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A non-mentalistic cause-based heuristic in human social evaluations

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ABSTRACT

In situations where an agent unintentionally causes harm to a victim, the agent's (harmless) intention typically carries *more* weight than his/her (harmful) causal role. Therefore, healthy adults typically judge leniently agents responsible for an accident. Using animated cartoons, we show, however, that in the presence of a difficult concurrent task, this result is reversed: the agent's harmless intention is given *less* weight than her harmful causal role, inducing participants to judge harshly the accidental agent. This was found even though cognitive load did not selectively impair the detection of intentions over causal roles. Not only is this finding evidence that the social/moral evaluation system relies on two dissociable components, but it also demonstrates that these components are asymmetrical, the causal component being more intuitive than the intentional component, and the full integration of the two requiring central cognitive resources.

1. Introduction

If someone accidentally steps on your shoes in the street, your immediate response may be to blame him or her. However, after the initial inflow of emotions, you may revise your evaluation and take into account his or her intention. Most psychological models of moral cognition claim that adults give a primary role to the agent's intention to harm when performing moral judgment (Cushman, 2008; Piaget, 1965/1932). Recently, however, researchers have come to recognize that human moral competence is not a unitary system, but rather a collection of heterogeneous components running concurrently, some of which implicate fast emotional responses (Greene, Morelli, Lowenberg, Nystrom, & Cohen, 2008; Greene, Sommerville, Nystrom, Darley, & Cohen, 2001), frugal heuristics (Sunstein, 2005) unconscious computations (Cushman, Young, & Hauser, 2006), or more deliberative processes (Cushman et al., 2006; Dupoux & Jacob, 2007; Greene et al., 2008). Examining the effects of the scarcity of cognitive resources on moral judgments is therefore a useful tool for uncovering the cognitive architecture underlying human moral competence.

The case of accidental harm is particularly interesting to study because it requires the resolution of a conflict between the agent's harmful causal role (the victim is harmed) and his/her harmless intention (the agent did not want to harm) (Young, Cushman, Hauser, & Saxe, 2007). Furthermore, the two terms of the conflict may rely on distinct cognitive systems (Cushman, 2008). On the one hand, representing the agent's causal role requires assessing his/her action and the amount of harm endured by the victim. Both computations can be achieved by relatively shallow heuristics: while spatiotemporal correlations help infering causal structure (Michotte, 1946/1963), distress cues and/or emotional contagion help computing the amount of harm (Blair, 1995; de Vignemont & Jacob, 2012). On the other hand, the content of the agent's *intention* must be inferred from prior mentalistic knowledge of

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some of her other mental states (Was the agent able to see the victim? Was the action deliberate?). In addition, Greene and colleagues have argued that if and when a conflict arises between an intuitive/emotional and a more costly/non-emotional response to an action, the former will prevail, unless strong executive resources are available (Greene, 2009; Greene, Nystrom, Engell, Darley, & Cohen, 2004). We should therefore expect that under cognitive load, a relatively shallow non-mentalistic analysis of the immediate causes of the victim's suffering should prevail and that judges should be more severe in evaluating a case of accidental harm than if fuller cognitive resources were available for a complete appraisal of the situation.

Indirect evidence suggest that this prediction is plausible: Young and collaborators found that the presentation of accidental harm scenarios generates an increased activation in regions associated with cognitive conflict (Young et al., 2007). This reinforces the view that accidental harm is a type of conflict that requires available cognitive/executive resources for its resolution. Other empirical evidence come from the developmental literature: even though young toddlers and even infants are reliably sensitive to agents' goals, beliefs and intentions (Behne, Carpenter, Call, & Tomasello, 2005; Brandone & Wellman, 2009; Onishi & Baillargeon, 2005) and children's moral judgments have been shown to become sensitive to agents' intentions between the age of 3 and 5 (Nelson, 1980; Nelson-le Gall, 1985; Nobes, Panagiotaki, & Pawson, 2009; Shultz & Wright, 1986; Zelazo, Helwig, & Lau, 1996), children are also notorious for blaming accidental agents until 7–9 years of age (Hebble, 1971; Imamoğlu, 1975; Shultz & Wright, 1986; Piaget 1965/1932). This suggests that integrating intentions into moral judgments is a challenging task for children, especially when an agent's intention and her causal role conflict.

Even though it is plausible that cognitive load modulates the influence of intentional cues during moral evaluation, there is surprisingly little or no direct empirical demonstration that it does so in healthy adults. If such a modulation was documented, it would support the existence of a non-mentalistic cause-based heuristic in moral evaluation. Such a heuristic would take as input a causal description of a social interaction together with emotional cues, and output a negative evaluation of the agent who caused harm to a victim, irrespective of his or her intentions. Overriding such a heuristic for the purpose of evaluating an agent of accidental harm would require additional cognitive resources. To test this hypothesis, we designed two experiments. In Experiment 1, we presented non-verbal animated cartoons to two groups of adults, one of whom had to simply watch the cartoons, and the other of whom had, in addition, to perform a demanding verbal shadowing task (Forgeot d'Arc & Ramus, 2011; Hermer-Vazquez, Spelke, & Katsnelson, 1999; Newton & de Villiers, 2007). After seeing the cartoons, we asked them to evaluate two agents that only differed either in their causal contribution to the victim's suffering or in their intention to harm the victim. We expected intentions to prevail over causes, but only when cognitive resources were available. In Experiment 2, we tested the extent to which the dual task could also impair participants' ability to perceive or decode the agent's intention or causal role in these scenarios.

2. Experiment 1

We constructed three minimally different computer animated scenarios. In the *Coincidence* scenario, the agent is coincidentally present when the patient hurts himself. In the *Accident* scenario, the agent unwillingly harms the patient. In the *Aggression* scenario, the agent intentionally harms the patient. In all three scenarios, the victim suffers the same painful outcome, while the agent's movements are carefully matched. Healthy adults were distributed randomly into two groups. One group was required to compare the *accident* and the *coincidence* scenarios (the causal contrast). These scenarios only differed in whether the agent causes the victim's suffering, yielding a measure of the influence of the agent's causal role in moral/social evaluations. Participants in the second group were required to evaluate and compare the agent in the *accident* and the *aggression* scenarios (the intentional contrast) by answering a moral/social questionnaire, yielding a measure of the influence of intention ascription in moral/social evaluations. Half of the participants in each group had to perform a concurrent verbal shadowing task and half did not (No-load vs. With Load groups, respectively). None of these scenarios included any verbal content and all of the relevant causal and intentional variables had to be inferred from the movie. We expected that without cognitive load, adults would be more sensitive to the intentional than to the causal role of agents. Under cognitive load, however, they should display a pattern dictated by the cause-based heuristic, being thus more sensitive to the causal than the intentional contrast.

2.1. Materials and methods

2.1.1. Stimuli

Two versions of each of the three scenarios were constructed using Adobe Flash 8.0, one in which the agent is Mr. Green, the other in which the agent is Mr. Blue, yielding six animated clips, each lasting 10 s. In all clips, the agent (Mr. Blue or Mr. Green) is swinging near a road (on a swing or a rope), depending on the version. In the *aggression* clips, the agent faces the road, swings just once and stops. Then, he looks at the road as the victim (Mr. Red) is approaching and starts swinging again when Mr. Red stands right in front of him, intentionally hitting him. In the *accidental* clips, the agent is facing away from the road. He looks at the road while there is nobody (for the same duration as in the aggression clips), and starts swinging. While the agent is swinging, Mr. Red who is walking by is accidentally hit by the second swinging action. In the *coincidental* clips, the agent's movements are identical to those displayed in the accidental clips except that they are shifted in time (0.5 s), so that he stops swinging before the victim tumbles by himself (see Fig. 1). The stimuli were validated by conducting a pilot experiment (see Supplementary Section S1 for procedure and results).

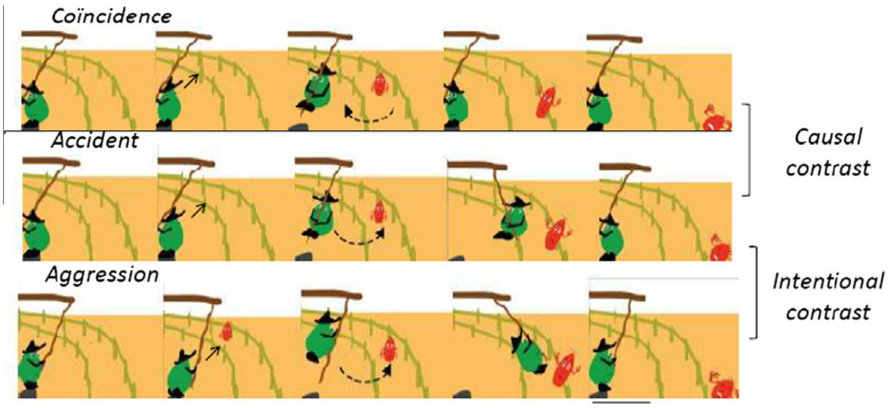

Fig. 1. Synopsis of the three scenarios used in Experiment 1. In the *Coincidence* scenario, the agent does not hit Mr. Red who falls on his own. In the *Accident* scenario, the agent hits Mr. Red without knowing that Mr. Red was on the road. In the *Aggression* scenario, the agent intentionally hits Mr. Red.

2.1.2. Procedure

All participants were placed in a quiet room and tested individually. Each subject was randomly assigned by an experimenter blind to the experimental condition to a pair of scenarios (causal or intentional contrast), one with Mr. Blue, and the other with Mr. Green, as main protagonist. The order of the two clips and role of the agents were counterbalanced among participants.

For participants in the no-load conditions the experiment was run in two sessions. In the familiarization session, each clip was presented twice, after which participants had to answer 4 *individual questions* about the agent, verbally administered by another experimenter blind to the condition being run: "Is he a good guy?", "Is he a bad guy?", "Do you want to play with him?", "Do you want to give him a gift?".[1] This session was intended to familiarize participants with the characters, scenarios, and questions. In the test session, each of the two clips were presented once (in the same order), after which four forced choice *comparative questions* were asked, while the two agents were presented side by side: "Who is the bad guy?", "Who is the good guy?", "Who do you want to play with?", "Who do you want to give a gift to?".

For the participants in the load condition, a training session was added before the familiarization session, during which they had to repeat aloud as accurately as possible sentences presented over headphones (verbal shadowing). The sentences were randomly sampled from a set of 125 neutral sentences with a mean duration of 2.8 s at a speed of 6.1 syllables per second (previously used in Forgeot d'Arc & Ramus (2010)). The experimenter blind to the experimental condition and sitting behind the screen (therefore not seeing the stimuli) listened to the sentences with a second pair of headphones and registered on-line each participant's failure to perform the task by pressing a key on a computer when participants did not correctly repeat sentences (blank or babbling). The training session was stopped after reaching five correct consecutive sentences. The following two sessions were implemented as in the no-load group, with the exception that participants were asked to repeat sentences while they were watching the clips. The sentences started 500 ms before the clip onset and were played continuously with a 600 ms inter-sentence interval until seven seconds after the end of each clip. Subjects were replaced if they stopped talking, made errors for a cumulative duration of more than 2 s during the experiment or failed the training procedure.

2.1.3. Participants

All participants were native French students recruited and tested at the École Normale Supérieure and paid 5 Euros for their participation in the experiment. Twenty-four adults were tested in the no-load condition, twenty-four in the load condition (of which ten had to be replaced). For each group of participants (No-Load, Load), half of the participants were tested on the causal contrast (CC, Accident vs. Coincidence), and half on the intentional contrast (IC, Aggression vs. Accident).

2.1.4. Scoring

Here we only report the results from the comparative questionnaire. A Comparative Valence Index (CVI) was computed on the responses to the *comparative* questionnaire as follows: For coding purposes, the aggressive agent was considered the most 'harmful', the coincidental agent the least 'harmful', and the accidental agent in between. Responses in favor of the least harmful agent in a given contrast (the coincidental one for the causal contrast, the accidental one for the intentional contrast) were scored +1. Responses in the opposite direction were scored −1. A response "both" or "none" was scored as a zero. The CVI was defined as the average of the four scores, thereby ranging between +1 (preference for the less harmful agent) and −1 (preference for the more harmful agent). The validity of averaging between the four questions is examined in Supplementary Section S2, and the results from the individual questionnaires (familiarization session) are provided in Supplementary Section S3.

[1] We used child-friendly questions because the experiment is part of a broader study designed to compare preschoolers and adults' ability to integrate the agent's causal role and intention to harm in their moral judgments (Buon, 2011).

2.2. Results and discussion

The results across groups are shown in Fig. 2. A General Linear Model (GLM) with *CVI* as dependant measure and load and contrast as between subjects factors revealed a significant load by contrast interaction ($F(1,47) = 9.19$, $p < .01$, $\eta p^2 = .17$). In the no-load condition, adults were sensitive to both the agent's causal role ($F(1,11) = 5.83$, $p < .05$, $\eta p^2 = .42$) and the agent's intention to harm ($F(1,11) = 33.11$, $p < .001$, $\eta p^2 = .80$), the effect of the causal role being significantly smaller than the effect of the intention ($F(1,23) = 7.95$, $p < .01$, $\eta p^2 = .26$). By contrast, in the load condition, adults were only sensitive to the agent's causal role ($F(1,11) = 23.12$, $p < .001$, $\eta p^2 = .74$), not to the agent's intention ($F(1,11) = 2.14$, $p > .1$, $\eta p^2 = .21$), the difference between these two effects being only marginal ($F(1,23) = 3.14$, $p = 0.9$, $\eta p^2 = .12$). As a result, we found a significant effect of load for each contrast but in the opposite direction (CC: $F(1,22) = 4.46$, $p < .05$, $\eta p^2 = .17$; IC: $F(1,23) = 4.73$, $p < .05$, $\eta p^2 = .17$), indicating that cognitive load increased the weight of the agent's causal role relative to his intention to harm.

Cognitive load had thus a rather spectacular effect on adults' moral/social judgments, reversing the respective importance of the agent's causal role and of his intention to harm in their evaluation of the agent. Without load, intentions carry more weight than causal roles. With load, it is the opposite. The responses to the individual questionnaires (familiarization session) showeded very congruent results (Supplementary Section S3).

Could it be that cognitive load impairs the ability to process the intentionality cues displayed by the agents? This would prevent participants from representing the lack of harmful intention in the accidental condition (Newton & de Villiers, 2007, but see Dungan & Saxe, 2012; Forgeot d'Arc & Ramus, 2011) or induce them to incorrectly ascribe a harmful intent to the accidental agent (Rosset, 2008). The next experiment addresses this issue.

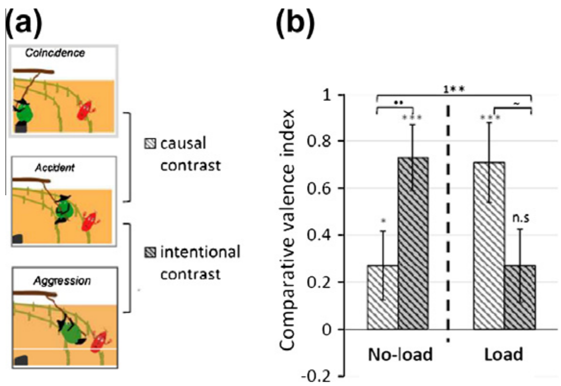

Fig. 2. (a) Key events in the Coincidence, Accident and Aggression scenarii. (b) Comparative Valence Index for participants without load (No load) and with cognitive load (Load), for the causal contrast (Accident vs. Coincidence) and the intentional contrast (Aggression vs. Accident). Dark gray stars represent the significance of between contrasts comparisons while light gray stars indicate whether each bar significantly differ from chance level (see Table S4 of the supplementary material for statistical results), n.s non significant, ~ $p < .1$, *$p < .05$, **$p < .01$, ***$p < .001$. [1]Significance of the load by contrast interaction.

3. Experiment 2

To explore whether cognitive load affects the detection of causal cues and/or intentional cues, we presented adults in the load and no-load conditions with exactly the same video-clips as before, but we replaced the moral/social evaluation questions by questions relevant to either the causal role of the agent in the victim's suffering (Causal detection task) or the agent's intention (Intentional detection task). Apart from the questions asked, the experimental protocol was exactly the same as detailed before.

3.1. Method

3.1.1. Procedure

The procedure for the Intention detection task was exactly the same as in Experiment 1 except that in the familiarization session, the four individual questions were replaced by: "Did he want to push Mr. Red?", "Did he deliberately cause Mr. Red to fall down?", "Did he want to hurt Mr. Red?", "Did he intentionally hurt Mr. Red?". For the Causal detection task, the questions were: "Did he collide with Mr. Red?", "Did he cause Mr. Red to fall down?", "Did he hurt Mr. Red?", "Did he make Mr. Red trip over?" As in Experiment 1, comparative versions of these questions were administered in the test session.

3.1.2. Participants

Thirty-two adults under no-load condition and 64 adults under load condition (eleven were replaced) were tested. For each group, half of the participants were replaced in the intentional detection task while the other half was placed in the causal detection task. For each task, half of the subjects was presented with the causal contrast, and the other half with the intentional contrast.

3.1.3. Scoring

We only report the results obtained from the comparative questionnaire (see Supplementary Section S3 for the results of the individual questionnaires). As in the previous experiment, a Comparative Index (CI) was computed for each of the tasks. A positive CI means that the participants distinguished between the two agents based on their causal role or their intention to harm, in favor of the least mean. The same analyses as in Experiment 1 were thus performed except that the Task (causal detection vs. intentional detection) was entered as an additional factor in the GLMs.

3.2. Results and discussion

The results across groups are shown in Fig. 3. A GLM with task, load and contrast as between subjects factor revealed no effect of task nor of contrast, ($Fs < 1$, $ps > .1$), but a main effect of load ($F(1,95) = 5.03$, $p < .05$, $\eta p^2 = .07$), a significant contrast by task interaction ($F(1,95) = 27.59$, $p < .0001$, $\eta p^2 = .30$) and a significant task by contrast by

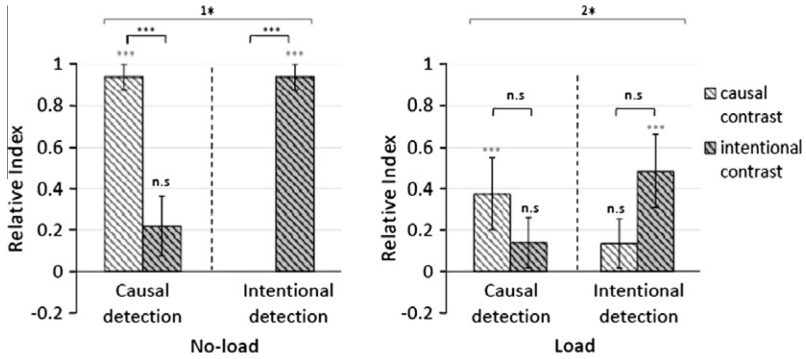

Fig. 3. Comparative Index for the Causal Contrast (Accident vs. Coincidence) and the Intentional Contrast (Aggression vs. Accident) for the Causal and Intentional detection task for participants without (left) or with a concurrent task (right). The error bars correspond to one standard error above and below the means, n.s non significant, $\sim p < .1$, $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$. [1]Task by Contrast Interaction for participants placed in the no-load conditions. [2]Task by Contrast Interaction for participants placed in the cognitive load condition. Dark gray stars represent the significance of between conditions and between contrasts comparisons while light gray ones indicate whether each bar significantly differ from chance level (see Supplementary Table S4).

load interaction ($F(1,95) = 6.32$, $p < 0.5$, $\eta p^2 = .09$). In order to clarify the meaning of these interactions, we analyzed each task through a separate GLM[2] (See Supplementary Section S4 for all statistics).

Regarding *the causal detection task*, we obtained a main effect of load ($F(1,47) = 5.48$, $p < .05$, $\eta p^2 = .14$), due to responses of larger amplitudes in the no-load than in the load condition. There was also an effect of contrast ($F(1,47) = 12.13$, $p < .001$, $\eta p^2 = .27$) due to the fact that participants rated the accidental agent as having more causal role than the coincidental agent (CI significantly above chance, see Table S4) whereas the aggressive and accidental agents were assigned similar causal roles (CI not different from zero). This effect was amplified in the no-load compared to the load conditions resulting in a marginal interaction ($F(1,47) = 3.13$, $p = .08$, $\eta p^2 = .08$).

Regarding the *intentional detection task*, we obtained no effect of load ($F(1,47) < 1$, $p > .1$) but an effect of contrast ($F(1,47) = 15.39$, $p < 0.001$, $\eta p^2 = .32$), due to the fact that participants rated the aggressive agent as having more intention to harm than the accidental agent (CI significantly above chance, see Table S4) whereas the accidental and coincidental agents did not differ (CI not different from zero). This effect was amplified under no-load compared to the load group resulting in a marginal interaction ($F(1,23) = 3.22$, $p = .08$, $\eta p^2 = .09$).

This experiment revealed that overall participants were able to assign to the agent his proper causal and intentional roles in each scenario. Cognitive load yielded a decrement in performance compared to the no-load condition. However, this decrement was not more pronounced in the retrieval of intentions than of causal roles. In line with two recent studies (Dungan& Saxe, 2012, Forgeot d'Arc & Ramus, 2010), we thus found no evidence that cognitive load either specifically disrupts adults' ability to process agents' intentions (Newton & de Villiers, 2007) or induces them to over-attribute negative intentions in the accidental condition (Rosset, 2008).

Of course, we cannot discard the possibility that in this experiment, participants rightfully extracted intentions (and causes) under cognitive load, but *only* because they were explicitly asked to do so. Apperly, Riggs, Simpson, Chiavarino, & Samson (2006) showed that asking participants to pay attention to mental states vs. physical details during a movie clip modified their ability to quickly respond to belief-related questions when tested afterwards. It should be pointed out however that mental states are spontaneously taken as relevant when adults evaluate moral situations (Cushman, 2008; Piaget, 1965/1932). Moreover, Young and Saxe (2009) showed that when adults were presented with short stories without mental terms but yielding potentially harmful consequences (the death of children due to contaminated vs. fresh meat in a meal), brain regions implicated in belief reasoning were spontaneously recruited. This suggests that the presence of harm and of moral questions in the questionnaires in Experiment 1 could also have led adults to spontaneously track the agent's intention. This assumption, however, would require further investigations to be confirmed.

4. General discussion

In Experiment 1, we measured the effect of cognitive load on the ability to integrate the agent's causal role and his/her intention to harm into social/moral evaluations. As predicted, without cognitive load, agents' intentions carried more weight than their harmful causal role (Cushman, 2008: Piaget, 1965/1932). However, this pattern was totally reversed when a concurrent demanding task was added. Under cognitive load, we found a significant and large effect of causal role, but no significant effect of intention. This effect was not due to cognitive load disrupting selectively the accessibility of intentional cues over causal cues, as shown in Experiment 2.

Our results are congruent with two strands of recent research. The first strand draws a distinction between *representing* intentions and *using* them in a task of moral evaluation, and claims that these two tasks are sustained by (partially) dissociated neural systems (Young & Saxe, 2008). The second strand claims that moral evaluations

[2] Note that contrast by task interactions was significant for both groups of participants (No-load: ($F(1,31) = 85.12$, $p < .0001$, $\eta p^2 = .84$) ; With load : ($F(1,63) = 4.49$, $p < .05$, $\eta p^2 = .30$).

are themselves underpinned by two dissociable subsystems, one of which is sensitive to the *causal role* of agents and the other to the content of his or her *intentions* (Cushman, 2008). What we add specifically to these distinctions is that, during moral evaluation, there is a fundamental *asymmetry* between the evaluation of causal and intentional cues, the former requiring less cognitive resources than the latter. Importantly, this asymmetry only arises in tasks of moral evaluation, not in a task where intentions and causes required to be simply represented. We shall now consider what might contribute to this asymmetry.

First, unlike the agent's causal role, the evaluation of the content of an agent's intention is revisable as more information about the agent's psychological context or ulterior motivations is made available. For instance, pushing another may be harmful. Still, whether an agent pushed another with the ulterior intention to save him from a greater harm is something that depends on background psychological information about the agent. In our experiments, participants in both the load and no-load conditions were able to draw the distinction between agents who intentionally and accidentally harmed a victim. However, under cognitive load, participants might not have enough cognitive resources to reason about and evaluate ulterior intentions or motivations that could have justified the agent's actions towards the victim.

Secondly, representing the agent's causal role in the victim's suffering may involve – at least in part – emotional processes such as emotional contagion to infer for inferring the amount of harm caused by the agent (Blair, 1995; de Vignemont & Jacob, 2012). According to Greene (2009) and Greene et al. (2004), emotion-triggered responses may tend to override rational/non-emotional mechanisms in the absence of cognitive control. Under cognitive load, participants may thus be unable to inhibit the emotional response caused by the representation of the agent's causal implication in the victim's suffering. This hypothesis is congruent with the implication of brain regions underlying cognitive conflict in judgments of accidental harm (Young et al., 2007) and with the late appearance of adult-like accidental harm judgments in children (Hebble, 1971; Imamoğlu, 1975; Killen, Lynn Mulvey, Richardson, Jampol, & Woodward, 2011; Nobes et al., 2009; Shultz & Wright, 1986; Zelazo et al., 1996).

Our study therefore suggests that in tasks of moral evaluation of an agent who caused accidental harm, two conspiring factors are at work: first, the agent's causal role may be easier to evaluate or less context dependent than the content of his/her intentions. Secondly, taking into account the agents' intention may require inhibiting the prepotent emotional response arising from the representation of the agent's negative causal role. The contribution of these two conspiring factors cannot be further disentangled based on the present study alone. To clarify the picture, one would need to investigate different situations like "attempted harm", where an agent has a harmful intention but his action causes no aversive outcome. If cognitive load disrupts the evaluation of the agent's motivation, then attempted harm should be evaluated like a simple coincidence. If, in contrast, it disrupts the ability to inhibit a fast heuristic triggered by the perception of emotionally salient outcomes for the victim of a harmful action, then there should be no effect of verbal shadowing on attempted harm.

Before concluding, we acknowledge that we have only explored a simple conflict involving intentions and causal structure, in particular one where the latter is accessible through simple cues. Real life situations may involve more complicated causal chains with unintended but foreseeable or long-term effects (Alicke, 2000; Lagnado & Channon, 2008), or causal chains without any physical contact as in omission (Cushman et al., 2006), in which case the retrieval and use of the relevant causes may also require costly rational processes. Another limitation regards the use of a verbal concurrent task to explore the effect of cognitive load in moral/social evaluations. Verbal tasks impact several general-purpose subsystems (attentional, executive, verbal short-term memory, resources, etc.). As a result, we cannot establish to what extent the resources needed to resolve the conflict between intentions and causes are specifically linguistical Further experiments using a non-verbal concurrent task matched in terms of their effects on controlled resources (Dugan & Young, 2012) are needed to explore this issue.

To conclude, our results confirm the critical role of both intuitive and more controlled processes in our ability to generate moral judgments. They could also have potentially important consequences for cultural psychology (Cohen & Rozin, 2001), and applied ethics, in particular in legal testimony or judgments of daily life events, where, as in tasks of verbal shadowing, adults typically perform several different actions at once with limited resources. The non-mentalistic cause-based heuristic therefore suggests the cautionary rule that one avoids stepping on the shoes of someone in the street, especially when he or she is talking over the phone.

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Appendix A. Supplementary material

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.cognition.2012.09.006.

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