

# Put Your Plan Into Action: The Influence of Action Plans on Agency and Responsibility

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While action plans and intentions have been considered to be important factors contributing to the personal sense of causation known as agency, the present research is the first to empirically investigate how action plans influence agency. Participants in multiple studies were required to plan or not to plan ahead their actions. Results consistently show that on trials in which participants were required to plan their actions, participants experienced *reduced* agency compared to trials in which participants were not required to plan their actions. These results were found for both explicit agency paradigms in which participants were asked for their experiences of causation (Studies 1 and 2), as well as in an implicit agency paradigm in which participants were asked to estimate the time between their actions and the consequences of their actions (Study 3). In addition, it was shown that the reduction in agency was smaller when plans and actions were temporally closer together (Study 4). In a final line of experiments we discovered that prior planning similarly reduced both the emotional experience of acting and feelings of responsibility in agents (Studies 5–7). However, the direction of this effect was reversed in observers, for whom cues related to planning by others increased attributions of responsibility toward those others (Study 8).

*Keywords:* agency, planning, intentional binding, responsibility, implementation intentions

Think of your plans for the coming evening. We often have a fairly good idea of what our plans for an upcoming evening are: We may have decided to make pasta for dinner, to go for a run in the park, or we may have made an explicit intention *not* to work

this evening but watch the latest episode of Game of Thrones instead (or vice versa). Plans and intentions seem to account for a considerable proportion of the contents of our consciousness (Brass & Haggard, 2008). The plans we make can influence another important part of our conscious experience, namely the sense that we are purposefully performing an action or causing an effect, a sensation known as agency. Usually, when our actions result in the planned outcome we experience more agency compared with situations in which the outcome was not what we had in mind. If we cook pasta but end up with pizza, our expectations are not in line with the eventual outcome and our sense of personal causation is likely to be reduced. Although a lot of previous studies have indeed shown that a match between predicted *outcomes* and actual outcomes contributes to the sense of agency, much less empirical attention has been directed toward the effects of *action* planning. The question remains whether the prior planning of actions can influence the experience of agency.

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Data and syntax-files can be accessed via the Open Science Framework at [https://osf.io/qfp84/?view\\_only=36853ca50e8f474c863228ec50b46b6b](https://osf.io/qfp84/?view_only=36853ca50e8f474c863228ec50b46b6b). We have reported all measures and manipulations in the present research. Sample sizes were determined based on earlier experiences with the experiments, or as a function of the number of participant signups during the allotted lab-space period. None of the reported effects reached significance just by adding more participants. No data was excluded without reporting so.

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In the present article we present a number of studies in which we investigated how action plans can influence agency and the subsequent sense of responsibility. In these studies we explored whether performing actions that were planned in advance would be related to an increased sense of agency. Such a prediction would seem logical given the abundance of literature showing that cognitions about action outcomes contribute to the sense of agency when the outcomes are in line with predictions, and it is implicitly

assumed that cognitions about action would work in similar way. However, we also considered it possible that action plans could increase the relative automaticity of action performance and then reduce the sense of agency instead, a process suggested by the literature on implementation intentions, a very specific type of action plans. We now discuss these alternative predictions more thoroughly.

### Agency: Predicting and Reflecting Upon Action Outcomes

Agency has been argued to be the outcome of two distinct processes. According to one account, agency is the outcome of an automatic motor process in which predicted sensory consequences of acting are compared with the actual sensory results (Blakemore, Wolpert, & Frith, 2002; Frith, 2013; Moore & Haggard, 2008; Wolpert & Flanagan, 2002). According to a second account, our sense of agency is derived from a process of cognitive inference in which thoughts, beliefs, and external cues shape our sense of agency (Wegner, 2002; Wegner, 2003; Wegner & Wheatley, 1999). Clearly, our own expectations and intentions about action outcomes are important: We feel agency when what we expect to happen, implicitly or explicitly, also actually happens.

A lot of empirical effort has been put into investigating the automatic and deliberate emergence of these prediction and expectations. For example, by priming possible effect outcomes (e.g., Aarts, Custers, & Wegner, 2005; Linser & Goschke, 2007; Sato, 2009) and the setting of deliberate goals (Pronin, Wegner, McCarthy, & Rodriguez, 2006; van der Weiden, Aarts, & Ruys, 2010) agency can be increased when the outcome is also in line with the primed effect or intended goal. Alternatively, effects that are unexpected or unintended decrease the sense of agency for those effects (Gentsch, Kathmann, & Schütz-Bosbach, 2012; Sato & Yasuda, 2005). Although these studies have empirically established that manipulating the thoughts or cognitions related to the *outcomes* of actions influence the sense of agency, relatively few studies have addressed whether and how thinking about our future *actions* influences agency (Wenke, Waszak, & Haggard, 2009). Although the process of action selection represents a major part of the action sequence (Brass & Haggard, 2008), exactly how this process influences our sense of agency remains unclear.

Recent studies by Wenke, Fleming, and Haggard (2010) and Damen, van Baaren, and Dijksterhuis (2014) have shown that the subliminal priming of potential actions will increase agency when actions are also compatible to the primed actions. They show that the unconscious activation of cognitions related to future behavior increases the sense of agency. However, although behavioral intentions we are not consciously aware of are undoubtedly be linked to a high proportion of human behavior, many of our action plans and intentions eventually *do* reach conscious awareness. The question then is how our conscious and deliberate action plans relate to the sense of agency?

While a number of theoretical approaches consider plans and intentions to be important to the sense of agency (e.g., Brass & Haggard, 2008; Pacherie, 2008; Pacherie & Haggard, 2010), there is not much empirical evidence to validate this relation. Although a number of studies did investigate proximal or immediate action intentions, or urges to act in relation to experiences of volition (e.g., Fried et al., 1991; Haggard & Eimer, 1999; Haggard &

Magno, 1999; Libet, 1985; Libet, Gleason, Wright, & Pearl, 1983), no research has been dedicated to more distal action intentions and the question of how these may influence our sense of agency. This neglect is surprising considering that the ability to plan ahead our actions further away in time is considered to be a characteristic unique to human cognition (Haslam, 2006; Waytz, Gray, Epley, & Wegner, 2010), and that agency-perception in others has been specifically linked to the capacity to both act and *plan* (Gray, Young, & Waytz, 2012). However, to our knowledge, no studies simply asked participants to plan ahead their actions (when multiple actions are possible), and investigated the influence of such a manipulation on the sense of agency.

How would our experience of agency change when we perform a planned action<sup>1</sup> rather than an action that was not planned in advance? On the one hand it is possible that the planning of specific actions increases the sense of agency for the effects of those actions compared with actions that are performed without advance planning; the act of planning, and a match between planned behavior and actual behavior, may strengthen the idea that one has acted deliberately, thereby increasing the sense of agency. Such a finding would be in line with the literature showing increases in agency caused by the compatibility between expected and actual effects (Gentsch & Schütz-Bosbach, 2011; Sato & Yasuda, 2005; van der Weiden, Ruys, & Aarts, 2013).

### Implementation Intentions

It is interesting to note that the research conducted in a related domain, specifically the research on implementation intentions, may suggest quite the opposite effect. Implementation intentions are behavioral intentions that link specific action plans to specific circumstances (Aarts & Dijksterhuis, 2000; Bargh & Gollwitzer, 1994; Gollwitzer, 1999; Gollwitzer & Sheeran, 2006; Verplanken, 2005).<sup>2</sup> Such intentions take the format of “I will do y when situation z is encountered.” For example, to work on one’s shape a person may explicitly make an intention to take the stairs after lunch instead of taking the elevator, thereby greatly increasing the likelihood of taking the stairs after lunch.

Since this technique was first introduced (Gollwitzer, 1999) a great number of studies have shown that implementation intentions are powerful techniques with the ability to overcome well-ingrained habits and effectuate positive behavioral change (Webb & Sheeran, 2006; Gollwitzer & Sheeran, 2006). For example, it has been shown that implementation intentions can increase healthy eating behavior (Verplanken & Faes, 1999), decrease unhealthy eating behavior (Armitage, 2004), increase exercise frequency and intensity (Prestwich, Lawton, & Conner, 2003), reduce habits (Holland, Aarts, & Langendam, 2006), help fight addictions such as smoking (Conner & Higgins, 2010), and can even reduce the behavioral expression of implicit stereotypes (Mendoza, Gollwitzer, & Amodio, 2010).

<sup>1</sup> With the terms planned and unplanned we do not wish to imply a presence versus an absence of an action decision, but we refer to the temporal distance between action decision and action performance, distal versus proximal.

<sup>2</sup> Although we regularly cite the literature on implementation intentions, Hommel’s (2000) work on the “prepared reflex” follows a similar kind of reasoning, and is recommended to anyone interested in learning more about the influence of present intentions on future automatic action performance.

The connection between implementation intentions and agency research becomes clearer when we investigate the processes underlying this technique. Numerous studies have demonstrated that implementation intentions promote the initiation of intended behaviors (e.g., Armitage, 2004; Sheeran & Orbell, 1999) and that as a result of forming an implementation intention, when the appropriate moment arises, the intended goal-directed behavior is initiated *immediately* (Cohen, Bayer, Jaudas, & Gollwitzer, 2008), *effortlessly* (Brandstätter, Lengfelder, & Gollwitzer, 2001; Gawrilow & Gollwitzer, 2008), and *without conscious intent* (Bayer, Achtziger, Gollwitzer, & Moskowitz, 2009). Accordingly, the execution of a behavior specified in an implementation intention exhibits features of automaticity as identified earlier by Bargh (1992, 1994).

An increase in action automaticity is often associated with a reduction in conscious action awareness. Given that the initiation of such actions can be performed automatically, without deliberately requiring effort or cognitive attention, it is likely that performance of implementation intentions leads to less agency compared with actions that are performed without individuals having had prior intentions. However, to our knowledge no empirical research on implementation intentions asked participants about their feelings of agency, and this theory remains to be validated. However, the processes that are regarded to underlie implementation intentions—action initiation without conscious intent, attention, and effort—have in previous research been related to reductions in the sense of agency (e.g., David, Newen, & Vogeley, 2008; Demanet, Muhle-Karbe, Lynn, Blotenberg, & Brass, 2013; Frith, 2002; Haggard, Clark, & Kalogeras, 2002). Therefore, we suspect that implementation intentions would be related to reductions in the sense of agency, and that when participants plan ahead their action in the present research paradigms, their sense of agency may also be reduced.

### Responsibility

Although the scientific quest for the emergence of agency is an important one, it is equally important to investigate how agency can in turn influence human behavior and cognition. Unfortunately, much research directed at studying the emergence of agency stops right there, and does not further explore how agency—and factors that influence the sense of agency—may subsequently shape the way we think and act. For example, while agency and responsibility are often seen as intertwined constructs (Moll et al., 2007), and although it is even argued that the primary function of agency is to inform responsibility (Frith, 2013), the sense of agency and the sense of responsibility do not regularly meet in empirical research. Given the suspected close relation between the agency and responsibility, it would be interesting to explore how factors that may influence the sense of agency may subsequently also influence the sense of responsibility. For example, if it was shown that the planning of actions would reduce the sense of agency, could these action plans then also reduce the sense of responsibility?

### The Present Research

In the present article we report eight studies in which we investigated how the formation and implementation of action plans

can influence the sense of agency but also how action plans can influence one's sense of responsibility for actions.

In the first part of the article we report four studies in which the basic experience of agency is investigated in relation to planned or unplanned action. First, we investigated whether prior planning could influence the sense of agency compared to situations without planning (Studies 1–3). Planning and its influence on agency were measured both explicitly, by asking participants the degree to which they experienced causing specific action outcomes (Studies 1, 2 and 4), but also through an implicit measure of agency in which participants were asked for their estimation of time between action and effect (Study 3). Subsequently, we went on to explore the importance of the temporal distance between action planning and the action, by varying the moment at which participants were able to perform their planned action: Either delayed or immediately after the moment of planning (Study 4).

In the second part of the present article we report a number of studies in which we investigated the degree to which action plans could influence perceptions of responsibility. Participants were given moral judgment dilemmas in which they had to make a decision, or read vignettes about the actions of another person. The actions were either planned or not planned, followed by measures on feelings of responsibility (Studies 5–8).

### Study 1

The aim of Study 1 was to investigate whether asking participants to plan ahead their action would subsequently influence the sense of agency in an explicit agency paradigm. Participants were required to plan ahead or were not required to plan ahead their actions (the clicking of specific buttons) on trials in the experiment. Subsequently, their sense of agency for the consequences of their actions (the presentation of tones) was measured. If prior planning would strengthen the idea of a match between planned actions and actual actions and outcomes, we would expect higher agency ratings on the trials in which participants were asked to plan their actions ahead. However, if prior planning reduced the actual conscious involvement at the moment of action performance, we would expect lower agency ratings on the trials in which actions were planned.

### Method

**Participants.** Forty-four undergraduate students (31 females;  $M_{\text{age}} = 21.33$ ) at the Radboud University Nijmegen participated in exchange for 5 Euro's or course credit.

**Materials and procedure.** Participants performed a mouse-click agency task (see Figure 1). Clicking on presented action-buttons would generate tones, and participants were either given the opportunity to plan or were not given the opportunity to plan which button they were going to click. Participants were told that the presented tones could be generated by their mouse-clicks, but could also be produced by the computer (Sato & Yasuda, 2005); participants had to indicate the degree to which they felt that they (not the computer) had caused the tone to occur.

On trials in which participants were not required to plan participants were shown small yellow rectangles, the action-buttons, featuring the letters A, B, C, and D, that were presented in a diamond pattern on the monitor displaying a white background.

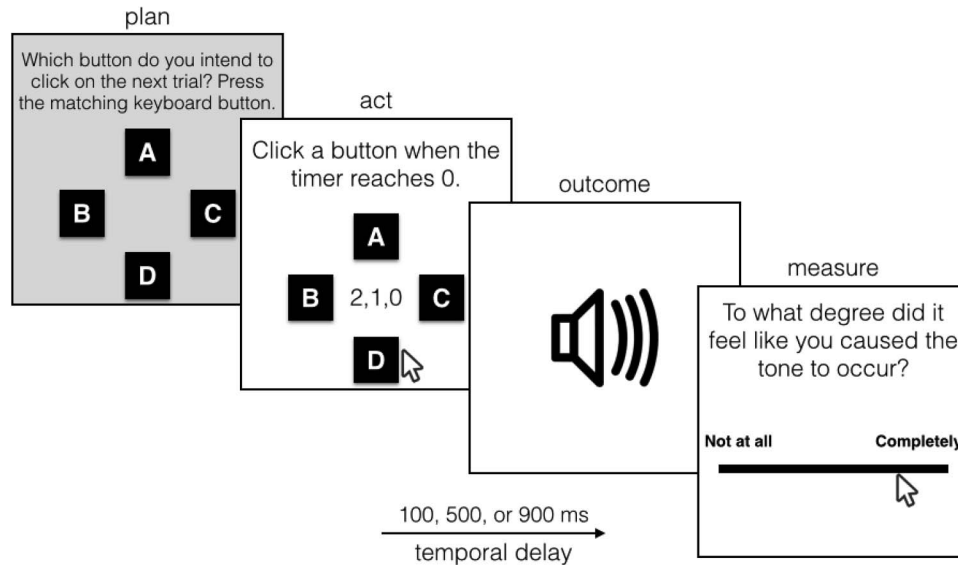


Figure 1. Schematic experimental overview.

Participants were able to successfully click the action-buttons the moment a presented timer reached 0, which was after 2 s. Clicks were followed by 300 ms tones: a 600 Hz tone after clicking on the A-button, and 800 Hz, 1000 Hz, and 1,200 Hz tones after, respectively, clicking the B, C, or D buttons. To increase the ambiguity of the task, the time interval between clicks and the subsequent tones was manipulated (100 ms vs. 500 ms vs. 900 ms<sup>3</sup> evenly divided over trials; see [Sato & Yasuda, 2005](#)). At the end of each trial, participants were asked to indicate on a 100-point scale the degree to which they felt they had caused the tone to occur.

In half of the trials, participants were required to plan ahead their actions: they were presented with the action-buttons against a gray background, were asked to make a mental plan about which button they were going to press and indicate their plan by pressing the matching keyboard button (press the A button on their keyboard when their plan was to click on the A action-button presented on the monitor). After indicating their plan the trial proceeded exactly like a trial without prior planning. One participant was removed from the analysis because this person regularly acted incompatible with his or her plans. For the rest of the participants, trials in which participants did not click the button they had planned to click were removed from the analysis (1.6% of the trials).

In the present study there were also a number of filler trials in which participants heard a randomly selected tone 2,500 ms after their action. The purpose of these trials was to have participants experience trials in which (allegedly) the computer clearly produced the tone. These filler trials were evenly divided over planning and no-planning trials, but were not a part of the main analysis. The main task consisted of 114 experimental and 12 filler trials.

## Results

**Agency ratings.** A 3 (Temporal delay: 100 ms vs. 500 ms vs. 900 ms)  $\times$  2 (Planning condition: planned vs. unplanned)

repeated-measures analysis of variance (ANOVA) on Agency scores showed a main effect of Temporal delay,  $F(2, 84) = 15.50$ ,  $p < .001$ ,  $\eta_p^2 = .27$ . Shorter delays led to higher agency scores compared to longer delays ( $M_{100\text{ ms}} = 69.80$ ,  $SD = 25.28$ ;  $M_{500\text{ ms}} = 56.45$ ,  $SD = 24.43$ ;  $M_{900\text{ ms}} = 49.47$ ,  $SD = 23.99$ ). Additionally, there was a main effect of Planning condition,  $F(1, 42) = 7.13$ ,  $p = .011$ ,  $\eta_p^2 = .15$ . Trials on which participants planned their actions resulted in significantly lower agency ratings compared to trials in which participants did not plan their actions ( $M_{\text{planned}} = 55.33$ ,  $SD = 20.94$  vs.  $M_{\text{unplanned}} = 61.82$ ,  $SD = 22.39$ ). There was no interaction between the Temporal delay and Planning conditions,  $F < 1$ , *ns*. The results pertaining to the Temporal delay and Planning conditions are illustrated in [Figure 2](#).

**Reaction times.** A 3 (Temporal delay: 100 ms vs. 500 ms vs. 900 ms)  $\times$  2 (Planning condition: planned vs. unplanned) repeated-measures ANOVA on reaction times (RTs) showed a marginal effect of Planning condition,  $F(1, 42) = 3.45$ ,  $p = .070$ ,  $\eta_p^2 = .08$ . Participants were able to click marginally faster on the action-buttons (when the timer reached 0) on planning trials compared to trials in which participants did not plan their actions ( $M_{\text{planned}} = 504$ ,  $SD = 220$ ;  $M_{\text{unplanned}} = 578$ ,  $SD = 315$ ). There was no main effect of Temporal delay,  $F < 1$ , *ns*, nor did the results show an interaction between the Temporal delay and Planning conditions,  $F(2, 84) = 1.34$ ,  $p = .27$ . To discover more about the relation between the RTs and the agency scores we checked the correlations between these variables within the respective planning conditions. These correlations, however, proved not significant:  $r_{\text{planned}} = -.25$ ,  $p = .11$ , and  $r_{\text{unplanned}} = .07$ ,  $p = .65$ . Finally, the analysis also showed no significant correlation between agency

<sup>3</sup> In the presented studies we used different time intervals to determine the generalizability of the effect. The results (generally) show that the effects of planning were not dependent on these specific paradigm settings.



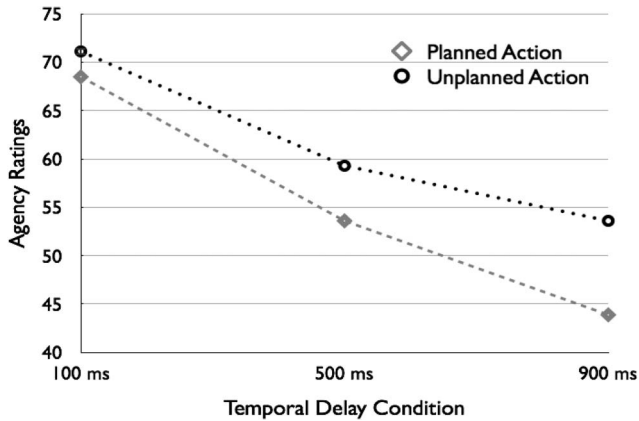


Figure 2. Mean agency ratings per Planning condition and Temporal delay conditions.

scores and RTs, with regards to the difference scores between planning conditions,  $r = -.03$ ,  $p = .83$ .<sup>4</sup>

## Discussion

The findings from Study 1 expand upon the literature on action planning and intentionality by showing that prior action plans can actually reduce the sense of agency experienced for those actions. Although several theoretical approaches consider prior planning as a condition that generally contributes to the sense of agency (Brass & Haggard, 2008; Pacherie, 2008; Pacherie & Haggard, 2010), we show that (distal) action planning actually reduced agency. This finding suggests that because of our prior made plans, we feel less conscious involvement during the actual moment of action performance. The present results are in line with the literature on implementation intentions (e.g., Gollwitzer, 1999), in which it is argued that deliberate action intentions make the execution of those intentions more likely and more automatic at the appropriate moment (Brandstätter et al., 2001). This automaticity may have subsequently lead to a reduction in the sense of agency. The trend observed in the analysis over RTs shows that planned actions were implemented faster than unplanned actions, and seemed a promising indicator of automaticity. However, the absence of correlations between RTs and the agency scores, both within and between conditions, makes the RTs unlikely to have acted as a mediator between the planning conditions and the agency scores.

Study 1 featured several methodological choices that may have affected our results and our subsequent interpretations. First, participants were not free to choose when (and when not) they planned their actions. Second, participants were asked to indicate their prior plans by the advance pressing of a keyboard button, which can be seen as an additional action beyond mere planning. Third, there was a difference in trial-duration between the plan and no-plan trials. All these factors could potentially influence agency beyond the condition of planning, and were therefore addressed in Study 2.

## Study 2

In Study 2 we aimed to replicate the main finding from Study 1 that showed that prior action planning leads to a reduction in

experienced agency for those future actions. We also sought to address some potential confounds in the methodology of Study 1 that may have influenced results in that study. Different from our first study, participants in Study 2 were able to decide themselves whether they wanted to plan their actions or not; participants were only asked to think of future actions without having to indicate that plan; and the trial-duration of planning and no-planning was kept constant. We hypothesized that again, on trials in which participants planned ahead their actions, participants subsequently experienced reduced agency compared with the trials in which actions were not planned in advance.

## Method

**Participants.** Thirty-four undergraduate students (30 females;  $M_{\text{age}} = 22.39$ ) at the Radboud University Nijmegen participated in exchange for 5 Euro's or course credit.

**Materials and procedure.** Study 2 was similar to Study 1. Again participants performed a mouse-click agency task, and were required to indicate their experience of agency for the tone caused by their button-click. However, each trial started with the question whether participants would like to plan their action or not, and they could indicate their decision by the clicking of a "yes" or "no" button. Participants were instructed to do both planning and no-planning trials, and it was specifically emphasized they should mentally plan ahead their response on the planning trials, but refrain from planning on the no-plan trials. Subsequently, the planning trials featured the instruction "Plan ahead your response" for a duration of 6,000 ms, while the no-plan trials featured the instruction "Wait for the experiment to continue" for the same duration. Participants were not required to indicate their plans in advance. In the present study temporal delays were set at 100, 450, and 800 ms. There were 120 trials in total, of which 108 were experimental trials and 12 were filler trials.

## Results

**Agency ratings.** A 3 (Temporal delay: 100 ms vs. 450 ms vs. 800 ms)  $\times$  2 (Planning condition: planned vs. unplanned) repeated-measures ANOVA on Agency scores showed a main effect of Temporal delay,  $F(2, 66) = 67.92$ ,  $p < .001$ ,  $\eta_p^2 = .67$ . Shorter delays led to higher agency scores compared to longer delays ( $M_{100 \text{ ms}} = 86.18$ ,  $SD = 11.56$ ;  $M_{450 \text{ ms}} = 66.72$ ,  $SD = 16.46$ ;  $M_{800 \text{ ms}} = 51.40$ ,  $SD = 21.20$ ). Additionally, there was a main effect of Planning condition,  $F(1, 33) = 11.04$ ,  $p = .002$ ,  $\eta_p^2 = .25$ . Trials in which participants planned their actions led to significantly lower agency ratings compared to trials in which participants did not plan their actions ( $M_{\text{planned}} = 65.66$ ,  $SD = 15.40$  vs.  $M_{\text{unplanned}} = 70.54$ ,  $SD = 12.87$ ; see Figure 3). There was no interaction between the Temporal delay and Planning conditions,  $F(2, 66) = 1.18$ ,  $p = .31$ .

**Reaction times.** A 3 (Temporal delay: 100 ms vs. 450 ms vs. 800 ms)  $\times$  2 (Planning condition: planning vs. no-planning) repeated-measures ANOVA on RTs showed a main effect of

<sup>4</sup> In Studies 1–3 we conducted several mediation analyses using the RTs as a proposed mediator between the plan-conditions and the agency scores using procedures outlined by Judd, Kenny, and McClelland (2001). However, we found no evidence for mediation.

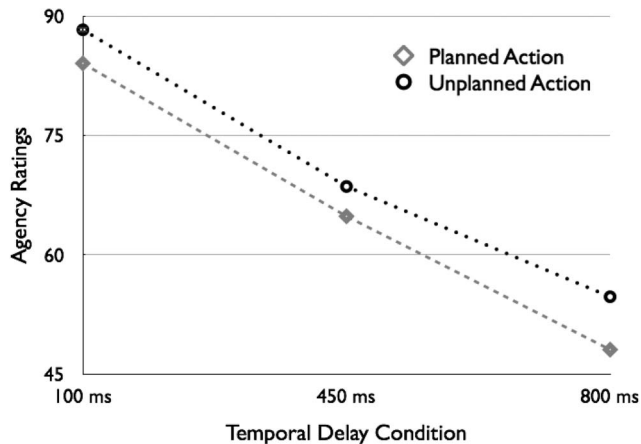


Figure 3. Mean agency ratings per Planning condition and Temporal delay conditions.

Planning condition,  $F(1, 33) = 21.63, p < .001, \eta_p^2 = .40$ . Participants performed their actions faster on planning trials than trials without planning ( $M_{\text{planned}} = 919, SD = 302; M_{\text{unplanned}} = 1159, SD = 364$ ). There was no main effect of Temporal delay, nor was there an interaction between the Temporal delay and Planning conditions,  $F$ 's  $< 1, ns$ . There were no significant correlations between the RTs and the agency scores within the respective planning conditions:  $r_{\text{planned}} = .06, p = .73$ , and  $r_{\text{unplanned}} = .13, p = .44$ . Finally, the analysis showed no significant correlation between agency scores and RTs, with regards to the difference scores between planning conditions,  $r = -.25, p = .13$ .

## Discussion

The results from Study 2 replicate the main finding from Study 1, showing a reduction in agency scores on the trials in which participants planned ahead their action. The fact that the difference in agency scores did not disappear when correcting for a number of potential confounds, suggests these results are robust, and do not depend on certain methodological choices. Although there was already a clear trend in RTs in our first study, RTs in Study 2 were significantly faster for planned than for unplanned actions. This indicates planned actions were implemented faster than unplanned actions. However, we again did not find significant correlations between the RTs and the agency scores making the RTs an unlikely mediator.

There is always the possibility that the explicit nature of the agency paradigm influenced the results from the previous studies. Because participants were explicitly asked for their agentic experience, participants' responses may have been influenced by their inferences and expectations with regards to the experiment (Gawronski, Lebel, & Peters, 2007; Goldstein, Rosnow, Goodstadt, & Suls, 1972; Orne, 1962). In Study 3, we used an implicit measure of agency much less susceptible to the effects of potential experimenter demand.

## Study 3

A number of studies has reverted to implicit measures to investigate the experience of agency or volition (e.g., Aliu, Houde, &

Nagarajan, 2009; Bäβ, Jacobsen, & Schröger, 2008; Blakemore, Wolpert, & Frith, 1998, 1999, 2000; Engbert, Wohlschläger, Thomas, & Haggard, 2007; Haggard et al., 2002; Humphreys & Buehner, 2009, 2010; Libet et al., 1983; Sato, 2008). One intriguing implicit measure that has drawn considerable attention is our perception of time itself. It seems that depending on our sense of agency, our perception of time can be influenced in such a way that controlled or caused actions seem to last shorter than actions without the experience of causation (Moore, Wegner, & Haggard, 2009). Specifically, when we purposefully act, the moment of acting is experienced as later in our perception and memory, whereas its effects seem to arise earlier in time; a perceptual attraction or binding occurs (Haggard & Clark, 2003). In contrast, less deliberate and uncontrolled actions (e.g., passive movements, movements of other individuals) show repulsion, as the time of the action is experienced earlier and the consequence of that action as later. This intentional binding effect (Haggard et al., 2002) is used as a measure of agency, because the binding between voluntary actions and effects reliably occurs in situations in which the participant is an agent compared to situations in which a participant is not an agent (e.g., Engbert, Wohlschläger, & Haggard, 2008).

As in Study 1, participants were instructed to plan or not plan their actions. However, instead of giving agency judgments for the effects of those actions, participants were asked to estimate the time interval between their mouse-click and the presentation of the tone. We expected that time estimates would be higher, suggesting a lower sense of agency, for the trials in which participants planned their actions compared with trials without prior planning.

## Method

**Participants.** Fifty-two undergraduate students (31 females;  $M_{\text{age}} = 20.64$ ) at the Radboud University Nijmegen participated in exchange for 5 Euro's or course credit.

**Materials and procedure.** Participants performed a mouse-click agency task, and were per trial instructed to plan or not plan ahead their action. As in Study 1, participants had to indicate their plans with keyboard responses matching the presented action-buttons. However, instead of giving explicit agency judgments, participants were now required to give their estimations of the time it took for the tone to be delivered after their mouse-click. Tones were generated after 500, 900, and 1,300 ms, evenly divided over trials, and participants were asked to type their answer in milliseconds (with a maximum of 2,000; see also Moore et al., 2009). Trials in which participant did not click the button he or she had planned to click were removed from the analysis (1.4% of the trials). The main task consisted of 72 experimental trials.

## Results

**Agency ratings.** A 3 (Temporal delay: 500 ms vs. 900 ms vs. 1,300 ms)  $\times$  2 (Planning condition: planned vs. unplanned) repeated-measures ANOVA on Time estimates showed a main effect of Temporal delay,  $F(2, 102) = 187.36, p < .001, \eta_p^2 = .78$ . Shorter delays led to shorter times estimates compared to longer delays ( $M_{500 \text{ ms}} = 647, SD = 396; M_{900 \text{ ms}} = 920, SD = 398; M_{1300 \text{ ms}} = 1256, SD = 410$ ). Additionally, there was a main effect of Planning condition,  $F(1, 51) = 12.24, p = .001, \eta_p^2 = .19$ .

Time estimates on trials in which participants planned their action were significantly longer, indicating a decreased sense of agency, compared to trials in which participants did not plan ahead their actions ( $M_{\text{planned}} = 957, SD = 374; M_{\text{unplanned}} = 924, SD = 388$ ). There was a significant interaction between the Temporal delay and Planning conditions,  $F(2, 102) = 3.25, p = .043, \eta_p^2 = .06$ . The mean difference between the trials with planning and trials without planning condition was significant ( $p < .05$ ) in the 900 ms and 1,300 ms conditions, but not in the 500 ms condition ( $p = .89$ ; see Figure 4).

**Reaction times.** A 3 (Temporal delay: 500 ms vs. 900 ms vs. 1,300 ms)  $\times$  2 (Planning condition: planned vs. unplanned) repeated-measures ANOVA on RTs showed a significant effect of Planning condition,  $F(1, 51) = 7.76, p = .007, \eta_p^2 = .13$ . Participants acted significantly faster when they had planned their action compared to when they had not planned their actions ( $M_{\text{planned}} = 937, SD = 295; M_{\text{unplanned}} = 1103, SD = 589$ ). There were no significant correlations between RTs and Time estimates within the respective planning conditions:  $r_{\text{planned}} = .16, p = .26$ , and  $r_{\text{unplanned}} = .25, p = .07$ . Finally, the analysis showed no significant correlation between Time Estimates and RTs, with regards to the difference scores between planning conditions,  $r = .09, p = .52$ .

## Discussion

The results again indicate that planned actions lead to a reduced sense of agency in comparison to unplanned actions. The fact that this effect is shown using an implicit measure of agency, time estimation, decreases the likelihood that the effects presented in our prior studies were caused by the knowledge and expectations of participants in those studies.

The present study also expands the literature on the relation between time perception and agency. Although a number of studies have already revealed that manipulating the experience of acting can influence perceptions of time (e.g., Haggard et al., 2002), a series of recent studies have shown that factors more indirectly involved in the experience of acting, such as contextual primes (Moore et al., 2009) and prior beliefs (Desantis, Roussel, &

Waszak, 2011) can also influence time perception. The present study further expands these findings by showing the effects of action plans, an internal factor that emerges before action performance, but subsequently does influence both action and time perception.

## Study 4

In our previous studies the time between action planning and moment of action performance was held constant over the different trials. However this interval itself may influence subsequent experiences of agency. In the next study, we explored the effects of different time intervals between action planning and action performance on the sense of agency. The results from the prior studies suggest that after action planning we experience less conscious involvement during action performance. Instead of a fluent process in which a decision is acted upon immediately, the moment of action performance is separated from the conscious action decision, leading to a reduction in agency. A prediction following from these hypotheses would be that a longer interval between planning and acting should lead to an increased reduction in agency. Alternatively, when actions follow plans shortly, planning and action performance could be experienced as one fluent process, decreasing the reduction in agency (Chambon & Haggard, 2012; Wenke et al., 2010). In the present study, we tested these predictions by manipulating the time between action planning and action performance in an explicit agency design.

## Method

**Participants.** Fifty-one American adults (35 male;  $M_{\text{age}} = 32.78$ ) participated in this study, in exchange for \$2.50 dollars. Participants were recruited through Amazon.com's Mechanical Turk service, an integrated participant recruitment and compensation system that is both diverse and reliable (Buhrmester, Kwang, & Gosling, 2011). The experiment was conducted using the online environment of Inquisit 4.0.2 (Draine, 2009). Three participants did not complete the experiment and were removed from the analysis.

**Materials and procedure.** Participants performed a mouse-click agency task similar to Study 1. Participants always planned their actions. During the planning phase, participants were shown three small yellow rectangles featuring the letters A, B, and C. These action-buttons were presented in a triangular pattern on the monitor displaying a gray background with the instruction: "Plan which button you are going to press." Participants did not have to indicate their plans. After 6,000 ms, the trial proceeded and the action-buttons were displayed against a white background in the presence of a timer counting down to 0. The timer reached 0, thereby allowing participants to successfully click on the action-buttons, either immediately after the planning part of the trial (0 ms timer delay condition), or after a delay of 1,500 ms<sup>5</sup> or 3,000 ms. Clicks were followed by 300 ms tones: a 600 Hz tone after clicking on the A button, and 800 Hz, and 1,000 Hz tones after, respectively, clicking the B and C buttons. These tones were presented

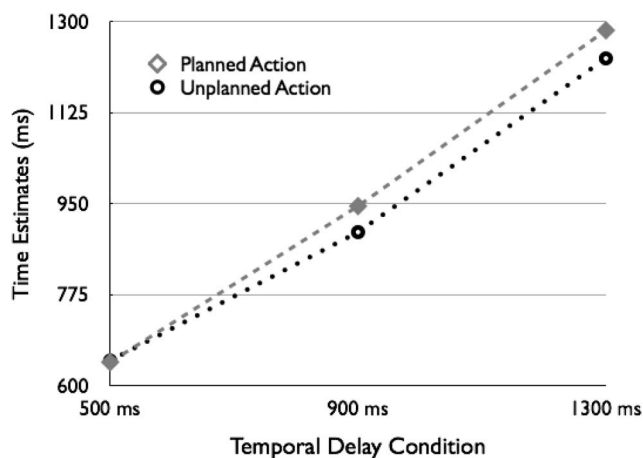


Figure 4. Mean time estimates per Planning condition and Temporal delay conditions.

<sup>5</sup> The timer started at 1 after 500 ms.



after 100, 500, or 900 ms depending on temporal delay condition. The main task consisted of 90 experimental trials and 9 filler trials.

**Agency ratings.** A 3 (Temporal delay: 100 ms vs. 500 ms vs. 900 ms)  $\times$  2 (Timer delay: 0 ms vs. 1500 ms vs. 3000 ms) repeated-measures ANOVA on Agency scores showed a main effect of Temporal delay,  $F(2, 94) = 35.64, p < .001, \eta_p^2 = .43$ . Shorter delays led to higher agency scores compared to longer delays ( $M_{100\text{ ms}} = 75.68, SD = 19.54; M_{500\text{ ms}} = 61.14, SD = 17.39; M_{900\text{ ms}} = 50.46, SD = 19.61$ ). Additionally, there was a main effect of Timer condition,  $F(2, 94) = 4.44, p = .014, \eta_p^2 = .09$ . Longer delays between plans and actions led to lower experiences of agency compared shorter delays ( $M_{0\text{ ms}} = 63.49, SD = 15.45; M_{1500\text{ ms}} = 62.46, SD = 14.76; M_{3000\text{ ms}} = 61.32, SD = 14.41$ ; see Figure 5). There was no interaction between the Temporal delay and Timer delay conditions,  $F(4, 188) = 1.82, p = .126$ .

**Reaction times.** A 3 (Temporal delay: 100 ms vs. 500 ms vs. 900 ms)  $\times$  2 (Timer: 0 ms vs. 1500 ms vs. 3000 ms) repeated-measures ANOVA on RTs showed a significant effect of Timer condition,  $F(2, 94) = 155.37, p < .001, \eta_p^2 = .77$ . Participants acted slower on the 0 ms Timer condition compared to the 1,500 ms and 3,000 ms timer conditions ( $M_{0\text{ ms}} = 1306, SD = 714; M_{1500\text{ ms}} = 645, SD = 533; M_{3000\text{ ms}} = 645, SD = 464$ ). There was no main effect of Temporal delay,  $F(2, 94) = 1.05, p = .353$ ; nor was there an interaction between the Temporal delay and Timer delay conditions,  $F(4, 188) = 1.96, p = .103$ .

The correlations between RTs and Agency scores within the respective Timer conditions were not significant for the 0 ms Timer condition,  $r_{0\text{ ms}} = -.19, p = .20$ , and for the 1,500 ms Timer condition,  $r_{1500\text{ ms}} = -.24, p = .10$ , but was significant for the 3,000 ms Timer condition,  $r_{3000\text{ ms}} = -.38, p = .01$ . This suggests a significant negative relation between RTs and agency scores in the event of a larger interval between planning and performance. When participants were required to wait relatively long before being able to implement their plans, the quicker they acted the higher their agency scores became. Finally, the analysis showed no significant correlations between Agency scores and RTs, with regards to the difference scores between Timer conditions,  $r_{\text{timer } 0\text{ ms versus } 1500\text{ ms}} = .05, p = .75$ ,  $r_{\text{timer } 0\text{ ms versus } 3000\text{ ms}} = .24, p = .10$ ;  $r_{\text{timer } 1500\text{ ms versus } 3000\text{ ms}} = .01, p = .95$ .

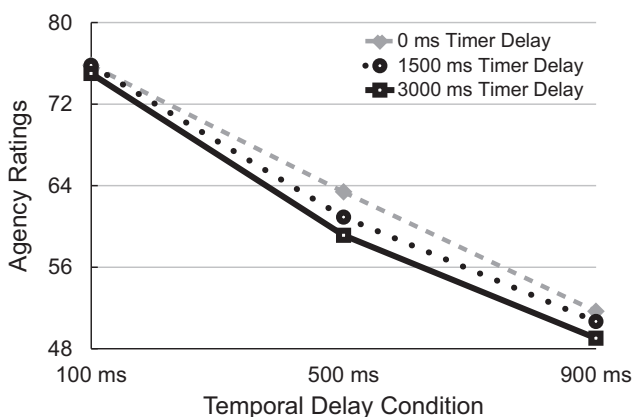


Figure 5. Mean agency ratings per Timer and Temporal delay conditions.

## Results

The results from Study 4 suggest that a separation in time between planning and performance is related to a lower sense of agency. This could indicate that because a separation in time occurs between planning and acting, the conscious involvement of the action decision is no longer fluently connected to action performance, thereby reducing the experience of intentional action. In other words, because we already know what to do, we do not really think about it anymore, but just do it at the right moment. The current results are also in line with a previous study by Wegner and Wheatley (1999), who showed that primes compatible with the location a mouse cursor was about to stop, made participants more likely to declare they had indeed intended to stop the cursor right there; but this was mostly so when the prime was delivered just before acting; agency ratings were weaker when the primes were presented relatively long before action performance.

The results from Studies 1 to 3 showed a clear difference in RTs between planned and unplanned actions, suggesting that perhaps the relative speed and ease with which we perform planned actions could drive the reduction in agency. However, the absence of significant correlations between RTs and agency scores reduced the likelihood of such a relation. In the analysis of the RTs in Study 4, a study in which all participants were required to plan; however, we do see a correlation between RTs and agency scores when participants were required to wait relatively long before they were able to implement their actions. However, lower RTs were related to higher agency scores, a result not in line with the automaticity explanation, and difficult to interpret. Finally, there again were no significant correlations between agency difference scores and RTs difference scores of the Timer delay conditions, also reducing the likelihood that the results on the agency scores were driven by differences in RTs.

## Studies 5–8

In the previous studies we have shown that advance planning was able to reduce the sense of agency. In our next studies, we investigated whether action plans would similarly influence constructs that are related to the sense of agency, such as the degree to which we experience actions as positive or negative, and our experiences and attributions of responsibility.

Although agency is considered an vital aspect of our conscious experience, the degree to which agency perceptions can in turn influence human behavior and cognition has received only limited empirical attention. This neglect is unfortunate as agentic experience is considered crucial for the way we reflect on the actions we perform and how we reflect on ourselves, especially in the case of negative events (Bandura, Barbaranelli, Caprara, & Pastorelli, 1996). For example, if we act in a way that has negative consequences but we do not have the conscious experience of acting, the act itself may also be experienced as less negative (Bandura, 1999; Milgram, 1974). Our sense of agency may therefore determine the experienced emotional intensity of our actions, a prediction we investigated in Study 5.

Similarly, experiences of agency may also influence the degree to which we experience responsibility for our actions. The degree to which we view others as willful agents determines how responsible we judge them to be, making perceptions of intentionality arguably the most important factor by which we attribute respon-



sibility (Alicke, 2000; Malle, 2004; Shaver, 1985). Research has indeed shown that moral judgments and attributions of responsibility are dependent on the degree to which we perceive others to have intentionality and abilities to bring about or avert specific outcomes (Cushman, Young, & Hauser, 2006; Greene & Haidt, 2002; Hamilton, 1978; Lagnado & Channon, 2008; Ohtsubo, 2007; Shaver, 1985; Weiner, 1995). Responsibility and perceptions of agency can therefore be seen as intertwined constructs. Both our perceptions of others as agents, and our personal sense of agency will to a large extent determine our perceptions of responsibility. However, the results from our previous studies and the findings in the previously discussed literature suggest a discrepancy: While our perceptions of intentionality and planning by others increase our attributions of responsibility toward those others, our own prior action plans actually reduce agency, and may then also reduce experiences of responsibility. In Studies 5–8 we addressed this discrepancy.

In the previous studies we discovered that prior action planning was associated with a reduced sense of agency. A process potentially involved in this reduction relates to the sensations of effort we experience when we perform our actions. As previous research has shown, the more effort we experience, the more likely we are to become consciously aware of those actions and the effects they cause (Damen, Dijksterhuis, & van Baaren, 2014; Demanet et al., 2013; Preston & Wegner, 2007). We may be more aware of the fact that we are walking when in full sprint compared with when we proceed at a normal walking pace. It is possible, that when we plan our actions it also becomes easier to perform the actions, subsequently reducing action awareness, agency, and responsibility. In Study 7, we investigated this prediction by asking participants to plan ahead their actions and subsequently asking for their experiences of effort and their experiences of responsibility.

In four experiments we studied whether action planning could influence attributions of responsibility and the experienced emotional intensity of actions. In a first study, participants were either required to plan ahead their decisions in a moral judgment dilemma or did not have to plan ahead their actions. Participants subsequently had to rate the degree to which they found their action unpleasant (Study 5). In two subsequent studies, participants were asked to indicate the degree to which they felt responsible for their action (Studies 6 and 7), and found it difficult to perform their action (Study 7). In a final study we looked at planning and responsibility from the observer's point of view. Participants were either informed about the planning of an action by an actor, or did not receive any cues that would indicate prior planning. Participants were asked to rate the degree to which they believed this actor would feel responsibility for the action, and the degree to which that they considered the actor to be responsible (Study 8).

We expected that when participants were required to engage in the moral judgment dilemma as an agent, prior planning would decrease the experience of unpleasantness of a negative action, and the subsequent feeling of responsibility. However, when participants observed another agent performing the planning and acting, we expected planning cues instead to increase attributions of responsibility.

## Method

**Participants.** Participants (all American adults) were recruited through Amazon.com's Mechanical Turk service. The experiment was conducted using the online environment of Inquisit 4.0.2 (Draine, 2009).<sup>6</sup> There were 322 participants in Study 5 (153 males;  $M_{\text{age}} = 31.17$ ); 443 participants in Study 6 (216 males;  $M_{\text{age}} = 32.80$ ); 257 participants in Study 7 (159 males;  $M_{\text{age}} = 35.16$ ); and 283 participants in Study 8 (176 males;  $M_{\text{age}} = 29.83$ ). Subjects were rewarded \$ 0.25 dollars for their participation.

**Materials and procedure.** Participants in Study 5 were introduced to the following moral dilemma:

Imagine the following situation: You are looking at profiles on a dating website and suddenly you stumble upon the profile of someone you immediately recognize: it is the husband of your best friend Megan. It was clearly updated recently. You knew they recently had some struggles, but Megan had assured you they were 100% committed to working things out. Looking at the profile, you are sure that it is Megan's husband, with whom she has two children. You wanted to confront him to ask about the profile, but he is on a business trip for some time and you don't have his contact information.

After 2 s the story continued and participants read the following: "You are meeting Megan at her house for your weekly get-together. You sit down with her and decide." Participants were then able to click on a button that indicated "To tell" or on a button that read "Not to tell." In the planning condition, participants were first were asked to indicate what they would do the next time they saw Megan and to plan whether going to tell or not going to tell her about her husband's profile. They were asked to indicate this plan by pressing a 1 on their keyboard if they were going to tell, or a 2 if they were not going to tell. Participants were finally asked how unpleasant it was to tell or not to tell Megan about her husband's profile. They could do this by indicating the degree to which their action was unpleasant on a 10-point scale (1 = *Not at all unpleasant*; 10 = *Really unpleasant*). Twenty-two participants were removed from the analysis for not acting in accordance with their plans.

Study 6 was similar to Study 5, with the main difference that participants were asked to indicate the degree to which they felt responsible for their decision to tell or not to tell (1 = *No responsibility*; 10 = *Complete responsibility*). Nineteen participants were removed from the analysis for not acting in accordance with their plans.

In Study 7, participants were similarly asked for their sense of responsibility, but then were additionally asked the degree to which they found it difficult to tell or not to tell Megan about her husband's profile (1 = *Not difficult at all*; 10 = *Extremely difficult*). Sixteen participants were removed from the analysis for not acting in accordance to their plans.

In Study 8, the story was altered in such a way that participants were instead reading about Megan's best friend John, facing the decision to tell or not tell Megan about her husband's dating profile. In this study, John decides to tell Megan about her husband's profile: "A day later John is at Megan's house for their weekly get-together. He sits down with her and starts telling her about her husband's profile." Participants were asked to indicate

<sup>6</sup> Study 8 was presented using the Google-Drive interface.

the degree to which they believed *John* to *feel* responsible for his decision to tell Megan, and to indicate the degree to which *they* held John responsible for his decision. Participants in the planning condition in addition were told: “After contemplating what to do, John comes to a decision and plans to tell Megan about her husband’s profile the next time he sees her.”

## Results

Responses in studies 5–8 were not always normally distributed<sup>7</sup> and regularly featured negative skew or negative kurtosis. The reported results are the parameter estimates from bootstrapping procedures, an analytic approach that does not require the assumption of normality (Hayes & Preacher, 2006). Bootstraps were conducted with bias corrected intervals using 5,000 random samples.

**Action decisions Studies 5–7.** In Study 5, 66% of the participants overall chose to tell Megan about her husband’s profile. In the planning condition, 61% of the participants told Megan, and 70% in the condition without planning. A logistic regression with planning condition as a predictor and Action decision as the outcome variable showed this difference not to be significant ( $B = .36$ ,  $SE = .24$ ,  $p = .15$ ). In Study 6, 68% of the participants overall chose to tell Megan about her husband’s profile. In the planning condition, 65% of the participants told Megan, and 71% in the condition without planning. A logistic regression with planning condition as a predictor and Action decision as the outcome variable showed this difference not to be significant ( $B = .26$ ,  $SE = .21$ ,  $p = .22$ ). In Study 7, 61% of the participants overall chose to tell Megan about her husband’s profile. In the planning condition, 56% of the participants told Megan, and 65% in the condition without planning. A logistic regression with planning condition as a predictor and Action decision as the outcome variable showed this difference not to be significant ( $B = .35$ ,  $SE = .26$ ,  $p = .19$ ).

**Unpleasantness and responsibility judgments Studies 5 and 6.** We conducted a 2 (Planning condition: planned vs. unplanned)  $\times$  2 (Action decision: tell vs. do not tell) bootstrapped comparison on the unpleasantness scores (Study 5) and on the responsibility scores (Study 6). Similar to our findings on the sense of agency, prior planning reduced both the perceived unpleasantness of actions in Study 5,  $B = .97$ ,  $SE = .28$ ,  $p < .001$  [95% CI: .44 to 1.51], and as well as the subsequent experiences of responsibility in Study 6,  $B = 1.07$ ,  $SE = .38$ ,  $p = .007$  [CI: .31 to 1.81]. Actions were experienced as less unpleasant when they were planned in advance, and participants felt less responsible for planned actions (see Table 1). There was also a main effect of Action decision, as both unpleasantness and responsibility scores were higher when participants had decided to tell instead of not to tell Megan about her husband’s dating profile (Study 5:  $B = -.96$ ,  $SE = .35$ ,  $p = .006$ , [CI:  $-1.64$  to  $-.28$ ]; Study 6:  $B = -1.46$ ,  $SE = .44$ ,  $p = .001$  [CI:  $-2.31$  to  $-.66$ ]). There were no interaction effects between the Planning and Action decision conditions ( $ps > .25$ ).

**Responsibility and effort judgments Study 7.** We conducted a 2 (Planning condition: planned vs. unplanned)  $\times$  2 (Action decision: tell vs. do not tell) bootstrapped comparison on the responsibility scores with the effort scores featuring as a covariate. The results showed a main effect of planning on the responsibility

scores,  $B = .93$ ,  $SE = .35$ ,  $p = .010$  [CI: .24 to 1.62]. Participants felt less responsible for planned compared to unplanned actions. There was a main effect of Action decision, as the decision to tell lead to higher responsibility scores than the decision not to tell,  $B = -1.14$ ,  $SE = .44$ ,  $p = .011$  [CI:  $-2.00$  to  $-.28$ ]. Finally, a main effect of effort indicated that increased experiences of effort were related to higher responsibility scores,  $B = .16$ ,  $SE = .06$ ,  $p = .009$  [CI: .04 to .28]. There was no interaction effect between the Planning and Action decision conditions ( $p = .65$ ).

We tested for mediation using bootstrap-procedures with 5,000 random samples as outlined by Preacher and Hayes (2008). The results showed a significant relation of both the Planning and Action decisions on the responsibility scores ( $ps < .05$ ). When entering the proposed mediator, the effort scores, there was also a significant relation between the effort scores and, respectively, the Planning condition and responsibility scores ( $ps < .05$ ). Finally, in the analysis of the direct and indirect effects, the 95% confidence interval (CI) ranged from  $-1.60$  to  $-.48$  for the direct effects, and  $-.35$  to  $-.01$  for the indirect effects, indicating that both the total direct and indirect effects are significant at the  $\alpha = .05$  level. This demonstrates partial mediation by the effort scores.

**Responsibility attributions Study 8.** Using bootstrapping procedures we contrasted the average responsibility scores of the planned and unplanned conditions. As shown in Table 1, planning cues increased beliefs about John’s feelings of responsibility,  $B = -.66$ ,  $SE = .26$ ,  $p = .012$  [CI:  $-1.18$  to  $-.15$ ], and also increased attributions of responsibility,  $B = -.56$ ,  $SE = .27$ ,  $p = .036$  [CI:  $-1.08$  to  $-.04$ ].

**RT Studies 5–7.** In a 2 (Planning condition: planned vs. unplanned)  $\times$  2 (Action decision: tell vs. do not tell) bootstrapped comparison on the Response Times<sup>8</sup> we found a main effect for Action decision in Study 5 ( $M_{\text{tell}} = 3838$ ,  $SD = 3108$ ;  $M_{\text{donottell}} = 4799$ ,  $SD = 3977$ ;  $B = 10462.14$ ,  $SE = 305.42$ ,  $p < .001$  [CI: 9828.96 to 11032.50]), a marginal effect in Study 6 ( $M_{\text{tell}} = 3920$ ,  $SD = 3184$ ;  $M_{\text{donottell}} = 5294$ ,  $SD = 3881$ ;  $B = 1007.61$ ,  $SE = 530.55$ ,  $p = .06$  [CI:  $-1.13$  to 2083.21]); however, in Study 7 the Response Times of telling were not significantly lower than the Response Times of not telling ( $p = .19$ ). In Studies 5 and 6 participants were faster to indicate their decision to tell than to their decision not to tell. There were no main effects of Planning condition on Response Times ( $ps > .38$ ) nor were their interaction effects between the Planning and Action decision conditions ( $ps > .36$ ). Finally, there was no main effect of effort scores on Response Times in Study 7 ( $p = .90$ ).

## Discussion

In the last series of studies of the present article we set out to determine whether action planning—a factor that in previous studies was shown to influence the sense of agency—also influenced the emotional intensity and sense of responsibility related to acting. The present studies showed that this was indeed the case, as

<sup>7</sup> Normality was tested for in all studies. Only in Studies 5–8 did the data violate the assumption of normality. Across all studies, designations of statistical significance did not depend on the analytic strategy used but were consistent throughout.

<sup>8</sup> Given the high latencies we speak about response times instead of reaction times.

Table 1  
*Studies 5–8 Means and SDs Across Conditions*

Study	Mean ( <i>SD</i> )		Total
	Planned	Unplanned	
Dating profile			
5. Agent–Experiences of unpleasantness	6.99 (2.37)	7.90 (2.00)	
Tell	7.37 (2.31)	8.33 (1.59)	7.92 (1.98)
Do not tell	6.38 (2.37)	6.92 (2.47)	6.64 (2.43)
6. Agent–Experiences of responsibility	4.17 (3.23)	5.13 (3.17)	
Tell	4.69 (3.27)	5.76 (3.28)	5.26 (3.32)
Do not tell	3.22 (2.90)	3.61 (2.27)	3.40 (2.62)
7. Agent–Experiences of responsibility	7.20 (2.57)	7.88 (2.11)	
Tell	7.76 (2.28)	8.07 (2.07)	7.93 (2.16)
Do not tell	6.48 (2.77)	7.53 (2.17)	6.97 (2.55)
8a. Observer–Perceptions of responsibility in other agent	7.53 (2.08)	6.87 (2.33)	7.19 (2.23)
8b. Observer–Attributions of responsibility towards other agent	8.00 (2.11)	7.44 (2.11)	7.72 (2.24)

advance planning of a negative action led that action to be perceived as less unpleasant and reduced experiences of responsibility for the negative action.

In a number of theoretical approaches, human and moral agency have been linked to selective disengagement as a result of negative conduct (Bandura, 1999; Bandura et al., 1996). Without the experience of agency, the need for self-regulation or even self-sanction is much less prominent when a person has acted in a negative way (Milgram, 1974). Of interest to the authors, the present findings suggest that through action planning, we may be able to better cope with negative actions, because we experience less agency for them (Studies 1–3), and (therefore) also find them less unpleasant (Study 5).

Observing intentional behavior in others has been shown to lead to increased attributions of responsibility in previous literature (e.g., Cushman, 2008). Attributions of responsibility, and subsequently praise and blame, are more likely to be attributed by us when we infer that another person has acted intently (Alicke, 2000; Malle, 2004; Shaver, 1985). Such an effect was indeed shown in Study 8, where cues and indications of prior planning, and thus intentionality, led to increased attributions of responsibility. However, the relation between planning and responsibility was very different when participants themselves planned and acted, as in Studies 6 and 7 planning led participants to experience a reduced sense of responsibility. Probably through a reduced sense of consciousness or agency, planning one's actions can also reduce the personal sense of responsibility.

The results from Study 7 also offer some first insights with regards to the process that may underlie the reduction in responsibility and agency because of planning. The significant mediation analysis showed that the relationship between planning and agency is influenced through the effort scores: Planning reduced the experienced effort during action performance, and the lower effort scores subsequently reduced the sense of agency. However, the fact that the results showed partial and not full mediation hints to other underlying processes operating in parallel, which are discussed in the general discussion.

The relationship between effort and responsibility also expands on previous research on agency and effort. Although the link between effort in action performance and agency was already established in earlier research (Damen et al., 2014; Demanet et al.,

2013; Preston & Wegner, 2007), to our knowledge, this research is the first to show an effect of effort on responsibility judgments. Furthermore, while earlier research has shown a relationship between effort and agency in very clinical lab-settings, we demonstrate a very similar relationship can be found when using a moral dilemma vignette.

While we use the term action plans throughout this article, the absence of an interaction effect between the planning and the decision conditions in Studies 5–7 suggests that a plan not to act can also reduce the sense of responsibility. It seems that when the appropriate moment to implement an intention has come, and one has been able to plan the response ahead, both acting and refraining from acting seem to lead to a similar reduction in responsibility. However, more studies are needed to validate this idea. An agency study featuring multiple trials would be a good way to test this idea more thoroughly in future research.

We have to consider some limitations of the studies. First, in the present studies we investigated cognitive experiences through moral judgment dilemmas and vignettes. Although these are powerful research tools for researchers (Hughes, 1998), caution should be used when making inferences with regards to real life behavior. However, we are confident that the dilemmas and vignettes in the present study serve as a proxy for actual behavior for a number of reasons: First, in Studies 5 and 6 we used the same basic setup as we used in our previous studies where we investigated real (not imagined) behavior and agency. As in those studies, participants were asked to plan ahead, and were also able to act by indicating their decision, thereby incorporating to some degree the actual behavior in these paradigms. Additionally, the link between perceived intentionality and attributions of responsibility to another individual, as shown in Study 8, has been extensively documented in other literature using a wide range of methods (e.g., Cushman et al., 2006; Greene & Haidt, 2002; Hamilton, 1978; Lagnado & Channon, 2008; Ohtsubo, 2007; Shaver, 1985; Weiner, 1995). A second important consideration here is that some inferences that can be drawn by comparing the studies indeed rely upon differences between separate studies, and not on factors manipulated within one experimental design. Therefore, one should take caution in interpreting these results.



## General Discussion

### Agency

In the present investigation we revealed how action planning could reduce the sense of agency. A number of theoretical accounts on agency have considered the importance of prior plans for the sense of agency (e.g., Brass & Haggard, 2008; Pacherie, 2008; Pacherie & Haggard, 2010) but largely consider such plans to contribute to agency. This reasoning is not illogical considering that a number of studies has shown that a match between expected and actual effects increases agency, while agency is reduced when outcomes do not match expectations (Gentsch & Schütz-Bosbach, 2011; Sato & Yasuda, 2005; van der Weiden et al., 2013). However, although it may be very possible that the sense of agency benefits from a comparison between *outcomes* that are intended and predicted, we show in a number of studies that the prior planning of *actions* may actually reduce agency. Therefore, the present findings theoretically expand the current literature on agency, specifically on models that emphasize the importance of prior thoughts and cognitions for agency (e.g., Synofzik, Vosgerau, & Newen, 2008; Wegner, 2003).

Research on agency has in the past distinguished between two main models, each receiving extensive empirical support: The comparator model of agency emphasizes automatic processes of motor-prediction as being central to the sense of agency (Blakemore, Wolpert, & Frith, 2002). It sees our brain as continuously predicting the consequences of actions we are about to perform. When there is a match between predicted and actual effects, we experience a sense of agency (Frith, Blakemore, & Wolpert, 2000; Wolpert & Flanagan, 2002).

Alternatively, the theory of apparent mental causation considers higher-level interpretative processes between thoughts and actions to underlie the sense of agency (Wegner & Wheatley, 1999). According to this model, the mind attempts to make sense of our actions after we have performed them. When effects quickly follow our actions, when actions and effects are consistent with any prior thoughts we were having about those actions before we acted, and when there is an absence of other potential agents, we are likely to experience a sense of agency (Wegner, 2002, 2003). Both models are now seen as complementary, the sense of agency being informed primarily by automatic motor prediction and subsequently also by inferential processes (Synofzik et al., 2008).

The present research offers a natural fit to an inferential account of agency, because of the importance such accounts attach to the relation between actions and prior thoughts. When it is easy to relate actions to prior thoughts, the experience of agency is increased. When this is more difficult, for example, because of a separation in time between action decision and performance (as in Study 4) agency is reduced. It is interesting to note that when Wegner and Wheatley (1999) introduced their theory of apparent mental causation, they explicitly referred to the implementation intentions literature themselves, suggesting a reduction in agency is possible in the event of distal planning and that “in the absence of thought about the action just before action performance, even the most distant foresight would do little to promote the feeling that one had consciously willed the action” (p. 484). Our results seem to confirm such ideas. Although the inferential model appears to be the most applicable account, it would be interesting for

future research to investigate whether processes of motor prediction also change as a function of action planning.

### Implementation Intentions

The power of prior plans on actual behavior has earlier been shown in the domain of implementation intentions (e.g., Gollwitzer, 1999). A deliberate intention to do X in situation Y has been shown to increase the likelihood of acting in the desired way (e.g., Armitage, 2007; Sheeran & Orbell, 1999) and leads to immediate and effortless initiation of the planned behavior at the right time (Brandstätter et al., 2001; Cohen et al., 2008; Gawrilow & Gollwitzer, 2008). These studies show the power of deliberate intentions to act in a desired manner. The present investigation complements these findings by showing that the implementations of those action plans are actually accompanied with a reduced sense of conscious involvement, or agency, for subsequent actions.

The present findings may suggest an intriguing tension between the effectiveness of implementation intentions on one hand and how important it is to experience agency and responsibility when performing an action on the other hand. The question is, if it is a “good” thing that this technique can also lead individuals to experience less agency and responsibility for their actions, as is suggested by the present results. Often, the actions we find most memorable, insightful, and rewarding are the actions for which we experience agency, and factors that deduct from agency also deduct from these beneficial experiences. However, we do not wish to suggest abandoning this effective technique, but just to put into a new perspective some cognitive consequences of using implementation intentions.

### Processes Underlying the Reduction in Agency

The question then is: What causes this reduction? As described above, the literature on implementation intentions emphasizes an increase in action automaticity—action initiation becomes quick, effortless, and can occur without requiring conscious intent—and it is likely that such automaticity is indeed related to the reduction in agency as observed in the present research. To be more specific about processes behind such automaticity, we explored whether several study parameters were related to the magnitude of the observed effects.

First, from the analyses on RTs in Studies 1–3 we observe that planned actions are performed more quickly than unplanned actions. This could indicate that through planning we may prepare our motor system for acting; the motor system may then respond very quickly at the required moment; with the conscious awareness of acting lagging behind (similar to how we experience reflexive actions). In other words, the relative speed in acting then reduces the sense of agency. However, the absence of significant correlations between the RTs and the agency scores makes the former an unlikely mediator.

A second explanation may lie in the difficulty or effort one experiences when performing a preplanned action; this action may be easier to perform compared with an action that was not planned in advance. The mediation analysis from Study 7 indeed shows that experienced effort partially mediated the effect of planning on agency. These findings add to recent research on effort and agency (Damen et al., 2014; Demanet et al., 2013; Preston & Wegner,



2007) by showing that action planning can reduce experienced effort and thereby influence agency. That said, there are two reasons suggesting the presence of additional processes underlying the shown effects. First, the mediation analysis showed only partial and not full mediation through effort. Second, the relative simplicity of the actions in the agency studies (Studies 1–4) reduces the likelihood that differences in effort played a big role in those studies.

Another process potentially underlying the current results may be a difference in cognitive involvement during the action performance. Because action decision and action performance—and the cognitive involvement that goes with them—become separated in time, an individual is less likely to see these two activities as related (Wegner & Wheatley, 1999). The results from Study 4 in general seem in line with this idea, as a greater distance between planning and performance led to a greater reduction in agency. Additionally, acting upon preplanned actions may also require less cognitive involvement during action performance, but studies which can monitor neurological activation are needed to test the validity of such ideas.

A large number of theoretical accounts on motor control and agency emphasize the importance of cognitions related to action outcomes (Wenke, Fleming, & Haggard, 2010). When we perform actions, we use representations of the likely outcomes of our actions as a cue to our agency. The process of action planning may however influence the degree to which these outcome representations are relied upon. Planning may increase the likelihood of (strong) action representation, perhaps even at the cost of outcome representation. Participants may then decide what tone to produce, but once a decision is made, all that follows is execution and outcomes are no longer considered (Hommel, 2000). A related process that may be influenced by planning could be the relative concreteness or abstractness of action representation. As shown by Vallacher and Wegner (1987, 1989), each action we perform can be represented both in very concrete terms (e.g., moving a finger to push a doorbell) or more abstract terms (e.g., visiting a friend). The planning of specific actions could lead to a shift, making representations more concrete and related to action-performance. Such a change may also reduce the degree to which outcomes or abstract goals are represented, perhaps thereby reducing the sense of agency.

### Potential Moderators

Does this mean we always experience reduced agency after action planning? We actually believe there are a number of situations in which action planning can lead to different effects: For example, when actions are complex it may be difficult for them to be triggered or be performed without conscious guidance. Furthermore, when the situation for which one has planned to act is rather different from what was expected, a new deliberate decision may be made and acted upon. This would then override the earlier decision, subsequently leading to a level of agency one would experience without advance planning. Next, as suggested by the results from Study 4, if prior planning is immediately followed by action performance, these events could be experienced as one fluent process, stopping the reduction in agency (Chambon & Haggard, 2012). Finally, through repetition or prolonged acting, one may eventually master the performed action. Action perfor-

mance then becomes relatively automatized, and plans related to the actions may be substituted with plans with regards to the immediate effects of those actions (Vallacher & Wegner, 1987). Instead of planning to press a certain button, we may already be thinking of the effect of that action (e.g., turning on the light). We believe the moderators described above offer promising avenues for future research.

There are also a considerable number ways in which individuals may differ if it comes to their cognitions about action performance. Such differences may influence the degree to which individuals are inclined to plan ahead (Schunk, 1991), to engage in deliberative processing or act on their gut-feelings (Epstein, Pacini, Denes-Raj, & Heier, 1996), or think about their actions in a concrete or abstract manner (Vallacher & Wegner, 1987). Such individual differences may influence agency and, therefore, seem promising factors to pursue in future research. We expect that individuals who, because of their personality, are more inclined to plan for the future in a concrete way, should more often experience a reduced sense of agency or responsibility while they are acting.

### Emotional Intensity and Responsibility

In the present investigation we were interested in the influence action planning would have beyond agentic experience. Human agency is of central importance to the degree to which we fully experience the nature of our emotions (Bandura, 2001), and the characteristic by which we experience and attribute responsibility (Cushman et al., 2006). In the present investigation we showed that action plans would also influence the intensity by which an action is experienced. Although perceptions of agency in others have been shown to affect beliefs about another's ability to feel and experience emotions (Gray & Wegner, 2009), to our knowledge, no empirical evidence has shown that personal agency could influence the degree to which we experience the intensity of emotions.

The present findings also expand the literature on responsibility, by showing that the same factors that manipulate the sense of agency, such as the action plans of the present investigation, similarly influence personal experiences of responsibility. Crucially, however, is the role of the person in the situation. If the person is an agent, action plans reduce the personal sense of responsibility. If a person is observing another agent, cues related to planning by that other person increase our perceptions of responsibility and accountability. While the relation between intentionality, planning, and attributions of responsibility toward others has been a well established finding (Cushman et al., 2006; Greene & Haidt, 2002; Hamilton, 1978; Lagnado & Channon, 2008; Ohtsubo, 2007; Shaver, 1985; Weiner, 1995) the present work therefore expands this literature by showing the reverse effect in agents. Such actor-observer discrepancies have been illustrated in a number of other domains. For example, the fundamental attribution error (Ross, 1977), or actor-observer bias (Jones & Nisbett, 1971), describes how we overvalue situational explanations of our own behavior, and yet undervalue situational explanations of others' behaviors. In the present study we show another such actor-observer discrepancy, in the relation between planning cues and perceptions of responsibility.

## Implications

Our attributions of agency and responsibility toward other individuals often determine how we judge those others. We ascribe responsibility, and subsequently praise or blame, when we consider individuals to be personally responsible for their actions and to have personal agency over them. Ascriptions of agency and responsibility form the cornerstone for many of our legal and social systems (Bandura, 2001; Jeannerod, 1999). In these systems, and in general in the way we judge others, planning and premeditation are seen as cues of agency and responsibility. Such cues can lead someone to be punished more severely, as in virtually every legal system crimes that are premeditated are punished more severely than crimes committed in the spur-of-the-moment. We think the results we presented in the current research can bring a new perspective in the way we judge an individuals' theory of mind when performing a planned action: He or she may be less likely to experience agency and responsibility at the moment of action performance.

## Limitations

The action alternatives that were presented in the current studies were similar in terms of valence. This made it natural for participants to consider both options, and in the case of the vignettes made them a true dilemma. However, this also means that we need to reserve a degree of caution when making statements about the generalizability of the present findings. It remains to be seen what happens when participants decide between a positive and negative option, or decide between a personal gain or an action that would lead to a greater common good (as in a prisoners' dilemma). One option can be more socially acceptable than another option. It may be that for individuals who often act in a socially acceptable way (e.g., noncriminals) a plan to perform a socially negative action will remain active for a long time after planning (e.g., rumination, guilt). This is important to keep into mind in the discussion on the societal implications of the present study.

## Conclusion

Even though much of human cognition has been shown to be the result of automatic and unconscious or preconscious processes (e.g., Aarts & Dijksterhuis, 2000; Bargh & Ferguson, 2000; Libet et al., 1983) the influence of consciousness and conscious deliberations on human experience remains large and considerable. As was revealed in the present investigation, deliberate action plans may influence the experience of subsequent actions in a number of different ways: they influence both our personal sense of agency and the emotional intensity of actions, and they can even influence our perceptions of responsibility. Each day we go through many moments in which we contemplate our future actions. We may have planned our behavior in the coming minute, the next day and some of us may already know their plans for the entire week. The present research however shows that such plans can influence a large degree of our subsequent conscious experience.

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