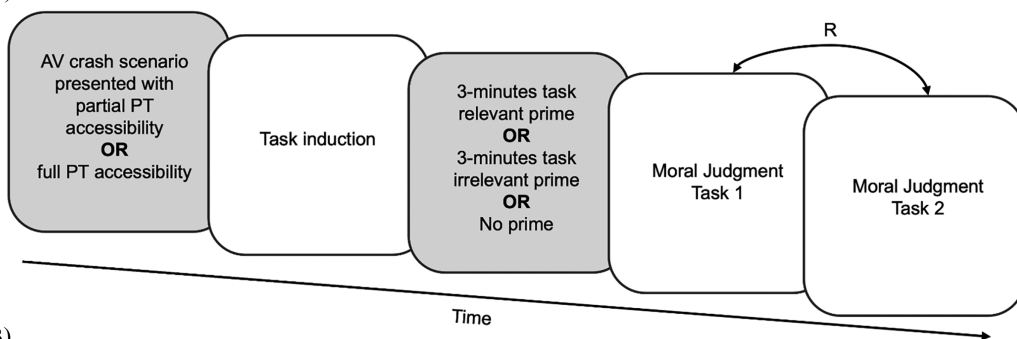
Results

All 360 participants included in the analysis passed the manipulation check by correctly recalling the number of people inside and outside of the car in the moral scenario. Therefore, any differences in utilitarian judgments across conditions cannot be accounted for by a decline in memory for utilitarian details.

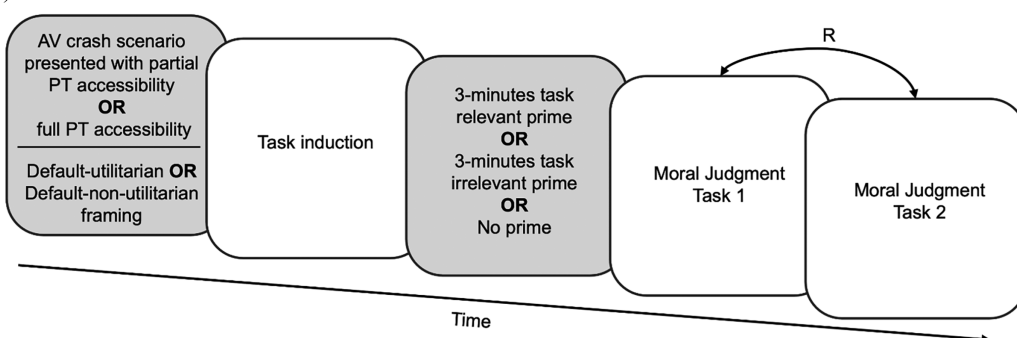
Figure 1

Experimental Procedure for Experiments 1 and 2

(A)



(B)



Note. Panel A represents the procedure for Study 1. Panel B represents the procedure for Study 2. Shaded boxes indicate the differences in tasks according to experimental manipulations. Moral Judgment Task 1 required participants to make judgments about utilitarian AVs, and Moral Judgment Task 2 required participants to make judgments about nonutilitarian AVs. Moral judgment tasks (1 and 2) were presented in a randomized order (as denoted by R). AV = autonomous vehicle; PT = perspective-taking.

Judgments of Moral Appropriateness

A 2×3 independent-measures ANOVA was conducted to explore the influence of the independent variables, type of perspective-taking accessibility (full or partial) and type of cognitive priming (no prime, task-relevant prime, task-irrelevant prime), on judgments of moral appropriateness. As described in the Method section, this dependent measure is a utilitarian weight. See the [Supplemental Material](#) for a report of main and interaction effects of the independent variables on judgments of moral appropriateness for utilitarian and nonutilitarian autonomous vehicles. The results revealed that type of perspective-taking accessibility significantly influenced participants' judgments of moral appropriateness, $F(1, 354) = 51.04$, $p < .001$, $\eta_p^2 = .13$. In particular, participants were significantly more prosocial and utilitarian in their judgments when provided with full perspective-taking accessibility ($M = 4.37$, $SD = 3.18$) compared to when they were provided with partial perspective-taking accessibility ($M = 1.79$, $SD = 3.71$; see [Figure 2](#)). Moreover, the two-way interaction of type of perspective-taking accessibility by type of cognitive priming significantly influenced respondents' judgments of moral appropriateness,

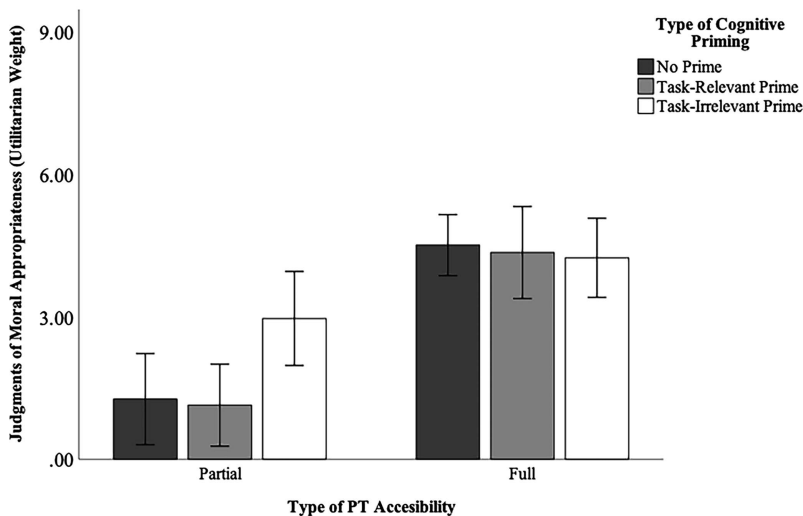
$F(2, 354) = 3.25$, $p = .040$, $\eta_p^2 = .02$. However, the results revealed that the main effect for type of cognitive priming on judgments of moral appropriateness was not statistically significant, $F(2, 354) = 2.16$, $p = .117$, $\eta_p^2 = .01$ (see [Figure 2](#)).

Due to the significant two-way interaction, follow-up simple-effect tests were conducted by type of perspective-taking accessibility.

Partial Perspective-Taking Accessibility. A follow-up simple-effect test revealed that with partial perspective-taking accessibility, the main effect of type of cognitive priming, $F(2, 177) = 4.71$, $p = .010$, $\eta_p^2 = .05$, significantly influenced respondents' judgments of moral appropriateness. Specifically, the results revealed that with partial perspective-taking accessibility, participants who underwent a task-irrelevant prime ($M = 2.97$, $SD = 3.84$) were more utilitarian in their moral judgments compared with participants who underwent a task-relevant prime ($M = 1.14$, $SD = 3.35$), $t(118) = -2.78$, $p = .006$, Cohen's $d = -.507$. Similarly, participants who underwent the task-irrelevant prime were more utilitarian in their moral judgments ($M = 2.97$, $SD = 3.84$) than participants who received no prime ($M = 1.27$, $SD = 3.72$), $t(118) = -2.46$, $p = .015$, Cohen's

Figure 2

Participants' Judgments of Moral Appropriateness (Utilitarian Weight) in Experiment 1



Note. Positive mean values indicate participants' preference for utilitarian autonomous vehicles over nonutilitarian autonomous vehicles. Error bars represent the 95% confidence intervals of the mean. PT = perspective-taking.

$d = -.450$. Moreover, the results revealed no statistically significant difference in moral judgments between participants who received the task-relevant prime ($M = 1.14$, $SD = 3.35$) and no prime ($M = 1.27$, $SD = 3.72$), $t(118) = 0.197$, $p = .844$, Cohen's $d = .036$ (see Figure 2).

Full Perspective-Taking Accessibility. Importantly and in contrast to the moral judgments with partial perspective-taking accessibility, with full perspective-taking accessibility, respondents' judgments of moral appropriateness were not significantly influenced by the type of cognitive priming, $F(2, 177) = 0.11$, $p = .899$, $\eta_p^2 = .00$ (see Figure 2). Therefore, the distraction advantage was found only under conditions of partial perspective-taking accessibility.

Discussion

The findings from Experiment 1 reveal that when participants are presented with hypothetical moral scenarios containing partial perspective-taking accessibility, their moral judgments are influenced by the type of cognitive priming they have experienced. In particular, participants who undertook a task-irrelevant prime prior to making moral judgments showed greater approval of utilitarian vehicles than participants who undertook a task-relevant prime or no prime. Interestingly, when participants are presented with hypothetical scenarios containing full perspective-taking accessibility, they are more approving of utilitarian autonomous vehicles and their approval does not statistically differ between types of cognitive priming conditions. Hence, plausibly, the task-irrelevant cognitive priming enhances utilitarian behavior in the absence of full perspective-taking accessibility.

Experiment 2

Method

We conducted a second experiment to explore the influence of type of perspective-taking accessibility, type of cognitive priming, and the new independent variable *type of scenario* on judgments of moral appropriateness. For example, in the moral scenarios presented in Experiment 1, the default option (to stay on the path) is always nonutilitarian, and the option that requires deviation from the default (to swerve to the side of the

road) is always utilitarian. Thus, a possible confounding variable emerges; participants may to some extent be influenced by whether an option is presented as the default or nondefault. To ensure our findings remain consistent regardless of whether the utilitarian option is presented as the default or deviation from the default, we introduced a new independent variable type of scenario, which has been described in detail in the Experiment 2 methods and procedure.

In Experiment 2, we were also interested in exploring whether the independent variables impact upon the time participants take to make their moral judgments. While the task-relevant and task-irrelevant priming conditions impose a fixed 3-min task between scenario exposure and judgment tasks, in all conditions, once judgment tasks are displayed on the screen, participants are free to make judgments in their own time (without limits). Accordingly, in Experiment 2, we have also included a new dependent variable (judgment time) to explore how long participants took on average to make their moral judgments across type of perspective-taking accessibility, type of cognitive priming, and the new variable, type of scenario.

Participants

Participants living in the United Kingdom ($N = 566$; 324 females, 242 males) were recruited through PureProfile to take part in an online experiment. The mean age of participants was 52 years ($SD = 15.8$). A power analysis was conducted on the between-subjects effects of type of perspective-taking accessibility, type of cognitive priming, type of scenario, and their interaction. A sensitivity power analysis indicated that, for a $2 \times 3 \times 2$ between-subjects ANOVA with a total sample size of $N = 566$, the design had 80% power ($1 - \beta = .80$) to detect a minimum effect size of $\eta_p^2 = .01$, assuming an alpha level of $\alpha = .05$. This means the study would not be able to reliably detect effects smaller than $\eta_p^2 = .01$.

Experimental Design

A 2 (type of perspective-taking accessibility) $\times 3$ (type of cognitive priming) $\times 2$ (type of scenario) experimental design was employed. The first independent variable, type of perspective-taking accessibility, had two levels (partial or full). The second independent variable, type of cognitive priming, had three levels (no prime, task-relevant

prime, or task-irrelevant prime). The third independent variable, type of scenario, had two levels (nonutilitarian default or utilitarian default). The first dependent variable was judgments of moral appropriateness and was measured as a utilitarian weight as in Experiment 1 (i.e., judgment for utilitarian autonomous vehicle – judgment for nonutilitarian autonomous vehicle). The second dependent variable was judgment time (measured in seconds) and was an average of the time taken to make each moral judgment (judgments for utilitarian and nonutilitarian autonomous vehicles).

Materials and Procedure

The experiment followed a similar procedure to Experiment 1 (see Figure 1B). Participants received a moral scenario and visual stimuli that contained either full or partial perspective-taking accessibility and were then randomly allocated to a type of cognitive prime (no prime, task-relevant prime, and task-irrelevant prime) condition. To counterbalance presentation of scenarios (e.g., whether the default [stay] option was utilitarian or nonutilitarian), we presented half of the participants with the standard versions of the scenario (as seen in Table 1) and the remaining participants with versions of the scenario where a physical barrier rather than 10 pedestrians obstructs the autonomous vehicle's path (see Table 2).

After making their moral judgments, participants completed the same manipulation check employed in Experiment 1 to ensure that they could correctly recall the moral scenario's utilitarian details.

Results

Judgments of Moral Appropriateness

A $2 \times 3 \times 2$ independent-measures ANOVA was conducted to explore the influence of the independent variables type of perspective-taking accessibility (full or partial), type of cognitive priming (no prime, task-relevant prime, task-irrelevant prime), and type of scenario (nonutilitarian default, utilitarian default) on judgments of moral appropriateness.

The results revealed that type of perspective-taking accessibility significantly influenced participants' judgments of moral appropriateness, $F(1, 554) = 46.37, p < .001, \eta_p^2 = .08$. As with Experiment 1, participants were significantly more prosocial/utilitarian in their judgments when provided with full perspective-taking accessibility ($M = 3.67, SD = 3.77$) than when they made the judgments with partial perspective-taking accessibility ($M = 1.50, SD = 3.78$; see Figure 3). However, the main effect of type of cognitive priming on respondents' judgments of moral appropriateness was not statistically significant, $F(2, 554) = 1.34, p = .263, \eta_p^2 = .01$. Furthermore, as anticipated, the main effect of type of scenario was statistically nonsignificant, indicating that participants' judgments of moral appropriateness were not significantly influenced by whether the scenario presentation framed the utilitarian or nonutilitarian option as the default, $F(1, 554) = 0.05, p = .829, \eta_p^2 = .00$.

The two-way interaction for type of perspective-taking accessibility by type of cognitive

Table 2

The Moral Scenarios Depicting an Autonomous Vehicle Crash Used in the Utilitarian-Default Conditions in Experiments 2 and 3

Partial PT accessibility	Full PT accessibility
<p>“You are the sole passenger in an autonomous self-driving vehicle, travelling at the speed limit down a main road. Suddenly, a barrier appears ahead, in the direct path of the car. The car could be programmed to either SWERVE off to the side of the road, where it will hit 10 pedestrians, killing them but leaving you unharmed or STAY on its current path where it will impact the barrier, killing you, but leaving the 10 pedestrians unharmed (see the picture illustrating this scenario).”</p>	<p>“You could be the sole passenger in an autonomous self-driving vehicle travelling at the speed limit down a main road. Or you could be one of the 10 pedestrians that are stood on the side of the road. Suddenly, a barrier appears ahead, in the direct path of the car. The car could be programmed to either SWERVE off to the side of the road, where it will hit the 10 pedestrians, killing them (this could include you) or STAY on its current path where it will impact the barrier, killing the passenger (this could be you), but the 10 pedestrians will be unharmed (see the picture illustrating this scenario).”</p>

Note. PT = perspective-taking

priming was not statistically significant, although it indicated a pattern according to the Fisher coefficient that was greater than 1: $F(2, 554) = 1.95, p = .143, \eta_p^2 = .01$. Similarly, the interaction effect of type of scenario by type of perspective-taking accessibility was statistically nonsignificant, $F(1, 554) = 0.06, p = .803, \eta_p^2 = .00$. This was also the case for the interaction between type of scenario and type of cognitive priming, $F(2, 554) = 0.73, p = .485, \eta_p^2 = .00$. Finally, the three-way interaction of type of perspective-taking accessibility, type of cognitive priming, and type of scenario was statistically nonsignificant, $F(2, 554) = 0.509, p = .601, \eta_p^2 = .00$.

Due to the pattern ($F = 1.95$, but nonsignificant) exhibited between type of perspective-taking accessibility and type of cognitive priming, as with Experiment 1, we ran a simple-effect test by type of perspective-taking accessibility.

Partial Perspective-Taking Accessibility. A follow-up simple-effect test revealed that with partial perspective-taking accessibility, type of cognitive priming significantly influenced respondents' judgments of moral appropriateness, $F(2, 281) = 3.37, p = .036, \eta_p^2 = .02$. Specifically, the results revealed that with partial perspective-taking accessibility, participants in the task-irrelevant prime condition were more utilitarian

in their moral judgments ($M = 2.32, SD = 3.98$) than participants in the task-relevant prime condition ($M = 1.11, SD = 3.85$), $t(186) = -2.11, p = .036$, Cohen's $d = -.308$. Similarly, participants in the task-irrelevant prime condition were also more utilitarian in their moral judgments ($M = 2.32, SD = 3.98$) than participants who received no prime ($M = 1.07, SD = 3.40$), $t(192) = -2.34, p = .020$, Cohen's $d = -.336$. Moreover, the results revealed no statistically significant difference between the task-relevant prime and no prime condition, $t(190) = -0.07, p = .946$, Cohen's $d = .010$ (see Figure 3).

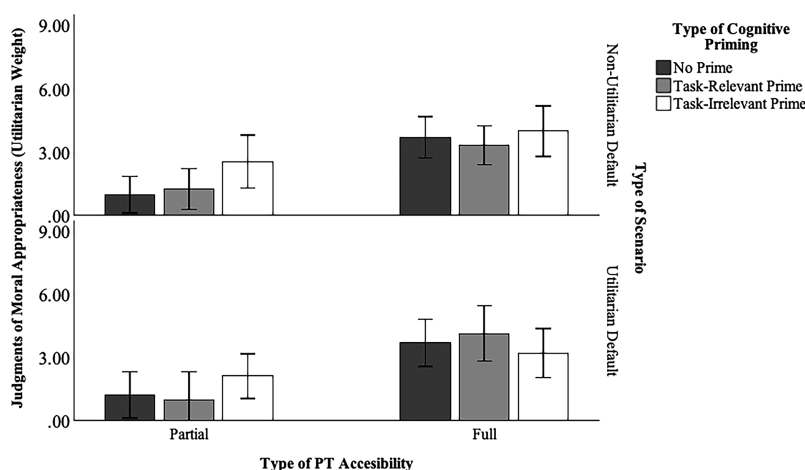
Full Perspective-Taking Accessibility. Importantly and in contrast to the moral judgments with partial perspective-taking accessibility, with full perspective-taking accessibility, respondents' judgments of moral appropriateness were not significantly influenced by the type of cognitive prime, $F(2, 273) = 0.03, p = .971, \eta_p^2 = .00$ (see Figure 3).

Judgment Time

We conducted a $2 \times 3 \times 3$ independent-measures ANOVA to explore the influence of the independent variables type of perspective-taking accessibility, type of cognitive prime, and type of scenario

Figure 3

Participants' Judgments of Moral Appropriateness (Utilitarian Weight) in Experiment 2



Note. Positive mean values indicate participants' preference for utilitarian autonomous vehicles over nonutilitarian autonomous vehicles. Error bars represent the 95% confidence intervals of the mean. PT = perspective-taking.

on participants' judgment time. Judgment time was reported as seconds taken to judge the moral appropriateness of utilitarian and nonutilitarian vehicles.

The main effect of type of cognitive priming significantly influenced participants' judgment time, $F(2, 554) = 5.09, p = .006, \eta_p^2 = .02$. Participants took significantly more time to make their moral judgments in the task-relevant prime condition ($M = 25.49, SD = 12.56$) compared to the no prime condition ($M = 22.72, SD = 12.57$), $t(381) = -2.15, p = .032$, Cohen's $d = -.220$. Participants also took significantly more time to make their moral judgments in the task-relevant prime condition ($M = 25.49, SD = 12.56$) compared to the task-irrelevant prime condition ($M = 21.25, SD = 13.82$), $t(363) = 3.07, p = .002$, Cohen's $d = .321$. However, the difference between the no prime ($M = 22.72, SD = 12.57$) and task-irrelevant prime ($M = 21.25, SD = 13.82$) conditions was statistically nonsignificant, $t(382) = 1.10, p = .274$, Cohen's $d = .112$.

The main effects of type of perspective-taking accessibility on judgment time were not statistically significant, $F(1, 554) = 3.17, p = .075, \eta_p^2 = .01$. This was also the case for the main effect of type of scenario, which did not significantly influence judgment time, $F(1, 554) = 3.30, p = .070, \eta_p^2 = .01$. The interaction of type of perspective-taking accessibility and type of cognitive prime was not statistically significant, $F(2, 554) = 0.89, p = .411, \eta_p^2 = .00$. Moreover, the interaction of type of perspective-taking accessibility and type of scenario on judgment time was statistically nonsignificant, $F(1, 554) = 0.42, p = .517, \eta_p^2 = .00$. Furthermore, no statistically significant interaction was found between type of cognitive priming and type of scenario, $F(2, 554) = 0.09, p = .914, \eta_p^2 = .00$. Finally, the three-way interaction of type of perspective-taking accessibility, type of cognitive prime, and type of scenario was also statistically nonsignificant, $F(2, 554) = 0.49, p = .613, \eta_p^2 = .00$.

Discussion

As per Experiment 1, participants who received scenarios with partial perspective-taking accessibility were less approving of utilitarian autonomous vehicles than participants who received scenarios with full perspective-taking accessibility. However, with partial perspective-taking

accessibility, there was a difference in approval of utilitarian autonomous vehicles as a function of type of cognitive priming. Participants who received task-irrelevant cognitive priming were significantly more approving of utilitarian autonomous vehicles than participants who received task-relevant or no cognitive priming. However, this was not the case for participants who received scenarios with full perspective-taking accessibility; their approval for utilitarian vehicles did not significantly differ across type of cognitive priming conditions. In other words, offering full perspective-taking accessibility (a) enhanced utilitarian behavior in line with the findings of [Martin, Kusev, and van Schaik \(2021\)](#) and (b) eliminated judgment inconsistencies across cognitive priming conditions. Note, however, that unlike Experiment 1, the two-way interaction for type of perspective-taking accessibility by type of cognitive priming was nonsignificant. Therefore, we cannot be confident that there is a clear difference between full and partial perspective-taking accessibility for the effect of type of cognitive priming.

At face value, our findings appear consistent with predictions of UTT, where the task-irrelevant prime serves as a distraction from conscious processing of the moral scenario, leading to enhanced utilitarian judgments (the unconscious thought effect; [Ham & van den Bos, 2010](#)). However, we propose an alternative explanation for our findings. It is plausible that the anagram task itself contains properties that enhance utilitarian judgments relative to the task-relevant and no prime condition. Previous empirical work has revealed that cognitive priming experienced by participants prior to hypothetical moral tasks boosts utilitarian behavior through activation of analytical thinking (e.g., [Baron et al., 2015](#); [Paxton et al., 2012](#)). Since cortical regions involved in attention and problem-solving have been found to be activated during anagram-solving ([Schneider et al., 1996](#)), it is plausible that offering an anagram task may similarly enhance utilitarian responses. To explore whether the enhanced utilitarian judgments can be explained by properties of the anagram task (as opposed to its role as a distraction task), in Experiment 3, we devised a new independent variable (type of cognitive priming) where the anagram task is used before or after the moral scenario.

Experiment 3

Method

In Experiments 1 and 2, in the task-irrelevant prime conditions, we presented participants with a moral scenario. However, before participants could make moral judgments, they were first required to solve a fixed 3-min anagram task. With such a design, one may interpret anagram-solving as a distraction from the main task: making moral judgments in response to a moral scenario. In Experiment 3, we offer a variation of this design in which we place the anagram task before or after the moral scenario to explore whether the utilitarian benefit in the anagram task conditions remains. Such a finding would indicate that properties of the anagram task itself (and not a distraction period between the moral scenario and judgment task) induce participants' utilitarian behavior.

Participants

We recruited 730 U.K. participants (415 females, 315 males) through PureProfile to take part in an online experiment. The mean age of participants was 50 years ($SD = 16.5$). A significance level of .05 was set for statistical testing. A power analysis was conducted on the between-subjects effects of type of perspective-taking accessibility, type of cognitive priming, type of scenario, and their interaction. A sensitivity power analysis indicated that, for a $2 \times 3 \times 2$ between-subjects ANOVA with a total sample size of $N = 730$, the design had 80% power ($1 - \beta = .80$) to detect a minimum effect size of $\eta_p^2 = .01$, assuming an alpha level of $\alpha = .05$. This means the study would not be able to reliably detect effects smaller than $\eta_p^2 = .01$.

Experimental Design

We employed a 2 (type of perspective-taking accessibility) $\times 3$ (type of cognitive prime) $\times 2$ (type of scenario) experimental design. The first independent variable, type of perspective-taking accessibility, had two levels (partial or full). The second independent variable, type of cognitive priming, had three levels (no prime, early task-irrelevant prime, or late task-irrelevant prime). The third independent variable, type of scenario,

had two levels (nonutilitarian default or utilitarian default). As with Experiment 2, the dependent variables included weighted judgments of moral appropriateness and judgment time and were measured the same way as in Experiment 2.

Materials and Procedure

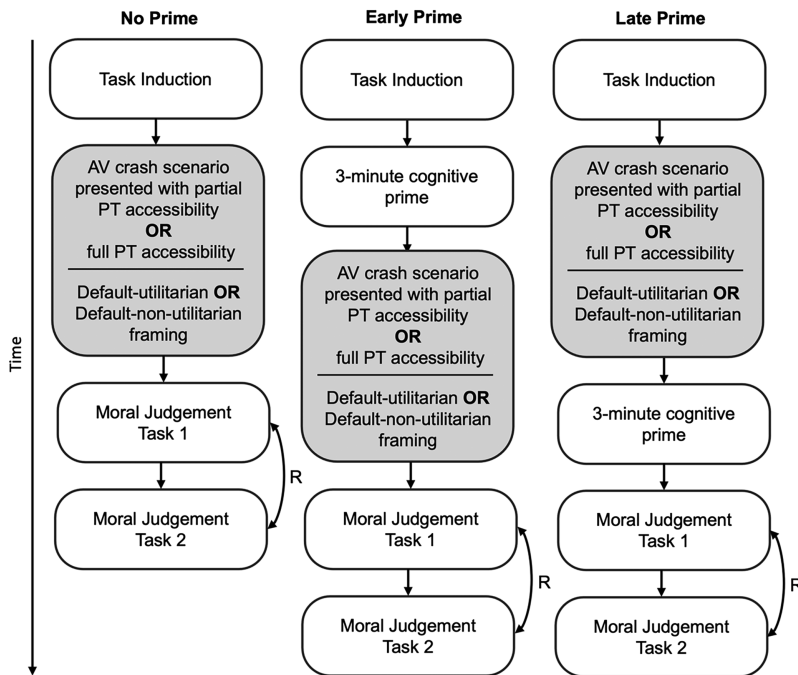
The independent variables, type of perspective-taking accessibility and type of scenario, were implemented the same way as in Experiment 2. However, we changed the type of cognitive priming variable, which included three levels: no prime, task-irrelevant early prime, and task-irrelevant late prime. As with Experiments 1 and 2, the task-irrelevant priming conditions (early and late) required participants to work on a fixed 3-min anagram task where participants were presented with 20 anagrams to solve. Participants in the late prime conditions underwent a similar procedure to the task-irrelevant condition of Experiments 1 and 2. Specifically, participants received a moral scenario, followed by an anagram task, and were then invited to make their moral judgments for each autonomous vehicle (utilitarian and nonutilitarian) with the order of presentation randomized. Participants in the early prime conditions instead completed the anagram task first, followed by a moral scenario, and then made their moral judgments. Finally, participants in the no prime condition received the moral scenario followed by the judgment task (as per the no prime condition in Experiments 1 and 2). See Figure 4 for a visual representation of the procedure in Experiment 3. Participants' judgments of moral appropriateness and judgment time were measured and calculated the same way as in Experiment 2.

Results

Judgments of Moral Appropriateness

A $2 \times 3 \times 2$ ANOVA was employed to explore the influence of type of perspective-taking accessibility (partial, full), type of cognitive priming (no prime, early prime, late prime), type of scenario (utilitarian default, nonutilitarian default), and their interaction on participants' judgments of moral appropriateness. The type of perspective-taking accessibility significantly influenced participants' judgments of moral appropriateness, $F(1, 718) = 141.20$, $p < .001$,

Figure 4
The Experimental Procedure for Experiment 3



Note. Moral Judgment Task 1 required participants to make judgments about utilitarian AVs, and Moral Judgment Task 2 required participants to make judgments about nonutilitarian AVs. Moral judgment tasks (1 and 2) were presented in a randomized order (as denoted by R). AV = autonomous vehicle; PT = perspective-taking.

$\eta_p^2 = .16$. Specifically, participants who received scenarios with full perspective-taking accessibility were more utilitarian in their judgments of moral appropriateness ($M = 4.59$, $SD = 3.03$) than participants who received scenarios with partial perspective-taking accessibility ($M = 1.85$, $SD = 3.19$).

The main effect of type of scenario was not statistically significant, $F(1, 718) = 0.22$, $p = .640$, $\eta_p^2 = .00$, nor was the interaction effect of type of perspective-taking accessibility and type of scenario, $F(1, 718) = 0.07$, $p = .796$, $\eta_p^2 = .00$, nor the interaction effect of type of cognitive priming and type of scenario, $F(2, 718) = 0.06$, $p = .944$, $\eta_p^2 = .00$. The main effect of type of cognitive priming was significant with a small effect size, $F(2, 718) = 8.59$, $p < .001$, $\eta_p^2 = .02$. In particular, participants in the early prime condition ($M = 3.61$, $SD = 3.38$) were more utilitarian in their moral judgments than participants in

the no prime condition ($M = 2.57$, $SD = 3.34$), $t(495) = -3.46$, $p < .001$, Cohen's $d = -.311$. Likewise, participants in the late prime condition ($M = 3.47$, $SD = 3.39$) were more utilitarian in their moral judgments than participants in the no prime condition ($M = 2.57$, $SD = 3.34$), $t(492) = 2.98$, $p = .003$, Cohen's $d = -.268$. However, there was no significant difference in utilitarian moral judgments between participants in the early prime ($M = 3.61$, $SD = 3.38$) and late prime conditions ($M = 3.47$, $SD = 3.39$), $t(467) = -0.45$, $p = .651$, Cohen's $d = -.042$.

Moreover, while the interaction of type of perspective-taking accessibility and type of cognitive priming was not statistically significant, the results did show a pattern, $F(2, 718) = 2.17$, $p = .115$, $\eta_p^2 = .01$. Given the pattern ($F = 2.17$, but nonsignificant), as with Experiments 1 and 2, we ran a simple-effect test for the effect of cognitive prime by type of perspective-taking accessibility.

Partial Perspective-Taking Accessibility. A follow-up simple-effect test revealed that with partial perspective-taking accessibility, the main effect of type of cognitive priming significantly influenced respondents' judgments of moral appropriateness, $F(2, 365) = 9.30, p < .001, \eta_p^2 = .05$. Specifically, the results revealed that with partial perspective-taking accessibility, participants who received an early prime ($M = 2.37, SD = 3.38$) were more utilitarian in their moral judgments than participants who received no prime ($M = .90, SD = 2.57$), $t(250) = -3.9, p < .001$, Cohen's $d = -.490$. Moreover, participants who received a late prime ($M = 2.37, SD = 3.37$) were also more utilitarian in their judgments compared to participants who received no prime ($M = .90, SD = 2.57$), $t(249) = -3.9, p < .001$, Cohen's $d = -.491$. However, there was no significant difference in moral judgments between participants who received an early prime ($M = 2.37, SD = 3.38$) and participants who received a late prime ($M = 2.37, SD = 3.37$), $t(237) = 0.00, p = 1$, Cohen's $d = .000$ (see Figure 5).

Full Perspective-Taking Accessibility. Importantly and in contrast to the moral judgments with

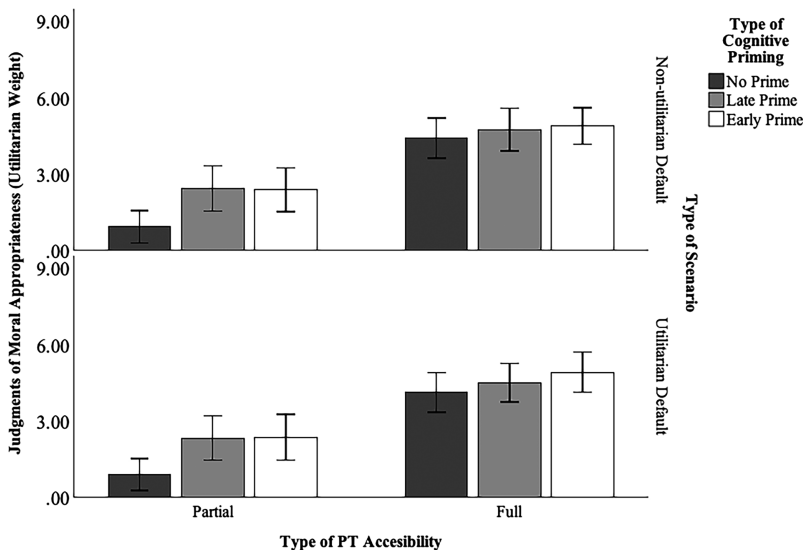
partial perspective-taking accessibility, with full perspective-taking accessibility, respondents' judgments of moral appropriateness were not influenced by the type of cognitive prime, $F(2, 353) = 1.35, p = .262, \eta_p^2 = .01$ (see Figure 5).

Judgment Time

A $2 \times 3 \times 2$ ANOVA was conducted to explore the influence of type of perspective-taking accessibility, type of cognitive priming, and type of scenario on participants' judgment time. The results revealed the main effect of type of perspective-taking accessibility did not significantly influence judgment time, $F(1, 718) = 0.24, p = .627, \eta_p^2 = .00$. Furthermore, the main effect of type of cognitive priming on judgment time was also not statistically significant, $F(2, 718) = 0.28, p = .760, \eta_p^2 = .00$. Similarly, type of scenario did not statistically influence judgment time scenario, $F(1, 718) = 0.02, p = .894, \eta_p^2 = .00$. Moreover, the two-way interactions of type of perspective-taking accessibility and type of cognitive priming did not significantly influence judgment time, $F(2, 718) = 0.30, p = .74, \eta_p^2 = .00$. This was also the

Figure 5

Participants' Judgments of Moral Appropriateness (Utilitarian Weight) in Experiment 3



Note. Positive mean values indicate participants' preference for utilitarian autonomous vehicles over nonutilitarian autonomous vehicles. Error bars represent the 95% confidence intervals of the mean. PT = perspective-taking.

case for the interaction of type of perspective-taking accessibility and type of scenario, $F(1, 718) = 0.07, p = .796, \eta_p^2 = .00$, which did not significantly influence judgment time. The interaction of type of cognitive priming and type of scenario was also not statistically significant, $F(2, 718) = 0.07, p = .937, \eta_p^2 = .00$. Finally, the three-way interaction of type of perspective-taking accessibility, type of cognitive priming, and type of scenario was also nonsignificant, $F(2, 718) = 0.21, p = .808, \eta_p^2 = .00$.

Discussion

As in Experiments 1 and 2, the results from Experiment 3 confirmed the effect of full perspective-taking accessibility on participants' judgments of moral appropriateness. Specifically, with full perspective-taking accessibility, participants were more utilitarian in their judgments than the participants who judged the scenarios with partial perspective-taking accessibility.

In Experiments 1 and 2, we found that placing the anagram task after the moral scenario induced participants' utilitarian moral judgments. Accordingly, in Experiment 3, we explored whether placing the anagram task before the moral scenario would have a similar effect on participants' judgments. The results revealed that cognitive priming significantly influenced participants' judgments of moral appropriateness only in the conditions with partial perspective-taking accessibility. Specifically, participants who received an early or late prime were also more utilitarian in their judgments compared to participants who received no prime. However, crucially, the results revealed no statistically significant difference between receiving an early and late prime—the properties of the anagram task itself (and not a distraction period between the scenario and judgment task) enhance participants' moral utilitarian behavior.

General Discussion

Judgments of Moral Appropriateness

In three experiments, we have explored the influence that full perspective-taking accessibility in hypothetical moral scenarios has on participants' moral judgments. Participants who were presented the perspective of both the autonomous vehicle passenger and a pedestrian (full perspective-taking

accessibility) were more utilitarian in their moral judgments than participants who were presented with the perspective of the passenger only (partial perspective-taking accessibility). This finding was consistent across all three experiments with medium to large effect sizes according to Cohen's (1988) guidelines. With partial perspective-taking accessibility, participants are biased by the singular perspective of the passenger. For participants to acquire alternative perspectives, they would need to mentally simulate these. However, the simulation of inaccessible information is effortful and not guaranteed to occur spontaneously (Kahneman, 2003; Kusev et al., 2016). Hence, they tend to be less approving of utilitarian vehicles since they are making judgments from the perspective of an autonomous vehicle passenger. With full perspective-taking accessibility, participants are granted access to both situational perspectives and are not required to mentally simulate missing information. Accordingly, the perceived overall benefit of a utilitarian vehicle is enhanced when participants appreciate that they could be in either situation during an autonomous vehicle crash—as a passenger or a pedestrian (Martin, Kusev, & van Schaik, 2021).

In Experiments 1 and 2, we introduced cognitive priming tasks where participants made judgments after contemplating the scenario for 3 min (task-relevant prime) or after undertaking a cognitively demanding anagram task (task-irrelevant prime). We reasoned that although partial perspective-taking accessibility biases participants' judgments in favor of the autonomous vehicle passenger, it is possible that undertaking cognitive priming may enhance participants' utilitarian judgments in the absence of accessible information. Indeed, in Experiments 1 and 2, we found that under conditions of partial perspective-taking accessibility, participants who underwent the task-irrelevant prime (solved anagrams) were more approving of utilitarian autonomous vehicles than participants who underwent the task-relevant prime or experienced no prime. Although the effect size was not large, this finding reveals that undertaking a challenging anagram task rather than thinking carefully about the scenario enhanced utilitarian judgments.

The increased approval of utilitarian autonomous vehicles after a task-irrelevant cognitive prime points to at least two explanations. The first, in line with Dijksterhuis and Nordgren's (2006) UTT, would indicate that the anagram task

serves as a distraction from the moral scenario, with the high-load task preventing conscious processing of scenario details and instead inducing “superior” unconscious processing resulting in utilitarian judgments. According to this explanation, both properties of the task itself and its role as a distraction task are necessary to enhance utilitarian judgments.

The second explanation is the anagram task serves as a cognitive prime that activates participants’ analytical thinking and has carryover effects to the moral judgment task. Paxton et al. (2011) demonstrated how utilitarian responses to moral dilemmas are enhanced after partaking in and obtaining correct answers to cognitive reflection tests. The authors suggest that working on and obtaining correct solutions to cognitive reflection tests involves analytical thinking while suppressing intuitive responses. Moreover, the link between analytical thinking and utilitarian moral judgments is well established in the decision-making literature (e.g., Barque-Duran & Pothos, 2021; Greene et al., 2001, 2004; Patil et al., 2021). For example, Greene et al. (2001) demonstrated that activation of working memory regions predicts utilitarian judgments in response to moral scenarios. Hence, it is reasonable to suggest that in Experiments 1 and 2, the anagram task has served as a prime for analytical thinking, which in turn enhanced utilitarian judgments. According to this explanation, only the properties of the anagram task itself are necessary to enhance utilitarian judgments.

In Experiment 3, we explored whether the influence of the anagram task on participants’ utilitarian judgments of moral appropriateness remained even when the anagram task was not used as a distraction. In the early prime condition, participants underwent the anagram task → moral scenario → judgment task ordering, whereas participants in the late prime condition were presented with the moral scenario → anagram task → judgment task ordering. Participants in the no prime condition were presented with the moral scenario, followed by the judgment task. We found that relative to the no prime condition, utilitarian judgments were enhanced for all participants who undertook the anagram task, regardless of whether it served as a distractor task (late prime) or not (early prime). Particularly, there was no statistical difference in participants’ utilitarian judgments between the early and late prime

conditions. Hence, we conclude that properties of the anagram task itself were influential in enhancing utilitarian judgments. Hence, task-irrelevant cognitive priming and not mere distraction boosts participants’ utilitarian judgments.

Interestingly, while utilitarian judgments vary as a function of cognitive priming when perspective-taking information is not fully accessible, this is not the case for participants who have access to full perspective-taking in moral scenarios. With full perspective-taking accessibility, participants were more approving of utilitarian autonomous vehicles regardless of the type of cognitive priming task employed, demonstrating further the importance of accessible information in informing consistent utilitarian moral judgments (see Kusev et al., 2016; Martin, Kusev, et al., 2021; Martin, Kusev, & van Schaik, 2021; Martin et al., 2017).

Judgment Time

In Experiment 2, there was no difference in judgment time between the task-irrelevant prime and no prime conditions. However, participants in the task-relevant prime condition took more time to reach their moral judgments than participants in the task-irrelevant and no prime conditions. While we can only speculate, we reason that since the task-relevant prime prepared participants to contemplate scenario details, it is possible that this induced participants to take the same approach with the judgment task. Hence, extended contemplation of the judgment task took more time. However, counter to previous studies (Suter & Hertwig, 2011), under conditions of partial perspective-taking accessibility, taking more time to make a moral judgment did not enhance utilitarian judgments. In Experiment 3, where the variable type of cognitive priming referred to early task-irrelevant prime, late task-irrelevant prime, and no prime, there was no statistically significant difference in the time taken to make moral judgments across the cognitive priming conditions.

Limitations

Since we utilized the UTT experimental paradigm in our work, we acknowledge potential methodological limitations associated with this paradigm including variability in utilitarian

behavior as a function of the experimental configuration. For instance, in our study, we have only explored the use of an anagram task as a task-irrelevant prime. It is possible that variations in task-irrelevant prime could produce variations in utilitarian responses to the moral scenario, particularly with relation to task difficulty. For example, in a nonmoral decision-making study, [McMahon et al. \(2011\)](#) found that with increasing difficulty of the priming task, participants' decision optimality decreased. Furthermore, in Experiments 1 and 2, the task-relevant prime required participants to consider the moral scenario carefully for a fixed 3 min. In the present experiments, we did not explore alternative methods of operationalizing this priming task. For example, previous studies have found that allowing participants to contemplate at their own pace (rather than under timed conditions) enhances their utilitarian judgments ([Payne et al., 2008](#); [Suter & Hertwig, 2011](#)).

Our findings from Experiment 3 reveal that a task-relevant prime enhanced utilitarian judgments in response to moral scenarios that offered only partial perspective-taking accessibility. We have speculated that task-irrelevant priming may activate analytical thinking (resulting in enhanced utilitarian judgments) and have supported this claim with evidence from experimental research in cognition and neuropsychology. However, we did not directly measure analytical thinking. Instead, we have made this inference based on the experimental factors that significantly influence the behavioral measures (i.e., differences in utilitarian judgments across experimental groups). Thus, we invite future studies to propose appropriate measures of analytical thinking and to explore directly the link between task-irrelevant priming and analytical thinking and its influence on moral utilitarian judgments.

Conclusion

The experiments presented herein reveal that participants are more prosocial (utilitarian) in their moral judgments when they are presented with hypothetical moral scenarios that offer full perspective-taking accessibility rather than partial perspective-taking accessibility. However, when perspective-taking accessibility is only partially accessible, task-irrelevant priming enhances prosocial utilitarian judgments. Moreover, when perspective-taking is fully accessible, participants demonstrate enhanced prosocial judgments and these judgments are consistent across cognitive

priming tasks. Our experimental findings carry significant implications for how inconsistencies in everyday moral judgments may stem from a deficiency in perspective-taking. We argue that to reduce bias and promote impartiality, it is essential that perspective-taking tasks are presented with full perspective-taking accessibility. Humans should not be expected to mentally simulate perspective-taking information that is not accessible. Moreover, while undertaking an irrelevant cognitive prime may reduce participants' bias in scenarios with partial perspective-taking accessibility, decision-makers should not be expected to undertake primes to inform their judgments. Instead, people require accessible information in order to make informed judgments. Accordingly, our findings offer evidence that providing participants with full accessibility to situational perspectives boosts their utilitarian prosocial behavior.

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