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## Disfluent fonts lead to more utilitarian decisions in moral dilemmas

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Previous research suggests that utilitarian decisions to moral dilemmas often stem from analytic, controlled cognitive processes. Furthermore, processing disfluency can trigger analytic thinking and improve performance on tasks that require logic and cognitive reflection. In the present study we investigated how processing fluency affects the readiness with which people give utilitarian responses to both personal and impersonal dilemmas. Participants were presented in two different experimental blocks with dilemmas written in both easy- (fluent) and hard-to-read (disfluent) fonts. We expected that dilemmas written in a disfluent font would be associated with more utilitarian responses. Results supported this prediction, albeit only when the disfluent dilemmas appeared first, showing that participants endorsed more utilitarian actions in the disfluent condition than in the fluent condition across dilemma types. These data suggest that increasing processing disfluency by manipulating the font affects decisions in the moral domain.

People are often faced with difficult moral dilemmas that can have important life changing consequences. Accordingly, an increasing body of work has sought to identify the different factors that affect moral judgments and decisions, as well as the processes underlying people's moral choices.

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The dual process theory of moral decision-making (Greene, Sommerville, Nystrom, Darley, & Cohen, 2001; Greene, Nystrom, Engell, Darley, & Cohen, 2004) is a prominent psychological approach that distinguishes between two different systems (e.g., Kahneman & Frederick, 2002; Sloman, 1996), namely an intuitive emotional system, which tends to be fast and automatic, and a controlled cognitive one, which tends to be slow and deliberate. According to this theory, decisions involving intuition and emotion generally support *deontological* judgments in moral dilemmas, favoring the essential rights of a person (e.g., one should not sacrifice an individual, even if this implies saving a larger number of people). Conversely, controlled cognitive processing favors *utilitarian* judgments, which lead to the greater good (e.g., one should aim to save the larger number of people, even if this means sacrificing an individual)<sup>1</sup>.

Numerous studies manipulating cognitive and emotional factors have provided support for the claim that utilitarian and deontological responses to moral dilemmas rely on dissociable cognitive processes. To illustrate, the prevalence of utilitarian responses has been found to increase as a result of manipulations that promote analytic over intuitive emotional processes. These include allowing participants more time to respond (Suter & Hertwig, 2011), presenting dilemmas in a foreign language (Costa et al., 2014; Costa, Vives, & Corey, 2017), or requiring participants to complete the *Cognitive Reflection Test* (CRT; Frederick, 2005) before they respond to dilemmas (Paxton, Ungar, & Greene, 2012). Utilitarian responses are also more common among individuals with a rational style of thinking (Bartels, 2008) and with higher working memory capacity (Moore, Clark, & Kane, 2008). Conversely, manipulations that hamper controlled cognitive processes such as induced stress (Youssef et al., 2012) and cognitive load (Trémolière, De Neys, & Bonnefon, 2012) often result in a higher prevalence of deontological responses. Taken together, these studies suggest that increased analytic thinking constitutes a key path to utilitarian responses to moral dilemmas (but see Baron, Scott, Fincher, & Metz, 2015; Gürçay & Baron, 2017).

Processing fluency (i.e., the experienced ease with which one processes information) may be another factor influencing moral reasoning, as it is a pervasive metacognitive cue that can have a substantial influence

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<sup>1</sup> While Greene et al.'s (2001, 2004) dual process model has provided the basis for a wide range of interesting studies about the role that emotion and cognition play in moral decision-making, it is not free from criticism. Many critiques focus on the vision of emotion and cognition working as two dissociable, antagonist and competitive cerebral processes, and they propose instead an interaction of both in moral decision-making (e.g., Duke & Bègue, 2015; Gürçay & Baron, 2017; Moore, Clark, & Kane, 2008).

on reasoning and judgment across many domains (Alter & Oppenheimer, 2009). These include, for example, judgments of truth (Reber & Schwarz, 1999) and confidence (Alter, Oppenheimer, Epley, & Eyre, 2007), where fluent stimuli are judged as truer and inspire more confidence than the same stimuli presented in a disfluent way. Studies have used a vast array of fluency manipulation techniques, including the visual ease with which stimuli are perceived (Alter et al., 2007; Reber & Schwarz, 1999), the ease with which stimuli are retrieved from memory (Bornstein & D'Agostino, 1992) and priming procedures (Swami, Voracek, Stieger, Tran, & Furnham, 2014). A common processing fluency manipulation has been to present stimuli either in an easy- or difficult-to-read font (Alter & Oppenheimer, 2009). Fonts that are harder to read are thought to increase experiences of processing difficulties (i.e., disfluency), which in turn can serve as a cue that more deliberative and effortful cognitive processes need to be activated (Alter et al., 2007; Alter & Oppenheimer, 2009). Supporting this idea, there is evidence that processing disfluency can lead to better performance on different cognitive tasks. For example, presenting information in a difficult-to-read font improves performance on the CRT and syllogistic reasoning tasks (Alter et al., 2007), the Moses Illusion task (Song & Schwarz, 2008; Swami et al., 2014) and beyond the laboratory, in educational settings (Diemand-Yauman, Oppenheimer, & Vaughan, 2010). Processing disfluency is also associated with lower belief in conspiracy theories (Swami et al., 2014). Taken together, the findings reviewed suggest that processing disfluency can trigger *analytic thinking* strategies, which may help overcome initial intuitive responses<sup>2</sup>.

However, it is currently unclear whether perceptual disfluency can also affect people's responses to moral dilemmas. To the best of our knowledge, only one study (Laham, Alter, & Goodwin, 2009) has examined a related issue, namely the role of fluency on evaluations of moral transgressions conducted by others (e.g., a family eating their dead dog for dinner). In this study, transgressions presented in an easy-to-read font were judged as less morally wrong than those presented in a difficult-to-read font. The authors argued that this tendency was due to the fact that the experience of fluency is hedonically marked, which would trigger a positive affective state. Relatedly, there is evidence that processing fluency can affect interpersonal evaluations, leading to more positive evaluations of individuals who are processed fluently, and more negative evaluations of

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<sup>2</sup> Although several studies have found that disfluent fonts improve performance on different cognitive tasks, some studies have failed to replicate this effect (Meyer et al., 2015), or found it limited to individuals with high cognitive ability (Thompson et al., 2013).

those who are processed disfluently (Lick & Johnson, 2015). Taken together, these studies suggest that fluency may indeed affect some aspects of moral reasoning. However, it is unclear whether fluency can affect how people respond to dilemmas involving a proposed utilitarian action (for a distinction between deciding in moral dilemmas and reacting to moral transgressions, see Monin, Pizarro, & Beer, 2007). Our main goal in the current work was to investigate this issue.

As noted earlier, analytic thinking is thought to prompt utilitarian responses to moral dilemmas. If disfluency enhances analytic, controlled cognitive processing when people are faced with such dilemmas, then disfluency might result in more utilitarian responses. To investigate whether this is the case or not, we presented participants with a series of moral dilemmas, and manipulated the font in which these were displayed. Based on the work reviewed above, we hypothesized that participants would rate the proposed actions as more appropriate (i.e., more utilitarian responses) when dilemmas were displayed using a difficult-to-read (disfluent) font than when they were displayed using an easy-to-read (fluent) font (H1).

Additionally, we aimed to examine whether a potential effect of disfluency would generalize across different dilemma types, or whether it would be restricted to certain types of dilemmas. Based on Greene et al. (2001, 2004), we distinguished between personal dilemmas (where the proposed action leads to serious bodily harm to the victim or victims, and this harm is not the result of deflecting an existing threat) and impersonal ones (involving the deflection of a threat but no agency). As compared to impersonal dilemmas, personal ones often elicit heightened emotional reactions leading to more frequent deontological responses. Thus, manipulations promoting analytic processing can have a stronger effect on personal dilemmas, as such processing may help to overcome the initial emotional response triggered by these scenarios (Costa et al., 2014; Duke & Bègue, 2015; Koenigs et al., 2007). Therefore, we further hypothesized that any effect of processing fluency would be stronger for personal than for impersonal dilemmas (H2).

To exclude potential confounds of any effects of fluency, we recorded the time that participants spent reading the dilemmas, as well as participants' self-reported mood. Utilitarian responses can be more common when people are given more time to respond (Suter & Hertwig, 2011; but see Gürçay & Baron, 2017). Thus, dilemmas written in a disfluent font may elicit more utilitarian responses than those written in a fluent font simply because reading the former type of font takes longer, and not because of the metacognitive cue provided. Additionally, we assessed participants' mood because disfluent fonts may lead to a more negative mood (Alter et al.,

2007). Negative moods can prompt more systematic processing (Schwarz, Bless, & Bohner, 1991). Thus, disfluency could also result in more utilitarian responses through its negative effect on mood, independently of the metacognitive experience of fluency itself. Indeed, as noted earlier, there is some evidence that fluency may elicit positive affect, which might translate into more positive evaluations of moral transgressions or of other people (Laham et al., 2009; Lick & Johnson, 2015). There is also evidence that positive affect can lead to more utilitarian responses to moral dilemmas (Valdesolo & DeSteno, 2006). Hence, we examined whether our fluency manipulation induced any changes in mood by registering participants' self-reported mood after both fluent and disfluent blocks of moral dilemmas.

## METHOD

**Participants.** Fifty one undergraduate students (38 female, age range 17–34,  $M = 18.76$ ,  $SD = 2.33$ ) recruited from the Faculty of Psychology of the University of Granada took part in the study in exchange of course credit. All the procedures were approved by the local Ethics Committee on Human Research.

**Materials and Apparatus.** All materials were presented using the survey programming software Unipark ([www.unipark.de](http://www.unipark.de)).

### *Dilemmas*<sup>3</sup>

Two short dilemmas without moral content were used as practice trials, to familiarize participants with the structure of the decision-making task and with the fluent and disfluent conditions. The dilemmas (*Brownies* and *Standard Turnips*) were taken from Greene et al. (2004). They were followed by a question in which participants had to rate the appropriateness of the proposed action using a scale ranging from 1 (*definitely no*) to 6 (*definitely yes*).

We used four dilemmas, including two fillers (*Stock Tip* and *Taxes*), and two moral (*Crying Baby* and *Burning Building*) dilemmas, taken from Moore et al. (2008). The two moral dilemmas had an almost identical number of words (*Crying Baby* = 126; *Burning Building* = 129), and each of these dilemmas had both a personal and an impersonal version (with exactly the same number of words), resulting in a total of six dilemmas. In all cases participants were asked to indicate how appropriate they felt the proposed action was (e.g., *Would it be appropriate for you to asphyxiate your child in*

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<sup>3</sup> All dilemmas used in this study are included in Appendices A (Spanish) and B (English).

order to save yourself and the other hidden people?) using the same response scale as in the practice dilemmas<sup>4</sup>.

All practice trials, dilemmas, and associated questions were written using Myriad Web 10-point font. In the disfluent font condition the words were at a 15% dark scale and italicized (see Alter et al., 2007, for a similar procedure).

This is an example of the fluent font.

*This is an example of the disfluent font.*

#### *Mood questions*

Following Alter et al. (2007), participants were asked to evaluate their mood on a response scale ranging from 1 (*very sad*) to 7 (*very happy*). Mood measurements were taken at three different points in the experiment, as will be described below.

**Design and Procedure.** We used a 2 (Fluency: Fluent vs. Disfluent) x 2 (Moral Dilemma Type: Personal vs. Impersonal) repeated measures design. Participants viewed all six dilemmas, presented in two blocks, each consisting of three dilemmas: the personal version of one of the moral dilemmas, the impersonal version of the other moral dilemma, and one of the filler dilemmas. That is, participants were presented with one block composed of the personal version of the *Crying Baby*, the impersonal version of the *Burning Building*, and the *Stocktip* dilemma, and another block composed of the impersonal version of the *Crying Baby*, the personal version of the *Burning Building*, and the *Taxes* dilemma. The order of presentation of dilemmas within each block was randomized. Each participant saw one block written in the fluent font and the other block written in the disfluent font. The order of blocks and fluency conditions was counterbalanced. To examine whether the specific order in which participants viewed the two blocks of dilemmas interacted with any effects of fluency, we included order as a factor in the analyses reported below.

Upon arrival, participants sat in front of individual computer screens. They read and signed a consent form and subsequently read instructions asking them to imagine that the described situations were real, and that no other options (besides the two presented) were possible. To ensure that participants read and considered each dilemma, they were informed that

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<sup>4</sup> The moral dilemmas were sacrificial and self-benefit (the life of the person who commits sacrifice is also in danger). They were slightly modified to meet the criteria of *unavoidable death* (the potential victim of the sacrifice would die even if no action were taken). Moore et al. (2008) found that this kind of dilemmas was more sensitive to capture differences in participants' working memory capacity. Thus, we reasoned that such dilemmas may be more sensitive to any effect of manipulating fluency.

they would have to answer questions about the content of the dilemmas, after all of them had been presented (e.g., 'In the story of the baby, where were the people seeking refuge found?' – the basement).

Before the experimental blocks, participants answered basic demographic questions and responded to the first mood question. Next, they were given the practice trials, one written in the fluent font (*Brownies*) and the other one in the disfluent font (*Standard Turnips*), and rated the appropriateness of the proposed actions using the response scale described above. Participants were then presented with the first block of dilemmas. In all cases they were asked to read the dilemma and click on a 'continue' button to proceed to another screen displaying the corresponding question and response scale. Times spent reading each dilemma were unlimited and were recorded.

Next, participants rated their mood again and were subsequently presented with the second block of dilemmas, following the same procedure used with the first block. The font used and the identity of dilemmas varied according to the counterbalancing of both factors.

Finally, participants were asked to respond to the questions concerning the content of dilemmas (two for the fillers and two for the moral dilemmas), followed by the final mood assessment.

## RESULTS

First, to test our hypotheses concerning the effect of fluency we ran a 2 (Fluency: fluent vs. disfluent, within-subjects) x 2 (Dilemma Type: personal vs. impersonal, within-subjects) x 2 (Order of experimental blocks, between-subjects, fluent first,  $n_1 = 25$ , disfluent first,  $n_2 = 26$ ) mixed Analysis of Variance (ANOVA) on participants' responses to the dilemmas (see Table 1 for the means and standard errors for each combination of Fluency, Dilemma Type, and Order). This analysis yielded a main effect of Fluency,  $F(1, 49) = 5.60$ ,  $p = .02$ ,  $\eta_p^2 = .10$ , reflecting that the disfluent condition was associated with higher acceptability ratings than the fluent condition (Disfluent  $M = 3.29$ ,  $SE = .15$ ; Fluent  $M = 3.01$ ,  $SE = .18$ ), supporting hypothesis H1. However, this pattern was qualified by an interaction between Fluency and Order,  $F(1, 49) = 5.60$ ,  $p = .02$ ,  $\eta_p^2 = .10$ . A post hoc Tukey's test for unequal group sizes revealed that the effect of fluency was significant when the disfluent block was presented first,  $p = .008$ , but not when the fluent block was presented first,  $p = 1.00$  (see Figure 1). The analysis also revealed a main effect of Dilemma Type,  $F(1, 49) = 50.18$ ,  $p < .001$ ,  $\eta_p^2 = .51$ , suggesting that participants rated the actions

proposed in impersonal dilemmas as more acceptable than those proposed in personal ones, as expected (Impersonal  $M = 3.59$ ,  $SE = .16$ ; Personal  $M = 2.71$ ,  $SE = .17$ ). However, we did not find evidence for our hypothesis that effects of processing fluency would be stronger for personal dilemmas than for impersonal ones (H2), as the interaction between Fluency and Dilemma Type was not significant,  $F < 1$ . No other main effect or interactions were significant, highest  $F(1, 49) = 1.48$ ,  $p = .23$ ,  $\eta_p^2 = .03$ .

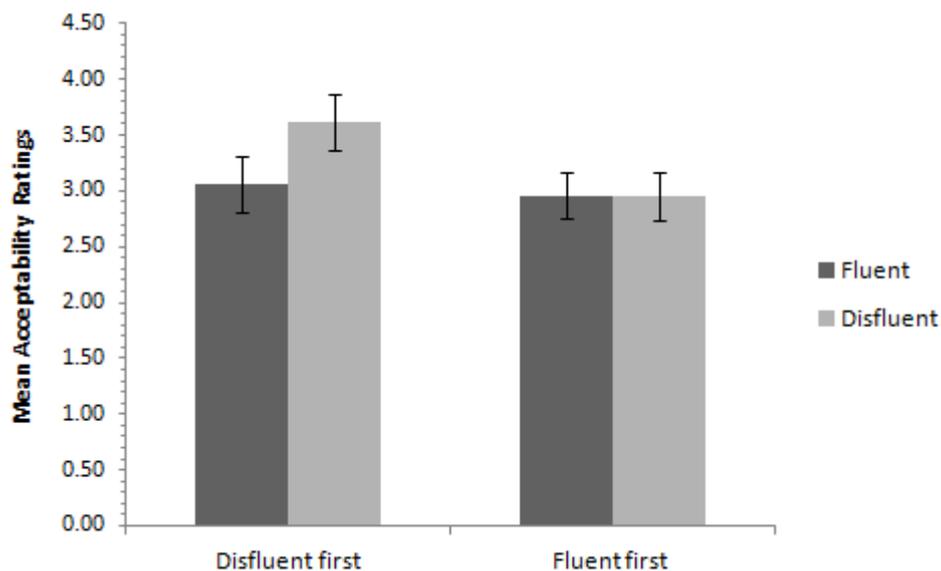
**Table 1. Responses to moral dilemmas.**

<b>Dilemma</b>	<b>Order</b>	<b><i>M</i> (<i>SE</i>)</b>
<i>Fluent</i>		
Personal	Fluent- Disfluent	2.72 (.31)
	Disfluent_Fluent	2.54 (.30)
Impersonal	Fluent- Disfluent	3.20 (.31)
	Disfluent_Fluent	3.58 (.30)
<i>Disfluent</i>		
Personal	Fluent- Disfluent	2.32 (.30)
	Disfluent_Fluent	3.27 (.29)
Impersonal	Fluent- Disfluent	3.60 (.31)
	Disfluent_Fluent	3.96 (.30)

Note. Mean acceptability ratings ( $M$ ) and standard errors ( $SE$ ) as a function of Fluency (Fluent vs. Disfluent), Type of Dilemma (Personal vs. Impersonal), and Order of blocks (Fluent or Disfluent first).

Although the analyses above supported our hypothesis concerning the effect of fluency (H1), from these analyses alone we cannot firmly conclude that disfluent fonts lead to more utilitarian responses. As noted above, differences between fluent and disfluent dilemmas were only observed when the disfluent dilemmas were presented first. Thus, it is possible that this effect is due to the order of presentation and not to the fluency manipulation itself. In order to solve the potential confound between our fluency manipulation and order, we selected only the first block for each participant (that was either fluent or disfluent) and analyzed fluency as a

between subject variable<sup>5</sup> (means for Personal dilemmas, Fluent  $M = 2.72$ ,  $SE = .30$ , Disfluent  $M = 3.27$ ,  $SE = .27$ ; Impersonal, Fluent  $M = 3.20$ ,  $SE = .31$ , Disfluent  $M = 3.96$ ,  $SE = .30$ ). The 2 (Dilemma Type: personal vs. impersonal, within-subjects)  $\times$  2 (Fluency: fluent vs. disfluent, between-subjects) mixed ANOVA yielded a significant main effect of Dilemma Type,  $F(1, 49) = 4.62$ ,  $p = .04$ ,  $\eta_p^2 = .09$ , indicating that utilitarian responses were higher for impersonal dilemmas (Impersonal  $M = 3.58$ ,  $SE = .21$ ; Personal  $M = 2.99$ ,  $SE = .21$ ). This analysis also revealed a marginally significant main effect of Fluency  $F(1, 49) = 4.00$ ,  $p = .05$ ,  $\eta_p^2 = .07$ , reflecting higher acceptability ratings for disfluent dilemmas than for fluent ones, as expected (Disfluent  $M = 3.61$ ,  $SE = .23$ ; Fluent  $M = 2.96$ ,  $SE = .23$ ). The interaction between Dilemma Type and Fluency, however, was not significant,  $F < 1$ . Thus we basically obtained the same pattern of results in this latter analysis without the potential confound arising between fluency and order of presentation.

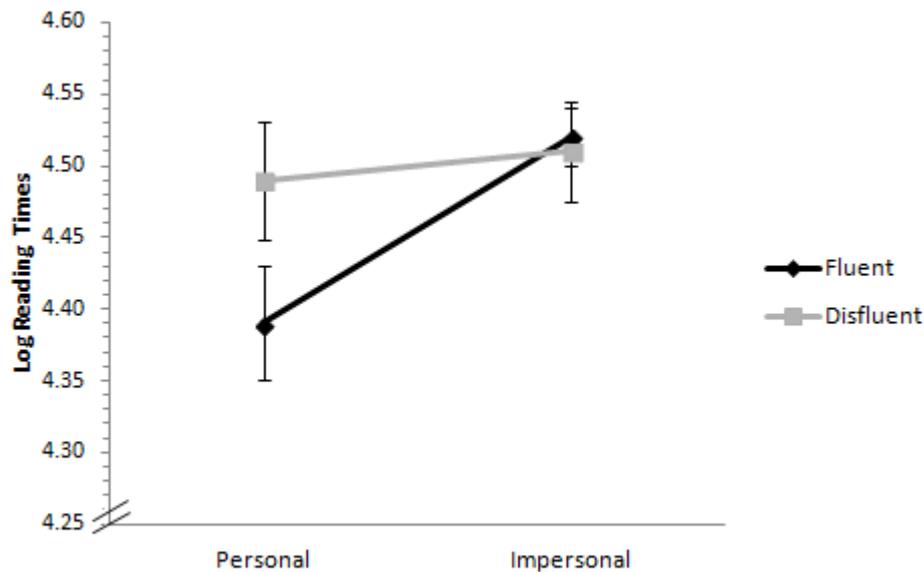


**Figure 1.** Mean acceptability ratings for the moral dilemmas presented in fluent and disfluent conditions, as a function of the order of experimental blocks (disfluent vs. fluent first). Error bars represent  $\pm 1$  SE (standard error).

<sup>5</sup> We thank an anonymous reviewer for this insight.

Next, we examined whether the time that participants spent reading dilemmas varied as a function of fluency or dilemma type. To this end we ran another 2 (Fluency: fluent vs. disfluent, within-subjects) x 2 (Dilemma Type: personal vs. impersonal, within-subjects) x 2 (Order of experimental blocks, between-subjects) mixed ANOVA on reading times. As reading-time frequency distributions departed from normality, we log-transformed the data ( $\log_{10}$ ), which improved both skewness and kurtosis. The ANOVA on log-transformed times revealed a main effect of Dilemma Type,  $F(1, 49) = 10.34$ ,  $p = .002$ ,  $\eta_p^2 = .17$ , whereby participants took longer to read impersonal dilemmas than personal ones (Impersonal  $M = 4.51$ ,  $SE = .02$ ; Personal  $M = 4.44$ ,  $SE = .03$ ). However, the main effect of Fluency was not significant,  $F(1, 49) = 1.47$ ,  $p = .23$ ,  $\eta_p^2 = .03$ . The analysis yielded an interaction between Fluency and Order that approached conventional levels of significance,  $F(1, 49) = 3.92$ ,  $p = .053$ ,  $\eta_p^2 = .07$ . However, post hoc tests did not reveal any significant difference between means, lowest  $p = 0.12$ .

Interestingly, this analysis also revealed an interaction between Fluency and Dilemma Type that approached conventional levels of significance,  $F(1, 49) = 3.85$ ,  $p = .055$ ,  $\eta_p^2 = .07$  (see Figure 2). A Tukey's HSD post hoc test revealed a significant difference in reading times between personal fluent and impersonal fluent ( $p = .01$ ), as well as between personal fluent and impersonal disfluent dilemmas ( $p = .03$ ). No other differences were significant ( $p_s > .08$ ). Therefore, we did not find evidence that participants spent longer overall reading the disfluent dilemmas than the fluent ones, either for personal or for impersonal dilemmas. The finding that participants took less time to read personal vs. impersonal fluent dilemmas is consistent with the notion that personal dilemmas produce quicker emotional responses that trigger deontological responses.



**Figure 2. Mean log-transformed reading times for personal and impersonal moral dilemmas, as a function of the fluency manipulation. Error bars represent  $\pm 1$  SE (standard error).**

A final analysis was performed to examine whether Fluency had an effect on participants' self-reported mood. To this end, we ran a mixed ANOVA with Timing of assessment (3 levels: Before, Middle, and End) as within subjects factor, and Order (Fluent first vs. Disfluent first) as the between subjects factor. This analysis revealed a main effect of Timing of assessment,  $F(2, 98) = 31.19, p < .001, \eta_p^2 = .39$  (Before  $M = 5.22, SE = .12$ ; Middle  $M = 4.45, SE = .15$ ; End  $M = 4.53, SE = .13$ ). A Tukey's HSD post hoc test revealed that participants' mood was more positive before starting the experiment ( $M = 5.22$ ), than both after the first block of dilemmas ( $M = 4.45$ ),  $p < .001$ , and at the end ( $M = 4.53$ ),  $p < .001$ ; there was no significant change between those last two ratings,  $p = .74$ . The main effect of Order and the interaction between Order and Timing of assessment were not significant, largest  $F < 1$ . That is, participants' mood became more negative after the first block and stayed that way after the second block, independently of whether fluent or disfluent fonts were presented first. This suggests that disfluency itself did not lead to a more negative mood (or fluency to a more positive one). A further analysis contrasting pre and post mood measures (before and after the first block of dilemmas, within-subject) being this fluent or disfluent (between-subject) confirmed a reduction of mood from pre to post measures,  $F(1, 49) = 54.51, p < .001$ ,

$\eta_p^2 = .53$ , but not a difference between fluent and disfluent blocks,  $F < 1$ , or a block by mood interaction,  $F < 1$ . Therefore, we did not find evidence of a mood change induced by fluency or disfluency, just a slight reduction in mood from the start to the end of the completion of the first block of trials (Before fluency  $M = 5.16$ ,  $SE = .17$ ; After fluency  $M = 4.32$ ,  $SE = .21$ ; Before disfluency  $M = 5.27$ ,  $SE = .16$ ; After disfluency  $M = 4.58$ ,  $SE = .20$ ).

## DISCUSSION

The goal of this experiment was to study the effect of disfluent fonts on judgments about moral dilemmas. We hypothesized that when participants read dilemmas in a difficult-to-read (disfluent) font vs. an easy-to-read (fluent) font, they would make more utilitarian decisions. We further hypothesized that this effect would be stronger for personal dilemmas than for impersonal ones. Our results supported our first hypothesis but not the second one. That is, participants endorsed more utilitarian actions in the disfluent condition than in the fluent condition across dilemma types, although they did so only when the disfluent block of dilemmas was presented in first place. However, analyses focusing on the first block of dilemmas revealed a similar pattern (i.e., more utilitarian responses in the disfluent condition), suggesting that the observed effect was not merely an artifact of the order of presentation of dilemmas. To the best of our knowledge, this is the first reported effect of processing fluency on decision-making concerning moral dilemmas.

Taken together, these findings support and extend previous work pointing to processing fluency as a metacognitive cue that can have a substantial influence on reasoning and judgments across many domains. Our findings are consistent with previous work demonstrating that disfluency enhances *analytic thinking*, thus improving performance in cognitive tasks (Alter et al., 2007; Diemand-Yauman et al., 2010; Song & Schwarz, 2008). Increased analytic thinking can also promote utilitarian responses to moral dilemmas (Bartels, 2008; Moore et al., 2008; Paxton et al., 2012). In our study, dilemmas written in disfluent fonts may have prompted analytic thinking in participants, leading to more utilitarian decisions.

Another possible explanation of our findings relates to the *perceived psychological distance* between stimuli, and how abstractly people represent them. Indeed, there is evidence that processing disfluency can increase perceived distance and lead to more abstract representations (Alter & Oppenheimer, 2008). At the same time, individuals in more abstract

mindsets who perceive some distance between themselves and the actions proposed in moral dilemmas may be more likely to give utilitarian responses, as they might focus more on the desirable consequences of the action than on the action itself. Supporting this notion, Aguilar, Brussino, and Fernández-Dols (2013) found that participants who were told that the proposed action (performing surgery on a man and sacrificing his life to save the lives of thousands) would happen in the distant future made more utilitarian choices than those who were told that it would happen in the near future.

In a similar vein, it could be argued that disfluent fonts prompted participants to be in more abstract mindsets in our study, resulting in more utilitarian responses. However, if this were the case, effects of disfluency should be stronger for personal dilemmas than for impersonal ones, as the killing proposed can be considered as more direct (Moore et al., 2008). Responses to personal dilemmas should thus be more affected by manipulations that increase the psychological distance between the action and its effect, making the killing appear more abstract and less direct. Our results, however, did not support this expectation, as disfluency increased utilitarian responses similarly for both personal and impersonal dilemmas.

Another potential alternative explanation to our finding that the disfluent font was associated with more utilitarian responses is that participants had to slow down to read such font. Indeed, manipulations that encourage people to spend more time reading moral dilemmas can increase the prevalence of utilitarian responses (Suter & Hertwig, 2011). However, our results also revealed that fluency itself did not reliably affect the time that participants spent reading dilemmas or their reported mood. This implies that the observed effect of disfluency cannot be attributed to the intervention of these potentially confounding factors. Interestingly, the results showed that, although there was no effect of fluency on reading time for either the impersonal or the personal dilemmas, participants took less time to read the fluent personal dilemmas than the fluent impersonal ones. This difference disappeared for the disfluent dilemmas where both personal and impersonal dilemmas recruited similar amounts of time to be read. This is consistent with the hypothesis that disfluency may trigger analytic processing in personal dilemmas, which is necessary to overcome the initial automatic emotional response of harm aversion, increasing processing time.

Similarly, our findings suggest that the observed effect of fluency on moral responses was not driven by a change in mood induced by our fluency manipulation. In our study, mood was slightly more negative after the completion of the first block of trials, regardless of whether this block was fluent or disfluent. This suggests that our one-item measure was

sensitive enough to detect this reduction following the first block of dilemmas, with independence of the font used. However, we did not find support for the notion that the experience of fluency triggers a positive affective state (see Laham et al., 2009; Lick & Johnson, 2015) or that disfluency triggers negative affect (Alter et al., 2009). One reason for these discrepancies with previous work may lay on the nature of our moral scenarios, which present difficult situations involving emotional reactions which may counteract the effect of any affect induced by fluency manipulations.

As with all studies, our investigation has some limitations that could be addressed in future work. First, it would be necessary to use additional disfluency manipulations beside perceptual fluency. Second, the dilemmas used may not reflect situations that people will generally encounter in real life, and thus it is not possible to determine to what extent our findings would generalize to more realistic situations. However, current technological developments such as self-driving cars have created real decision situations that resemble to some extent the kind of dilemmas used here (e.g., Bonnefon, Shariff, & Rahwan, 2016). Furthermore, there is evidence that the patterns of responses found for hypothetical dilemmas involving death generalize to dilemmas involving more common kinds of harm such as emotional and economic harm (Gold, Pulford, & Colman, 2013). Third, in the current study we used only four moral dilemmas. While the use of a limited number of dilemmas is not an unusual practice in the literature of moral decision making (e.g., Costa et al., 2014; Duke & Bègue, 2015), future research should include more diverse dilemmas to assess the generalizability of our findings. Finally, in the current work we did not directly assess the mechanisms underlying the effect of disfluency on utilitarian responses. Future work should examine this issue more directly. This could also help to shed light on our finding that the effect of disfluency held only when disfluent fonts were presented first.

The present work adds evidence to previous studies that highlight processing fluency as a pervasive metacognitive cue that affects a wide range of human judgments. Our findings suggest that increasing processing disfluency by manipulating the font used to present information not only reduces cognitive bias and promotes analytic thinking in mathematical or logic tasks, but can also affect judgments and decisions in the moral domain, biasing people's responses towards utilitarian decisions.

## RESUMEN

### El tipo de letra difícil de leer (“disfluent”) produce más decisiones utilitarias en dilemas morales

Investigaciones previas sugieren que las decisiones utilitarias a dilemas morales a menudo tienen origen en procesos cognitivos controlados y analíticos. Se sabe además que el procesamiento disfluyente puede inducir pensamiento analítico y mejorar la ejecución en tareas que requieren lógica y reflexión cognitiva. En este estudio se investigó cómo la fluencia de procesamiento afecta a la disponibilidad con la que se dan repuestas utilitarias a dilemas morales personales e impersonales. Se presentaron a los participantes dilemas escritos tanto en una letra fácil (*fluent*) como difícil de leer (*disfluent*) en dos bloques experimentales diferentes. Se esperaba encontrar una asociación entre este último tipo de dilemas y respuestas más utilitarias. Los resultados apoyaron esta predicción cuando los dilemas *disfluent* se presentaron en primer lugar, mostrando que los participantes suscribían más acciones utilitarias en la condición *disfluent* que en la *fluent*, tanto para dilemas personales como impersonales. Estos datos sugieren que incrementar la disfluencia de procesamiento manipulando el tipo de letra utilizado afecta a las decisiones en el ámbito moral.

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## APPENDIX A

### Dilemmas used in the present study (in Spanish)

Practice dilemmas (Greene et al., 2004), slightly modified to make them more familiar to Spanish participants.

#### *Brownies (59 words)*

Una chica decide hacer una tarta de chocolate. Busca en el libro de recetas y encuentra una para la que necesita una taza de nueces. Sin embargo, no le

gustan mucho las nueces, y sí las almendras. Afortunadamente tiene nueces y almendras suficientes en la despensa, de tal modo que podría hacer la tarta con cualquiera de las dos.

¿Sería apropiado que la chica sustituyese las nueces por almendras para evitar comer nueces?

*Standard Turnips* (48 words)

Un granjero conduce una cosechadora y está llegando a una bifurcación de un camino. Si elige el camino de la izquierda cosechará diez kilos de trigo, mientras que si elige el camino de la derecha cosechará veinte kilos. Si no hace nada la cosechadora girará a la izquierda.

¿Sería apropiado que el granjero girara a la derecha para cosechar veinte kilos en lugar de diez?

Non-Moral Dilemmas (Moore et al., 2008)

*Stock Tip* (94 words)

Eres un consultor trabajando en un caso para un cliente de una gran empresa. Tienes acceso a información confidencial que sería muy útil a los inversores. Además conoces a una amiga que trabaja en el mercado de la bolsa a quien debes una gran cantidad de dinero. Por proporcionarle alguna de esa información confidencial a tu amiga, le podrías ayudar a ganar un montón de dinero, mucho más de lo que le debes. Si haces esto, ella cancelará tu deuda. Pero darle esa información causaría a los inversores perder una gran cantidad de dinero.

¿Sería apropiado que proporcionaras esa información a tu amiga para que se pueda cancelar tu deuda?

*Taxes* (101 words)

Eres el propietario de un pequeño negocio. Tu negocio llega a fin de mes, pero no es muy rentable. Te gustaría mucho comprarte un coche nuevo. Sin embargo, su precio está muy lejos de lo que puedes pagar. Se te ocurre que podrías bajar tus impuestos si falsificaras uno de tus gastos personales como gastos de empresa. Por ejemplo, podrías decir que el estéreo de tu habitación está siendo usado en la oficina, o que las cenas con tu mujer en restaurantes son cenas con clientes. Esta mentira a la agencia tributaria te proporcionaría suficiente dinero para comprarte el nuevo coche.

¿Sería apropiado que falsificaras alguno de tus gastos personales como gastos de empresa y así poder comprarte un coche nuevo?

Moral Dilemmas (Moore et al., 2008)

*Burning Building – Personal Version (129 words)*

Tú y otras cinco personas estáis atrapadas en un edificio ardiendo. Sólo hay una salida de emergencia por donde podríais escapar de manera segura, pero está bloqueada por escombros ardiendo. Ves a otra persona en el pasillo que lleva a la salida. Esta persona tiene una herida mortal y está bloqueando un pequeño agujero que hay en la puerta de salida. Tú y las cinco personas detrás de ti no tenéis tiempo para pasar a través del agujero en la puerta. Te das cuenta de que podrías coger al herido y usar su cuerpo como un ariete para romper los escombros que hay en el pasillo y que os impiden escapar. Haciendo esto es cierto que morirá, aunque, si no lo haces, moriréis tú y las otras cinco personas.

¿Sería apropiado que mataras a esta persona que está malherida para salvarte a ti y a los otros cinco?

*Burning Building – Impersonal Version (129 words)*

Tú y otras cinco personas estáis atrapadas en un edificio ardiendo. Sólo hay una salida de emergencia por donde podríais escapar de manera segura, pero está bloqueada por escombros ardiendo. Ves a otra persona en el pasillo que lleva a la salida. Esta persona tiene una herida mortal y está bloqueando un pequeño agujero que hay en la puerta de salida. Tú y las cinco personas detrás de ti no tenéis tiempo para pasar a través del agujero en la puerta. Hay un sistema de emergencia que puede apagar el fuego eliminando el oxígeno del pasillo y tú puedes activarlo apretando un botón. Haciendo esto el fuego se apagará, pero la persona herida se ahogará y morirá. Sin embargo, si no lo haces, tú y las otras personas moriréis.

¿Sería apropiado que activaras el sistema de emergencia para salvarte a ti y a los otros cinco?

*Crying Baby – Personal Version (126 words)*

Soldados enemigos se han apoderado de tu pueblo. Tienen órdenes de matar a todos los civiles que encuentren. Tú y un grupo de personas del pueblo habéis encontrado refugio en el sótano de una casa grande. Afuera se

escuchan las voces de los soldados que vienen a la casa en busca de objetos valiosos. Tu bebé, que está contigo, empieza a llorar con fuerza. Le cubres la boca para amortiguar el sonido de su llanto. Si retiras la mano de su boca, su llanto llamará la atención de los soldados, quienes matarán a todos los que se encuentran en el sótano, incluyéndote a ti y a tu bebé. Para salvarte a ti y salvar a los demás tienes que asfixiar a tu hijo hasta que muera.

¿Sería apropiado que asfixiases a tu hijo para salvarte a ti y al resto de personas que están escondidas?

*Crying Baby – Impersonal Version (126 words)*

Soldados enemigos se han apoderado de tu pueblo. Tienen órdenes de matar a todos los civiles que encuentren. Tú y un grupo de personas del pueblo habéis encontrado refugio en el sótano de una casa grande. Afuera se escuchan las voces de los soldados que vienen a la casa en busca de objetos valiosos. Tu bebé, que está contigo, empieza a llorar con fuerza. Su llanto llamará la atención de los soldados, quienes matarán a todos los que se encuentran en el sótano, incluyéndote a ti y a tu bebé. Hay una caldera que cuando está activa es muy ruidosa. Si la enciendes, su ruido bloqueará el sonido del llanto, pero la habitación se calentará a una temperatura que el bebé no podrá soportar y morirá.

¿Sería apropiado que encendieses la caldera para salvarte a ti y al resto de personas escondidas?

## APPENDIX B

### Dilemmas used in the present study (in English).

Practice dilemmas (Greene et al., 2004), slightly modified to make them more familiar to Spanish participants.

*Brownies*

A girl decided to make a chocolate cake. She searches in a recipe book finding one that calls for a cup of nuts. However, she does not like nuts, but she does almonds. Luckily, she has got enough nuts and almonds in the cupboard, so she could make the cake with either.

Would it be appropriate for her to substitute nuts for almonds in order to avoid eating nuts?

*Standard Turnips*

A farm worker is driving a wheat-harvesting machine approaching a fork in the road. By choosing the path on the left, he will harvest ten kilograms of wheat, whereas by choosing the path on the right he will harvest twenty kilograms. If he does nothing, the wheat-harvesting machine will turn to the left.

Would it be it appropriate for him to turn the wheat-harvesting machine to the right in order to harvest twenty kilograms of wheat instead of ten?

Fillers (Moore et al., 2008)

*Stock Tip*

You are a managing consultant working on a case for a large corporate client. You have access to confidential information that would be very useful to investors. You also have a friend who plays the stock market and to whom you owe a sizable sum of money. By providing her with certain confidential information you could help her make a lot of money, considerably more that you owe her. If you do this, she will cancel your debt. However releasing information could cause other investors to lose a great deal of money

Would it be appropriate for you to release this information to your friend so that she will cancel your debt?

*Taxes*

You are the owner of a small business. Your company is making ends meet, but it is not terribly profitable. You would really like to buy a new car. However its price is beyond your price range. It occurs to you that you could lower your taxes by pretending that some of your personal expenses are business expenses. For example, you could say that the stereo in your bedroom is being used in the lounge at the office, or that dinners out with your wife are dinners with clients. This lie would allow you to hide enough money from the IRS to buy the new car.

Would it be appropriate for you to pretend that certain personal expenses are business expenses in order to buy a new car?

Moral Dilemmas (Moore et al., 2008)

*Burning Building – Personal Version*

You and five other people are trapped in a burning building. There is only one emergency exit through which all of you could escape to safety, but it is blocked by burning debris. You notice another person in the hallway leading to the exit. This person has a mortal wound and is blocking a small hole at the exit door. You and the five people behind you do not have time to climb through the small hole. You realize that you could grab the injured man and use his body as a battering-ram to break through the debris blockage in the hallway that is preventing your escape. Doing this is certain to kill him, although if you do not do it, you and the five people behind you will die.

Would it be appropriate for you to kill this person who is badly injured in order to save yourself and the other five people?

*Burning Building – Impersonal Version*

You and five other people are trapped in a burning building. There is only one emergency exit through which all of you could escape to safety, but it is blocked by burning debris. You notice another person in the hallway leading to the exit. This person has a mortal wound and is blocking a small hole at the exit door. You and the five people behind you do not have time to climb through the small hole. The hallway's emergency system puts out fire by eliminating oxygen from the hall and you can activate the system by pressing a button. By doing that, the fire will go out, but the injured person will suffocate and die. However, if you do not do it, you and the five people behind you will die.

Would it be appropriate for you to activate the system in order to save yourself and the other five people?

*Crying Baby – Personal Version*

Enemy soldiers have taken over your village. They have orders to kill all remaining civilians. You and some of your townspeople have found refuge in the cellar of a large house. Outside you hear the voices of soldiers who have come to search the house for valuables. Your baby, who is with you in the room, begins to cry loudly. You put your hand over his mouth to block the sound of his crying. If you remove your hand from his mouth his crying will summon the attention of the soldiers who will kill all of you, including you and your baby. To save yourself and the others you must smother your baby to death.

Would it be appropriate for you to smother your baby in order to save yourself and the other townspeople who are hiding?

*Crying Baby – Impersonal Version*

Enemy soldiers have taken over your village. They have orders to kill all remaining civilians. You and some of your townspeople have found refuge in the cellar of a large house. Outside you hear the voices of soldiers who have come to search the house for valuables. Your baby, who is with you in the room, begins to cry loudly. His crying will summon the attention of the soldiers who will kill all of you, including you and your baby. There is a furnace which is very noisy when it is working. If you turn it on, its noise would block the sound of the crying, but the room will become deadly hot for the baby and he will die.

Would it be appropriate for you to turn on the furnace in order to save yourself and the other townspeople who are hiding?

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