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**INFLUENCING THE SENSE
OF AGENCY**

TOM DAMEN

Influencing the Sense of Agency

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Influencing the Sense of Agency

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'New shit has come to light.'

-The Big Lebowski

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Chapter 1

**General Introduction,
Summary and Discussion**

It is 8:39 AM on a chilly Monday-morning, and I am waiting for the bus at Utrecht Central Station.

I am standing in a long line together with about sixty students all waiting for number 12 bus to arrive, a long bus with multiple entry-doors that has the local university as its destination. It is always very crowded at this hour given the fact that the first lectures of the day start at 9 o'clock. Not yet completely awake, I am craving for the first cup of crappy coffee we can get from the coffee machine at our department. When the bus arrives we all take our positions, and when the doors open the daily race for a seat begins. Thankfully the doors on this bus are wide enough for multiple individuals to enter simultaneously. Upon entering, I quickly determine which seat is the most promising given its distance and the behavior of the competition. I hold my public transportation card against the nearest card reader, hear the 'beep' that confirms I successfully checked in on the bus, and sit down quickly. About twelve minutes later two ticket inspectors board the bus and start checking everybody's transportation cards. When they arrive at my seat I dutifully hold up my card for inspection. When one of the inspector reads my card using his portable device he looks at me in an annoyed manner and then asks: "Sir, please explain to me why you did not check in?" I am quite surprised by this question, and I tell the inspector I *did* check in! Walking defiantly to the card reader to show him how I had done so, I suddenly see a sticker on the card reader stating: "Out of order". Apparently, the card reader has been out of order for a week, making it impossible for me to have checked in. While I am left somewhat confused the inspector explains to me what had probably happened: The 'beep' I heard was in fact caused by another passenger checking in at the same time on an adjacent card reader, and I mistakenly assumed that it was my 'beep' that had been caused by my actions. My sense of personal causality, that sense of agency that I experienced for checking in, had just played a 'trick' on me! I put on my dumbest face – not much of an effort at that point in time – and to my relief, I am not given a fine.

INTRODUCTION, OVERVIEW, AND IMPLICATIONS

The sense of agency refers to our experience of personal causality: It is the feeling that we cause and control our actions and through those actions change our environment. Each day we encounter a multitude of these experiences that seem to come to us in a very natural way. We flip a light switch to turn on the light in our office and it feels like we caused the light to occur; we start running in an attempt to catch a train that is about to leave and feel a degree of personal achievement when we actually make it; and we may even experience a degree of self-control when, after contemplating our plans for the coming evening, we decide not to work – for a change – and turn on the TV to watch the latest episode of Game of Thrones instead (or vice versa of course). These examples demonstrate that we often

seem to experience a coherent link between our thoughts and our body movements and, in turn, to the external effects in the world, which brings about a feeling of control over these events. We experience this feeling of agency as something logical and intuitive. But is this experience of causal control indeed such a given when we act, or is it, like so many aspects of human cognition, influenced by factors operating outside of our conscious awareness? The present dissertation will show that there are a number of external and internal factors that influence our sense of agency, and deals with how and when our personal sense of agency emerges.

The experience of agency is of interest and importance as it lies at the heart of our motivated behavior. Consider how important our perceptions of control are for our motivation to form deliberate intentions and set future goals. The shops are filled with books on dieting, workouts to obtain that perfect six-pack, and other volumes on behavioral change that promise life-changing transformations (while getting rich in the process). But would we still make our New Year resolutions, or try out the latest Dr. Phil self-help book if we did not experience a feeling of control? Without a perception of personal causality and control over our actions and the environment, we would probably be much less motivated to change our behavior. That is also why perceptions of control are of central importance to a wide range of theoretical models of behavioral change (Ajzen, 1985; Ajzen, & Fishbein, 1980; Bandura, 1986; Fishbein, & Ajzen, 1975; Prochaska & DiClemente, 1986; Schwarzer, 1992).

Our sense of agency also influences the way we reflect on ourselves, our actions, and the world around us (Bandura, Barbaranelli, Caprara, & Pastorelli, 1996). Imagine we push another person and that person falls and breaks an arm. How we interpret this event greatly depends on whether we intentionally pushed that person – intentionality being an important cue for the sense of agency – or whether it happened accidentally as we reflexively reached out for grip while falling down ourselves. Similarly, our perceptions of agency in others also often determines how we judge them. Attributions such as respect, love, resentment or indignation, responses that are of central importance to our lives, are often attributed because we judge individuals to be personally responsible for their actions and to have personal agency over them. Without these attributions it would seem out of place to either praise or blame another person. Ascriptions of agency therefore form the cornerstone for many of our legal and social systems (Bandura, 2001; Jeannerod, 1999). Consequently, individuals that acted without intent (e.g., accidentally not checking-in on the bus) or who are not regarded to have a fully developed agentic mind (e.g., children, mentally ill) are held less responsible for their actions.

Interestingly, a growing body of scientific evidence is showing that agency is not a given when we act, but instead is the outcome of a multi-factor process involving prediction and inference. Depending on the specific circumstances in which we act, our experienced sense

of agency can be increased or reduced. In the remainder of this chapter, I will first discuss some instances that reveal agency is not as clear-cut as we may believe. Then, I will provide a brief historical overview of the scientific study of human agency and discuss the main theoretical models in the field in more detail. Subsequently, I will describe the research that represents the main body of the current dissertation. Based on those studies, I will explain how agency is influenced by a number of external and internal factors, in ways and contexts that had not been investigated in previous research. Specifically, I will show how contextual factors, such as cues to act and the presence of other agents in our environment influence our sense of agency; how internal factors, such as prior action plans and experiences of effort influence agency; and I will also show how experiences of agency in turn influence our behavior. Finally, I will outline the broader implications of the work described in the present dissertation.

Is agency ever unclear?

During the course of a normal day, we are not continuously introspecting whether we truly did or did not cause actions and effects. We are instead focused on getting 'things' done the right way and it is only when we discover those things were in fact done by another agent that we discover that our sense of agency was off the mark. Close inspection of our daily lives can reveal a lot of situations in which our experience of agency is not as clear-cut as we may intuitively believe it to be. The situation described at the beginning of this introduction is an illustration of experienced agency in the absence of a true effect: Because I expected a certain outcome (the 'beep' sound), I judged an outcome that matched my expectations to have been caused by my actions. In a similar sense, we may have the feeling that we called for an elevator by pushing the elevator button, that we caused it to stop at our floor, and even that we caused the doors to open, while the elevator and a colleague in it were in fact already on their way to that same floor.

We can also experience agency for events we are not directly involved in. For example, by rooting for our favorite sports-team to win, we can get the impression that we in fact helped-out; or instead jinxed them by running to the fridge and having them out of sight for a few seconds (Pronin, Wegner, McCarthy, & Rodriguez, 2007). As such, actions and effects that have no direct causal relation in real life nevertheless become related in our minds, making us believe we somehow influenced the outcome. As a by-product, we may start believing in the power of good luck charms or engage in ritualistic behavior¹ in an attempt

¹ For example, Wayne Gretzky, widely regarded as the greatest hockey player in NHL-history, would not get his hair cut while his team was on the road because one time when he did, his team suffered a major loss. Furthermore, during practice he would begin by shooting a puck to the right of the net; he would then drink a Diet Coke, a glass of iced water, a Gatorade and another Diet Coke in that exact order. As for his uniform, he would always put the left side on first and he would always tuck in the right side of his jersey. Also, he would put baby powder on the blade of his hockey stick.

to enhance control and agency over outcomes that co-occurred with our actions by chance.

It is also possible to act without experiencing agency. For example, there is a large number of actions performed by our body that we shall never regard as being under our personal control: While we can experience agency for what we do with our arms, legs, and lips, we do not continuously experience agency for our breathing, the dilation of our pupils, nor for the contractions of our heart. We seem to perform a lot of actions without immediate experiences of agency. Our sense of acting is also seriously reduced when we act reflexively (e.g., when avoiding collision), in which our awareness of action performance seems to lag behind our actual acting. Although we may consciously know that *we* indeed had moved, our immediate experience of personal agency is nevertheless seriously reduced.

A similar thing may happen for actions that are performed regularly or for prolonged periods of time: At a certain moment our attention shifts away from the action we are performing and our cognitive and perceptual lens is directed elsewhere (Schooler, 2002). Imagine riding a bike: Although in the beginning you may be focused on getting the cycling movement going, once you get some momentum and hit the main road, you may already be thinking about your upcoming day at work. Such a shift does not imply individuals will deny their agentic involvement when we ask them, “Were you the one who was cycling?”. Nevertheless, when we think about other things then the actions we are currently performing, our action awareness and the immediate experience of agency are likely to be reduced.

That agency is not a given when we act is also illustrated when we consider less ordinary examples. For example, while individuals under hypnosis are able to perform a wide array of complex actions, their sense of personal control over such actions is absent; even for the behaviors performed due to posthypnotic suggestion while awake (Lynn, Rhue, & Weekes, 1990). Similarly, survivors of life-threatening situations often report the events and their actions as being involuntary and automatic, as if they had experienced the event in a state of ‘trance’ (Noyes & Kletti, 1977). Furthermore, there are a number of pathological disorders that are accompanied with disruptions in the sense of agency. For example, patients with anarchic hand syndrome have the compelling experience that one of their hands is beyond their control, having its own will and responding to external cues (Marchetti & Della Sala, 1998). In contrast, patients suffering from utilization behavior will continuously and unnecessarily act upon the external stimuli in their environment (e.g., donning multiple spectacles; Lhermitte, 1983), and claim to have consciously willed those actions – even though all those actions were driven by exogenous factors. Finally, patients suffering from schizophrenia may indicate that their actions or thoughts feel as though they were externally generated or under the control of someone else (Graham & Stephens, 1994), or, they instead over-attribute their personal involvement in events, claiming control over the thoughts and actions of other persons (Jeannerod, 2009).

In sum, while we often feel our sense of agency to be a clear-cut experience, closer inspection of a number of normal and somewhat less normal processes reveals that agency is not simply a given fact when we act. Experiences of agency over actions and outcomes can be absent even when we did in fact cause those actions and action outcomes to occur, and experiences of agency can be present when we did not act nor produced effects (Wegner, 2003). It appears then that our sense of agency is not a given when we act. As I am about to show, agency emerges as the outcome of a complex process involving multiple cues and modules, and is therefore sensitive to a number of different factors.

The science of personal agency

The scientific inquiry in the origins of our experiences of agency goes back as far as science itself, to the ancient Greek world with the writings of Aristotle and Epicurus, who theorized about agency in decision making over 2000 years ago. Human agency and the question of free will or determinism have intrigued the minds of founding fathers of modern science and psychology such as David Hume (1739) and William James (1890). However, the amount of research into these concepts over the past two decades has been staggering and includes psychology (e.g., Aarts, Custers, & Wegner, 2005; Marcel, 2003; Sato & Yasuda, 2005), philosophy (e.g., de Vignemont & Fournieret, 2004; Eilan & Roessler, 2003; Gallagher, 2000, 2007; Pacherie, 2007; Synofzik, Vosgerau, & Newen, 2008), neuroscience (e.g., Blakemore, Wolpert, & Frith, 1999; Chaminade & Decety, 2002; Farrer et al., 2003; Tsakiris & Haggard, 2005), and psychopathology (e.g., Daprati et al., 1997; Frith, Blakemore, & Wolpert, 2000; Stephens & Graham, 2000).

A research line that has been pivotal for the renewed interest in this important topic is the work by Benjamin Libet (1985) and his studies on volitional acts and readiness potentials (representing activity in the motor cortex signaling a preparation to act). Although it was well known that readiness potentials precede physical actions, Libet investigated how readiness potentials corresponded to the conscious intention to move. In his studies, participants were asked to report the time at which they formed an intention to act. This point in time was then compared to the observed readiness potentials in the motor cortex signaling the preparation to act. Crucially, what Libet demonstrated was that the onset of readiness potentials regularly preceded awareness of the intention by several hundred milliseconds. This finding suggests that supposedly conscious decisions are in fact already prepared in the brain before we may become aware of them (Libet, 1985; Libet et al., 1983). These findings ignited a huge debate on free will and inspired research that has revolved around two central questions: First, is there such a thing as free will? And second, if our decisions to act do not emerge from our conscious intentions, then how, where and why does the sense of agency emerge?

The debate with regards to the existence of free will continues until today, and though a conclusive “yes” or “no” may never be possible, the empirical efforts emerging within this fascinating domain have facilitated a greater understanding of the processes that lead to our personal sense of agency. Research on agency has resulted in two main models, each receiving extensive empirical support: first, the comparator model of agency (Blakemore, Wolpert, & Frith, 2002; Frith, Blakemore, & Wolpert, 2000; Wolpert & Flanagan, 2002) and second the theory of apparent mental causation (Wegner, 2002; Wegner, 2003; Wegner & Wheatley, 1999). These two theories differ with respect to the degree which they emphasize either automatic processes of motor-prediction as being central to the sense of agency, or whether they consider high-level interpretative processes between thoughts and actions to underlie the sense of agency. We will examine both models briefly, then, we will discuss a third route to agentic experience that has recently attracted scientific interest: experiences of effort in acting.

A process of motor prediction

Comparator models view the brain as a prediction machine that continuously works to structure the input of our world around us based on our earlier experiences. We do not notice this during the course of a normal day until the moment comes that a prediction fails. For example, when an escalator is out of order, our brains will still attempt to compensate for the escalator’s movement, thereby creating a visual illusion of movement. According to the comparator model of agency, the motor system in our brain also makes predictions about the sensory experiences of acting and the immediate sensory consequences of the outcomes of actions. Each action is therefore accompanied by information regarding sensory predictions. When we reach out for a glass of water, our motor system predicts what to expect regarding the movement (e.g., distance, position, expected effort), and it may also predict the immediate sensory effects (texture and temperature of the glass, taste of water). Agency is then derived from a match between the predicted and actual outcomes. When predicted and actual sensory signals match, we experience agency, however, when these happen to mismatch agency is reduced. For example, imagine reaching out for a glass of water but that the glass of water suddenly feels very heavy. You will probably be wondering what is happening *to* you, instead of experiencing what is being done *by* you.

The impact of motor predictions on the sense of agency has been shown in a large number of studies. These studies regularly manipulate the availability of motor predictions, for example through the distortion of immediate action feedback (e.g., by giving false visual feedback; Leube et al., 2003), through the comparison of active and passive movements (e.g., pressing with your finger vs. having your finger pressed; Engbert, Wohlschläger, & Haggard, 2007), and through the variation of outcome probability (e.g., by manipulating whether specific key presses are followed by predictable outcomes; Moore, Lagnado,

Deal, & Haggard, 2009). Such findings helped shape and support the comparator model.

However, there are quite a number of situations that are difficult for the comparator model to explain (Synofzik et al., 2008). For example, we often act in situations in which the outcomes of our effects are unpredictable or incongruent to our predictions. Yet, that does not automatically mean we will attribute that action or action effect to another person. For example, I may believe that I am the agent of the action, just because I take into account the fact that I am the only one in the room (de Vignemont & Fournieret, 2004). We can therefore use inferential information when judging our own agency.

An inferential process of agency

A model that acknowledges the influence of inferential processing with regards to agency and that has attracted considerable support, is the theory of apparent mental causation (Wegner & Wheatley, 1999), also known as the inferential account of agency. This model does not tie agency directly to motor control. Instead, agency is inferred when individuals retrospectively link their actions and/or perceived contextual effects, to any thoughts they may have had about actions or outcomes prior to acting. Specifically, agency is most likely to be experienced when one's thoughts *precede* the actions (the principle of priority); when thoughts are *consistent* with actions or action outcomes (the principle of consistency); and when personal thoughts are the only plausible causes of actions (the principle of exclusivity; Wegner, 2002). This model is able to explain why we may feel agency for actions that are novel and unpredicted, and why we may sometimes feel agency in situations in which we did not even truly act (e.g., Dogge, Schaap, Custers, Wegner, & Aarts, 2012; Moore & Haggard, 2008; Moore, Wegner, & Haggard, 2009).

Studies that support the theory of apparent mental causation have often manipulated contextual and social information, or personal beliefs. For example, a number of studies have shown individuals to experience an increased sense of agency when they were given previews (e.g. in the form of instructions or primes) of the actions or actions' effects which they were about to perform or generate (e.g., Aarts et al., 2005; Wegner, Sparrow, & Winerman, 2004). Additionally, research has shown that the sense of agency can be influenced by manipulating the number of choice alternatives (fewer options can reduce the feeling of free choice and can thereby reduce agency; Barlas & Obhi, 2013) and by suggesting or priming the presence of potential other agents (e.g., by suggesting that the computer can cause certain effects to occur the sense of agency over those effects can be reduced; Dijksterhuis, Preston, Wegner, & Aarts, 2008; see also Desantis, Roussel, & Waszak, 2011).

These two theoretical accounts of agency are not mutually exclusive. Recent integrative frameworks assume that both pre-motor cues and post-motor inferences contribute to the sense of agency (Moore, Haggard, & Wegner, 2009; Sato, 2009): Initially, motor predictions

and sensory feedback elicit the primary feelings of agency (Tsakiris & Haggard, 2005); then, this low level information is integrated and subsequently adjusted by a person's intentions, thoughts, and social and contextual cues (Synofzik et al., 2008); these different agency cues may then combine to obtain the most robust and reliable estimate of agency (Synofzik, Vosgerau, & Lindner, 2009) as different cues are weighed differently depending on their reliability and availability given the situation (Moore et al., 2009). For example, the presence of potential alternative agents may change the weighting of internal signals: When a nearby glass falls on the floor, the knowledge of being alone in the room may be informative enough, whereas internal sensorimotor cues could receive more weight if other people were around (Gentsch et al., 2012).²

Experienced effort as cue to agency

Recently, there has been an increased interest regarding a third process potentially underlying the sense of agency. Specifically, it has been suggested that our experiences of effort can influence the likelihood for us to perceive ourselves as being causal agents. Effortful action is likely to reach our conscious awareness, and can therefore be a powerful cue to the sense of agency (Jeannerod, 1997; Pacherie, 2008). For example, we may be more aware of the fact that we are walking to the bus-stop when in full sprint compared to when we are walking at a leisurely pace. A number of recent empirical studies have indeed shown that when individuals have to exert effort, for example by holding a handgrip (Preston & Wegner, 2007) or pulling a stretch-band (Demanet et al., 2013), they are more likely to judge themselves as being agents in a parallel agency paradigm. Effortless acting is however linked to automaticity and thereby a reduced sense of agency. For example, a lot of the actions we perform have been practiced so often that they operate effortlessly, without conscious guidance (e.g., cycling) and therefore without our immediate action awareness (Bargh & Chartrand, 1999; Schooler, 2002).

Measures of agency

There are a number of ways that have been regularly used by the scientific community to measure the sense of agency. One approach has been to ask participants for their sense of causation for actions directly (Wegner, Sparrow, & Winerman, 2004), or for the effects their actions may or may not have caused (Sato, 2009). In experiments using such measures, participants are often made unsure of their sense of agency: Participants act (e.g., they press a keyboard button) and subsequently perceive effects (e.g., they hear a tone presented through a headset), but are instructed that these actions or effects can either be caused by

² Alternatively, another possibility is that we are more aware of others in a full room, increasing our reliance inferential information. Lots of alternative predictions for future research to explore.

them but could also have been caused by another agent (e.g., the computer; Aarts et al., 2005; or God, Dijksterhuis et al., 2008; Sousa & Swiney, 2013). At the same time, further ambiguity is often induced by varying the delay between action and outcome (the longer the delay, the more participants will become uncertain of their sense of agency; Sato & Yasuda, 2005), or by varying the nature of the effect itself (expected vs. unexpected effects; Moore & Haggard, 2008). Such an ambiguous situation (reflecting the ambiguity of agency in daily life) allows for repeated measurements of the factors that are under empirical scrutiny. See Figure 1.1 for a typical pattern of results we regularly observe in such experiments.

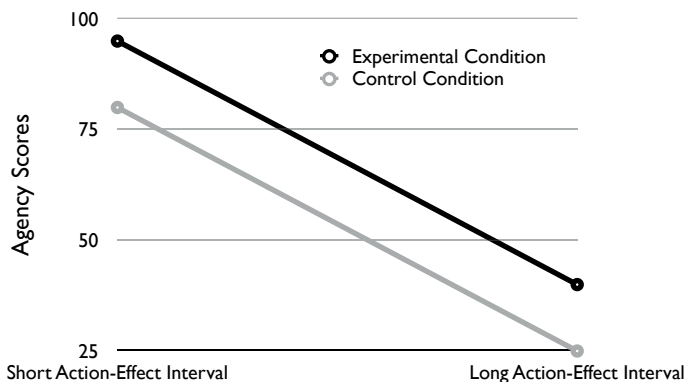


Figure 1.1. Example results of a simple agency experiment in which the action-effect delay is manipulated and which additionally features an experimental manipulation. It is often the case that the longer we have to wait for the effects of our actions to occur, the lower the sense of agency becomes, hence the decreasing slopes. The differences between the lines are indicative of differences between experimental conditions.

In addition, there are several fascinating implicit measures of agency that have been used in a large number of recent studies (Aliu, Houde, & Nagarajan, 2009; Bäb, Jacobsen, & Schröger, 2008; Blakemore et al., 1999; Buehner & Humphreys, 2009; Cardoso-Leite, Mamassian, Schütz-Bosbach, & Waszak, 2010; Cravo, Claessens, & Baldo, 2011; Engbert, Wohlschläger, Thomas, & Haggard, 2007; Haggard, Clark, & Kalogeras, 2002; Martikainen, 2004; Sato, 2008). For example, because our actions carry with them the sensory predictions related to action performance, the experience of these effects is *attenuated*. Specifically, in the case of a match between predicted sensation and actual feedback, the anticipatory sensations are cancelled, and the sensory event is subsequently experienced as less intense. This phenomenon explains why it is difficult to tickle yourself (tickling is only tickly when the tickle is unpredictable or uncontrollable; Blakemore, Wolpert, & Frith, 1998). Studies have therefore used intensity ratings of the experience of effects as an implicit measure of agency (e.g., Gentsch, Schütz-Bosbach, Endrass, & Kathmann, 2012; Sato, 2009).

Another intriguing phenomenon that is related to the experience of agency is our perception of time. When we feel that we voluntarily perform actions, our actions and their effects are perceived as being closer together in time compared to when we feel we involuntarily perform actions (Haggard et al., 2002). This decrease in the perceived interval between action and its effect is known as intentional binding, and reliably occurs when we are – or think we are – agents (Moore & Obhi, 2012). Time perception is therefore often used as an implicit measure of sense of agency (Desantis, Hughes, & Waszak, 2012). In the present dissertation we have sometimes used paradigms of time perception as an implicit measure to complement and expand on explicit paradigms. Such implicit measures have the added advantage that they are much less susceptible to participants' prior beliefs (Orne, 1962) and demand characteristics (Gawronski, LeBel, & Peters, 2007) than explicit measures of agency.

Conclusion

To conclude the first part of this introduction: our sense of agency is of great importance to us as individuals and as social beings. However, while we may intuitively believe that agency comes naturally with our actions, we can experience agency over actions and effects we did not truly cause, and act and cause effects without the experience of being a causal agent. Over the past three decades, much empirical work has investigated how and when the sense of agency emerges. Using both methods of direct inquiry as well as implicit measures that are related to the sense of agency, research has revealed that agency is influenced by multiple factors, involving processes of automatic motor prediction, subjective inferences of being a likely agent, as well as cues of effort when we are acting. In the studies that will be described in the present dissertation, I have further explored the factors and contexts that influence this important experience.

OVERVIEW OF THE PRESENT DISSERTATION

The inspiration of this PhD-project comes from a social psychology experiment, a study that itself did not measure agency at all. In what can arguably be regarded as the most (in) famous study in social psychology and psychology in general, Stanley Milgram showed that it was possible to create a situation that is so compelling that a majority of normal individuals showed willingness to deliver lethal shocks to their fellow human beings (Milgram, 1963). Crucially, Milgram not only believed that figures of authority represent powerful heuristics to which we are all susceptible, he also suggested that under the influence of a powerful authority figure we lose our sense of autonomy and thereby the sense that we are independent and responsible agents. He termed this (loss) the *Agentic State* (or *Agentic Shift*; Milgram, 1974). In turn, such a reduction in autonomy or agency could make individuals more receptive to the influences of powerful external forces, such as authority figures. However, the theory of the Agentic State has been criticized for its circular nature, and for the fact that Milgram did not have any empirical evidence to substantiate this theory (Blass, 2004; Darley, 1992; Haslam & Reicher, 2007; Helm & Morelli, 1979; Mantell & Panzarella, 1976; Miller, 1986; Miller, Collins, & Brief, 1995; Russell & Gregory, 2005). In spite of these criticisms, the question remains, however, how other agents, such as authority figures, can influence our sense of agency.

Factors affecting agency – contextual cues

Milgram's account for the sense of agency implies that the presence of others will influence our sense of agency in acting. It could therefore be that our sense of agency is influenced when we are told what to do by another person. In Chapter 2 we describe four experiments in which we investigated whether actions that participants were commanded to perform or that were performed in the context of command cues, led to a different level of agency compared to actions performed in the absence of commands. Using both explicit and implicit agency paradigms we show that being commanded to perform a specific action leads to reduced experiences of agency compared to actions that are not performed in the context of a command. The reduction in agency was shown not to be due to a removal of choice opportunity, as verbal commands that did not reduce choice opportunity (e.g., the more general command 'Press a keyboard button') reduced agency similarly to commands that did remove choice opportunity (e.g., the specific command 'Press the left keyboard button'). In a final study we discovered that external commands could even reduce agency during action performance, thus when actions had already been initiated, suggesting that the mere presence of a command can influence degree of experienced agency.

In Chapter 3 we further investigated the influence of cues related to acting on the sense of agency. Instead of responding to explicit commands, participants acted freely in a context in which cues related to acting were presented. Specifically, participants acted

in the presence of action primes (words presented on screen compatible or incompatible to participants' actions), as we aimed to discover whether such contextual cues and the decision to follow them or act 'against' them could influence the sense of agency. We discovered that the compatibility between primes and participant's actions influenced the sense of agency. Specifically, action primes decreased the sense of agency when participants acted in accordance and not contrary to these primes. Moreover, in the present study we also investigated whether the overtness of these primes changed these effects. It was found that when such action primes were presented subliminally and did not reach conscious awareness, the compatibility effect was reversed; subliminal primes reduced agency when they were incompatible rather than compatible. Apparently, when compatible action primes can be consciously perceived, we consider it possible that we have been influenced by those primes in our actions, subsequently reducing agency. Alternatively, when action primes are perceived but do not reach conscious awareness, the incompatible primes lead to a reduced sense of agency; likely the consequence of a disruption of the process of action selection.

In Chapter 4 we investigated how the presence of other agents influences our sense of agency. Specifically, we investigated whether cues that indicate external authority would lower the sense of agency, a prediction following from Milgram's Agentic State theory (1974). In three studies, participants were given instructions by cues that either conveyed direct authority, or did not convey direct authority. We manipulated external authority by changing the vocal properties (depth, self-assuredness, intensity) of the verbal instructions participants were given, a subtle yet powerful cue which conveys external authority (Cashdan, 1998; Gregory Jr. & Webster, 1996; Kimble & Musgrove, 1988; Lamb, 1981), and by manipulating the physical presence of an authority figure (Milgram, 1974). Interestingly, the results suggest an increase in agency as a consequence of external authority. Specifically, both vocal properties of external authority as well as the direct presence of authority were related to increases in the sense of agency. The presence of authority figures or authority cues might have primed authority, heightened the motivation to perform the task well, or increased the degree to which participants internalized their agentic role, increasing action awareness and the sense of agency (Weiss, Herwig, & Schütz-Bosbach, 2011).

Together, the studies in Chapters 2-4 revealed that the presence of other agents and action cues in the environment influence our sense of agency. Even when we act, the knowledge that we may have been influenced in our action reduces the sense of agency. However, contrary to what Milgram may have predicted, in general, cues indicating authority seem to increase, not reduce the immediate sense of agency.

Factors affecting agency – internal cues

As we described earlier in the introduction, experiences of effort have been suggested to represent a powerful cue to the sense of agency. However, as of yet there is still only limited

empirical evidence to substantiate this theory (e.g., Demanet et al., 2013). In Chapter 5 we describe research in which we investigated whether the degree of effort we experience depending on the actual hand we use when performing actions can influence the sense of agency.

At already a young age we develop a clear preference for our left or our right hand, and non-dominant hand skills will rarely reach the level of ability of the dominant hand. We hypothesized that the actions we perform with our non-dominant hand are therefore experienced as more effortful and less automatic, thereby leading to an increased sense of agency. Dominant hand use should however be related to a reduced sense of agency as it is more practiced than the non-dominant hand and can therefore often act without experiences of effort. In two studies, participants performed an agency task in which they either acted with their dominant or non-dominant hand. The results show that non-dominant hand use was related to an increased sense of agency compared to dominant hand use, and that this difference was to a large extent driven by differences in effort in the use of both hands. Our hands are the primary tools by which we produce changes in our physical environment. However, it appears that the specific hand we use can influence our sense of agency for those changes.

To what extent do our own deliberate action plans influence our sense of agency? While a number of theoretical approaches (e.g. Brass & Haggard, 2008; Pacherie, 2008; Pacherie & Haggard, 2010) consider the act of planning to be beneficial for the sense of agency, no research has empirically tested this assumption. In Chapter 6 we describe eight studies in which we tested the influence of deliberate action plans on explicit and implicit measures of agency. Participants were either asked to plan ahead which action they were going to perform (e.g., which button they were going to press), or were not given the instruction or opportunity to plan and immediately had to decide and act. In these studies we discovered that action plans in fact *reduced* agency. Apparently, the separation in time between conscious decision-making and action performance reduces the sense of cognitive involvement or increases the sense of automaticity for action performance, thereby decreasing the sense of agency. An additional study indeed confirmed that a larger separation in time between action planning and action performance is related to reduced agency compared to a shorter temporal separation between planning and performance.

Our sense of agency may influence a number of other aspects of human cognition. In several follow-up studies we investigated whether factors that influence agency, such as action plans, may similarly influence the intensity by which we experience our actions and feel responsible for them – constructs that flow from our experiences of agency (Frith, 2013). Using moral judgment dilemmas, we showed that prior action plans reduced the experienced emotional intensity while acting, as a negative action was experienced as less unpleasant when that action was planned in advance. Similarly, participants also felt less

responsible for planned than for unplanned actions. Our findings also point to an intriguing actor-observer discrepancy: While action plans reduce the experience of responsibility as an agent, attributions of another person's responsibility actually increase when we perceive cues indicating planned behavior by that person.

Together, these findings show that 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.

Agency affecting behavior

While the scientific quest for the emergence of our agentic experience is an important one, it is equally important to investigate how these perceptions influence our behavior. Our perceptions of personal control and agency have been considered to be important for the degree to which we are motivated to act, and to our capacity to enact self-driven change (Ajzen, & Fishbein, 1980; Bandura, 1997). Many theories on self-change therefore consider a boost in the sense of control to be a first priority (Eden & Aviram, 1993; Vinokur, van Ryn, Gramlich, & Price, 1991). Alternatively, a disrupted or absent sense of control may increase susceptibility to external forces. For example, Milgram (1974) theorized that a reduced sense of autonomy would increase the susceptibility to external heuristics. In a recent study, Fennis and Aarts (2012) indeed showed that recent experiences of the absence of control made participants more likely to be influenced by social heuristics.

In Chapter 7 we describe a study in which we further investigated the relation between recent experiences of control, capacity for self-facilitated change, and external susceptibility. Using short or long delays between actions and action effects, and by changing the predictability of action outcomes, we manipulated participants' sense of agency. Participants were then either presented with arguments from the local municipality as to why a clean local environment was important (external persuasion), or alternatively, participants were asked to generate those arguments themselves (internal self-persuasion). The results in this study revealed an important interaction between recent experiences of agency and the degree to which these persuasion techniques were effective. Specifically, participants were more inclined to indicate that a clean environment was personally important to them, and were also more likely to volunteer in a cleanup of the campus when self-persuasion techniques were implemented and when, simultaneously, participants had recently experienced high rather than low agency. However, techniques of direct persuasion were more effective when participants had experienced low rather than high agency. These findings suggest that our recent experiences of control, such as our experiences of agency, can influence both our capacity for self-driven change and our susceptibility to external forces.

THEORETICAL AND PRACTICAL IMPLICATIONS

As each chapter will itself present a more elaborate discussion, we will now shortly address the broader implications of the present dissertation.

The Agentic State

The studies presented in Chapters 2-4 and 7 are the first empirical attempts to investigate a number of explicit and implicit predictions following from Milgram's Agentic state (1974) theory. First, we tested whether experiences of agency influenced external susceptibility. In Chapter 7 we did indeed find that recent experiences of reduced agency can increase external susceptibility to external sources, such as authority heuristics. Second, we investigated whether external commands, action primes, and authority cues would reduce the sense of agency. The studies from Chapters 2 and 3 show that overt external commands and action-primes decrease agency. However, the studies from Chapter 4 reveal that cues related to authority actually increase the sense of agency, a finding that was unexpected given Milgram's theories about agency and authority. A reduction in agency as a general consequence of the presence of cues of external authority, one of the main hypotheses flowing from Milgram's theory, could therefore not be supported.

We do wish to emphasize that the absence of a decrease in agency due to external authority does not falsify Milgram's ideas about what happened in his research. The paradigms featuring in the present dissertation greatly differ from that famous experiment. For example, in our studies participants produced relatively neutral action effects (tones). Perhaps, when the action becomes negative (e.g., giving electric shocks to another person; Milgram, 1963) cues of external authority have a different impact and reduce the sense of agency – a promising avenue for future research. Future studies should also investigate how authority cues can influence other states of mind. For example, the presence of authority cues may influence one's promotion or prevention focus (Higgins, 1998), or the representation levels, concrete or abstract, by which individuals define their own behavior (Vallacher & Wegner, 1987). However, for now we can say that instead of reducing the sense of agency as Milgram would have predicted, this first empirical investigation on the relation between authority and agency has shown that cues of external authority seem to increase rather than decrease the sense of agency.

The Agentic Boost

As described earlier in the introduction, our perceptions of control will determine the degree to which we are motivated to change our behavior and improve ourselves. A first priority for interventions aimed at behavioral change is therefore to restore or boost perceptions of control (Eden & Aviram, 1993; Vinokur, et al., 1991). Using relatively short

temporal delays between actions and action effects, and by increasing the predictability of those effects, we induced experiences of increased agency in participants. The experiment described in Chapter 7 therefore suggests (although more research is needed to prove the direction of the effect) that with such a relatively short and simple intervention (a number of high-agency experiences), individuals' capacity to change their current attitudes and behavior can be increased.

Action plans decrease experiences related to acting

A number of theoretical accounts on agency have considered the importance of prior plans for the sense of agency but largely consider such plans to contribute to agency (e.g., Brass & Haggard, 2008, Pacherie, 2008; Pacherie & Haggard, 2010). We show in a number of studies in Chapter 6 that the prior planning of *actions* actually reduced agency. These findings therefore have implications for previous models on the sense of agency (Synofzik et al., 2008; Wegner, 2003) that *generally* consider compatible prior planning to add to the sense of agency.

Additionally, we showed that similar to the effects on agency, action plans also influenced aspects of human cognition related to agency, as feelings of unpleasantness and responsibility were also lower when a negative action was planned in advance. A large body of literature on responsibility exists to show that indications of intentionality in, or planning by another person leads to increased attributions of responsibility towards that person (Malle, 2004; Shaver, 1985). Together, this literature and the present findings point towards an important actor-observer discrepancy: while prior planning reduces the experience of responsibility in agents, indications of planned behavior in others will make us judge those others as being and feeling more responsible.

The processes related to action selection influence agency differently from effect related processing

The research presented in the present dissertation has regularly contrasted processes of action selection (what am I going to do) with processes related to outcome prediction (what effects am I going to see). While the process of action selection is considered a vital part of the actions sequence (e.g., Brass & Haggard, 2008), it has not received much attention in the literature on agency (for an exception see Wenke et al., 2009). In a number of chapters we have shown that factors that can be manipulated with regards to action selection often lead to outcomes that are different from similar manipulations in outcome prediction. For example, while both subliminal and supraliminal *outcome* primes can increase the sense of agency (Aarts et al., 2005; Moore et al., 2009), *action* primes reduce agency when they are consciously perceived. Similarly, while thoughts, intentions, and goals related to action outcomes may increase the sense of agency (van der Weiden et al., 2013), specific action

plans instead reduce agency. These results therefore reveal how manipulations within the context of action selection can have different effects on the sense of agency compared to similar manipulations within the context of outcome prediction.

Cues indirectly related to acting influence implicit measures of agency

In a number of studies we have used time estimation as an implicit measure of agency. Previous literature has often suggested that time perception is related to a lower, more primary feeling of agency, which is influenced by automatic motor prediction processes but not by cognitive deliberation or by contextual and social cues (Synofzik et al., 2008). Through a series of recent studies this view is slowly starting to change. A number of recent findings have shown that factors such as belief states and contextual cues may have more far-reaching effects than previously thought. For example, in a study by Rigoni, Kühn, Sartori & Brass (2012), individuals' belief in free will and beliefs about personal causality were shown to influence the degree of pre-motor activation in the brain: Individuals who disbelieved in free will showed a reduction in the amplitude of action related readiness potentials. Similarly, Desantis and colleagues (2011) showed that activating beliefs about personal agency increased intentional binding compared to individuals who were led to believe their actions were caused by another individual. The fact that we find effects of external commands (Chapter 2) and of prior planning (Chapter 6) on time perception further adds to these findings, suggesting that external and internal cues that are not directly related to motor prediction can influence time perception to a stronger degree than originally assumed.

Concluding remarks

The sense of agency is one of the most fundamental experiences of human consciousness. While we may intuitively feel that we should know when we have caused something to occur and when not, the research described in the present dissertation reveals that the sense of agency can be influenced by a number of different factors, including contextual action cues and internal action plans, the presence and nature of other agents, as well as hand dominance and experiences of effort. Importantly, experiences of agency in turn seem to influence our susceptibility to external forces and our ability to cause self-generated change. The present findings thereby further our knowledge on how, why, and when the sense of agency emerges and how that pervasive experience influences us in turn.

Something I will have to keep in mind, and explain the next time I encounter that ticket inspector again.

A SHORT NOTE ON RESEARCH TRANSPARENCY

In the present dissertation we have reported all measures and manipulations either in the main text of the chapters, or in a footnote when the manipulation was not of central importance to the presented 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. In case of a (suspected) power-problem, we re-ran the experiment with a sufficient number of participants. No data was excluded without reporting so.

The raw data files and the statistical syntax files are be made available online at:

https://osf.io/s4wxr/?view_only=4cc0482746fe43af9b1571a9768382db

PART 1

Factors Affecting Agency – Contextual Cues

Chapter 2

Agency under Obedience: External Commands Influence the Sense of Agency

This chapter is based on Damen, T. G. E., van Baaren, R. B., Brass, M., Kühn, S., & Dijksterhuis, A. (under review). *Agency under obedience: External commands influence the sense of agency.*

ABSTRACT

In four studies we show that being commanded to perform a specific action leads to lower experiences of agency compared to actions that were not accompanied by a command (Studies 2.1- 2.4). The commands also influenced intentional binding (Studies 2.2 & 2.4), an implicit measure of agency that is often considered to be relatively insusceptible to external factors. Furthermore, the present research shows that the reduction in agency was not due to a removal of choice opportunity, but was due to the presence of the command itself (Study 2.3). Finally, commands were even able to reduce agency when participants already initiated their action (Study 2.4). Together, the results show that our sense of agency for actions we perform can be influenced by external commands, and that commands can even influence levels of agency that originally were not assumed to be susceptible to external influence.

Agency, the feeling that we are performing or causing an action, is a pervasive experience of human consciousness. Our experiences would be very different without the sense of agency; it would seem as if our bodies and actions were controlled by an external source. Although our body is never truly under the control of another person, in many hierarchical relationships individuals perform actions because they are told to do so. For example, in the army, it is a soldier's duty to obey an order by a superior. The question is whether that soldier will experience the doing and causing of an action in a different way because s/he is obeying an order. In other words, does our agentic experience change when we perform an action instructed by another person, such as a superior? This question is important as experiences of agency influence the way we reflect on ourselves and on our actions (Bandura, Barbaranelli, Caprara, & Pastorelli, 1996), and they influence our decisions to perform or not to perform certain actions (Milgram, 1974). In the present paper we report four studies in which we investigated how the sense of agency is influenced by external commands.

Prior research has repeatedly shown that our sense of agency can be influenced by various sources (Moore, Wegner, & Haggard, 2009). For example, the priming of agents (Dijksterhuis, Preston, Wegner & Aarts, 2008) as well as of action effects (Aarts, Custers, & Wegner, 2005; Wegner & Wheatley, 1999) increase agency; synchronous visual feedback of a virtual hand increases agency for the virtual hands' movements (Tsakiris, Prabhu, & Haggard, 2006); agency is increased when the outcomes of actions are compatible with people's expectations (Sato, 2009); and agency is reduced when there is a delay between action and effect (Sato & Yasuda, 2005).

In contrast, little is known about the extent to which processes involved in the selection of actions contribute to our sense of agency (Wenke, Waszak, & Haggard, 2009). The selection of future actions represent a major part of the action sequence (Brass & Haggard, 2008), in which there is a competition between different response alternatives and a final decision on which action to execute (Botvinick, Braver, Barch, Carter, & Cohen, 2001; Nachev, Wydell, O'Neill, Husain, & Kennard, 2007). But it has only received limited attention as an important phase with regards to the sense of agency. Recently however, Wenke, Fleming & Haggard (2010) showed that the subliminal priming of actions facilitated responding, thereby increasing the sense of agency (see also Damen, van Baaren, & Dijksterhuis, 2014). Similarly, Chambon & Haggard (2012) have shown that a fluent process of action selection can be beneficial for the sense of agency.

Why the phase of action planning and selection is important becomes clear when we think about how others influence our behavior. To a large extent, we rely on information from and about others for our future actions: we imitate (Miller & Dollard, 1941) and conform to others (Asch, 1956); we can be susceptible to suggestions from others (Bearden, Netemeyer, & Teel, 1989); and sometimes we are subject to direct commands of others telling us what to do (Milgram, 1974). In other words, the presence and the

behavior of others often influence the plans we make and the actions we perform. It is therefore important to explore how such influence affects our sense of agency.

Models of agency

To describe the emergence of the sense of agency, the literature has mostly distinguished between two main models, each receiving extensive empirical support. These models are respectively referred to as the motor prediction model of agency (also known as forward or comparator models; Blakemore, Wolpert, & Frith, 2002; Frith, Blakemore, & Wolpert, 2000; Wolpert & Flanagan, 2002) and the inferential model of agency (also known as the theory of apparent mental causation; Wegner, 2002; Wegner, 2003; Wegner & Wheatley, 1999). Both models describe different processes leading to the sense of agency, either based on one's accuracy in motor prediction or based upon one's reflective inference of having been a likely agent (Synofzik, Vosgerau, & Newen, 2008).

Motor prediction models suggest that when we are about to act, our motor system makes a prediction about the sensory signals we are likely to experience during acting and immediately after action performance. We feel agency when there is a match between these sensory predictions and the actual outcomes (Blakemore et al., 2000; Frith et al., 2000). However, when the outcomes are not what we had expected our sense of agency is likely to be reduced. For example, when we pull a chain to turn on the light, we feel agency when the light turns on, however our sense of agency in such a scenario would be much reduced if the lightbulb doesn't switch on, and the toilet starts flushing instead.

According to the inferential models on agency judgments, we regularly reflect back upon our actions and then make interpretive judgments of having been a likely agent (Wegner, 2002). We judge ourselves to be agents when we can easily relate our actions or the action effects we produce to any thoughts preceding it (David, Stenzel, Schneider, & Engel, 2011), and when our agency beliefs (Desantis, Hughes, & Waszak, 2012) or the contextual information (Synofzik et al., 2008) make us appear as the most likely agent. A likely source of such contextual information would be the presence of other agents: the more we observe other agents, the more likely it is that these other individuals were in fact responsible for the events around us.

Recent approaches actually consider agency to emerge from both processes (Synofzik et al., 2008). At a primary level, motor prediction processes first inform the sense of agency. The experiences of agency emerging from this motor prediction phase are often referred to as *feelings of agency*. Subsequently, inferential processes may further influence the sense of agency, and the experiences of agency that emerge from this inferential phase are often referred to as *judgments of agency*.

The presence of other agents

Although the presence of other agents has been described as a key factor in determining ones' sense of agency (Wegner, 2003), it has not received much empirical attention. While agency paradigms often suggest that another agent, human or artificial, could have produced an outcome (e.g., the computer could have caused a tone to occur or could have stopped a motion: Sato & Yasuda, 2005; van der Weiden, Aarts, & Ruys, 2010), experimental manipulations of the presence of agents, or their influence, during the action planning and selection process are rare (but see Dijksterhuis et al., 2008). Hence, the question remains whether actions we perform on our own initiative are experienced differently compared to actions that we perform at the command of another.

Related approaches would suggest so. For example, research has shown that the motivation to act is reduced after receiving rewards for action performance (Lepper, Greene, & Nisbett, 1973), and that depending on one's personal sense of power, individuals are in general more likely to make dispositional or contextual attributions (Keltner, Van Kleef, Chen, & Kraus, 2008). These studies show that the degree to which we see our actions as self-driven will influence our motivation to perform these actions and our global attributions about these actions. But will our state experiences of acting be similarly influenced?

While our sense of responsibility will often flow from our sense of agency (e.g., Frith, 2013), it is not difficult to imagine situations in which experiences of agency and responsibility can diverge (David, Newen, & Vogeley, 2008). When a person is explicitly divested of all responsibility (Milgram, 1963), or when forced compliance makes individuals to feel less responsible for their actions (Festinger & Carlsmith, 1959), a person remains an agent with the ability to fully experience the sensations involved in action performance. The question then is whether our immediate agentic experience is influenced when we act on the command of another.

Measuring agency

Agency has often been measured with explicit measures. In many experiments, participants were simply asked for the degree to which they felt like they caused an action (e.g., Wegner, Sparrow, & Winerman, 2004) or an action effect to occur (e.g., Aarts et al., 2005). However, a considerable number studies have also used implicit measures to determine agency (Aliu, Houde, & Nagarajan, 2009; Bäß, Jacobsen, & Schröger, 2008; Blakemore, Wolpert, & Frith, 1999; Cardoso-Leite, Mamassian, Schütz-Bosbach, & Waszak, 2010; Cravo, Claessens, & Baldo, 2011; Engbert, Wohlschläger, Thomas, & Haggard, 2007; Haggard, Clark, & Kalogeras, 2002; Buehner & Humphreys, 2009; Martikainen, 2004; Sato, 2008) thereby avoiding potential problems caused by prior beliefs and demand characteristics (Gawronski, LeBel, & Peters, 2007). For example, it has been shown that feelings of

control and voluntariness affect one's perception of time: when we feel we are voluntarily performing actions, our actions and their effects are perceived as closer together in time compared to when we feel we are involuntarily performing actions (Haggard et al., 2002). This decrease in the perceived interval between action and its effect is known as intentional binding. This phenomenon is derived from our feelings of personal causation, and is thus used as an implicit measure for sense of agency (Desantis et al., 2012). Often, intentional binding effects are considered to reflect motor prediction processes also responsible for the emergence of feelings of agency, while the agency judgments of the explicit paradigms are considered to reflect both motor prediction effects *and* reflective inferences.

The present investigation

In four studies we investigated the influence of external commands on the sense of agency. Using both explicit and implicit measures, the present investigation aimed to determine whether external commands influence both agency judgments and feelings of agency. In Study 2.1 we investigated obedience to verbal commands in an explicit agency judgment paradigm; we expected that obedience to commands would lower agency judgments. In Study 2.2 we investigated whether obedience to commands would also influence the more primary feelings of agency, using a time estimation paradigm as an implicit measure of agency; we expected verbal commands to lower feelings of agency. In Study 2.3 we set out to determine the underlying process in the reduction in agency due to obedience. In an explicit agency judgment paradigm we investigated whether the reduction in agency was due to removal of choice opportunity, or due to the contextual presence of the command. Finally in Study 2.4, again using a time estimation paradigm, we investigated whether feelings of agency could be influenced when verbal commands were given after participants had already initiated their action; we expected commands that were compatible with the performed action to lower agency compared to incompatible commands.

STUDY 2.1

Obedying to the commands of another person has been shown to shift the sense of responsibility (Milgram, 1974). But to what extent do other agents influence our sense of agency? While a study by Dijksterhuis and colleagues (2008) showed that subliminally priming participants with other agents (e.g., a computer) could lower the sense of agency, the question remains whether our sense of agency is also affected when we are given a command by another person to perform an action. Is our sense of performing an action, like our sense of responsibility, lowered when obeying the commands by another person?

In Study 2.1 we looked at whether actions that are performed at the command of another person influence explicit agency judgments. Participants were either commanded

to perform specific button-presses, or they were free to choose and press one of two buttons. Each button-press caused a subsequent tone and participants were asked to rate the degree to which they felt they had caused the tone to occur. We expected lower agency judgments when participants were commanded to press a specific button, compared to when they were free to choose and press a button.

METHODS

Participants

Twenty-six undergraduate students from the Radboud University Nijmegen (23 females; $M_{\text{age}} = 20.31$, $SD = 1.64$) participated in exchange for five euros or course credit.

Explicit agency task

Participants completed an adapted version of a paradigm earlier used by Sato and Yasuda (2005) as an explicit measure of agency. Over multiple trials, participants were either given a command by one of two confederates¹ to press a keyboard button, or were not given a command and thus could choose freely. After each button-press participants heard a tone. Participants were told that there were two possibilities: either the tone had been generated by the computer, or by their own button-press. Participants had to indicate the degree to which they felt as if they had caused the occurrence of the tone.

Three seconds after the trial started, when a visual timer on the screen hit zero, participants had to press one of two buttons on a keyboard. During the countdown to zero, one of the two confederates, both present in the room, could give a verbal command (saying “Left” vs. “Right”) to press either button, and participants had to press the designated button. If participants made a mistake, and pressed the wrong button, it was excluded from the analysis (1.46 % of trials). Confederates knew when to give a command by hidden visual cues presented on screen². Participants reported no awareness of these cues during the debriefing. Participants were not able to successfully press a button and generate a tone

1 The two confederates were the experimenter and another alleged participant. This was done to additionally explore the influence of authoritative-ness on agency. To check whether the two confederates indeed differed on characteristics as perceived authoritative-ness, dominance, and liking, these characteristics were explicitly measured using a 7-point scale (example item: ‘How much authority did the experimenter / other participant have?’). However, none of these explicit measures revealed any differences, F 's < 1, n.s. As there were also no differences in agentic experience (results Study 1), we did not feel justified to draw any conclusions. For motivations of both ease of interpretation and research transparency we chose to address this exploration in the present footnote. All other manipulations and dependent variables have been reported in the present investigation.

2 Each trial, the following instruction was displayed: “If no command is given at 0 seconds, choose and press a button yourself.” When this sentence did not begin with a capital letter, the confederate on the left would give a command. When the sentence ended without a period, the confederate on the right gave a command. When the sentence both began with a capital letter and ended by a period, no command was given.

before the visual timer had reached zero. This was done to ensure that there was a fixed point in time at which participants would act over all conditions. This procedural safeguard was present in all studies. After each button-press participants would hear a tone: a 1000 Hz tone for a duration of 300 ms after a left button-press, and a 600 Hz tone for a duration of 300 ms after a right button-press. After hearing a tone, participants had to indicate the degree to which it felt like they had just produced that tone (“To what degree did it feel like you produced the tone and not the computer?”). They could do this by clicking on a 100-point scale slider, with higher scores indicating higher experienced agency, and lower scores indicating lower experienced agency.

Tones occurred after fixed time lags (0 ms vs. 200 ms vs. 400 ms vs. 600 ms after button-presses). These were produced randomly but evenly divided over experimental conditions. Although temporal delay between action and effect influences sense of agency (Sato & Yasuda, 2005), it was not a main factor of interest. It was used in the current paradigm to make the task more ambiguous.

The main task consisted of 106 trials. In 64 trials participants were given a command by one of two confederates to press a certain button, in 32 of the trials participants were given no command. Finally, there were 10 filler trials in which no command was given and a random tone automatically occurred 200 ms before participants would press a button. The purpose of these trials was to have participant experience trials in which the computer clearly produced the tone. These filler trials were not analyzed.

Procedure

Participants were welcomed and introduced to two other participants who had allegedly received prior instructions. The two other participants were in fact confederates. Participants and confederates were seated together in front of a computer, the participant in the middle and the two confederates on either side. Participants were told that this study was on feelings of causation. They were then informed that on each trial they were going to press a keyboard button; either one they chose themselves or one they were commanded to press by one of the confederates. Participants were told that after each button-press they would hear a tone, caused either by their button-press, or by the computer itself. Participants had to indicate the degree to which it felt that they had produced that tone. Afterwards participants were thanked and debriefed. Funneled debriefings indicated that none of the participants were aware of the true nature of the study.

RESULTS

Agency ratings

Figure 2.1 shows the average agency ratings per condition. A 4 (Time lag: 0 ms vs. 200 ms vs. 400 ms vs. 600 ms) x 3 (Agent: Self vs. Confederate 1 vs. Confederate 2) repeated measures Analysis of Variance (ANOVA) on participants' reported agency ratings showed a main effect of Time lag $F(3, 75) = 56.28, p < .001, \eta_p^2 = .69$. Shorter Time lags between button-presses and tones led to higher experiences of agency compared to longer Time lags ($M_0 = 83.22, SD = 12.59; M_{200} = 78.02, SD = 11.26; M_{400} = 60.70, SD = 13.29; M_{600} = 50.90, SD = 16.34$).

There was a main effect of Agent condition $F(2, 50) = 5.94, p = .005, \eta_p^2 = .19$. Planned contrasts revealed that a command by a confederate to press a button led to lower experiences of agency compared to when participants received no command ($M = 72.48; SD = 9.20$). Agency ratings were significantly lower when commanded by Confederate 1 ($M = 65.81; SD = 12.44, F(1, 25) = 8.42, p = .008, \eta_p^2 = .25$), and also when commanded by Confederate 2 ($M = 66.35; SD = 13.87, F(1, 25) = 8.42, p = .03, \eta_p^2 = .17$). There were no differences in experienced agency as a function of Confederate, $F < 1, n.s.$ There was no significant interaction between the Time lag conditions and Commander conditions, $F < 1, n.s.$

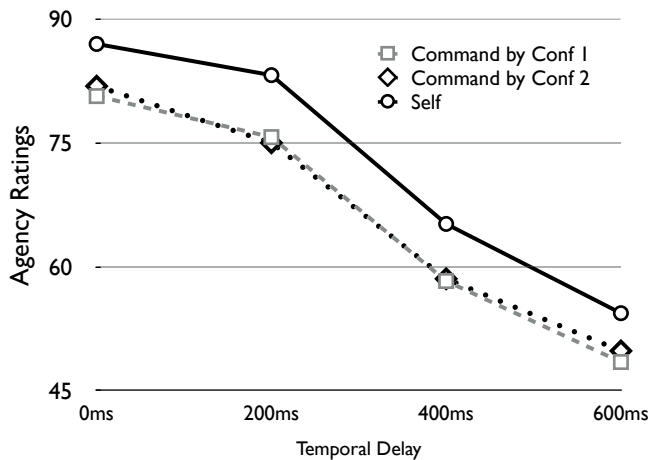


Figure 2.1. Mean agency ratings per Time lag and Agent conditions.

Reaction times

A 4 (Time lag: 0 ms vs. 200 ms vs. 400 ms vs. 600 ms) x 3 (Agent: Self vs. Confederate 1 vs. Confederate 2) repeated measures Analysis of Variance (ANOVA) on participants' Reaction Times (RT's) showed a main effect of Agent condition, $F(2, 50) = 43.30, p < .001$,

$\eta_p^2 = .63$. Participants were slower to respond on trials in which they received no command compared to trials in which they received a command by Confederate 1 ($M_{Self} = 1350$; $SD = 83.651$ vs. $M_{Confederate\ 1} = 840$; $SD = 44.70$; $F(1, 25) = 53.48$, $p < .001$, $\eta_p^2 = .68$) and also slower compared to trials in which they received a command by Confederate 2, ($M_{Self} = 1350$; $SD = 83.651$ vs. $M_{Confederate\ 2} = 936$; $SD = 46.823$; $F(1, 25) = 34.25$, $p < .001$, $\eta_p^2 = .58$). There was no main effect of Time Lag condition, $F < 1$, n.s., nor was there an interaction effect between the Time Lag and Command conditions, $F(6, 150) = 1.05$, $p = .39$

Mediation analysis

To test for mediation in a within-subjects design, we followed the procedure outlined by Judd, Kenny, and McClelland (2001). As described by Judd and colleagues (2001), one can test for mediation in a two-level within subjects design by regressing the difference score of the two levels of the dependent variable on both the sum- and difference scores of the two levels of the proposed mediator. In this analysis, a significant regression coefficient for sum-scores would indicate moderation while a significant regression coefficient for the difference scores would indicate mediation (see Judd et al., 2001, for further details).

To test for mediation in the present study we first collapsed the agency scores over the Time lag conditions. We then conducted two regression analyses: In the first we compared the trials without a command to the trials in which the participant was instructed what to do by Confederate 1. Following the procedure outlined above, we regressed the difference scores in agency levels ($M_{Agency}^{No-command} - M_{Agency}^{Confederate\ 1}$) on both the sum-scores and difference-scores of the average RT's ($M_{RT}^{No-command} - / + M_{RT}^{Confederate\ 1}$). This analysis did not show a significant regression coefficient for the RT sum-scores, $B = .00$, $p = .73$, nor for the difference scores, $B = .00$, $p = .62$. In a second analysis, we compared the trials without a command to the trials in which the participant was instructed what to do by Confederate 2. Similar to the first analysis, the second regression showed neither a significant regression coefficient for the RT sum-scores, $B = .00$, $p = .78$, nor for the RT difference scores, $B = .00$, $p = .64$. The results from the mediation analyses therefore suggest that the difference in response latencies caused by the Agent manipulation did not mediate or moderate the agency scores.

DISCUSSION

The main question in the first study was whether following a command given by another person influences our sense of agency. The results suggest that, compared to a situation in which individuals were free to decide and act on their own, agency judgments are reduced when people follow a command. These results thus expand the literature on responsibility and authority (e.g., Milgram, 1974), showing that performing actions commanded by others

influences the experience of causation. While studies on obedience show that responsibility is displaced when commanded (Bandura, 1999; Milgram, 1963), following commands also alters our conscious experience of agency: the commands reduce one's sense of causation. The present findings also replicate results from earlier work by Wenke and colleagues (2010) who cued participants to give specific responses using arrow-shaped targets pointing towards the left when requiring a left response, and pointing towards the right when requiring a right response. However, when participants were cued with a double-headed arrow they were free to give either response. In line with the present results, they showed that when participants had most frequently been cued with single arrows requiring specific responses, participants reported - at the end of the experiment - reduced agency compared to when they had frequently been cued with the double arrows offering freedom of choice. The present study expands on this research by showing the same effects can be obtained on separate trials in a relatively strong contextual setting, and using verbal commands that are quite different from the targets in the study by Wenke and colleagues (2010).

Due to the explicit nature of the previous study, it is possible that the agency scores that were reported did not represent the actual experience of the participants. The ratings could have undergone correction as most participants seek opportunities to be a good subject (Orne, 1962), and often act in accordance with what they see as the purpose of a study (Goldstein, Rosnow, Goodstadt, & Suls, 1972). To avoid the risk of experimenter demand we used an implicit agency paradigm in the next study.

STUDY 2.2

We used participants' estimates of the time lags between button-presses and subsequent tones as an implicit measure of feelings of agency. Several studies have used time estimation as a measure of feelings of agency. It appears that when actions are experienced as caused or controlled, the onset of the action and the onset of the consequence of that action are experienced as being closer together in time (Moore et al., 2009). Thus, the perceived time of self-generated actions and subsequent effects show a perceptual attraction or binding (Haggard & Clark, 2003). In contrast, the perceived onset of an involuntary action and its effect 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 feelings of agency, because the binding between voluntary actions and effects reliably occurs in situations in which the participant is an agent (e.g., Engbert, Wohlschläger, & Haggard, 2008), compared to situations in which a participant is not an agent (e.g., passive movements, movements of other individuals). As in Study 2.1, participants were either commanded or not commanded to press a specific button. Presses were again followed by tones, however, instead of giving agency judgments, participants were asked to estimate the

time interval between their pressing of the button and the presented tone. To further reduce the risk of experimenter demand, participants were recruited and tested online (Nichols & Maner, 2008).

METHODS

Participants

Fifty³ American adults (29 females; $M_{\text{age}} = 30.32$, $SD = 9.64$) participated in this study, in exchange for \$2 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, 2012). One participant was removed from the analysis for not understanding the instructions. Two participants did not complete the experiment and were therefore removed from the analysis.

Interval judgment task

The interval estimation task has been used as an implicit measure of feelings of agency (Engbert et al., 2007). While paradigms on judgments of agency typically describe the presence of an alternative agent (e.g., a computer), no alternative agent is needed in a time interval task (Moore et al., 2009). In our version, participants had to perform left and right button-presses, but could also be commanded by recorded verbal commands to press specific buttons. After each button-press participants heard a tone after varying time intervals and were asked to estimate the time they thought it took for the tone to occur following their button-press.

Each trial started with the presentation of a fixation cross. Participants were instructed to press a left or right keyboard button the moment the fixation-cross disappeared, which was after 5 seconds. In the command trials, participants heard a verbal command indicating the required response ("Left" vs. "Right") 2 seconds after the start of the trial. The verbal commands were equalized in volume level, and were recorded and configured to last exactly 700 ms. In the no-command trials no verbal command was given, and participants were free to press a button. After each button-press participants would hear a tone: a 1000 Hz tone for a duration of 300 ms after a left button-press, and a 600 Hz tone for a duration of 300 ms after a right button-press. Tones occurred 500 ms, 900 ms, or 1300 ms after button-presses, and were produced randomly but evenly divided over experimental conditions. After hearing the tone, participants indicated on a scale of 1-2000 ms how long they thought it took the tone to occur after their button press.

³ The sample size in Study 2 was larger than in the other studies, as we wanted to be sure we had enough power to remove participants in case of noisy data, as this could have been an issue with online experimentation.

There were 96 trials in total. In 48 trials participants were given a verbal command. In 48 trials no command was given. Online debriefing procedures indicated that none of the participants was aware of the true nature of the study.

RESULTS

Time estimates

Figure 2.2 shows the average time estimates per condition. Higher time estimates indicate decreased agency. A 3 (Time lag: 500 ms vs. 900 ms vs. 1300 ms) \times 2 (Agent: Self vs. Command) repeated measures Analysis of Variance (ANOVA) on participants' interval judgments showed a main effect of the actual Time lag conditions $F(2, 92) = 114.12, p < .001, \eta^2_p = .71$. As expected, shorter Time lags between button presses and tones led to lower time estimates compared to longer Time lags ($M_{500} = 560, SD = 308; M_{900} = 811, SD = 316; M_{1300} = 1105, SD = 399$).

There was a main effect of Agent condition $F(1, 46) = 14.31, p = .001, \eta^2_p = .24$. Contrast analyses revealed that a command by a confederate to press a button led to higher time estimates compared to when participants received no command ($M_{\text{command}} = 852, SD = 320; M_{\text{self}} = 798, SD = 313$). There was no significant interaction between the Time lag conditions and Commander conditions, $F < 1, n.s.$

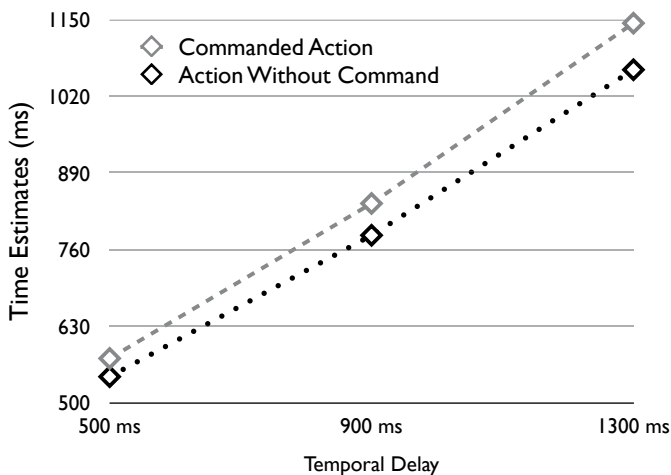


Figure 2.2. Mean time estimates per Time lag and Agent conditions.

Reaction times

A 3 (Time lag: 500 ms vs. 900 ms vs. 1300 ms) x 2 (Agent: Self vs. Command) repeated measures Analysis of Variance (ANOVA) on RT's showed a main effect of the Agent condition, $F(1, 46) = 19.17, p < .001, \eta_p^2 = .29$. Participants were faster to respond on trials in which participants were commanded to perform an action compared to when they were not given a command ($M_{\text{command}} = 863, SD = 962; M_{\text{self}} = 1255, SD = 956$). There was no main effect of Time Lag condition, $F(2, 92) = 1.80, p = .17$, nor was there an interaction effect between the Time Lag and Command conditions, $F < 1, n.s.$

Mediation analysis

To test for mediation in a within-subjects design, we again followed the procedure outlined by Judd and colleagues (2001). We collapsed the interval judgments over the Time Lag conditions and regressed the difference scores between the two Agent conditions ($M_{\text{Command}}^{\text{Time}} - M_{\text{Self}}^{\text{Time}}$) on both the sum-scores and difference-scores of the average RT's of the Agent conditions ($M_{\text{Command}}^{\text{RT}} + / - M_{\text{Self}}^{\text{RT}}$). This analysis did not show a significant regression coefficient for the RT sum-scores, $B = .01, p = .41$, nor for the difference scores, $B = .00, p = .90$, suggesting that the difference in response latencies caused by the Agent manipulation did not mediate or moderate the interval judgments.

DISCUSSION

The results from the Study 2.2 showed that actions and effects that were preceded by a verbal command were judged to be further apart in the participants' perception of time, compared to actions and effects that were not preceded by a verbal command. This implies that participants experienced decreased agency in the command trials compared to the no-command trials, a replication of the findings from Study 2.1. The fact that we also find this pattern of results using an implicit measure provides strong additional evidence that following commands influences the actual experience of agency, and not only the reported agency scores.

The present results also add to recent studies (e.g. Desantis, Roussel, & Waszak, 2011) that reveal that contextual cues not only influence agency *judgments*, but they can also influence measures that are presumed to reflect a more primary and lower level sense of agency (Synofzik et al., 2008), or *feelings* of agency. This may suggest that contextual cues may actually have more influence on these lower levels of agency than originally assumed (see also Rigoni, Kühn, Sartori, & Brass, 2011).

STUDY 2.3

Being free to choose between actions is vital for our feelings of control (Skinner, 1996), and we feel a psychological reactance when another threatens that freedom (Brehm, 1966). Our previous studies have shown that following commands lowers the sense of agency. However, the question is what exactly causes the reduced sense of agency. It is possible that the mere presence of a command lowers the sense of agency. Agency could then be affected by the inference of external influence. In other words, the awareness that we may have followed another's command instead of freely chosen an action may undermine our sense of freedom, and decrease the sense of agency. Alternatively, it is also possible that agency is reduced because the opportunity of choosing (between action alternatives) is removed from the process of action selection. In Study 2.3 we investigated these hypotheses.

In an explicit agency paradigm, participants received either a command that still allowed participants to choose between action alternatives, or participants received a command that was specific and removed choice opportunity. Both conditions were compared to a baseline condition in which no command was given. If specific commands lead to lower agency than general commands, a large part of the reduction due to obedience is likely due to the removal of choice opportunity. If no difference between command conditions is observed, the presence of the command itself is most likely to reduce the sense of agency.

METHOD

Participants

Thirty undergraduate students from the Radboud University Nijmegen (25 females; $M_{\text{age}} = 19.92$, $SD = 1.15$) participated in exchange for five euros or course credit. One participant was removed from the analysis as this person was extremely slow and needed more than double of the average experiment time.

Explicit agency task

In a paradigm similar to Study 2.1, participants could be given a verbal command through a headset. The command was either specific ("Left" vs. "Right"), or non-specific ("Press"). Participants were free to choose and press a keyboard button, except when a specific command was given which had to be obeyed. Button-presses again caused tones, and participants had to indicate the degree to which they and not the computer had caused the occurrence of the tone.

Each trial started with a blank screen. After 2 seconds a verbal command could be given. The verbal commands were equalized in volume level, and were recorded and configured to last exactly 600 ms. Participants had to press a button the moment a fixation cross appeared

on a screen, which was presented after 3.5 seconds. After each button-press participants would hear a tone: a 1000 Hz tone for a duration of 300 ms after a left button-press, and a 600 Hz tone for a duration of 300 ms after a right button-press. After hearing a tone, participants had to indicate the degree to which it felt like they had just produced that tone. They could do this by clicking on a 100-point scale slider, with higher scores indicating higher experienced agency, and lower scores indicating lower experienced agency. Tones occurred after fixed time lags (0 ms vs. 250 ms vs. 500 ms after button-presses) that were produced randomly but evenly divided over experimental conditions.

The main task consisted of 72 trials. In 24 trials participants were given a specific command, in 24 trials they received a non-specific command, and in 24 trials no command was given. Funneled debriefings indicated that none of the participants were aware of the true nature of the study.

RESULTS

Agency ratings

A 3 (Time lag: 0 ms vs. 250 ms vs. 500 ms) x 3 (Command condition: Specific vs. Non-specific vs. No-command) repeated measures Analysis of Variance (ANOVA) on participants' reported agency ratings showed a main effect Time lag, $F(2, 56) = 39.84, p < .001, \eta^2_p = .59$. Shorter Time lags between button-presses and tones led to higher experienced agency compared to longer Time lags ($M_0 = 76.53, SD = 14.59; M_{250} = 57.25, SD = 12.17; M_{500} = 40.96, SD = 18.79$).

Figure 2.3 shows the averaged agency ratings per command condition. For the sake of interpretation, reported means are the averages collapsed over Time lag conditions. There was a main effect of command condition $F(2, 56) = 5.33, p = .008, \eta^2_p = .16$. Planned contrasts revealed that being given a specific command ($M_{\text{specific}} = 56.34, SD = 12.01$), or being given a non-specific command ($M_{\text{non-specific}} = 57.62, SD = 7.97$), lead to lower experiences of agency compared to the condition in which no command was given ($M_{\text{no-command}} = 60.78, SD = 10.02$), $F(1, 28) = 8.40, p = .007, \eta^2_p = .23$, and $F(1, 28) = 6.06, p = .02, \eta^2_p = .18$ respectively. Contrast revealed no differences between the specific and non-specific command conditions $F < 1, n.s.$ There was no significant interaction between the Time lag conditions and Command conditions, $F < 1, n.s.$

Reaction times

A 3 (Time lag: 0 ms vs. 250 ms vs. 500 ms) x 3 (Command condition: Specific vs. Non-specific vs. No-command) repeated measures Analysis of Variance (ANOVA) on RT's showed a main effect of command condition, $F(2, 56) = 19.00, p < .001, \eta^2_p = .40$. RT's were the lower when participants received a non-specific command compared to when

participants received a specific command ($M_{\text{non-specific}} = 403, SD = 131$ vs. $M_{\text{specific}} = 589, SD = 315; F(1, 28) = 17.81, p < .001, \eta^2_p = .39$) and lower compared to when participants were given no command ($M_{\text{non-specific}} = 403, SD = 131$ vs. $M_{\text{no-command}} = 1048, SD = 702.359; F(1, 28) = 26.44, p < .001, \eta^2_p = .49$). Participants were also faster to respond to a specific command compared to when no commands were given, $F(1, 28) = 12.29, p = .002, \eta^2_p = .31$. There was no main effect of Time Lag condition, $F < 1, n.s.$, nor was there an interaction effect between the Time Lag and Command conditions, $F(4, 112), p = .29$. As the main effects of the RT's did not map onto the main effects of the agency scores, we did not investigate mediation.

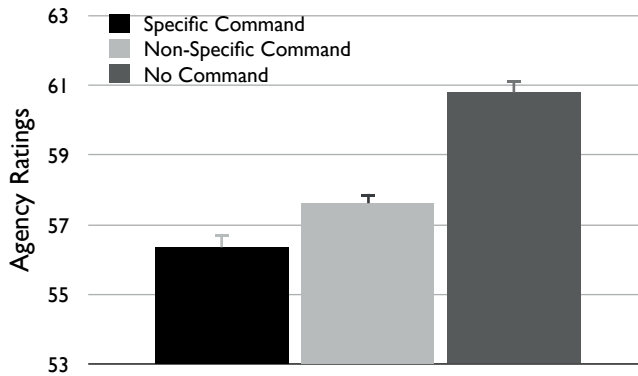


Figure 2.3. Mean agency ratings per command condition. Error bars represent Standard Errors.

DISCUSSION

In a recent study, Barlas & Obhi (2013) showed that a reduction in the number of action alternatives is related to decreases in the sense of agency. It was therefore possible that any reduction in the sense of agency after participants had followed commands would be due to a removal of the availability of choice in the process of action selection, and not due to the contextual presence of a verbal command. However, the present results showed a reduction in agency to occur both in the condition in which a command was given that removed the opportunity of choice, as well as in the condition in which participants were still able to choose between action alternatives. This finding suggests the reduction in agency is caused by the individuals' awareness that a command has been given, not by a process-difference related to choice.

STUDY 2.4

The results from the previous study suggest that the mere presence of commands could decrease the sense of agency. The question is whether commands that are given during action performance, and thus after action selection and action initiation, can also influence agency. In Study 2.4, participants initiated their action, and during action performance they heard verbal commands that were compatible, opposite, or unrelated to the performed action. The commands were purely contextual, irrelevant for the participants' current task, but merely matched or did not match participants' ongoing action. We again used an interval judgment task introduced in Study 2.2 as an implicit measure of agency. We expected that time estimates were higher, indicating a lower sense of agency, when participants heard a command that was compatible to the action they were performing, compared to opposite commands or commands that were unrelated to the performed action.

METHODS

Participants

Thirty-one undergraduate students from the Radboud University Nijmegen (23 females; $M_{\text{age}} = 23.66$, $SD = 1.79$) participated in exchange for course credit.

Interval judgment task

Participants were presented a red circle on their monitor, ostensibly representing a balloon. They were instructed to inflate the balloon until it popped. They could start inflating the balloon by clicking once on the red circle and holding down the mouse-button, thereby causing the red circle to gradually become bigger. After a fixed period of time (2500 ms vs. 3000 ms. vs. 3500 ms evenly divided over a total of 27 trials), the balloon popped, indicated by the recorded sound of a balloon burst and the presentation of the picture of a popped red balloon. Participants were then asked to give their estimation of the time it took for the balloon to pop. They were first required to indicate seconds, and then they were able to add decimal seconds. In case participants did not hold down the mouse-button and accidentally released it prior to the balloon burst, an error message appeared and the trial restarted. As an additional instruction, participants were explained that during the inflation process, they were going to hear recorded voices delivered over a headset, which they should however disregard. Evenly divided over trials, participants would hear the words 'Press' (compatible command); 'Stop' (opposite command); or 'Swim' (unrelated command). The verbal stimuli were delivered two times during the inflation process: 2000 ms and 1000 ms before trial end, were equalized in volume level, and were recorded and configured to last exactly 600 ms. Funneled debriefings indicated that none of the participants were aware of the true nature of the study.

RESULTS

A 3 (Action time: 2500 ms vs. 3000 ms vs. 3500 ms) x 3 (Command type: compatible commands vs. opposite/incompatible commands vs. unrelated commands) repeated measures Analysis of Variance (ANOVA) revealed a significant main effect of Action time, $F(2, 60) = 238.94, p < .001, \eta_p^2 = .88$. As expected, shorter Action times led to lower time estimates compared to longer Action times ($M_{2500} = 3.40, SD = .87$ vs. $M_{3000} = 4.06, SD = .99$ vs. $M_{3500} = 4.60, SD = .87$).

There was also a main effect of Command type, $F(2, 60) = 4.26, p = .02, \eta_p^2 = .12$. Figure 2.4 shows the averaged time estimates per Command type conditions. For the sake of interpretation, reported means are the averages collapsed over Action time conditions. Higher time estimates indicate decreased agency. Planned contrasts revealed that when participants were given compatible commands they reported increased time estimates, suggesting a reduced sense of agency, compared to when they were given opposite commands ($M_{compatible} = 4.11, SD = 1.01$ vs. $M_{opposite} = 3.93, SD = .919; F(1, 30) = 6.56, p = .016, \eta_p^2 = .18$). Compatible commands lead to marginally higher time estimates than unrelated commands ($M_{compatible} = 4.11, SD = 1.01$ vs. $M_{unrelated} = 4.02, SD = .969; F(1, 30) = 3.71, p = .06, \eta_p^2 = .11$). The difference between opposite and unrelated trials did not reach significance, $F(1, 30) = 2.04, p = .16, \eta_p^2 = .06$. No interaction effect between Command type and Action time was observed, $F(4, 120) = 1.70, p = .15$.⁴

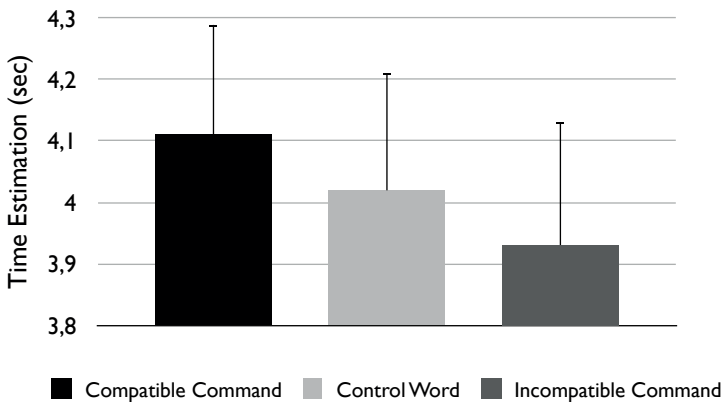


Figure 2.4. Mean time estimates per Command type condition. Error bars represent Standard Errors.

4 To explore whether the influence of commands in Study 4 was specific to self-performed actions and was not a general compatibility effect, we conducted an additional study in which 31 participants were presented with an experiment similar to Study 4. The main difference was that instead of acting themselves, participants saw the 'computers' cursor moving towards the balloon and inflating the balloon until it popped. There was however no difference in time estimation between command types, $F < 1, n.s.$, suggesting the influence of the commands in Study 4 was specific to the action related processes in that study.

DISCUSSION

The present study showed that participants' sense of agency could be influenced by contextual cues that were given after they had already initiated their actions. Even though participants were instructed to ignore whatever they heard through their headset, trials on which participants heard compatible commands were experienced as significantly longer than trials on which participants heard incompatible commands, suggesting a decreased sense of agency for compatible compared to incompatible commands. Although the present study differed from the previous study in that participants were not able to choose among different action possibilities, the present findings again suggest that the mere presence of verbal commands is able to influence agency. These findings also expand on some recent findings by Damen and colleagues (2014), who showed that compatible supraliminal action primes given before actions lead to lower agency ratings than incompatible primes. The present findings show that this process can also occur after action initiation.

It is interesting to note that participants' time estimates were relatively inaccurate. Specifically, time estimates were almost a second higher than the actual time intervals. Instead of intentional binding or temporal attraction, we observed increases and decreases in temporal separation depending on experimental condition. We can think of three explanations as to why this occurred: First, the presence of a potential other agent decreased the sense of agency in general, and as a related process, increased overall time estimates. Second, while traditional agency paradigms often feature a single quick action (e.g., a quick button-press) followed by an action effect, in the present study participants had to continue their action for a prolonged period of time until the action effect occurred, which may in itself increase time estimation. Finally, as shown by Humphreys and Buehner (2009), while binding does reliably occur at super-second intervals, longer intervals are associated with relatively inaccurate estimates.

GENERAL DISCUSSION

External commands influence the sense of agency

The present research explored whether the commands by another agent influence perceptions of one's own sense of agency. Using different measures, we found that obedience or acting compatible to a verbal command decreased the sense of agency. To some degree, these effects were to be expected as earlier research has shown that individuals experience less responsibility after forced compliance (Festinger & Carlsmith, 1959), and personal low power will lead to less agentic global attributions (Keltner, et al., 2008). However, the present research extends these findings by showing that even our immediate action experiences are influenced by acting upon commands (Study 2.1); that commands influence action related time perception (Studies 2.2 & 2.4); are even able to do so when individuals have already

started their action (Study 2.4); and that such effects are likely to occur not because of a limitation in choice opportunity, but are likely due to the contextual presence of an external command (Study 2.3).

Study 2.3 suggests that the reduction due to obedience was mostly due to the presence of the command itself, and is not the consequence of a removal in choice opportunity. As a recent study has shown that a reduction in the number of action alternatives is related to a decrease in the sense of agency (Barlas & Obhi, 2013), a reduction in the number of action alternatives to one possible action – essentially what a command does – could have been the process underlying the reduction in agency due to obedience. However, the findings from Study 2.3 suggest this is not the case: commands that did not alter choice opportunity led to lower agency levels, just as commands that did limit the number of action opportunities. This suggests this process is not due to the presence or absence of action alternatives, but that it is the presence of the command itself that influences the sense of agency.

The findings from Study 2.4 further support this explanation. Here, commands did not relate to choice opportunity as the commands were given after participants' actions had already been initiated. The results showed that these commands were again able to influence the sense of agency, depending on their compatibility with the ongoing action: verbal commands that were compatible with the action reduced agency compared to unrelated or opposite commands. While Moore et al. (2009) showed that supraliminal *effect* primes (a preview of a tone), increased agency when the effects were compatible rather than incompatible (for similar findings see Aarts et al., 2005), the present research shows that the presence of *action* related commands decreases the sense of agency when those commands are compatible. The findings from Study 2.4 also expand on a recent study by Damen and colleagues (2014), who showed that compatible supraliminal action primes given prior to action performance lead to lower agency ratings compared to incompatible primes. The present findings show that this process can also occur after action initiation. The conscious awareness that we may have been influenced or are actually doing something in line with the suggestions or commands of another will reduce our sense of agency (Damen et al., 2014). Imagine driving and taking a left turn, and someone in the passenger seat tells you to keep going left. You are then likely to experience decreased agency for taking the left turn compared to when the passenger was actually telling you to take a right turn instead.

Agency levels

Since previous literature has argued that explicit judgments and implicit feelings of agency reflect different levels of agency (Synofzik et al., 2008), both concepts of agency were investigated by using both explicit and implicit measures. In general, our results show that commands influence agency at both levels; receiving a command affects both our immediate feelings of agency, as well as our reflective judgments of being a likely agent.

However, the question remains why external commands would actually influence time perception, an implicit measure that has been considered to reflect a more primary or lower level of agency assumed to be unaffected by contextual cues (unrelated to motor prediction). Given the present findings, the most likely explanation is that processes of motor prediction can in fact be influenced by contextual cues: If you suddenly receive a voice command during your motor preparation, as in the present studies, it is not hard to imagine that you will be distracted and subsequently your sense of agency becomes reduced. Such an explanation would be in line with a number of recent findings that indeed challenge the view that motor prediction processes are inoculate to inferential cognitions and contextual cues, and suggest that factors such as belief states and contextual cues may have a much more fundamental effect than previously thought. For example, in a study by Rigoni and colleagues (2012), individuals' belief in free will and personal causality was shown to influence the degree of pre-motor activation in the brain; individuals who disbelieved in free will showed a reduction in readiness potential amplitudes. In similar vein, the readiness potentials can perhaps also be influenced by the presence of a verbal command; an interesting avenue to investigate in future research.

A second - and intriguing - explanation is that inferences and beliefs, perhaps also influenced by contextual cues, can influence feelings of agency and intentional binding more directly than previously considered. Desantis and colleagues (2011) showed that inducing participants with high beliefs about personal agency led to increased intentional binding compared to individuals who were led to believe their actions were caused by another individual. However, such an effect may still be caused by a difference in motor prediction. As mentioned above, Rigoni and colleagues (2012) have shown that beliefs about free will did also influence pre-motor activity. However, the results from Study 2.4 open the possibility of another explanation: that of a direct effect of contextual inference on time perception.

Previous studies in the domains of agency and binding have regularly required their participants to perform a single *short* action (e.g., a button-press) and to observe a single event (e.g., a tone). Study 2.4 is, to our knowledge, the first study to show that time estimation can be influenced on a task involving an *ongoing* action. The context of an ongoing action and over several seconds, makes it difficult to explain the present findings as an effect related to motor prediction. While one may reasonably argue that in Studies 2.1-2.3 ones motor preparation is disrupted due the context of a verbal command, and therefore the amount of sensory information the participants are receiving during the motor preparation period is different for the separate conditions, such an explanation is less likely to have occurred in Study 2.4. The results from Study 2.4 therefore suggest an effect that is inferential rather than related to motor prediction.

Optimal cue integration

In recent attempts to develop a comprehensive model for the sense of agency, researchers have advocated agency to arise by a process of optimal cue integration, also referred to as the Bayesian model of agency (e.g., Moore & Fletcher, 2012; Synofzik, Vosgerau, & Voss, 2013). According to these theories, multiple cues of agency are thought to be continuously integrated and weighted depending on their availability and reliability in a given situation. A key prediction of the Bayesian model is that when automatic motor processes that are linked to agency (e.g., sensory-motor prediction) become less reliable, the influence of other cues (e.g., contextual cues) becomes stronger. Although support for this model is limited as of yet (Gentsch, Kathmann, & Schütz-Bosbach, 2012; Moore et al., 2009), it would be interesting for future research to investigate the influence of external commands, in conditions in which automatic processes are less reliable (e.g., by manipulating contingency); the Bayesian model of agency would predict stronger effects of commands in these situations. In view of this theory, it is however interesting that we did not find an interaction between the experimental conditions and temporal delay in any of the studies. A Bayesian approach may have predicted increased influence of contextual factors (the commands) with longer temporal delays, as these delays may influence the degree to which internal predictions are perceived as reliable. Though speculative, this could suggest that increased temporal delay does not lead to an immediate susceptibility to contextual cues – or at least not when long temporal delays occur frequently.

Limitations

There are limitations in the present investigation that have to be addressed: first, due to the large number of females in a number of studies, we were often unable to investigate gender differences. It has been shown that gender interacts with the experience of self-causation in priming experiments (e.g., Belayachi & Van der Linden, 2010; Jones, de Wit, Fernyhough, & Meins, 2008), and any future studies should therefore test for gender differences. Second, we operationalized obedience in the current studies by having participants obey the commands of the experimenter. Such a setup may not fully capture the powerful and dominating context that is present in true hierarchies or conditions of obedience, in which an individual is bound by formal and informal conventions and group pressures to obey authority. We are however confident that the basic processes underlying the present studies also operate (and are likely to operate even stronger) in real life hierarchical situations. Finally, the use of intentional binding as an implicit measure of agency is not entirely uncontroversial. For example, intentional binding and explicit agency judgments have been dissociated in some studies (Ebert & Wegner, 2010; Obhi & Hall, 2011; Strother, House, & Obhi, 2010), making the link between intentional binding and feelings of agency still rather tentative.

CONCLUSION

In the present studies we find that agency, the experience of self-causation, is lowered, when following another's command. This in essence reflects what Milgram (1974) may have referred to as the agentic shift in which the experience of causing is transferred to another individual, and may in part explain why individuals show destructive obedience: if an action does not feel one's own, there is no urgency to control it. While research on (destructive) obedience has emphasized the importance of the experience of responsibility (Milgram, 1974), the experience of agency may be just as important: if a person does not feel as a performer or agent, that person should be less inclined to stop their actions or show the ability to change those actions. In a recent study by Fennis and Aarts (2012) a lowered sense of agency was linked to increased susceptibility to a request from an authority. The findings from Fennis & Aarts (2012) and the findings presented in this research may show parts of a potentially reinforcing cycle, as obeying orders will lower your sense of agency, while experiences of lowered agency will make you more likely to be obedient. Of course, these studies touched upon the following of commands, which is not necessarily the same as destructive obedience as defined by Milgram. Future studies on destructive obedience and agency are required to further experimentally investigate these hypotheses.

To conclude, in the present set of studies we investigated the sense of agency when participants were free to act or had to obey commands. Using different measures, and investigating agency on different levels of cognition, we repeatedly find that obedience to commands, or compatible command cues, decrease the sense of agency. The present investigation thereby reveals the importance of action selection process: agency is not fixed, even when you perform an action on your own, your sense of acting or causing can change as a result of external commands.

Chapter 3

You Should Read This! **Perceiving and Acting upon Action Primes** **Influences One's Sense of Agency**

This chapter is based on Damen, T. G. E., van Baaren, R. B., & Dijksterhuis, A. (2014). You should read this! Perceiving and acting upon action primes influences one's sense of agency. *Journal of Experimental Social Psychology*, 50, 21–26. doi:10.1016/j.jesp.2013.09.003

ABSTRACT

In two studies, we investigated the degree to which action primes, and acting upon those primes affect agency ratings. Participants performed left or right button-presses that generated tones, and were subsequently asked to indicate the degree to which they felt that they, instead of the computer, had caused the tones. Prior to button-presses, participants were subliminally or supraliminally primed with “left” or “right”. Participants were free to press either button, and thus could perform prime-compatible or prime-incompatible actions. Results showed that incompatible primes lowered sense of agency compared to the effects of compatible primes, when primes were presented subliminally. In contrast, supraliminal compatible primes lowered agency compared to incompatible primes.

The sense that we are performing an action or causing an effect – that is, the sense of agency – is a pervasive feature of consciousness. In conscious experience, we intuitively differentiate between states in which we feel that we caused something to occur, and states in which we feel no agency (Wegner, 2002). Although we like to think that our sense of agency is a clear-cut and robust sensation, recent investigations have shown that people can experience different degrees of agency, and that agency can be influenced by a number of different factors (Wegner, 2003). For example, numerous studies have shown that an important determinant for the experience of agency is the compatibility between an agent's prior thoughts and the effects that follow (Pronin, Wegner, McCarthy, & Rodriguez, 2006).

Studies have often used effect priming to influence or simulate those prior thoughts (Aarts, 2007; Sato, 2009), thereby activating the representation of those outcomes before the actions are performed (van der Weiden, Aarts, & Ruys, 2012). Effect primes have been shown to increase agency by subliminally priming the location where participants will stop a movement (Aarts, Custers, & Wegner, 2005); by having participants hear a tone before they subsequently cause that tone by their button-press (Moore, Wegner, & Haggard, 2009); or by subliminally priming the word “blue” before participants cause a blue circle to appear by their button-press (Sato, 2009). While such studies have established that giving a preview of an outcome just before that outcome occurs increases our sense of agency, related questions, namely how thinking about and selecting between appropriate actions influence agency, have received only limited attention (Wenke, Waszak, & Haggard, 2009). This neglect is surprising as individuals not only think about desired outcomes, but they can also think thoroughly about appropriate actions, making the process of action selection a major part of the action sequence (Brass & Haggard, 2008).

In a recent investigation by Wenke, Fleming, and Haggard (2010), the importance of action selection for sense of agency was investigated by subliminally priming participants with potential future actions. Participants experienced increased agency when their performed actions were compatible with the earlier action primes, compared to when they were incompatible. According to Wenke et al. (2010), compatible action primes ‘smoothen’ action selection, thereby increasing the sense of agency. That is, compatible primes facilitated responding, while incompatible primes interfered with response selection.

However, these findings may not generalize to situations where the primes are processed consciously rather than unconsciously. The explicit awareness of the action primes, may influence the subsequent sense of agency differently: when we become aware that we are doing (or may have done) something compatible with an external action prime, it is possible that our sense of agency is not increased, but weakened instead. Being free to choose between actions is vital for our feelings of control (Skinner, 1996), and we feel a psychological reactance when another threatens that freedom (Brehm, 1966). Awareness that we may have followed action primes instead of freely chosen an action ourselves may therefore undermine our sense of freedom, and decrease the sense of agency.

In two experiments we investigated the relation between action prime visibility, and the compatibility of the action prime with the following action, on the sense of agency. Using an explicit agency task, participants were subliminally and supraliminally primed with possible actions – ‘left’ or ‘right’ – prior to action execution – pressing a left or right keyboard button –, and were subsequently asked to report their sense of agency for the effects their actions caused; namely, a tone. We expected that subliminal primes compatible with subsequent actions lead to increased agency compared to incompatible primes. In contrast, awareness of the externally generated primes may reverse this pattern; primes compatible with actions may then lead to reduced agency compared to incompatible primes.

STUDY 3.1 METHOD

Participants

Twenty undergraduate students ($M_{\text{age}} = 19.50$; 15 females) participated in exchange for €10 euros or course credit.

Materials and procedure

Participants were welcomed and explained the study was about feelings of causation. They were going to produce tones with button-presses, but were told that it was also possible for the computer to generate tones, thereby creating an ambiguous situation. In fact participants always produced the tones.

The task comprised 300 trials (120 subliminal, 120 supraliminal, and 60 no-prime) presented in random order. In each trial, participants were either primed subliminally, supraliminally, or they were not primed. Participants focused on a row of X-es for 800 ms, during which time they were subliminally (16.7 ms^{-1}) or supraliminally (200 ms) primed (‘LEFT’ vs. ‘RIGHT’), or were not primed. Post-mask X-es appeared for 50 ms, and then disappeared. Participants were instructed to press a left or right button. On average, participants acted compatible with the action primes on 57.8% of the subliminal trials, and 64.0% of the supraliminal trials. These percentages did not significantly differ from one another $F(1,19) = 1.12, p = .30$. While responses to subliminal trials did not differ from chance level $t(1,19) = 1.53, p = .14$, responses to supraliminal trials were beyond chance level $t(1,19) = 3.91, p = .001$.

Participants were to press a button the moment the X-es disappeared. As such there was a fixed point in time when participants had to press a button of their choosing. Trials on which no response was given after 5000 ms were excluded from the analysis (0.4% of total trials). Participants were told that they could see words or flashes appearing within the X-es.

1 Represents 1 frame on a 60 Hz monitor.

They were instructed that these words should not distract them, and that they were always free to press a button of their own choosing. Button-presses generated a tone: a 1000 Hz tone for a duration of 500 ms after a left button-press, and a 600 Hz tone for a duration of 500 ms after a right button-press. The tones occurred after fixed time lags (0 ms vs. 200 ms vs. 400 ms vs. 600 ms; evenly divided over experimental conditions). Although temporal delay between action and effect influences sense of agency (Sato & Yasuda, 2005), it was not a main factor of interest. It was used in the current paradigm to make the task more ambiguous. At the end of each trial, participants had to indicate on a 100-point scale the degree to which they felt they had caused the tone to occur.

Debriefings indicated that none of the participants were aware that words were also presented during subliminal trials. Furthermore, none of them realized the true nature of the study.

RESULTS

Agency ratings

A 4 (Time Lag: 0 ms vs. 200 ms vs. 400 ms vs. 600 ms) \times 2 (Prime Visibility: subliminal vs. supraliminal) \times 2 (Prime Compatibility: compatible vs. incompatible) repeated-measures Analysis of Variance (ANOVA) on agency ratings showed a main effect of Time Lag, $F(3, 57) = 23.86, p < .001, \eta_p^2 = .56$. Shorter Time Lags led to significantly higher agency ratings than longer Time lags ($M_{0\text{ms}} = 77.94, SD = 16.73; M_{200\text{ms}} = 74.79, SD = 11.73; M_{400\text{ms}} = 64.58, SD = 12.24; M_{600\text{ms}} = 51.54, SD = 14.14$). There was no main effect of Prime Visibility, $F < 1, n.s.$, nor of Prime Compatibility, $F(1, 19) = 1.24, p = .28$. Analyses showed no interaction between Time Lag and Prime Visibility, nor was there an interaction between Time Lag and Prime Type, both F 's $< 1, n.s.$ Finally, there was no three-way interaction between Time Lag, Prime Visibility, and Prime Compatibility, $F < 1, n.s.$

However, analyses did show a significant interaction between Prime Visibility and Prime Compatibility, $F(1, 19) = 7.87, p = .01, \eta_p^2 = .29$ (see Fig. 3.1). Planned contrasts show that when primes were presented subliminally, compatible primes led to higher agency ratings compared to incompatible primes ($M_{\text{compatible}} = 69.78; SD = 9.43$ vs. $M_{\text{incompatible}} = 65.12; SD = 12.39; F(1, 19) = 5.18, p = .04, \eta_p^2 = .21$). However, the reverse was observed within the supraliminal prime condition: here, compatible primes led to less agency compared to incompatible primes ($M_{\text{compatible}} = 63.85; SD = 12.46$ vs. $M_{\text{incompatible}} = 70.11; SD = 10.48; F(1, 19) = 8.89, p = .008, \eta_p^2 = .32$). In an additional repeated-measures ANOVA, we contrasted the no-prime condition ($M_{\text{no-prime}} = 69.69; SD = 9.29$) with the four conditions of the interaction between Prime Visibility and Compatibility. Contrasts showed that compared to the no-prime baseline, agency was reduced both in the subliminal incompatible condition, $F(1, 19) = 10.35, p = .005, \eta_p^2 = .35$, and in the supraliminal compatible condition, $F(1, 19) = 16.31, p =$

.001, $\eta_p^2 = .46$. Contrasts between the no-prime condition and the subliminal compatible and supraliminal incompatible conditions revealed no differences in sense of agency, $F_s < 1$, n.s.

Reaction times

The repeated-measures ANOVA on Reaction Times (RT's), which was similar to the analysis on agency ratings, showed a main effect of Prime Visibility, $F(1, 19) = 27.60$, $p < .001$, $\eta_p^2 = .59$. RT's were higher after subliminal primes than after supraliminal primes ($M_{\text{subliminal}} = 670.52$; $SD = 259.27$ vs. $M_{\text{supraliminal}} = 573.12$; $SD = 241.57$). The interaction between Prime Visibility and Compatibility on RTs, which was the crucial test for the analysis on agency ratings, was not significant, $F < 1$, n.s.; similarly, none of the other tests in this analysis reached significance. A subsequent repeated-measures analysis on the average RT's of the subliminal, supraliminal and no-prime ($M_{\text{no-prime}} = 548.57$; $SD = 203.86$) conditions showed that participants were slower to respond in the subliminal condition compared to the supraliminal condition ($F(1, 19) = 13.38$, $p = .002$, $\eta_p^2 = .41$) and also compared to the no-prime condition ($F(1, 19) = 23.56$, $p < .001$, $\eta_p^2 = .55$)².

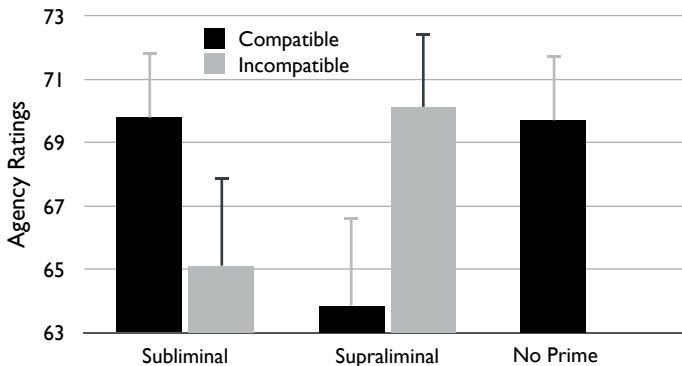


Figure 3.1. Mean agency ratings per Visibility and Compatibility conditions, collapsed over Time lag conditions. Error bars represent standard errors.

DISCUSSION

Our results showed that when primes were subliminal, compatible action primes led to higher agency ratings compared to incompatible primes. We thereby replicated the findings reported by Wenke et al. (2010), who showed higher agency ratings for compatible rather than incompatible subliminal primes. However, when we contrasted the subliminal prime

² In a further exploration of the data, we excluded 20, 40 and 50 percent of the slowest RT's per participant and condition in both studies. These analyses did not reveal any differences with regards to significance and non-significance, on response behavior, agency judgments, and RT's, compared to the results reported in the main text.

conditions to the no-prime control condition, only the incompatible primes led to different agency ratings; that is, incompatible primes resulted in lower agency ratings compared to the control condition. No difference was observed between the no-prime condition and the compatible prime condition. Taken together, these findings would suggest that agency is not enhanced by subliminal compatible primes, and instead, that the incompatible primes drive the effect: agency is reduced when subliminal primes are incompatible. The reverse findings were observed when the action primes were supraliminal. First, compatible primes led to lower ratings of agency compared to incompatible primes. When contrasting the supraliminal conditions to the no-prime condition, a difference was only observed compared to the compatible condition. That is, when we follow a visible action prime, we experience reduced agency.

The present study also showed a difference in RT's due to prime visibility, as responses were slower after subliminal prime trials compared to the supraliminal and no-prime trials. It's possible that subliminal action primes could have disrupted the action selection process. The supraliminal primes may have had no such effect because of their overt nature, and/or because participants were given the explicit instruction not to be distracted by the words they would see in the experiment. With regard to the present study, however, it's important to note that there were no differences in RT's when testing for the interaction between prime visibility and prime compatibility. This suggests that differences in agency in this interaction cannot be explained by differences in RT's.

In the first study, we contrasted our findings to a condition in which no prime was presented. In a second study, we aimed to replicate the results from our first study, additionally priming participants both subliminally and supraliminally with non-word primes, keeping priming a constant factor across study conditions.

STUDY 3.2 METHOD

Participants

Twenty undergraduate students ($M_{\text{age}} = 20.25$; 17 females) participated in exchange for €10 euros or course credit.

Materials and procedure

Study 3.2 was similar to Study 3.1; the differences being that there were three time lag conditions (0 ms vs. 300 ms vs. 600 ms; evenly divided over trials), and that participants were subliminally and supraliminally primed with a non-word ('WOTSL') instead of not primed. Trials on which no response was given after 5000 ms, were excluded from the analysis (0.8% of total trials). The explicit agency task comprised 324 trials

(81 subliminal, 81 subliminal non-word, 81 supraliminal, and 81 supraliminal non-word) presented in random order. On average, participants acted compatible with the action primes on 50.5% of the subliminal trials, and 51.0% of the supraliminal trials. These percentages did not significantly differ from one another or from chance level.

To further examine the subliminal nature of the prime presentation, participants worked on a 20-trial prime detection task. Participants were subliminally primed with ‘LEFT’ and ‘RIGHT’, and were to try to determine the presented word. They were to indicate this with the responses “Left”, “Right”, and “Unclear”. None of the participants scored beyond the 50% chance level when their proportion of correct responses was calculated ($M_{\text{proportion correct}} = .29$). Debriefings indicated that none of the participants were aware that words were also presented during the subliminal trials in the main task. Finally, none of the participants realized the true nature of the study.

RESULTS

Agency ratings

A 3 (Time Lag: 0 ms vs. 300 ms vs. 600 ms) \times 2 (Prime Visibility: subliminal vs. supraliminal) \times 3 (Prime Type: compatible vs. incompatible vs. non-word) repeated-measures ANOVA on agency ratings showed a main effect of time delay, as shorter Time Lags led to higher agency ratings than longer Time Lags ($F(2, 38) = 43.45, p < .001, \eta^2_p = .70; M_{0\text{ms}} = 85.60, SD = 7.85; M_{300\text{ms}} = 68.22, SD = 16.21; M_{600\text{ms}} = 46.99, SD = 23.34$). There was no main effect of Prime Visibility $F(1, 19) = 2.82, p = .11$, nor was there a main effect of Prime Type $F < 1$, n.s. Analyses showed no interaction between Time Lag and Prime Visibility, $F(2, 38) = 2.53, p = .09$, nor was there an interaction between Time Lag and Prime Type, $F(4, 76) = 1.71, p = .16$. Finally, there was no three-way interaction between Time Delay, Prime Type, and Prime Compatibility, $F < 1$, n.s.

There was a significant interaction between Prime Visibility and Prime Type, $F(2, 38) = 13.671, p < .001, \eta^2_p = .42$ (see Fig. 3.2). Compatible and incompatible primes led to different agency ratings between the subliminal and the supraliminal prime conditions, $F(1, 19) = 11.69, p = .003, \eta^2_p = .38$. When primes were presented subliminally, compatible primes led to significantly higher ratings of agency than incompatible primes ($M_{\text{compatible}} = 68.98; SD = 13.35$ vs. $M_{\text{incompatible}} = 66.90; SD = 14.03; F(1, 19) = 8.41, p = .009, \eta^2_p = .31$). Again, a reverse trend was observed in the supraliminal condition, as compatible primes then led to significantly lower ratings of agency compared to incompatible primes ($M_{\text{compatible}} = 64.62; SD = 11.76$ vs. $M_{\text{incompatible}} = 67.58; SD = 13.68; F(1, 19) = 4.34, p = .05, \eta^2_p = .17$). When looking at the direction of the compatibility effects relative to the non-word primes we found that when primes were presented subliminally, compatible primes led to higher agency ratings than non-word primes ($M_{\text{no prime}} = 66.23; SD = 13.72$ vs. $M_{\text{compatible}} = 68.98;$

$SD = 13.34$; $F(1, 19) = 11.25$, $p = .003$, $\eta^2_p = .37$). However, when primes were presented supraliminally, non-word primes instead led marginally higher agency ratings ($M_{\text{compatible}} = 64.62$; $SD = 11.76$ vs. $M_{\text{nonprime}} = 67.30$; $SD = 14.57$; $F(1, 19) = 4.20$, $p = .06$, $\eta^2_p = .18$). In both the subliminal and supraliminal conditions, there were no differences in agency between the non-word and incompatible primes, $F_s < 1$. The non-word primes thereby led to agency ratings similar to the incompatible primes.

Reaction times

The repeated-measures ANOVA on RT's, which was similar to the analysis on agency ratings, showed a main effect of Prime Visibility, $F(1, 19) = 27.60$, $p < .001$, $\eta^2_p = .59$. As in Study 3.1, RT's after subliminal primes were higher than after supraliminal primes ($M_{\text{subliminal}} = 861.60$; $SD = 488.22$ vs. $M_{\text{supraliminal}} = 707.94$; $SD = 379.62$). The interaction between Prime Visibility and Compatibility on RT's, which was the crucial test for the analysis on agency ratings, was not significant, $F < 1$, n.s.; similarly, none of the other tests in this analysis reached significance.

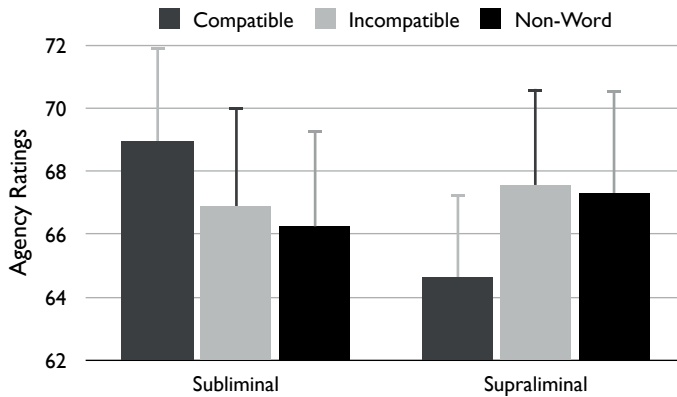


Figure 3.2. Mean agency ratings per Visibility and Prime-Type conditions, collapsed over Time lag conditions. Error bars represent standard errors.

DISCUSSION

Again, we found that compatible subliminal primes led to higher agency ratings when compared to incompatible subliminal primes, while the reverse was true for supraliminal primes. Comparisons with the non-word prime conditions suggest an increase in the sense of agency by compatible subliminal primes, and a decrease in agency due to compatible supraliminal primes. A conclusion on the direction of the effect would be different from Study 3.1, in which incompatible subliminal primes and compatible supraliminal primes

reduced agency compared to the baseline. This discrepancy will be addressed in the general discussion. Finally, the analysis on RT's again showed no differences in RT's when testing for the interaction between prime compatibility and visibility, suggesting that differences in agency ratings were not driven by differences in RT's.

GENERAL DISCUSSION

The central question of the current two studies was whether consciously perceiving and acting upon primes influences our sense of agency. Results showed that when action primes were presented subliminally, primes that were incompatible to the following actions led to a decrease in the sense of agency compared to compatible primes. However, the reverse pattern was observed when primes could be consciously perceived, as when participants were aware of the external primes and acted compatible to them, their sense of agency was reduced compared to when they acted in an incompatible manner.

The observed compatibility effect of subliminal primes replicates earlier work by Wenke et al. (2010), who showed higher agency ratings for compatible rather than incompatible primes. Compatible subliminal action primes may facilitate action selection, and give a perception of smooth processing, ultimately increasing experiences of agency compared to incompatible primes (Chambon & Haggard, 2012). Additionally, the fact that the effects of supraliminal primes were in a different direction than those of the subliminal primes provides strong additional evidence that subliminal action primes indeed affected agency experiences, and cannot be explained by assuming that the primes were not fully subliminal. The present study showed that when the primes were consciously perceived, compatible action primes led to lower reported experiences of agency compared to incompatible primes. Likely, the awareness that one has potentially followed an external action prime lowers the sense of agency compared to the awareness that one disregarded an external action prime.

The present research differs from many previously conducted priming studies on agency with regard to the nature of the primes employed. While in many previous studies participants were primed with the potential effects of their actions (e.g., Aarts et al., 2005), and thus given a preview of the effect of a subsequent action, in the present studies participant were instead primed with possible actions. Agency was, therefore, not influenced by a match between effect primes and actual effects, but by a match between action primes and actual actions. The results reveal differences in the consequences action primes may have on agency compared to effect primes. While Moore et al. (2009) showed that supraliminal effect primes (a preview of a tone) increased agency when the effects were compatible rather than incompatible (for similar findings see Aarts et al., 2005), in the present study compatible supraliminal action primes reduced agency compared to

incompatible primes. These divergent findings show that action primes influence us more than by simply giving a preview of things to come as effect primes do. As freedom of choice is vital to our sense of control (Skinner, 1996), the conscious awareness that we may have been influenced will reduce our sense of agency when we act compatibly to an external prime.

In a recent study on response interference, Morsella and colleagues (2009) showed reduced perceptions of control to occur after incompatible trials on a Stroop task (Stroop, 1935). However, compared to the present agency paradigms, response interference paradigms do not suggest the presence of another agent, and, more importantly, do not provide the participant with the freedom to act. These differences, together with the present findings revealing increased agency after incompatible subliminal action primes, suggest these different paradigms also reflect different processes.

In the present studies two types of controls were used: a no-prime condition in Study 3.1 and non-word prime conditions in Study 3.2. Intriguingly, the different control conditions lead to different conclusions regarding the direction of the general effect of compatibility. How one interprets the results depends on one's view of the best control condition: if one considers non-word primes to be the most appropriate controls, then compatible subliminal primes increase agency while compatible supraliminal primes decrease agency. The finding that compatible subliminal primes increase agency would be in line with previous findings on subliminal outcome priming (e.g., Aarts et al., 2005). However, if one considers the no-prime baseline to be the most appropriate control condition, then agency is reduced after subliminal incompatible primes and supraliminal compatible primes. Such a conclusion would have theoretical implications, as agency is not increased compared to a baseline, but reduced depending on visibility and compatibility. This is, however, different from the effects of outcome priming, in which primes can increase levels of agency compared to baseline levels (e.g., Moore et al., 2009). It would also suggest that the non-word primes were actually experienced as incompatible primes. Although this view is intuitively appealing, given the observation (in Study 3.2) that agency levels of the non-word primes always closely followed the agency levels of the incompatible prime conditions, it is clear that more research is required before any strong claims about the direction relative to a baseline could be made.

We have to address some limitations in the present study. First, considering the high number of females across studies it was not possible to control for a potential gender effect in the present research. As it has been shown that gender interacts with the experience of self-causation in priming experiments (e.g., Belayachi & Van der Linden, 2010; Jones, de-Wit, Fernyhough, & Meins, 2008), future studies should include gender as a factor. Second, it is unclear why supraliminal priming affected response selection in Study 3.1 but not in Study 3.2. It's possible that the introduction of non-word primes invalidated, to a certain

extent, the action primes, thereby decreasing the influence of primes on response selection. It is however, unlikely that differences in behavior priming led to the differences with regard to the control conditions. The difference between the two studies is such that in Study 3.1 supraliminal action primes influenced behavior, whereas none of the primes seemed to have affected behavior in Study 3.2. For the results on agency, however, the crucial differences with regard to the different control conditions are within the subliminal conditions, for which there are no indications of behavioral priming in either of the studies. Third, the results from the present studies are different from the results reported by Wenke and colleagues (2010) with regard to response facilitation and selection. Wenke and colleagues showed both response priming and shorter RT's for compatible primes compared to incompatible primes. In the present studies differences in RT's were only observed due to prime visibility, however there were no differences in RT's due to prime compatibility. Furthermore, only in Study 3.1 did the results suggest a behavioral priming effect (in the supraliminal prime condition). This indicates that the compatibility effect on agency is neither due to differences in RT's nor due to response priming, but can be considered to be an independent effect. It is difficult to explain the cause of the differences in RT's and response selection between the investigation by Wenke and colleagues and the present investigation, as there were also marked differences between the respective paradigms³.

Synofzik, Vosgerau, and Newen (2008) have recently emphasized the importance of investigating agency not solely as a consequence of motor control processes, such as efferent motor information and sensory feedback (e.g. Blakemore, Wolpert, & Frith, 2000), but also as a consequence of higher-order sources of information, such as beliefs, social and contextual cues, goals, and intentions (e.g. Aarts et al., 2005). Synofzik and colleagues (2008) therefore proposed a two-step account of agency. According to this account, *feelings* of agency arise primarily, which are derived from sensorimotor processes, and operate before a reflective act of consciousness occurs. In a second step, an explicit higher-order agency *judgment* can occur, which is informed not only by feelings of agency, but is also based on the reflective attributions of being a likely agent. These reflective attributions can be influenced by higher-order information, such as contextual cues. The present study is an example of the second step in this model, and it is thereby in line with a number of other studies showing that contextual cues can indeed influence agency *judgments* beyond the influence of the primary *feelings* of agency (e.g., Aarts, 2007; Dijksterhuis, Preston, Wegner, & Aarts, 2008; Wenke et al., 2010). Interestingly, some recent studies have shown that contextual cues were also able to influence *feelings* of agency (Desantis, Roussel, & Waszak, 2011), suggesting that contextual cues may actually have more influence on these

³ The moments of measurement (trial by trial vs. at the end of the paradigm); nature of the effect (sound vs. color); presence of supraliminal primes; and the presence of forced choice trials (responses to targets vs. free choice responses) all represent differences between the paradigms used in the present investigation and the investigation by Wenke et al. (2010).

primary and lower levels of agency than originally assumed. Future studies should therefore establish whether action primes also influence measures of *feelings* of agency (through other processes than behavior priming), for example using intentional binding (e.g., Haggard, Clark, & Kalogeras, 2002) or sensory attenuation paradigms (e.g., Blakemore et al., 2000).

The present investigation showed that our sense of agency, which we may think of as robust and clear-cut, can be influenced by action primes and our subsequent actions. A future question is whether action primes work similarly to suggestions with regards to agency. Others often suggest actions such as to buy shampoo of brand X rather than Y, to watch the new TV show by Michael Palin, or to avoid the horrible new vegetable soup in the cafeteria. Our findings suggest that our awareness of those suggestions, and our decisions to act upon them or not, influence our sense of agency.

Chapter 4

Agency and Authority: Authority Cues Increase the Sense of Agency

This chapter is based on Damen, T. G. E., van Baaren, R. B., Brass, M., Demanet, J., & Dijksterhuis, A. (in prep). *Agency and authority: Authority cues increase the sense of agency.*

ABSTRACT

In three studies, we investigated the influence of cues of external authority on the sense of agency. Participants performed a task in which their sense of agency for the effects of their actions was made ambiguous. Participants were instructed what actions to perform by voices that inherently conveyed or did not convey external authority. In Study 4.1, participants were instructed what actions to perform by either a low-pitched and confident voice, or a high-pitch hesitant recorded voice. In Study 4.2, the instructions varied in another vocal quality that has been associated with authority, namely vocal intensity. Results in both studies show that on trials in which participants were instructed by a voice conveying external authority, they were more likely to experience agency than on non-authority trials. In Study 4.3 participants were either given instructions by an experimenter who was physically present, or they heard the experimenters' recorded instructions through a speaker. Agency was increased when the experimenter was physically present. These findings do not support Milgram's (1974) notion of an Agentic State, a hypothesized lowered state of consciousness in the presence of authority. Instead, the presence of cues of external authority seems to increase the sense of agency over action effects.

“For a man to feel responsible for his actions, he must sense that the behavior has flowed from ‘the self.’ In the situation we have studied, subjects have precisely the opposite view of their actions—namely, they see them as originating in the motives of some other person.”
(Milgram, 1974, p. 146).

In what can arguably be described as the most (in)famous study in psychology, Stanley Milgram (1963) investigated how far participants were willing to go under the influence of a powerful authority figure. Milgram showed that most participants were actually prepared to inflict lethal harm on their fellow participants when the experimenter instructed them to do so in the name of ‘science.’ In trying to account for these findings, Milgram did not merely view authority as a powerful heuristic to which individuals are susceptible, he also theorized that in the presence of authority, people lose their sense of autonomy and the sense that they are independent agents. He termed this loss the ‘*Agentic Shift*’ and the resulting mindless state the ‘*Agentic State*’ (Milgram, 1974).

Over the years Milgram’s notion of an Agentic State has been criticized (e.g., Blass, 2004; Darley, 1992; Haslam & Reicher, 2007; Helm & Morelli, 1979; Mantell & Panzarella, 1976; Miller, 1986; Miller, Collins, & Brief, 1995; Russell & Gregory, 2005). Milgram himself devised his theory more than a decade after the first publication of his research and was unable to provide empirical evidence to substantiate his ideas. Furthermore, recent archival research has revealed a lot about the process leading up to Milgram’s paradigm (e.g., Perry, 2012; Russell, 2011). For example, Milgram worked on his paradigm for almost two years, adding so-called binding factors (e.g., having participants sign a contract) and strain-resolving mechanisms (e.g., greater distance to victim; Russell, 2011). Milgram’s paradigm incorporated a considerable number of factors that together led to an extremely powerful situation. Consequently, there has been much attention for the effects of these situational factors, and the notion of a mindless state triggered by the presence of authority as being the primary explanation behind (destructive) obedience, has received much less support (Miller, 2004). However, no research has actually empirically investigated whether cues of external authority can in fact influence our state of mind. Do we indeed become more mindless, and is our conscious experience indeed reduced in the presence of authority, as Milgram proposed?

An important part of that conscious experience is our sense of agency. Agency is the experience that one is performing an action or causing an effect (Gallagher, 2000). It is the feeling that we, through our actions, cause changes in the world around us. While we may intuitively think agency comes naturally when we act, over the past three decades research has shown that agency is the outcome of a complex process involving prediction and inference,

including both automatic motor processes (e.g., feed-forward cues, proprioception, sensory feedback; Blakemore, Wolpert, & Frith, 2002; Synofzik, Vosgerau, & Newen, 2008), and also higher inferential processes (e.g., beliefs, prior intentions, contextual cues; Synofzik et al., 2008; Wegner, 2003). Hence, agency can be influenced by a number of internal and external factors (Wegner & Sparrow, 2004).

For example, the presence of other potential agents has often been considered to be a powerful factor influencing the sense of agency. When the effects we observe in our environment can also be attributed to potential other agents, our sense of agency may be reduced. If a glass of water falls from a table surrounded by six others, we may be less inclined to attribute this event to any action of ours, compared to a situation in which the glass falls from our table without others being present. We are therefore susceptible to the presence of other potential agents in judging our own agency. Previous research by Dijksterhuis, Preston, Wegner, and Aarts (2008) illustrates this effect. In their studies, participants were primed with words representing agents (e.g., a computer, God) and were then asked whether they experienced agency for effects that could have also been caused by someone else. The agent primes made participants less likely to judge *themselves* as being agents.

However, while it is clear that the presence of other agents influences our sense of agency, the question remains whether the nature of those other agents is also important in determining our personal agency. For example, will cues that indicate the presence of external agents with *authority* lower our sense of agency compared to the presence of agents without clear authority? Considering that authority has so often been regarded as a powerful cue to which we are all susceptible (Cialdini, 2001; Milgram, 1974), it is perhaps possible that cues of external authority trigger a subordinate mindset that makes us less inclined to see ourselves as potential agents.

Research in a related domain, the domain of power, does suggest a relation between the ability to influence others and action-related cognitions. Power is the (perceived) capability to limit or steer the behavior of others (Galinsky, Magee, Gruenfeld, Whitson, & Liljenquist, 2008), and thereby represents a situation that is quite the opposite of a situation in which one is a subordinate compared to an external authority figure. The priming of personal power has been shown to increase action orientation tendencies (Anderson & Galinsky, 2006) and to activate the behavioral approach system (Keltner, Gruenfeld, & Anderson, 2003). Alternatively, the absence of power seems to limit the action oriented mindset (Magee, Galinsky, & Gruenfeld, 2007). Furthermore, the absence of power makes individuals more likely to make situational rather than dispositional attributions (Keltner, Van Kleef, Chen, & Kraus, 2008). We therefore wondered whether instructions that conveyed external authority would, in a similar vein, decrease an individuals' sense of autonomy and the likelihood for individuals to perceive themselves as independent agents, reducing the sense of agency.

In the present paper we report three studies in which we explored the applicability of Milgram's (1974) Agentic State theory to the sense of agency. In all studies, participants performed a task in which their sense of agency was made ambiguous. Participants performed actions (button-presses) and were subsequently presented with action effects (tones). Participants were told that either they could have caused those tones with their actions, but that it was also possible that the computer had caused the tones instead – irrespective of their button-presses. In addition, participants received external instructions as to which buttons they should press by low-pitch confident voices that conveyed external authority or high-pitch insecure voices that did not convey authority (Study 4.1); by voices that varied in vocal intensity, a characteristic linked to authority (Study 4.2); or they were given instructions by the experimenter who was either physically present with the participants or absent instead (Study 4.3). Following Milgram's reasoning, we expected that an instruction that conveyed external authority would make participants less likely to perceive themselves as agents compared to instructions that did not (directly) convey authority.

STUDY 4.1

In one of his experiments, Milgram (1974) showed the importance of appropriate clothing for authority. Obedience levels were shown to be higher when the person who was requiring obedience was wearing a scientific lab-coat, compared to a situation in which that person was wearing casual clothing. While clothing is certainly one of the factors through which individuals can convey their status and authority, another powerful way by which one can convey authority is through non-verbal communication. For example, while we may intuitively feel that our perception of another person should only to a small degree be influenced by the characteristics of that person's voice, research has shown that vocal properties are in fact extremely important for impression formation (e.g., Addington, 1968; Mohammadi & Vinciarelli, 2012) – and are likewise vital to our impressions of power and authority of that other person (Bradac & Street, 1989). Specifically, vocal features such as the amount of talking-time, speech loudness, tempo, and pitch seem to play a key role in our perceptions of dominance, credibility, and leadership ability (Cashdan, 1998; Gregory Jr. & Webster, 1996; Kimble & Musgrove, 1988; Lamb, 1981).

In the present study participants performed a task in which their sense of agency was made ambiguous. Participants performed actions (the pressing of buttons) and observed action effects (tones), and were then asked for their sense of agency regarding these action effects (see also Damen, van Baaren, & Dijksterhuis, 2014). Participants were, however, given verbal instructions as to which button they should press. We manipulated both pitch and perceived self-confidence of these verbal instructions to convey authority or non-

authority. We expected that participants would experience reduced agency for authoritative compared to non-authoritative instructions.

METHOD

Participants

Twenty-six undergraduate students (20 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 completed an adapted version of a paradigm used earlier by Sato and Yasuda (2005) as an explicit measure of agency. Over multiple trials, participants were instructed to press specific keyboard buttons by voices that either did or did not convey external authority. After each button-press participants heard a tone. Participants were told that there were two possibilities: the tone had been generated by the computer or by their own button-press. Participants had to indicate the degree to which they felt they had caused the occurrence of the tone.

Each trial started with the presentation of a fixation-cross. After 2 seconds, participants heard a verbal instruction (“Left” vs. “Right”) through a headset indicating the required response (a designated left or right button on their keyboard). The instructions were the recordings of two voices that a pilot study¹ identified as respectively conveying the most and the least external authority. The authoritative instruction was confident and relatively low-pitched. The non-authoritative instruction was uncertain and relatively high-pitched. The verbal instructions were equalized in volume level, and were recorded and configured to last exactly 700 ms. After each button-press participants would hear a tone: a 1000 Hz tone for a duration of 300 ms after a left button-press, and a 600 Hz tone for a duration of 300 ms after a right button-press. Participants were instructed to press a left or right keyboard button the moment the fixation-cross disappeared, which was 5 seconds after trial start. At the end of each trial, participants had to indicate on a 100-point scale the degree to which they felt that they, not the computer, had caused the tone to occur.

Tones occurred after fixed time lags (0 ms vs. 200 ms vs. 400 ms vs. 600 ms after button-presses). These were produced randomly but evenly divided over experimental conditions.

¹ Two pilot studies were conducted. In a first study forty-nine participants were asked to list three speech qualities that they believed to convey authority. There was a clear Top 4 of: 1. Confidence/Self-assuredness, 2. Loudness, 3. Directness, and 4. Pitch. We then recorded the voices of six individuals with a low pitch voice, and asked them to speak in a confident and direct manner. We also recorded the voices of six males with a high pitch voice, and asked them to speak in an uncertain manner. Twenty-four participants ranked these twelve voices on the question “To what degree does the voice you just heard convey authority?”, and for Study 4.1 selected the top and bottom ranked voices.

Although temporal delay between action and effect influences sense of agency (Sato & Yasuda, 2005), it was not a main factor of interest. It was used in the current paradigm to make the task more ambiguous.

The main task consisted of 74 trials. In 32 of the trials participants were given an instruction by a high authoritative voice, in 32 of the trials the instruction was non-authoritative. Finally, there were 10 filler trials in which participants heard a random tone 8 seconds after they had pressed the instructed button. The purpose of these trials was to convince the participants of the fact that the computer could also produce the tones. These filler trials were not analyzed.

At the end of the experiment participants heard the recorded voices again, and were required to rate each voice on a 7-point scale on the degree to which they believed the voices conveyed authority (1 = *Not at all*; 7 = *Completely*). After the experiment participants were thanked, debriefed, and paid. In the debriefings participants were asked what they believed to be the research question that was investigated, and were additionally asked when these beliefs (if any) had emerged. The debriefings indicated that none of the participants realized the true nature of the study while they were performing the main task.

RESULTS

Manipulation check

A 2-level (Voice: authoritative vs. non-authoritative) repeated-measures Analysis of Variance (ANOVA) on authority ratings showed a main effect of Voice, $F(1, 25) = 128.05$, $p < .001$, $\eta_p^2 = .84$. Participants judged the authoritative voice to convey more external authority ($M_{\text{authoritative}} = 6.00$; $SD = 1.20$) compared to the non-authoritative voice ($M_{\text{non-authoritative}} = 2.69$; $SD = 1.23$).

Agency scores

The results for agency scores are depicted in Figure 4.1. A 4 (Temporal delay: 0 ms vs. 200 ms vs. 400 ms vs. 600 ms) \times 2 (Voice: authoritative vs. submissive) repeated-measures ANOVA on mean agency scores, showed a main effect of Temporal delay, $F(3, 75) = 59.17$, $p < .001$, $\eta_p^2 = .70$. Shorter delays led to higher agency scores than longer delays ($M_{0 \text{ ms}} = 89.16$, $SD = 8.28$; $M_{200 \text{ ms}} = 78.46$, $SD = 11.63$; $M_{400 \text{ ms}} = 67.19$, $SD = 18.99$; $M_{600 \text{ ms}} = 55.39$, $SD = 22.51$). Additionally, there was a main effect of Voice, $F(1, 25) = 7.85$, $p = .01$, $\eta_p^2 = .24$, as an instruction by an authoritative voice led to higher agency scores compared to an instruction by a non-authoritative voice ($M_{\text{authoritative}} = 74.15$, $SD = 13.59$; $M_{\text{non-authoritative}} = 70.95$, $SD = 14.08$). There was no interaction between the Temporal Delay and Voice conditions $F(3, 75) = 1.23$, $p = .31$.

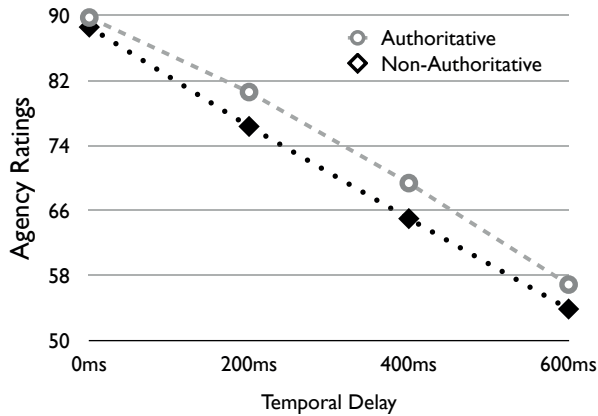


Figure 4.1. Mean agency ratings per Temporal delay and Voice conditions.

DISCUSSION

The present study shows that when individuals act after being instructed by a voice that conveys external authority, they are more likely to experience agency compared to when they act after being instructed by a non-authoritative voice. This finding was contrary to our expectations, as we actually predicted a decrease, not an increase in agency when participants were instructed by an authoritative voice. The current result is also incompatible with Milgram's (1974) idea about a lowered sense of consciousness in the presence of authority.

Before proceeding to a discussion about the potential processes underlying this result, we first wished to establish whether the current finding is a reliable effect. In Study 4.1 we contrasted a confident and low-pitch voice with an insecure and high-pitch voice as a manipulation of external authority. In Study 4.2 we manipulated another vocal characteristic that is indicative of authority, namely vocal intensity.

STUDY 4.2

Higher than normal vocal intensity has been considered to represent a degree of dominance in interpersonal communication, as it constitutes an invasion of another's acoustic space (Aronovitch, 1976; Goffman, 1971; Minter, 1974; Remland, 2009). Especially in hierarchical contexts, where communication flows from high to low-status agents, increases in vocal intensity are likely to occur (Remland, 2009; Smith & Galinsky, 2010). The tendency for one agent to speak louder towards another agent can therefore be perceived as conveying a higher degree of authority in the former, and a lower degree of authority in the latter. A person receiving relatively loud instructions may therefore also be more likely to perceive his/her actions as being directed by that other person, potentially influencing the sense of being an autonomous and independent agent.

In Study 4.2 we investigated whether the degree in vocal intensity by which a person is instructed to perform actions influences the experienced agency for the effects of those actions. First, it is possible that loud instructions may increase the idea that we have acted (as a subordinate) upon the instructions of another, thereby reducing the sense of agency. Alternatively, it was also possible that we found the same pattern as in Study 4.1, in which vocal cues that convey external authority, such as loud instructions, actually increase the sense of agency.

METHOD

Participants

Twenty-three undergraduate students (20 females; $M_{\text{age}} = 20.59$) at the Radboud University Nijmegen participated in exchange for 5 Euro's or course credit.

Materials and procedure

Study 4.2 was similar to Study 4.1, except that participants heard only one male voice that a pilot study showed to be neither extremely authoritative nor extremely submissive. The loudness of these instructions was then varied across trials to obtain instructions that were relatively soft (played at 50 db perceived volume) and relatively loud (70 db), next to instructions of normal loudness (60 db). The main task consisted of 76 trials. In 24 trials participants received an instruction that was soft, in 24 trials they received an instruction of normal loudness, and in 24 trials they received a loud instruction. There were 10 filler trials similar to the filler trials from Study 4.1. Debriefings indicated that none of the participants realized the true nature of the study.

RESULTS

A 4 (Temporal delay: 0 ms vs. 200 ms vs. 400 ms vs. 600 ms) \times 3 (Loudness: soft vs. normal vs. loud) repeated-measures ANOVA on mean agency scores, showed a main effect of Temporal delay. Shorter delays led to higher agency scores than longer delays, $F(3, 66) = 48.97, p < .001, \eta^2_p = .69$ ($M_{0\text{ ms}} = 86.06, SD = 12.33; M_{200\text{ ms}} = 74.29, SD = 12.66; M_{400\text{ ms}} = 62.38, SD = 15.92; M_{600\text{ ms}} = 50.02, SD = 18.70$). Additionally, there was a main effect of Loudness, $F(2, 44) = 3.59, p = .036, \eta^2_p = .14$. Contrast analyses revealed that there were no significant differences in agency scores between instructions of soft and normal vocal intensity ($M_{\text{soft}} = 66.78, SD = 12.33$ vs. $M_{\text{normal}} = 67.58, SD = 12.23; F < 1, \text{ n.s.}$). However, the loud instructions ($M_{\text{loud}} = 70.20, SD = 13.14$) led to significantly higher agency scores compared to both the instructions of normal loudness ($F(1, 22) = 4.37, p = .048, \eta^2_p = .17$), and the soft instructions ($F(1, 22) = 5.58, p = .027, \eta^2_p = .20$). There was no interaction between the Temporal Delay and Loudness conditions, $F < 1, \text{ n.s.}$

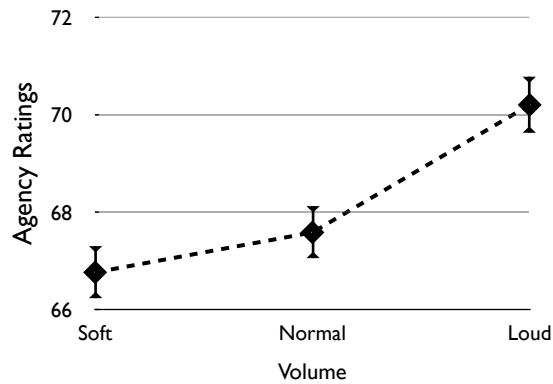


Figure 4.2. Mean agency ratings per vocal Intensity condition, collapsed over Temporal delay conditions. Error bars represent standard errors.

DISCUSSION

In Study 4.2 we discovered that vocal intensity - a vocal characteristic of dominance and authority (Minter, 1974; Remland, 2009) - can influence the personal sense of agency. Specifically, loud instructions led to an increased sense of agency compared to instructions of normal and soft vocal intensity. The present results seem to offer a conceptual replication of Study 4.1. Both studies suggest that vocal characteristics that are linked to external authority increase rather than decrease the sense of agency. These findings are not in line with Milgram's theory (1974) about an Agentic Shift - a reduced sense of consciousness in the presence of authority (cues).

However, one could argue that in the studies presented so far participants may not have interpreted the situation as one that was hierarchical, in the sense that participants perceived that their actions were directed by a high-status agent whom they were required to obey. Perhaps the cues of authority were too subtle to transcend the context of a mere stimulus-response task, and therefore primed a degree of authority in the participants themselves instead. An important next step to further validate the finding that agency is increased by cues of external authority, is to have an experimental setting in which participants were directly instructed by an authority figure who was physically present.

STUDY 4.3

In one of the several variations of the obedience experiments, Milgram manipulated the physical distance of the experimenter. Instead of being physically present in the room and instructing the participant to continue the experiment, the experimenter was absent and instructed the participant through a telephone. Crucially, obedience rates dropped

dramatically, from 65% in the original study to 20.5% in this variation (Milgram, 1974). This finding highlights the importance of the physical presence of authority in order to establish a hierarchical situation in which one agent perceives him/herself to be subject to the instructions of another – especially in situations that are novel, or in which the low-status agent feels reluctant to continue. But does this then also imply that the actual physical presence of an authority figure could influence the sense of agency?

As in the previous studies, participants in Study 4.3 acted in a situation in which their agency over action effects was made ambiguous. Crucially however, in Study 4.3 the instructions were either provided verbally by an experimenter who was physically present in the same room as the participant, or participants received the recorded instructions of the experimenter through a speaker which was connected to the computer on which the experimental program was run. Based on Studies 4.1 and 4.2, we expected that a situation in which the experimenter was physically present would increase the sense of agency compared to a situation in which participants acted on the instructions delivered through a speaker. Again, participants could be instructed to press a specific button, however, there were also trials in which participants were free to act and to choose a button themselves. These trials were added to the experimental design as we were wondering how general or specific a potential effect of an authority's physical presence would be. For example, it could be that only on trials in which the participants were verbally instructed the presence of authority would affect the sense of agency, as on these trials participants were directly influenced in their actions. Alternatively, it could also be that the mere presence of authority would be able to influence agency without requiring direct interaction. An effect of external authority would then also be possible on the trials in which participants were not (specifically) instructed by the experimenter.

METHOD

Participants

Twenty-eight undergraduate students (19 females; $M_{\text{age}} = 22.39$) at the Radboud University Nijmegen participated in exchange for 5 Euro's or course credit.

Materials and procedure

The trials were similar to the trials in Studies 4.1 and 4.2. Each trial started with the presentation of a fixation-cross that disappeared after 5 seconds at which time participants were required to act. After two seconds participants could be given an instruction. Participants were either given an instruction to press a specific button, or heard a unrelated control word (“Swim”) that allowed participants to choose a button themselves. It was also possible that the participants did not get any instruction, allowing them to freely choose

and press a button. The trials differed from the previous studies in that there were three (instead of four) temporal delay conditions (100 ms vs. 400 ms vs. 700 ms) between button-presses and tones.

The experiment consisted of two blocks. In one block the experimenter (male) was physically present in the room where the participant was performing the experiment. The experimenter was trained to keep the volume level of his instructions as constant as possible at around 60 db. Additionally, the volume levels of the experimenter's instructions were measured and displayed on a portable decibel meter (only visible for the experimenter). The experimenter knew the appropriate response by hidden visual cues presented on screen². Participants reported no awareness of these cues during their debriefing. The second experimental block featured the same types and number of trials however without the physical presence of the experimenter. Instead, participants heard the experimenters' recorded voice presented through a speaker (at 60 db) at the same location as were the experimenter was sitting or would sit (depending on block order). Participants were also informed that the voice they heard was the voice from the experimenter.

Block-order was counterbalanced between subjects. Each block consisted of 36 trials. In 12 trials participants were given a direct instruction, in 12 trials participants heard a control word, and in 12 trials nothing was said at all. This experiment did not feature filler trials. At the end of each block participants were asked to indicate: "To what degree did you feel subject to the instructions of the experimenter in the previous experimental block?" Participants were required to give their response on a 7-point scale on (1 = *Not at all*; 7 = *Completely*).

Debriefings indicated that none of the participants realized what the true nature of the study was. One person was removed from the analysis as it became clear s/he was not proficient enough in Dutch to have comprehended the instructions well enough.

RESULTS

Manipulation check

A 2-level (Block: authority present vs. authority absent) repeated-measures ANOVA showed a main effect on the degree to which participants experienced themselves subject to the commands of the experimenter, $F(1, 26) = 45.14, p < .001, \eta_p^2 = .33$. Participants were more likely to experience a subordinate role when the experimenter was present compared to when he was absent ($M_{\text{present}} = 5.21; SD = 1.27$ vs. $M_{\text{absent}} = 3.54; SD = 1.16$).

² At the start of each trial, the following instruction was displayed: "If no instruction is given when the fixation cross disappears, choose and press a button yourself." When this sentence did not begin with a capital letter, the experimenter would give a direct instruction ("Left / Right"). When the sentence ended without a period, the experimenter would say "Swim". When the sentence both began with a capital letter and ended with a period, no instruction was given.

Agency scores

A 2 (Block: authority present vs. authority absent) \times 3 (Temporal delay: 100 ms vs. 400 ms vs. 700 ms) \times 2 (Trial-type: instruction vs. control word vs. no-instruction) repeated-measures ANOVA on mean agency scores, showed a main effect of Temporal delay. Shorter delays led to a higher agency scores compared to longer delays, $F(2, 52) = 60.74, p < .001, \eta_p^2 = .70$ ($M_{100\text{ ms}} = 85.31, SD = 12.99; M_{400\text{ ms}} = 68.67, SD = 17.51; M_{700\text{ ms}} = 52.52, SD = 21.51$). Additionally, there was a main effect of Trial-Type, $F(2, 52) = 23.07, p < .001, \eta_p^2 = .47$. Specifically, acting on the instruction of another led to lower agency scores compared to actions that were done in the absence of an instruction ($M_{\text{instruction}} = 66.60, SD = 16.53$ vs. $M_{\text{no-instruction}} = 71.99, SD = 14.48; F(1, 26) = 44.53, p < .001, \eta_p^2 = .63$). The agency scores on trials in which participants heard a control word ($M_{\text{control}} = 67.91, SD = 15.28$) were marginally higher compared to instruction trials, $F(1, 26) = 3.09, p = .09, \eta_p^2 = .11$, and lower than on trials in which no instruction was given, $F(1, 26) = 19.63, p < .001, \eta_p^2 = .43$.

Finally, there was also a main effect of block condition, $F(1, 26) = 12.95, p < .001, \eta_p^2 = .39$. Agency scores were higher in the block in which the experimenter was physically present than in the block in which the experimenter was absent ($M_{\text{present}} = 71.08, SD = 15.48$ vs. $M_{\text{absent}} = 66.59, SD = 15.54$). This effect became more pronounced with longer Temporal Delays, indicated by a significant interaction between the Block and Temporal Delay conditions, $F(2, 52) = 4.62, p = .014, \eta_p^2 = .15$ (Presence – Absence difference scores: $M_{100\text{ ms}} = 1.17; M_{400\text{ ms}} = 4.10; M_{700\text{ ms}} = 8.19$). There were no other significant interactions (p 's $> .05$).

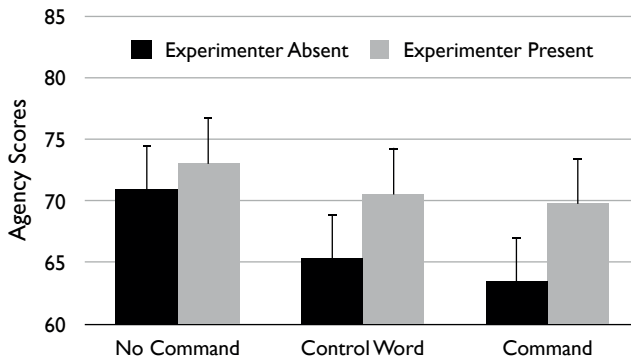


Figure 4.3. Mean agency ratings per Block and Trial-type conditions, collapsed over Temporal delay conditions. Error bars represent standard errors.

DISCUSSION

The findings from Study 4.3 are in line with the results from the first and second study, in the sense that cues that conveyed external authority increased the sense of agency. Whereas in the previous studies we used subtle markers of authority, in Study 4.3 we directly manipulated the physical presence of authority. The fact that all studies show the same pattern suggests that results from Studies 4.1 and 4.2 were not merely findings that occur in a context where participants reacted to instructions delivered through the computer, but also occur when participants are truly under the instruction of the experimenter. Interestingly, the physical presence of the experimenter led to a general increase in the sense of agency, as both on trials in which participants were specifically instructed to perform an action, as well as on trials where participants were able to choose an action themselves the agency scores were higher. This suggests a general increase in action awareness and agency in the presence of authority.

GENERAL DISCUSSION

In the present research we investigated whether cues that convey external authority could influence the personal sense of causation known as agency. Initially we expected that cues of external authority would lower the sense of agency, a prediction following from Milgram's Agentic State theory (1974). In a line of studies we contrasted the influence of vocally authoritative and non-authoritative instructions on agency (Study 4.1); we investigated the influence of instructions that differed in vocal intensity, a cue for authority (Study 4.2), and finally, we investigated the influence of the physical presence of authority on the sense of agency (Study 4.3). Across these studies, a similar pattern emerged in that cues conveying external authority were related to increases in the sense of agency. Instead of decreasing the sense of agency as Milgram would have predicted, authority cues actually increased the sense of agency.

There are a number of explanations as to why this effect may have occurred. First, it is possible that by our manipulations, instead of increasing participants' awareness of a subordinate role, participants actually became primed with authority. Research has shown that power increases action orientation (e.g., Anderson & Galinsky, 2006) and is also able to activate the behavioral approach system (Keltner et al., 2003). A process in which an individual is primed with authority (or power), therefore represents a possible explanation in the context of a paradigm in which the participant does not construe the experimental setup as hierarchical, and does not see his/her behavior as subject to the instructions of the experimenter. However, this explanation becomes less likely given the fact that we see the same pattern occurring in Study 4.3, where the physical presence of an (instructing) authority did make participants more likely to experience a hierarchy, and where they were

aware of their subordinate role in it. Nevertheless, also in Study 4.3 the presence of authority increased the sense of agency.

Another possibility is that the presence of authority cues increased individuals' motivation to perform the task well, increasing task-related focus and action awareness, and finally, the sense of agency. In other words, authority may have led to an observer-effect (or Hawthorne effect; Roethlisberger & Dickson, 1939) that is more strongly triggered by cues of external authority. The finding that we see a general increase in the sense of agency in Study 4.3, for both actions that participants were instructed to perform as well as for actions that participants themselves chose to perform could be interpreted as support for this explanation.

A final possibility is that the presence of other agents *in general* increases the sense of agency. While other agents are often regarded as cues that are likely to reduce the sense of agency (e.g., Wegner, 2003), they may also serve as reminders that we are in fact agents ourselves. This explanation would suggest a paradoxical effect where acting upon the instruction of another person would reduce the sense of agency, while the increased agentic nature of that other person at the same time increases the likelihood of perceiving oneself as an agent. Some preliminary work in our lab does suggest that acting in the presence of potential agents who are not perceived as being fully able to intently initiate goal-directed actions (e.g., children, computers), will reduce the sense of agency compared to acting in the presence of 'more' *agentic* agents (e.g. human adults). However, it is clear that more research is needed to determine which of the above explanations is valid.

We have to address some limitations in the present study. First, as we wished to keep our studies relatively simple, in Study 4.1 participants were presented with one authoritative and one submissive voice instead of a large number of voices. We were afraid that multiple authoritative and non-authoritative voices would make the design unnecessarily complex, and that participants would be distracted when they were often presented with novel voices. That said, we are well aware that an experiment with multiple voices would be more convincing with regards to the generalizability of the effect. Second, in Study 4.3 participants were not given a non-authority control condition. We therefore cannot rule out that the increase in agency observed there is due to the presence of any agent, and not specific to authority. However, given the nature of the paradigm it seemed paradoxical to include a non-authority person who nevertheless was required to give instructions to the experimenter. But while these individual studies have their inherent limitations, we are confident of the validity of the overall pattern that is displayed across these studies: The sense of agency increases when individuals act within the context of external authority - a finding quite different from what Milgram would have predicted.

We do wish to emphasize that the absence of a decrease in agency due to external authority does not falsify Milgram's ideas about what happened in his research. The

paradigms featuring in the present paper greatly differ from the Milgram experiments. For example, in our studies participants produced relatively neutral action effects (tones). Perhaps, when the action becomes negative (e.g., giving electric shocks to another person; Milgram, 1963) cues of external authority have a different impact and reduce the sense of agency since an experience of agency over negative effects is an unpleasant experience. A manipulation of outcome valence may therefore be a promising avenue for future research with regards to agency and authority. However, the present research shows there is no *general* reduction in agentic experience due to the presence of authority cues. Our work on the relation between authority and agency instead shows that in the present paradigms cues of external authority seem to increase rather than decrease the sense of agency.

PART 2

Factors Affecting Agency – Internal Cues

Chapter 5

On the Other Hand: Non-Dominant Hand Use Increases Sense of Agency

This chapter is based on Damen, T. G. E., Dijksterhuis, A., & van Baaren, R. B. (2014). On the other hand: Non-dominant hand use increases sense of agency. *Social Psychological and Personality Science*, 5, 680-683. doi: 10.1177/1948550614527626.

ABSTRACT

In two studies we investigated the influence of hand dominance on the sense of self-causation, or agency. Participants alternately used their dominant or non-dominant hand to cause the occurrence of an effect (a tone) in a task in which agency was made ambiguous. Participants were subsequently asked to indicate the degree to which they felt they had caused that tone to occur. Results showed that the sense of agency was increased when individuals used their non-dominant hand prior to the onset of the tone, compared to when they used their dominant hand. Furthermore, the degree of experienced agency was moderated by perceived effort. The difference in agency levels occurred independently of experimentally induced or naturally occurring differences in response latencies, and even occurred in the absence of (major) arm movement.

Our hands play a vital role in shaping our everyday experience. They reach out to inform our bodies about the world and to relay back into the world our physical response. The precise origins of handedness remain unknown (Vuoksimaa, Koskenvuo, Rose, & Kaprio, 2009), but ultrasound studies suggest that the formation of handedness already takes place prenatally (Hepper, McCartney, & Shannon, 1998). Over time the dominant hand becomes both stronger and more precise than the non-dominant hand (Petersen, Petrick, Connor, & Conklin, 1989). While one can learn to do simple tasks with the non-dominant hand, the non-dominant hand will seldom reach or exceed the level of skill of the dominant hand (Annett, 2002; Peters, 1981). In general, whereas people experience relative ease when using their dominant hand, performing actions with their non-dominant hand often requires considerable effort, even when it concerns relatively simple tasks.

The sensations of effort that may accompany our actions have consequences for our conscious experience of those actions: They are able to contribute to the experience of performing an action or causing an effect, an experience also known as the sense of agency (Jeannerod, 1997; Pacherie, 2008). For example, research has shown that squeezing a handgrip (Preston & Wegner, 2007), or pulling stretch bands during action performance (Demanet, Muhle-Karbe, Lynn, Blotenberg, & Brass, 2013) can increase this sense of agency for concurrent actions and events.

Conversely, a degree of effortlessness in action is more characteristic of automaticity, and thus a low sense of agency, as the easiest actions require little control or conscious supervision (Bargh, 1994; Wegner & Sparrow, 2004). Actions that become more efficient over time, due to practice, can operate effortlessly and without conscious guidance (Bargh & Chartrand, 1999; Schooler, 2002). Effortlessness can thereby give the impression of events happening to a person instead of being authored by that person (Csikszentmihalyi, Abuhamdeh, & Nakamura, 2005). The question is whether the degree of effort or effortlessness that we experience in our everyday hand use can also influence these perceptions of agency. Does use of the non-dominant hand, because it is relied upon less often (Hollis & Watson, 1993) also influence the sense of agency, and in a different way than dominant hand use?

In two studies we investigated the sense of agency as a function of hand dominance. Participants alternated between using their dominant and non-dominant hand in a task in which agency was ambiguous. We expected that use of the non-dominant hand would be experienced as less automatic and more effortful, and would therefore lead to higher experienced agency compared to dominant hand use.

STUDY 5.1 METHOD

Participants

Thirty-two undergraduate students (29 females; 28 right-handed; $M_{\text{age}} = 21.75$) at the Radboud University Nijmegen participated in exchange for 4 Euro's or course credit.

Materials & Procedure

Participants performed a mouse-click agency task. Participants had to respond to targets by clicking on them with the mouse cursor, and clicks were followed by tones presented through a headset. Participants were told that the tones could be generated by their mouse-clicks, but could also be produced by the computer; participants had to indicate the degree to which they felt that they - not the computer - had caused the tone to occur. In fact, participants always produced the tones.

The mouse cursor was always positioned center screen at trial start. Targets were black squares (1 cm²) that were presented in the center of the monitor at trial start. As the mouse cursor was also positioned in the center of the monitor at the beginning of each trial, participants were only required to click to give their response; no arm movement was necessary. Clicks on the squares were followed by 1000 Hz tones for 500 ms. To increase agency ambiguity, the time interval between clicks and the subsequent tones was manipulated (100 ms vs. 400 ms vs. 700 ms evenly divided over trials). For sake of interpretation, we collapsed the temporal delay conditions over the other factors in the design¹.

While an increased delay between *action performance* and its subsequent outcome is well known to reduce the sense of agency (Sato & Yasuda, 2005), we thought it was also possible that a delay in *action initiation* could influence agency (e.g., Chambon & Haggard, 2012). We were interested in the possible effects of a delay in action initiation as our non-dominant hand may similarly be slower to act than our dominant hand. In the present study we therefore experimentally manipulated the moment participants were able to successfully click on the squares, which was after a presented timer reached 0 (timer duration: 4s vs. 3s vs. 2s). At the end of each trial, participants used the keyboard to enter a number between 1-100 to indicate the degree to which they felt that they had caused the tone to occur (1 = *absolutely no self-causation*; 100 = *certainty of self-causation*).

The task consisted of 144 trials divided over 8 blocks. At the start of each block, participants were instructed to use the left or right hand; block-order was counterbalanced between subjects.

1 Temporal delay between action and effect has been shown to influence the sense of agency (Sato & Yasuda, 2005). In the present study, we indeed found that shorter intervals led to higher agency ratings than longer intervals (Sato & Yasuda, 2005). Study 5.1: $F(2, 62) = 63.36, p < .001$. Study 5.2: $F(2, 58) = 28.00, p < .001$. There were no interactions between intervals and experimental conditions.

RESULTS & DISCUSSION

A 2 (Hand: dominant vs. non-dominant) \times 3 (Timer duration: 4s vs. 3s vs. 2s) repeated-measures Analysis of Variance (ANOVA) showed a main effect of hand use, $F(1, 31) = 8.25, p = .007, \eta^2_p = .21$. Participants reported increased agency after non-dominant hand use compared to dominant hand use, ($M_{\text{dominant}} = 65.45, SD = 15.52; M_{\text{non-dominant}} = 68.67, SD = 13.90$)². There was no effect of Timer duration ($M_{\text{timer4s}} = 66.93, SD = 14.52; M_{\text{timer3s}} = 67.08, SD = 15.07; M_{\text{timer2s}} = 67.17, SD = 14.37$), and no interaction between Hand and Timer duration, $F_s < 1, n.s$. A similar analysis on response latencies showed no significant differences between Hand conditions, $F(1, 31) = 2.08, p = .16$ ($M_{\text{dominant}} = 482, SD = 42; M_{\text{non-dominant}} = 512, SD = 48$).

The results were in line with the expectation that non-dominant hand use would lead to higher experiences of agency compared to dominant hand use. As it was possible that the use of the non-dominant hand could have been slower compared to use of the dominant hand, and that it would have been this delay that influenced the agency ratings, we included a timer in the design to indirectly test the validity of this alternative explanation. However, the timer duration conditions did not show differences in agency ratings, and thus, the experimentally induced delays did not influence levels of agency. Furthermore, the analysis on response latencies revealed no actual differences in response speed between hand conditions. These findings suggest that the increased agency levels that were experienced after non-dominant compared to dominant hand-use were not caused by differences in response latency.

In the second study we attempted to replicate the previous findings, and to investigate the importance of experienced effort in hand use for the increased agency by the non-dominant hand.

STUDY 5.2 METHOD

Participants

Thirty undergraduate students (24 females; 29 right-handed; $M_{\text{age}} = 21.73$) at the Radboud University Nijmegen participated in exchange for 4 Euro's or course credit.

² Five participants in Study 5.1 and two participants in Study 5.2 regularly used the lower end of the agency scale compared to the other participants, leading to relatively high overall SD 's. Including or excluding these participants did not meaningfully change the results for significance testing, but did greatly lower SD 's, indicating the sizes of the SD 's were mostly due to individual differences in scale use.

Materials & Procedure

Study 5.2 was similar to Study 5.1, except for the differences described below. First, target squares were now presented in random corner sections of the monitor. Successfully clicking a target square therefore required an arm movement, in going from the cursors' starting point in the center of the monitor to the corner section where the target square was presented. A second difference was that there was no timer to delay responding; participants were therefore able to start their action (arm movement and mouse-click) as soon as the target square appeared on the monitor. Third, participants alternated using their left and right hand in 4 blocks instead of 8. Finally, to test for the hypothesized importance of effort, participants were required to indicate on a 7-point scale the degree of effort they had experienced for use of each hand (1 = *no effort*; 7 = *much effort*), at the end of the main task.

RESULTS & DISCUSSION

A 2-level (Hand: dominant vs. non-dominant) repeated-measures ANOVA again showed increased agency after non-dominant hand use compared to dominant hand use, $F(1, 29) = 16.61, p < .001, \eta^2_p = .36$ ($M_{\text{dominant}} = 62.88, SD = 18.68; M_{\text{non-dominant}} = 65.63, SD = 18.48$). A similar analysis on response latencies indicated slower responses when using the non-dominant hand, $F(1, 29) = 235.42, p < .001, \eta^2_p = .89$ ($M_{\text{dominant}} = 1296, SD = 175; M_{\text{non-dominant}} = 2080, SD = 326$).

A 2-level (Hand: dominant vs. non-dominant) repeated-measures ANOVA on effort ratings showed a main effect of hand condition on effort, $F(1, 29) = 148.06, p < .001, \eta^2_p = .84$. Participants experienced increased effort for use of the non-dominant hand ($M_{\text{non-dominant effort}} = 5.03; SD = 1.42$) compared to dominant hand use ($M_{\text{dominant effort}} = 1.27; SD = .83$).

To test for mediation and moderation in a within-subjects design, we followed procedures described by Judd, Kenny, and McClelland (2001), and regressed the difference scores in agency levels (non-dominant – dominant) on both the sum- and difference scores of the effort ratings for both hands. In this analysis, a significant regression coefficient for the effort sum-scores would indicate moderation while a significant regression coefficient for the difference scores would indicate mediation (see Judd et al., 2001, for further details). The analysis showed a significant regression coefficient for the effort sum-scores, $B = .94, p = .045$, but not for the difference scores ($p = .48$) thereby suggesting that the effort scores moderated the sense of agency.

The findings from the second study replicated and expanded the results from the first study. Again, experiences of agency were higher after non-dominant compared to dominant hand use. Second, we showed that the differences in participant' effort ratings for use of their dominant and non-dominant hand moderated the difference between agency levels. The higher the difference in effort ratings, the larger the difference in agency levels following dominant and non-dominant hand use.

GENERAL DISCUSSION

While the link between effort and agency has been suggested in previous literature (Jeannerod, 1997), only recent investigations have empirically shown that increased effort leads to increased experiences of agency (Demant et al., 2013; Preston & Wegner, 2007). The present investigation adds to these findings, and suggests this process can also occur as a function of hand dominance. The use of your non-dominant hand can, at least partly due to experienced effort, increase the sense of agency. The results from Study 5.1 suggest that this effect occurs independently of experimentally induced or naturally occurring differences in response latency, and even occurs in the absence of (major) arm movement.

Although a number of studies have suggested that smooth or fluent processing can increase the sense of agency (e.g., Wenke, Fleming & Haggard, 2010), such effects seem limited to the phase of action selection (Chambon & Haggard, 2012); and can be annulled by contextual cues (e.g., the presence of other agents; Damen, van Baaren, & Dijksterhuis, 2014). For example, a recent study by Chambon and Haggard (2012) showed that while fluent processing with regards to *action selection* increased the sense of agency, *action performance* that was not fluent (or effortful) also led to an increased sense of agency. In sum, fluency does not in general seem to lead to increases in the sense of agency, as the present study and a number of other investigations have shown how effort experienced during action performance increases the likelihood that we see ourselves as intentional agents (Bargh, 1994; Demant et al., 2013; Preston & Wegner, 2007; Wegner & Bargh, 1998).

In the present investigation participants were required to do a relatively simple task. However, it is possible that the link between hand use, effort, and agency may be influenced by the degree of task difficulty and chances of success (Aarts, 2007; Miller & Ross, 1975). Imagine throwing darts with your non-dominant hand. As accurate dart-throwing requires a great deal of skill, throwing darts with the non-dominant hand may feel weird, and accurately hitting the bull's-eye unreal. Future research could therefore explore how hand dominance influences agency with increased task difficulty. Similarly, although the current findings are well grounded in other literature on effort on agency, and we did observe moderation by effort, future research could investigate whether the novelty of a situation or an action could also influence agency, as use of the non-dominant hand for the computer mouse may have been both effortful and novel.

Due to the large number of right-handed participants, we were unable to include handedness as a factor in our analyses. We have indications that the present findings can be generalized across individuals: the significant moderation by the effort ratings strongly suggests the importance of experienced effort. Therefore, as long as individuals experience increased effort for non-dominant compared to dominant hand use, the current findings should apply for both right- and left-handed individuals.

Although we like to think that our sense of agency is a clear-cut and robust sensation, recent investigations have shown that people can experience different degrees of agency, and that agency can be influenced by a number of different factors (Wegner, 2002). The present investigation showed that our sense of agency, which we may think of as robust and clear-cut, can actually be influenced by the hand we use. We use our hands everyday, to brush our teeth in the morning, to request a stop when we're on the bus, or to switch the tv-channel to watch the latest episode of Game of Thrones. Our hands are thereby the primary tools by which we produce changes in our physical environment; however, the specific hand we use can influence our sense of agency for those changes.

Chapter 6

The Influence of Action plans on Agency and Responsibility

This chapter is based on Damen, T. G. E., van Baaren, R. B., Brass, M., Aarts, H., & Dijksterhuis, A. (in press). Put your plan into action: The Influence of action plans on agency and responsibility. *Journal of Personality and Social Psychology*.

ABSTRACT

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 6.1 & 6.2), 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 6.3). In addition, it was shown that the reduction in agency was smaller when plans and actions were temporally closer together (Study 6.4). 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 6.5 & 6.6). However, the direction of this effect was reversed in observers, for whom cues related to planning by others increased attributions of responsibility towards those others (Study 6.7 & 6.8).

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). Interestingly, 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 to 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 towards the effects of *action* planning. The question therefore remains whether the prior planning of actions can influence the experience of agency.

In the present paper 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 as expected, and it is implicitly assumed that action cognitions would work similarly. 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; which in essence are very specific 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 to 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 therefore 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). While 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 & Haggard (2010) and Damen, van Baaren, & Dijksterhuis (2014) have shown that the subliminal priming of potential actions will increase agency when actions are also compatible to the primed actions. They thereby 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 action¹ rather than an action that was not planned in advance? On the one hand it is possible that the

1 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.

planning of specific actions increases the sense of agency for the effects of those actions compared to 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

Interestingly, 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)². Such intentions take the format of 'I will do y when situation z is encountered'. For example, in order 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, & Cooner, 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).

The connection between implementation intentions and agency research becomes more clear when we investigate the processes underlying this technique. Numerous studies have demonstrated that implementation intentions promote the initiation of intended behaviors (e.g., Armitage, 2007; 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).

² 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.

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 to 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 therefore 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; Haggard, Clark, & Kalogeras, 2002; Frith, 2002). We therefore 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

While 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 while 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 paper 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 paper 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 6.1 – 6.3). Planning and its influence on agency were measured both explicitly, by asking participants the degree to which they experienced causing specific action outcomes

(Studies 6.1, 6.2 & 6.4), but also through an implicit measure of agency in which participants were asked for their estimation of time between action and effect (Study 6.3). 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 6.4).

In the second part of the present paper 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 6.5 – 6.8).

STUDY 6.1

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. If however 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 & Procedure

Participants performed a mouse-click agency task (see Fig. 6.1). 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.

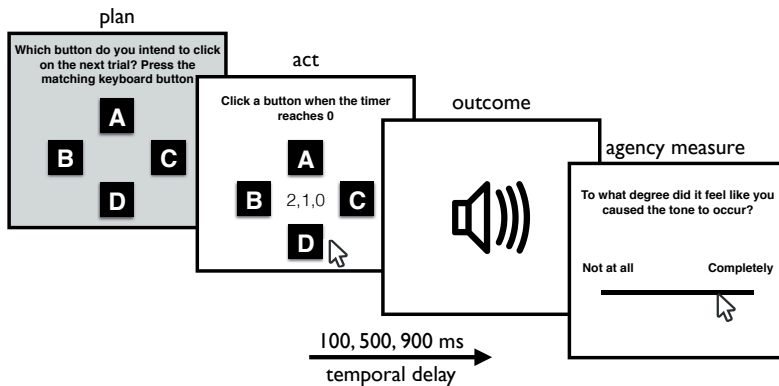


Figure 6.1. Schematic experimental overview.

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, & D, that were presented in a diamond pattern on the monitor displaying a white background. Participants were able to successfully click the action-buttons the moment a presented timer reached 0, which was after two seconds. Clicks were followed by 300 ms tones: a 600 Hz tone after clicking on the A-button, and 800 Hz, 1000 Hz, and 1200 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 ms³ 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 grey 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/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 2500 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.

³ 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.

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, $F < 1$, n.s. The results pertaining to the Temporal delay and Planning conditions are illustrated in Figure 6.2.

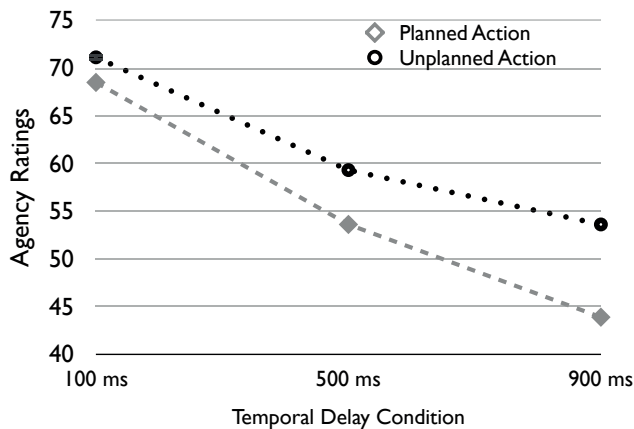


Figure 6.2. Mean agency ratings per Planning condition and Temporal delay conditions.

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 (RT's) 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, $F < 1$, n.s., 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 RT's and the agency

scores we checked the correlations between these variables within the respective planning conditions. These correlations however proved not significant: $r_{planned} = -.25$, $p = .11$, and $r_{unplanned} = .07$, $p = .65$.⁴

DISCUSSION

The findings from Study 6.1 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 and Haggard, 2008, Pacherie, 2008; Pacherie & Haggard, 2010), we show that (distal) action planning actually reduced agency. This finding suggests that due to 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 RT's shows that planned actions were implemented faster than unplanned actions, and seemed a promising indicator of automaticity. However the absence of a correlation between RT's and agency scores makes it unlikely to have acted as a mediator between the planning conditions and the agency scores.

Study 6.1 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. And 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 6.2.

STUDY 6.2

In Study 6.2 we aimed to replicate the main finding from Study 6.1 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 6.1 that may have influenced results in that study. Different from our first study, participants in Study 6.2 were able to decide themselves whether they wanted to plan their actions or not; participants

⁴ In Studies 6.1-6.3 we conducted several mediation analyses using the RT's as a proposed mediator between the plan-conditions and the agency scores using procedures outlined by Judd, Kenny, & McClelland (2001). As was to be expected based on the correlations, we found no evidence for mediation.

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 to 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 & Procedure

Study 6.2 was similar to Study 6.1. 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 6000 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, $F(2, 66) = 67.92$, $p < .001$, $\eta^2_p = .67$. 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, $F(1, 33) = 11.04$, $p = .002$, $\eta^2_p = .25$. 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 Fig. 6.3). 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 RT's showed a main effect of 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 , n.s. Finally, there were no significant correlations between the RT's and the agency scores within the respective planning conditions: $r_{\text{planned}} = .06, p = .73$, and $r_{\text{unplanned}} = .13, p = .44$.

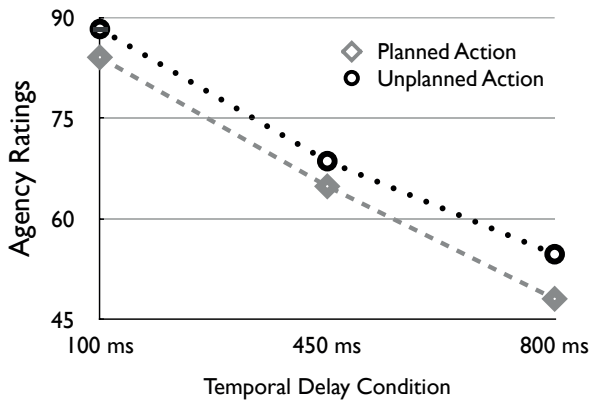


Figure 6.3. Mean agency ratings per Planning condition and Temporal delay conditions.

DISCUSSION

The results from Study 6.2 replicate the main finding from Study 6.1, 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 RT's in our first study, RT's in Study 6.2 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 a significant correlation between the RT's and the agency scores making the RT's an unlikely mediator.

There is always the possibility that the explicit nature of the agency paradigm influenced the results from the previous studies. Since 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 6.3, we therefore used

an implicit measure of agency much less susceptible to the effects of potential experimenter demand.

STUDY 6.3

A number of studies has reverted to implicit measures to investigate the experience of agency or volition (e.g., Aliu, Houde, & Nagarajan, 2009; Bäß, 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, while 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 6.1, 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 to 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 & Procedure

Participants performed a mouse-click agency task, and were per trial instructed to plan or not plan ahead their action. As in Study 6.1, 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 following their mouse-click. Tones were generated after 500, 900 and 1300 ms, evenly divided over trials, and participants were asked to type their answer in milliseconds (with a maximum of 2000; see also Moore et al., 2009). Trials in which participant did not click the button s/he 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. 1300 ms) \times 2 (Planning condition: planned vs. unplanned) repeated-measures ANOVA on Time estimates showed a main effect of Temporal delay, $F(2, 102) = 187.36, p < .001, \eta^2_p = .78$. 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, $F(1, 51) = 12.24, p = .001, \eta^2_p = .19$. 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, $F(2, 102) = 3.25, p = .043, \eta^2_p = .06$. The mean difference between the trials with planning and trials without planning condition was significant ($p < .05$) in the 900 ms and 1300 ms conditions, but not in the 500 ms condition ($p = .89$; see Fig. 6.4).

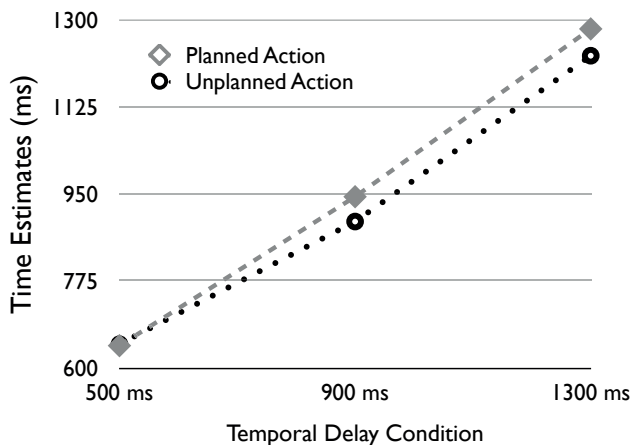


Figure 6.4. Mean time estimates per Planning condition and Temporal delay conditions.

Reaction times

A 3 (Temporal delay: 500 ms vs. 900 ms vs. 1300 ms) \times 2 (Planning condition: planned vs. unplanned) repeated-measures ANOVA on RT's 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 RT's and Time estimates within the respective planning conditions: $r_{\text{planned}} = .16$, $p = .26$, and $r_{\text{unplanned}} = .25$, $p = .07$.

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. While 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 6.4

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, 2012). Three participants did not complete the experiment and were therefore removed from the analysis.

Materials & Procedure

Participants performed a mouse-click agency task similar to Study 6.1. Participants always planned their actions. During the planning phase, participants were shown three small yellow rectangles featuring the letters A, B, C. These action-buttons were presented in a triangular pattern on the monitor displaying a grey background with the instruction: "Plan which button you are going to press". Participants did not have to indicate their plans. After 6000 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 1500 ms⁵ or 3000 ms. Clicks were followed by 300 ms tones: a 600 Hz tone after clicking on the A-button, and 800 Hz, and 1000 Hz tones after respectively clicking the B, C-buttons. These tones were presented 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 judgments showed a main effect of Temporal delay, $F(2, 94) = 35.64$, $p < .001$, $\eta^2_p = .43$. Shorter delays led to higher agency judgments 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, $F(2, 94) = 4.44$, $p = .014$, $\eta^2_p = .09$. Longer delays between plans and actions led to lower

5 The timer started at 1 after 500 ms

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 6.5). There was no interaction between the Temporal delay and Timer delay conditions, $F(4, 188) = 1.82$, $p = .126$.

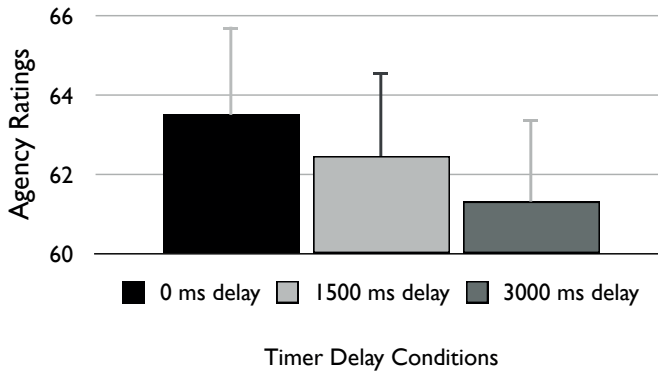


Figure 6.5. Mean agency ratings per Timer Delay condition collapsed over Temporal delay conditions. Error bars represent standard errors.

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 RT's 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 1500 ms and 3000 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, $F(4, 188) = 1.96$, $p = .103$.

DISCUSSION

The results from Studies 6.1 to 6.3 showed a clear difference in RT's 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 the RT's suggest this is not the case. The results from Study 6.4 suggest an alternative explanation, as a separation in time could in itself lower 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 don't 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 prior to acting; agency ratings were weaker when the primes were presented relatively long before action performance.

STUDIES 6.5 – 6.8

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.

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 responsibility (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 towards those others, our own prior action plans actually reduce agency, and may then also reduce experiences of responsibility. In a final series of experiments we investigated this discrepancy.

In four experiments we studied whether action planning could influence experiences 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 6.5). In a second study, participants were asked to indicate the degree to which they felt responsible for their final decision and action within the presented dilemma (Study 6.6). In two final studies 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. In Study 6.7 participants were asked to rate the degree to which they believed this actor would feel responsibility for the action. In Study 6.8 we investigated whether cues related to planning by another actor influenced the degree to which participants held the actor accountable as well as the degree to which they believed this actor deserved punishment.

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 were passive observers of another agent doing the planning and acting, we expected planning cues instead to increase attributions of responsibility, accountability, and degree of punishment compared to situations without prior planning

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, 2012)⁶. There were 322 participants in Study 6.5 (153 males; $M_{\text{age}} = 31.17$); 443 participants in Study 6.6 (216 males; $M_{\text{age}} = 32.80$); 301 participants in Study 6.7 (176 males; $M_{\text{age}} = 29.83$) and 209 participants in Study 6.8 (134 males; $M_{\text{age}} = 36.37$). Subjects were rewarded \$ 0.25 dollars for their participation.

Materials & Procedure

Participants in Study 6.5 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

⁶ Study 8 was presented using the Google-Drive interface

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 seconds 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 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 Megan 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/not to tell Megan about her husband's profile. They could do this by indicating degree of unpleasantness 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 6.6 was similar to 6.5, with the main difference that participants were asked to indicate the degree to which they felt responsible for their decision to tell/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 6.7, 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 the degree to which they believed John to feel responsible for his decision to tell Megan. As in the previous studies, participants in the planning condition received an extra trial in-between the first part of the story and the get-together with Megan, in which they 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."

In Study 6.8, participants read a different story:

"Your friends John and Peter were having a snowball fight with some other people in the neighborhood. Snowballs were flying all over the place, and at first everything was really funny. Everybody was having a good time. All of a sudden, John turns and throws a snowball at Peter and hits him right in the face. Peter falls down and is clearly hurt."

Participants in the planning condition were told in the beginning of the story: "At the start of the snowball fight, John already plans that at some point, he is going to throw a snowball right in Peter's face." After reading the story, participants were asked to indicate the degree to which they held John responsible for his action and the consequences of his

action (1 = *Not at all*; 10 = *Yes, very much*), and whether John should be punished (1 = *Not at all*; 10 = *Yes, severely*).

RESULTS

Responses in studies 6.5 - 6.8 were not always normally distributed and regularly featured negative skew or negative kurtosis. The reported results are therefore 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 5000 random samples.

Action decisions Studies 6.5 - 6.6

In Study 6.5, 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 6.6, 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 ($B = .26$, $SE = .21$, $p = .22$).

Unpleasantness and responsibility judgments Studies 6.5 - 6.6

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 6.5) and on the responsibility scores (Study 6.6). Similar to our findings on the sense of agency, prior planning reduced both the perceived unpleasantness of actions in Study 6.5, $B = .97$, $SE = .28$, $p < .001$ [95% CI: .44 to 1.51], as well as the subsequent experiences of responsibility in Study 6.6, $B = 1.07$, $SE = .38$, $p = .007$ [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 6.1). 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 6.5: $B = -.96$, $SE = .35$, $p = .006$, [CI: -1.64 to -.28]; Study 6.6: $B = -1.46$, $SE = .44$, $p = .001$ [CI: -2.31 to -.66]). There were no interaction effects between the Planning and Action decision conditions ($p = .25$).

Responsibility scores Study 6.7

Using bootstrapping procedures we contrasted the average responsibility scores of the planned and unplanned conditions. As shown in Table 6.1, planning cues increased beliefs about John's feelings of responsibility, $B = .83$, $SE = .31$, $p = .008$ [CI: .18 to 1.48].

Responsibility scores Study 6.8

Using bootstrapping procedures we contrasted the average responsibility and punishment scores of the planned and unplanned conditions. As shown in Table 6.1, planning cues increased both the degree to which participants held John responsible/accountable for his behavior, $B = -1.85$, $SE = .31$, $p < .001$ [CI: -2.45 to -1.25], and also increased the severity of punishment participants considered appropriate, $B = -.82$, $SE = .36$, $p = .02$ [CI: -1.52 to -.12].

Response Times Studies 6.5 - 6.7

In a 2 (Planning condition: planned vs. unplanned) \times 2 (Action decision: tell vs. do not tell) bootstrapped comparison on the Response Times⁷ we found a main effect for Action decision in Study 6.5 ($M_{\text{tell}} = 3838$, $SD = 3108$; $M_{\text{donottell}} = 4799$, $SD = 3977$; $B = 10462.14$, $SE = 305.42$, $p < .001$ [CI: 9828.96 to 11032.50]), and a marginal effect in Study 6.6 ($M_{\text{tell}} = 3920$, $SD = 3184$; $M_{\text{donottell}} = 5294$, $SD = 3881$; $B = 1007.61$, $SE = 530.55$, $p = .06$ [CI: -1.13 to 2083.21]). In Studies 6.5 and 6.6 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 (p 's $> .38$) nor were their interaction effects between the Planning and Action decision conditions (p 's $> .36$).

Table 6.1

Study	Mean (SD)	
	Planned	Unplanned
<i>Dating profile</i>		
6.5 Agent – Experiences of unpleasantness	6.99 (2.37)	7.90 (2.00)
6.6 Agent – Experiences of responsibility	4.17 (3.23)	5.13 (3.17)
6.7 Observer – Perceptions of responsibility	7.53 (2.08)	6.87 (2.33)
<i>Snowball fight</i>		
6.8 Observer – Perceptions of accountability	8.69 (1.91)	6.85 (2.51)
6.8 Observer – Severity of punishment	6.28 (2.47)	5.45 (2.65)

Studies 6.5 – 6.8 Results Regarding Planning Conditions

⁷ Given the high latencies we speak about response times instead of reaction times.

DISCUSSION

In the last series of studies of the present paper 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 advance planning of a negative action lead 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). Interestingly, 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 6.1 - 6.3), and (therefore) also find them less unpleasant (Study 6.5).

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 Studies 6.7 and 6.8, where cues and indications of prior planning, and thus intentionality, led to increased attributions of responsibility and even to increases in the degree to which participants thought that punishment for negative actions should be severe. However, the relation between planning and responsibility was very different when participants themselves planned and acted, as in Study 6.7 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.

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. We are however 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 6.5 and 6.6 we used the same basic setup as we used our 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 Studies 6.7 and 6.8, 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 stories), and not on factors manipulated within one experimental design. One should therefore take caution in interpreting these results, as different contexts may increase or decrease potential effects of planning on perceptions of responsibility.

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 have shown that a match between expected and actual effects increases agency, while agency is reduced when outcomes did not match expectations (Gentsch & Schütz-Bosbach, 2011; Sato & Yasuda, 2005; van der Weiden et al., 2013). But while 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) as the present findings indicate that plans with regards to future actions can reduce agency.

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 them before we acted, and when there is an absence of other potential agents, we are likely to experience a sense of agency (Wegner, 2002; Wegner, 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, due to a separation in time between action decision and performance, (as in Study 4) agency is reduced. Interestingly, 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 prior to 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 this theory. Finally, 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 over 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. We do not however wish to suggest abandoning this effective technique, but just to put into a new perspective what can cognitively happen when 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 effects.

First, from the analyses on reaction times in Studies 6.1–6.3 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 reaction times 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 to an action that was not planned in advance. Recent research on effort and agency has indeed shown that increased effort during action performance is related to an increased sense of agency (Damen et al., 2014; Demanet et al., 2013; Preston & Wegner, 2007). That said, the relative simplicity of the actions in the agency studies (Studies 6.1 - 6.4) 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 6.4 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 believe not. 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 earlier 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 6.4, 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 performance 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, for example turning on the light. We believe the potential moderators described above offer promising avenues for future research.

There are a considerable number of 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 all influence agency and therefore seem promising factors to pursue in future research. We expect that individuals who, due to 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 planning would also influence the intensity by which an action is experienced. While 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, actions plans reduce the personal sense of responsibility. If however 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 towards 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 over-value situational explanations of our own behavior, and yet under-value 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 towards 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 therefore 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., non-criminals) 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.

PART 3

Agency Affecting Cognition & Behavior

Chapter 7

Revisiting the Agentic Shift: Sense of Agency Influences the Effectiveness of (Self)-Persuasion

This chapter based on Damen, T. G. E., Müller, C. N., van Baaren, R. B., & Dijksterhuis, A. (under review). *Revisiting the agentic Shift: Sense of agency influences the effectiveness of (self)-persuasion.*

ABSTRACT

In the present study we investigated whether differences in the sense of agency influenced the effectiveness of both direct persuasion and self-persuasion techniques. By manipulating both the delay and contingency of the outcomes of actions, participants were led to experience either a low or high sense of agency. Participants were subsequently presented with arguments as to why a clean local environment is important (direct persuasion), or were asked to generate those arguments themselves (self-persuasion). Subsequently, participants' cleanliness attitudes and willingness to participate in a campus cleanup were measured. The results show that techniques of direct persuasion effectively influenced attitudes and volunteering behavior under conditions of low rather than high agency, whereas techniques of self-persuasion were most effective under conditions of high rather than low agency. The present findings therefore show how recent experiences of agency, a state based experience of control, can influence the effectiveness of both external and internal persuasion techniques.

Our beliefs and feelings about the ability to control or influence our actions, environment, and lives, represent an important aspect of our everyday cognitive experience. In turn, these cognitions can greatly determine our future behavior. Consider for example how important our feelings of control are for the extent to which we form deliberate intentions and set future goals. Would we still plan for the evening, set New Year resolutions, or try out the latest Men's Health workout for the perfect six-pack without the belief that we are able to make a change? In the present study we investigated how recent experiences of action control, or agency, can shape and determine both our ability to effectuate self-driven change, as well as influence our susceptibility to external forces.

The sense of agency refers to the ability to recognize oneself as the controller of one's own actions and to distinguish these from actions caused or controlled by other sources (Blakemore, Oakley, & Frith, 2003; Gallagher, 2000). When the sense of agency is high we experience a sense of control over our actions. However, when actions are performed without an accompanying sense of agency, it can feel like they are happening to a person instead of being authored by that person (Wegner, 2002). Instead of a long-term belief of personal control, the sense of agency therefore represents a state construct that binds together our thoughts, actions, and action-effects to give rise to the personal sense of having successfully influenced the immediate environment.

When one has recently experienced the ability to cause such a change in the environment, a person is likely to feel a high agentic ability, or, the experience of being a causal force. This could encourage an individual to make the most of any opportunities for self-driven change. However, when one experiences a low agentic ability, one may respond less to such techniques. After all, this person would be less likely to consider him- or herself to be a causal force, simultaneously increasing the susceptibility to external sources.

Previous research has linked increased long-term control beliefs to self-facilitated change (Bandura, 1997; Judge, Jackson, Shaw, Scott, & Rich, 2007; Zhao, Seibert, & Hills, 2005). For example, individuals with a high belief in the ability to control events in their life showed increased attitude change after writing a counter-attitudinal essay (Sherman, 1973). Furthermore, an individuals' belief in the ability to control situations strongly influences the power a person has to seek out challenges (Csikszentmihalyi, 1997) and effectively deal with those challenges (Schunk, 1990). Control beliefs are therefore of central importance to a wide range of theoretical models of behavioral change (Ajzen, 1985; Bandura, 1997; Fishbein & Ajzen, 1975; Prochaska & DiClemente, 1986; Schwarzer, 1992).

Low perceptions of control have however been linked to increased susceptibility towards others (Avtgis, 1998; Milgram, 1974; Sherman, 1973), as we may be more likely to be influenced by external forces when our sense of control is disrupted (Fennis & Aarts, 2012). For example, individuals who in general believe having little control over the events in their lives are more likely to be influenced and persuaded by external factors than individuals

with a high belief of control (Avtgis, 1998; Biondo & MacDonald, 1971). In one of the first studies to look at the influence of state perceptions of control, Fennis and Aarts (2012) recently showed that individuals who had recent experiences of reduced *agency* were more likely to comply with a request from the experimenter. While this study suggests that a low sense of agency seems to increase susceptibility to *direct persuasion*, the question remains whether agency can also influence the effectiveness of other persuasion techniques, such as *self-persuasion*.

Research on self-persuasion has long shown that messages that people generate to convince themselves can provide powerful and long-lasting changes (Aronson, 1999). Self-persuasion is more effective in changing the individual's attitudes and subsequent behavioral intentions than arguments that are presented by others (e.g., Miller & Wozniak, 2001); is less prone to correction (Mussweiler & Neumann, 2000) or reactance (Rothman, Haddock, & Schwarz, 2001); and even reduces addictive behaviors like smoking (Müller et al., 2009). The question however is under what circumstances self-persuasion is most effective; if low agency increases the effectiveness of direct persuasion techniques, can experiences of high agency then increase the effectiveness of self-persuasion techniques?

In the present study we investigated the relation between experiences of agency and the effectiveness of persuasion techniques. Participants conducted a task in which they either experienced low or high agency. Depending on experimental condition, participants then received arguments by an authority institution as to why it is important to keep the city clean, or participants were asked to generate these arguments themselves. We expected that direct persuasion would be more effective after participants had recently experienced low rather than high agency. However, we expected self-persuasion to be more effective after participants had experienced high rather than low agency.

METHOD

Participants

One-hundred -and-twenty undergraduate students (93 females; $M_{\text{age}} = 23.33$; $SD = 2.43$)¹ from the Radboud University Nijmegen participated in exchange for course credit or €2. They all gave written informed consent before participating in the experiment. The study was conducted in accordance with the Declaration of Helsinki and was approved by the Radboud University Nijmegen Ethics Committee of the Faculty of Social Sciences.

1 Five participants participated a week later in this study than the other participants due to lab-space considerations

Materials and procedure

Participants started with the agency manipulation task: Participants were required to press a left or a right response button on their keyboard, after which they would hear a tone presented through a headset. Participants were told that they could have produced the tone by their button-press, but that it was also possible that the computer caused the tone, thereby making the sense of agency ambiguous. In the high agency condition, participants were presented with a large number of trials in which tones were matched to specific left or right button-presses, and these tones always quickly followed the keyboard-presses. In the low agency condition, participants were presented a large number of trials in which random tones were presented, these tones took considerably longer to occur, or occurred even before presses were performed (low agency condition). Both timing and action-effect contingency have been shown to elicit strong effects on the sense of agency (e.g., Gentsch & Schütz-Bosbach, 2011; Sato & Yasuda, 2005).

Each trial started with the presentation of a row of X-es for 1500 ms in the center of the monitor. Participants were instructed to press a left or a right button the moment the fixation-cross disappeared. On high agency trials, button-presses produced a tone 100 ms after a button-press. On low agency trials, tones were produced 50 ms before the fixation-cross disappeared (therefore before a button could have been pressed), or 7750 ms after the button-press. On high agency trials left button-presses produced 1000 Hz tones for 500 ms. Right button-press elicited 600 Hz tones for 500 ms. On low agency trials the presented tone was a randomly selected 600 Hz or 1000 Hz tone. After tone presentation, participants had to indicate the degree to which they felt they – not the computer – had just caused the tone to occur. They could do this by clicking on a 100-point scale slider, with higher scores indicating higher feelings of causation, and lower scores indicating lower feelings of causation. The task contained 30 trials in total. The high agency condition consisted of 24 high agency and 6 low agency trials. The low agency condition consisted of 6 high agency and 24 low agency trials

After the agency manipulation task, participants were presented with a direct persuasion or a self-persuasion manipulation, and received the following instructions:

“You are going to see a question regarding the cleanliness of the city of Nijmegen. This question will be presented on the monitor for two minutes. During that time, you will be presented with reasons which are, according the municipality of Nijmegen, the most important reasons to keep the city clean (direct persuasion condition) / during that time, write down arguments why you think it is important to keep the city clean (self-persuasion condition). Carefully attend to the question and the reasons to keep the city clean.”

In the direct persuasion condition participants were presented with 5 arguments (mentioned most often in a pilot study²), which, according to the city municipality, represented the most important reasons to keep the city of Nijmegen clean (e.g., “People feel happier when they walk through a clean city”). Arguments were presented on screen for 2 minutes. In the self-persuasion condition participants were required to type in reasons for why it is important to keep the city of Nijmegen clean. They had 2 minutes to write down their reasons. Participants generated 4.58 arguments on average.

After the agency and persuasion manipulations, participants’ attitudes toward a clean environment were assessed. Participants were given 6 statements related to city and campus cleanliness (e.g., “It is important to keep the city clean”; $\alpha = .76$; $M = 7.72$; $SD = 1.27$). Participants had to express agreement with each item on a scale ranging from 1 (*strongly disagree*) to 11 (*strongly agree*). Finally, participants were asked to contribute to keeping the campus clean: The experimenter allegedly worked in collaboration with the University board to stimulate environment friendly behavior. Participants were told there will be a big cleanup of the university campus in the near future in collaboration with student volunteers, and were asked whether they would be willing to participate in the campus cleanup. Participants could indicate their willingness to contribute by indicating yes or no.

Debriefings indicated that none of the participants realized the true nature of the study.

RESULTS

Agency manipulation check

An Analysis of Variance (ANOVA) was conducted on the mean scores of the reported agency ratings, with agency condition (low agency vs. high agency) as a between-subjects predictor. Results showed that participants indeed reported increased agency in the high agency condition compared to the low agency condition ($M_{\text{low agency}} = 17.00$, $SD = 8.10$; $M_{\text{high agency}} = 33.44$, $SD = 11.32$), $F(1, 118) = 83.66$, $p < .001$, $\eta^2_p = .42$.

Attitude ratings

A 2 (Agency: high vs. low) x 2 (Persuasion: direct persuasion vs. self-persuasion) ANOVA was conducted, with the mean score of the six attitude ratings towards a clean environment as dependent variable. Results showed neither a main effect of agency condition nor of persuasion condition, $F^2 < 1$, n.s. However, there was a significant interaction effect between

² Thirty participants were asked for the most important reasons to keep the city of Nijmegen clean in a way similar to the described self-persuasion condition of the present study. The direct persuasion condition of the present study presented the responses that were most frequently given in this pilot study, which were: 1. A clean city looks and smells better; 2. A clean city is good for the environment. Waste on the street is bad for the environment; 3. A clean city is more attractive; 4. It’s important to give a good example as a society towards others, especially towards children; 5. Individuals feel happier when they walk through a clean city.

the agency and persuasion conditions, $F(1, 116) = 9.20, p = .003, \eta^2_p = .07$ (See Figure 1). Simple effects showed that direct persuasion was marginally effective when participants had recently experienced low compared to high agency ($M_{\text{low agency}} = 7.97, SD = 1.46; M_{\text{high agency}} = 7.24, SD = 1.41$), $F(1, 116) = 3.76, p = .055, \eta^2_p = .03$. However, self-persuasion was more effective after experiences of high compared to low agency ($M_{\text{low agency}} = 7.37, SD = 1.63; M_{\text{high agency}} = 8.26, SD = 1.32$), $F(1, 116) = 5.51, p = .021, \eta^2_p = .05$.

To further explore the relation between agentic experience and effectiveness of the persuasion techniques we regressed the attitude scores on the persuasion condition and the mean agency scores. This analysis showed neither a main effect of persuasion condition, $\beta = .07, t(116) = .79, p = .432$, nor did the results show a main effect of the agency scores, $\beta = .11, t(116) = 1.21, p = .227$. The results did however show a significant interaction between the persuasion condition and the mean agency scores, $\beta = .24, t(116) = 2.62, p = .010$. Simple slope analyses (Aiken & West, 1991) for mean agency scores in the persuasion and self-persuasion conditions showed a significant effect in the self-persuasion condition, $\beta = .35, t(116) = 2.62, p = .010$. The more individuals experienced agency within the self-persuasion condition, the more they were likely to declare a clean environment was important to them. The relation between agency scores and cleanliness attitudes did not reach significance within the direct persuasion condition, $\beta = -.13, t(116) = -1.03, p = .303$.

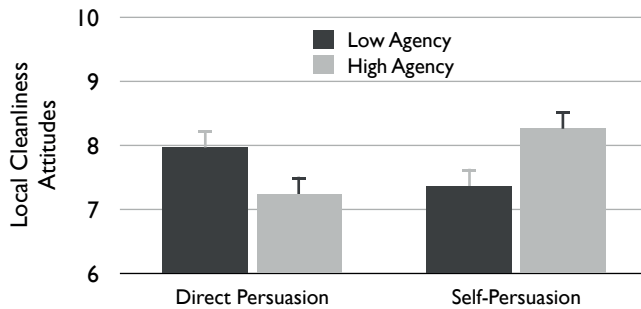


Figure 7.1. Mean cleanliness attitudes as a function of Agency and Persuasion conditions. Error bars represent standard errors.

Volunteering

A binary logistic regression on volunteering behavior with agency condition, persuasion condition, and the interaction between agency and persuasion as predictors was conducted. Results showed only the interaction to be a significant predictor of volunteering behavior, $b = -2.86, SE = .93, Wald = 9.44, p = .002, odds\ ratio = .06$. Similar to the findings on cleanliness attitudes, direct persuasion led to more signups for helping out in a campus cleanup after participants had previously experienced low rather than high agency (M_{low}

agency = .33; $M_{\text{high agency}} = .10$; $b = -1.54$, $SE = .72$, $Wald = 4.57$, $p = .033$, odds ratio = 0.21; means represent volunteering percentages). Within the self-persuasion condition, participants who had experienced high agency were more likely to volunteer than participants who had experienced low agency ($M_{\text{low agency}} = .20$; $M_{\text{high agency}} = .48$; $b = 1.32$, $SE = .59$, $Wald = 5.01$, $p = .025$, odds ratio = 3.73).

We conducted another binary logistic regression using the mean agency scores (standardized) as a predictor instead of the agency condition. Results showed only the interaction between the persuasion condition and the agency scores to be a significant predictor of volunteering behavior, $b = .50$, $SE = .22$, $Wald = 5.08$, $p = .024$, odds ratio = 1.66. There was a marginal effect of agency scores on volunteering behavior within the self-persuasion condition, $b = .50$, $SE = .30$, $Wald = 2.81$, $p = .094$, odds ratio = 1.64, yet no (significant) effect within the direct persuasion condition, $b = -.51$, $SE = .34$, $Wald = 2.33$, $p = .127$, odds ratio = 0.60.

DISCUSSION

The present study revealed that the effectiveness of direct persuasion and self-persuasion techniques is influenced by experiences of control, specifically the sense of action control known as agency. Using a number of different analyses we investigated the influence of an agency manipulation on the degree to which different persuasion techniques were able to successfully influence attitudes and intentions. Across a number of different analyses, we tested whether direct persuasion was more effective after experiences of low rather than high agency, and whether self-persuasion was more effective after experiences of high rather than low agency. Not every hypothesized difference between conditions reached a level of significance and we therefore must take care in interpreting these results, however, overall the results convincingly show differential effects of agency for different persuasion techniques.

First, the present results showed the trend that direct persuasion is more effective after recent experiences of low agency rather than high agency, with regards to both participants' attitudes and behavior. Similar findings were obtained by Fennis and Aarts (2012) who revealed that individuals who had recently experienced weakened personal control were more likely to be susceptible to social influence attempts. The present study extends these findings by suggesting that experiences of agency not only influence behavior after a persuasive message, but can also promote attitude change. However, such an effect was not evident when we used the individual agency scores as a predictor instead of the agency manipulation, suggesting future research is needed to definitively validate the relation between agency and direct persuasion.

In prior research the effectiveness of self-persuasion has often been advocated, as it would produce more powerful and long-lasting effects than direct persuasion (Aronson, 1999). However, in the present study the results did not suggest a superiority of self-persuasion over direct-persuasion techniques; the degree to which self-persuasion was a powerful technique was highly dependent on the agency manipulation. This does not directly prove that self-persuasion is no longer a better technique compared to direct persuasion; perhaps individuals in general are more likely to experience at least some degree of agency, making self-persuasion generally effective tactic in daily life. The present research does however complement recent developments in research which have started to investigate the boundary conditions of self-persuasion. For example, it has been shown that requiring individuals to generate a high number of arguments (e.g., 10) will reduce the effectiveness of the self- persuasion technique (van Someren, van Leeuwen, Gloudemans, Müller, & Greifeneder, 2013); and that counter-attitudinal arguments are more effective than pro-attitudinal arguments (Briñol, McCaslin & Petty, 2012). The present results add to these studies by showing that self-persuasion can be hampered or helped by experiences of agency, creating instances in which direct persuasion, at least in the short term, can be more effective than self-persuasion: When agency is low, and the sense of personal control is weakened, techniques such as self- persuasion become less powerful.

Earlier research on personality traits, such as locus of control (Rotter, 1966) and beliefs on self-efficacy (Bandura, 1997), demonstrated that general beliefs of personal control are related to susceptibility to persuasion (Avtgis, 1998) and to the ability for self-change (Bandura, 2001; Sherman, 1973). The present study extends these findings by showing that state-based experiences of control, such as agency, can increase susceptibility to direct persuasion after experiences of low agency, and increase the effectiveness of self-persuasion after experiences of high agency.

In the present study we cannot rule out that the agency manipulation influenced alternative processes. Future studies should investigate whether experiences of agency can influence self-esteem or self-confidence, and thereby influence the effectiveness of persuasion techniques. However, given the fact that the slopes of the actual agency scores closely mapped the observed effects that we found when using the agency condition as a predictor (especially in the self-persuasion condition), suggests an important role for agentic experience herein. A second limitation is that our design did not feature a control condition by which we were able to determine the direction of the effects. It is of course possible that only experiences of low and not high agency caused changes to occur (or vice versa). However, the ability for self-promoted change and external susceptibility have both been empirically linked to long-term beliefs about personal control (e.g., Avtgis, 1998; Sherman, 1973), and it stands to reason to assume that both processes operate in everyday life as a consequence of agentic experience.

While the present study focused on the sense of agency, other manipulations of control may also influence the effectiveness of (self) persuasion techniques (Fennis & Aarts, 2012). For example, Briñol, Petty, Valle, Rucker, & Becerra (2007) found that power, when induced before a message, decreased external message processing, while when power is induced after a message, a person's own thoughts exerted greater impact on their attitudes (see also Galinsky, Magee, Gruenfeld, Whitson, & Liljenquist, 2008). The present findings extend such findings by showing the impact of recent experiences of action control, or agency.

It remains unclear exactly which process underlies the self-persuasion technique. It has been suggested that the effort in processing might be of special importance when it comes to self-persuasion (Brinol et al., 2012). Besides cognitive demand, research has also shown that correcting for externally generated stimuli is much easier (Mussweiler & Neumann, 2000), that individuals engaging in self-persuasion want to be seen as acting consistent with their arguments (Cialdini, 2001), or that they try to decrease cognitive dissonance (Brehm & Sensenig, 1966). Hence, more research is needed to further specify the exact mechanism.

In trying to explain his findings on destructive obedience, Stanley Milgram (1974) hypothesized about an agentic shift: a lowered sense of causation that makes individuals more susceptible to powerful social heuristics such as authority figures. The present study indeed showed that a shift in agency may influence susceptibility, as individuals are more susceptible to persuasion after experiences of reduced agency. However, whereas experiences of low agency can make one susceptible to outside persuasion, high agency will increase the influence of self-persuasion (although we would prefer it if this would not be used for the goal of destructive obedience). A number of different approaches in both the scientific and the public domain emphasize the power of self-generated change to improve individuals' behavior, cognitions, and more general, lifestyles. The present findings suggest that with a relatively short boost of experienced control, we can help individuals to help themselves.

Summary

One of the most exciting aspects of human consciousness is the sensation that we cause actions and that we are personally involved in the direct consequences those actions have. This sensation, also known as agency, is of great importance to the way we perceive the world and to the way we see ourselves as having an important role in that world. Agency motivates us to regulate our behavior, helps us learn from the mistakes we make, enables us to distinguish the actions we perform compared to the actions performed by other individuals, makes us feel good about ourselves when we are successful, but can also give us a bad feeling when our actions lead to undesirable outcomes. This sense of agency therefore seems to be 'rather' important, but where does it actually come from? Over the past twenty years, this question has been crucial for a significant number of studies and researchers in different areas within psychology and philosophy, and has been the main focus of the research presented in this dissertation.

An intuitive sensation caused by a complex process

Agency appears to be a sensation that is quite logical and intuitive. It is difficult to imagine that we can perform actions without actually having the experience of acting. But the cognitive processes which produce this sense of agency are deceiving. They pull up a facade of simplicity as we are only aware of a final product, and we are left unaware of the cognitive processes that lead up to this sense of agency. Indeed, more and more research is showing that agency in fact arises from a complex system consisting of several processes involving predictions and inferences that work together to create this sensation. And it is precisely because agency is caused by a complex system that it can be influenced by a number of different factors.

A good example of the actual malleability of agency is the temporal delay between an action and an effect: Imagine that you press a light switch and the light in your office immediately turns on. You would probably have a high sense of agency and a strong feeling that you just caused that light to occur. However, if it would take ten seconds before the light turns on your sense of agency would probably be much weaker, making it appear as if the light had turned on by itself. That sense of agency, which we believed to be something intuitive and robust, can in practice be influenced quite easily by a number of different factors of which a delay between action and effect is only one example. In the present dissertation we present a number of research projects in which we have explored multiple factors that were able to influence that important sensation of agency.

Methodology

Before providing an overview of our research findings, we would like to broadly describe what a typical agency experiment actually looks like. The task participants were required to do in the different studies was often relatively simple: They performed an action, such

as the pressing of a keyboard button, and were then presented with an effect, such as a sound played by the computer. Subsequently, participants were asked to what extent they felt they had just caused the occurred effect. We increased the ambiguity of this situation by suggesting 'the computer' would also regularly produce the tone irrespective of whether the participants pressed a button or not. By varying the time after which the effects of actions occurred we further enhanced this ambiguity. This basic setup was used throughout the presented studies, and then slightly altered to allow us to investigate the influence of experimental manipulations depending on the research question of that specific study. For example, as shall be described below, participants were required to act in the presence of specific contextual cues, such as in the presence of an authority figure, were asked to use their dominant or non-dominant hand, or were required to plan or not plan their actions.

Acting in the presence of action cues

We regularly perform our actions in a contextually rich environment in which we are both subtly and sometimes very overtly exposed to the actions and suggestions by other sources. An important question is whether those suggestions can also influence us in our sense of agency. In the line of research described in Chapter 2 we show that verbal commands were able to reduce the sense of agency. Even if such cues would leave participants' freedom of choice intact, and even when participants were explicitly told to ignore them, these commands were able to exert their influence. The research described in Chapter 3 expands on these findings and shows that we do not even have to be aware of these suggestions in order to be influenced by them. In these studies, just before participants were about to perform their actions, they were presented with words (on a monitor) that were either compatible or incompatible to the actions the participants were about to perform. These words were either presented clearly visible or so briefly that participants were unable to consciously perceive them. The results showed that when the words were visible and in line with the actions of the participant, they led to a lower sense of agency than when the words did not correspond with the actions they performed - similar to the findings presented in Chapter 2. However when these words could not be consciously perceived, the results showed the reverse effect: compatible words increased and incompatible words decreased the sense of agency. These findings show that when we are not aware of external influence, compatible suggestions can facilitate agency, but when we become aware of them they often reduce agency instead.

Acting in the presence of authority

The presence of other individuals can influence the degree to which we consider it likely we caused something to happen. But does it actually matter in *whose* presence we act? The famous social psychologist Stanley Milgram once theorized that we are very susceptible

to individuals with authority, and that in the presence of authority we lose - to a certain degree - the tendency to see ourselves as autonomous and independent agents. In the line of research described in Chapter 4 we investigated this theory, and stumbled upon a finding we did not expect: When participants acted in the presence of an authority individual, or acted in the presence of contextual cues of authority, they reported not a reduced but an increased sense of agency. We suspect that instead of reducing action awareness, the presence of authority cues instead motivated participants to do the task well, increasing their task-awareness and agency.

Experience effort related to non-dominant hand use increases agency

The extent to which we experience difficulty when we are performing our actions can greatly influence the extent to which we are fully aware of those actions. We may be more aware of the fact that we are walking to the bus-stop when in full sprint compared to when we are walking at a leisurely pace. Similarly, we may be more aware of the actions we perform with the non-dominant hand compared to use of the dominant hand. At already a young age we develop a clear preference for our left or right hand, and non-dominant hand skills will rarely reach the level of ability of the dominant hand. Although a relation between perceptions of effort and agency would seem logical, the research described in Chapter 5 features two of the few studies to have empirically investigated this relation. In these studies, we compared the effects of using the dominant compared to using the non-dominant hand on effort and agency. Participants performed an agency experiment in which they alternately used the dominant and non-dominant hand. The results showed that when participants acted with the non-dominant hand, they reported an increased sense of agency compared to actions performed with the dominant hand, and the analyses also pointed towards the importance of experienced effort herein.

Action planning reduces agency and responsibility.

In the research line presented in Chapter 6 we investigated whether our sense of agency for actions can be influenced when we plan those actions in advance. In a series of studies, we were able to show that the pre-planning of future actions was associated with a reduced sense of agency at the moment of action performance. This is an important finding for our understanding of agency, considering that previous research has shown that thoughts about *outcomes* of actions are related to an increased sense of agency, and it was theorized that thinking about *actions* would work in a similar way. However, it seems that precisely because we already decided which action we are going to perform when we planned ahead, less cognitive deliberation is required at the moment of action performance. The action can be performed more automatically, thereby reducing the sense of agency. In a further set of studies we were able to show that action planning was similarly able to reduce feelings

of responsibility, and these results therefore point towards an important actor-observer discrepancy: While we generally consider and hold a person to be more responsible when that person plans his or her actions in advance, when we plan and act ourselves, we often experience a reduced sense of agency and responsibility.

The influence of agency on cognition and behavior

In Chapter 7 we describe a study in which we investigated whether experiences of agency can in turn influence cognition and behavior. Given that our sense of agency can be high or low depending on the situation, we wondered whether such agency experiences could in turn influence the way we think or act. In the presented study we investigated whether experiences of agency would help or hinder the effectiveness of different persuasion techniques. The results show that individuals who experienced low agency on several occasions were more likely to be convinced by external arguments than people with high agency experiences. In other words, the sensation that you have played no causal role in the events around you can increase your susceptibility to external sources. In addition, the results show that participants with a number of high-agency experiences were better able at convincing and motivating themselves, a technique known as self-persuasion, than participants with low agency experiences. The sensation that we were able to play a causal role in the events around us allows us to put more stock into the validity of our own arguments. Therefore, it seems that agency can indeed experience subsequent cognition and behavior, and different techniques of persuasion can be more or less effective depending on these agency experiences.

Conclusion

The sense of agency is one of the most fundamental experiences of human consciousness. While we may intuitively feel that we should know when we have caused something to occur and when not, the research described in the present dissertation reveals that the sense of agency can be influenced by a number of different factors, including contextual action cues and internal action plans, the presence and nature of other agents, as well as hand dominance and experiences of effort. Importantly, experiences of agency in turn seem to influence our susceptibility to external forces and our ability to cause self-driven change. The present findings thereby further our knowledge on how, why, and when the sense of agency emerges and how that pervasive experience influences us in turn.

Samenvatting
Dutch summary

Een van de meest enerverende aspecten van het menselijk bewustzijn is ons gevoel dat we persoonlijk verantwoordelijk zijn voor onze handelingen en de directe gevolgen die onze handelingen teweegbrengen. Dit gevoel, ook wel agency genoemd, is van enorm belang voor de manier waarop wij naar de wereld en onze rol in die wereld kijken. Agency motiveert ons om ons gedrag te reguleren, van fouten te leren, en de handelingen van onszelf ten opzichte van die van anderen te onderscheiden. Ook geeft het ons een goed gevoel als we succes hebben en een rot gevoel als iets door ons toedoen helemaal misgaat. Het gevoel van agency is daarmee ‘best belangrijk’, maar waar komt het eigenlijk vandaan? Deze vraag is de afgelopen twintig jaar bepalend geweest voor een enorm aantal onderzoeken en onderzoekers uit verschillende domeinen binnen psychologie en filosofie, en is ook de leidraad geweest in de onderzoeksprojecten die in deze dissertatie worden gepresenteerd.

Het intuïtieve eindproduct van een complex proces

Agency, het lijkt een intuïtief en logisch gevoel. We kunnen ons bijna niet voorstellen dat we handelingen verrichten zonder daarbij de ervaring van handelen te hebben. Maar de processen die plaatsvinden in ons brein en ons dat gevoel van agency geven, zetten ons hierbij een beetje op het verkeerde been: We worden ons namelijk alleen gewaar van een eindproduct. Meer en meer laat onderzoek zien dat agency ontstaat vanuit een complex systeem waarin meerdere processen van predictie en inferentie samenwerken om ons dat uiteindelijke gevoel te geven. En juist doordat dit gevoel ontstaat door een complex systeem, kan het beïnvloed worden door een hoop verschillende factoren.

Een goed voorbeeld hiervan is de tijd die zit tussen een actie en een effect: Stel je voor dat je een lichtknopje indrukt en dat vervolgens de lamp op je kantoor meteen aanspringt. Je hebt dan waarschijnlijk sterk de ervaring dat jij zojuist dat licht hebt geproduceerd en dus een hoog gevoel van agency. Stel je nu voor dat je weer op een lichtknopje drukt, maar nu springt de lamp niet meteen aan, pas na een poosje, dan is je gevoel van agency een stuk minder - het lijkt dan misschien alsof de lamp uit zichzelf aan is gegaan. Dat gevoel waarvan we dachten dat het intuïtief en robuust is, blijkt in de praktijk vrij gemakkelijk beïnvloed te worden door verschillende factoren, waarvan tijd slechts één voorbeeld is. In de huidige dissertatie presenteren we een aantal onderzoeksprojecten waarin de invloed van verschillende factoren op agency is onderzocht.

Gebruikte methodiek

Voordat we kort de bevindingen toelichten is het van belang om een idee te schetsen hoe een typisch agency-experiment eruit ziet. De taak die de deelnemers in de verschillende experimenten moesten doen was vaak relatief simpel: Men voerde een handeling uit, zoals het drukken op een knop van het toetsenbord, en deelnemers kregen vervolgens een effect gepresenteerd, zoals het door de computer afspelen van een geluid. Aan de deelnemers

werd gevraagd in hoeverre zij het gevoel kregen de toon te hebben veroorzaakt. We brachten de deelnemers hierover in vertwijfeling door te vertellen dat sommige tonen door ‘de computer’ werden veroorzaakt (ongeacht of ze op een knop hadden gedrukt). Deze ambiguïteit werd versterkt door het inbouwen van een tijdsvertraging tussen het drukken van de knop en het horen van de toon. Dit was de basis-setup die over de verschillende studies werd gebruikt. Deze setup werd vervolgens, afhankelijk van de onderzoeksvraag, veranderd om de invloed van verschillende factoren te onderzoeken. Participanten werden bijvoorbeeld gevraagd om te handelen in een specifieke context, zoals in de aanwezigheid van persoon met autoriteit, of werd gevraagd om hun dominante of niet-dominante hand te gebruiken, of hun acties van tevoren te plannen of niet te plannen.

Het handelen in een context van omgevingscues

Onze handelingen worden regelmatig in een context uitgevoerd waarin we bewust en onbewust worden blootgesteld aan de suggesties van andere individuen of andere bronnen. Een belangrijke vraag is echter of wij door dit soort contextuele cues ook beïnvloedt kunnen worden in ons gevoel van agency. In Hoofdstuk 2 wordt een onderzoekslijn beschreven die laat zien dat verbale commando’s in de omgeving ons gevoel van handelen verzwakken. Dit onderzoek laat verder zien dat zelfs als deze commando’s onze eigen keuzevrijheid intact laten, of zelfs als ze niet eens meer van belang zijn voor de actie die we uitvoeren, kunnen ze het gevoel van agency beïnvloeden.

Deze lijn van studies wordt aangevuld met het onderzoek zoals beschreven in Hoofdstuk 3 dat laat zien dat we niet eens bewust hoeven te zijn van deze contextuele cues om er door beïnvloedt te worden. Aan de deelnemers werden, net voordat ze een handeling gingen uitvoeren, woorden gepresenteerd die gerelateerd konden worden aan de handelingen die deelnemers gingen uitvoeren. Deze woorden werden duidelijk zichtbaar gepresenteerd, of zo kort dat ze niet bewust waarneembaar waren. Verder konden de woorden overeenkomen met de handelingen die deelnemers gingen uitvoeren, maar ze konden er ook van verschillen. De resultaten lieten zien dat wanneer de woorden zichtbaar waren en overeenkwamen met de handelingen van de deelnemer, deze woorden tot een lager gevoel van agency leidden dan wanneer de woorden *niet* overeenkwamen met de handeling. Waren de woorden echter onzichtbaar dan trad er een omgekeerd effect op waarbij de woorden die overeenkwamen met de handelingen het gevoel van agency verhoogden terwijl de woorden die niet overeenkwamen met de handelingen het gevoel van agency verlaagden. Deze resultaten laten zien dat suggesties in de omgeving ons gevoel van agency kunnen beïnvloeden als we kort na het oppikken van zo’n suggestie handelen. Worden we ons gewaar van een duidelijke link tussen onze handeling en een externe suggestie, dan heeft dit heel andere gevolgen voor ons gevoel van agency dan als we niet gewaar van deze link worden. In de eerste situatie wordt agency versterkt, in de tweede situatie wordt agency verzwakt.

De aanwezigheid van autoriteit

De aanwezigheid van anderen beïnvloedt hoe waarschijnlijk wij het achten dat we iets veroorzaken. Maar maakt het voor ons gevoel van agency ook uit wie er daadwerkelijk in onze omgeving is? De beroemde sociaal psycholoog Stanley Milgram veronderstelde ooit dat de aanwezigheid van een persoon met autoriteit kan zorgen voor een verschuiving in agency. De aanwezigheid van een autoriteit zou namelijk ten koste gaan van ons gevoel van autonomie, ons gevoel van vrije wil en het besef dat wij onafhankelijk kunnen handelen. In de onderzoekslijn beschreven in Hoofdstuk 4 hebben we een eerste stap gezet om deze veronderstelling te onderzoeken. We vonden hierbij een onverwacht resultaat, namelijk dat deelnemers juist meer en niet minder agency rapporteerden in de aanwezigheid van een persoon met autoriteit (of in de context van een cue van autoriteit). We vermoeden dat de autoriteitscues in onze experimenten ervoor hebben gezorgd dat deelnemers zich meer op de taak focusten, beter hun best wilden doen, en bewuster van hun taak werden waardoor zij ook meer agency voelden. Onze bevindingen suggereren dus dat in veel situaties de theorie van Milgram niet opgaat. De aanwezigheid van autoriteit lijkt vaak een agency-verhogende en niet een agency-verlagende werking te hebben.

Het gebruik van onze niet-dominante hand

De mate waarin we moeite ervaren in onze handelingen kan voor een groot deel bepalen in hoeverre we ons volledig bewust zijn van deze handelingen. Zo zijn we misschien meer bewust van het feit dat we lopen naar de bushalte als we bezig zijn met een volle sprint dan wanneer we in normaal tempo lopen, en zijn we misschien meer met onze aandacht bij het gebruik van onze niet-voorkeurshand dan bij de hand die je normaal het meest gebruikt. De meeste individuen vormen al vanaf een jonge leeftijd een duidelijke voorkeur voor een bepaalde hand, en hoewel men ook vaardigheden met de niet-voorkeurshand kan ontwikkelen, zullen deze vaardigheden zelden het niveau bereiken van de voorkeurshand. Hoewel het verband tussen de ervaren moeite en agency intuïtief lijkt, is het onderzoek zoals beschreven in Hoofdstuk 5 een van de weinige onderzoeken die dit verband daadwerkelijk empirisch heeft onderzocht. In dit onderzoek hebben we specifiek gekeken naar moeite met betrekking tot het gebruik van de niet-voorkeurshand ten opzichte van de voorkeurshand. Zelfs simpele acties die we dagelijks uitvoeren, zoals tandenpoetsen of een theekopje pakken, kunnen moeite kosten wanneer we de niet-voorkeurshand gebruiken. Deelnemers in het beschreven onderzoek deden mee aan een agency-taak waarbij zij afwisselend hun voorkeurs of niet-voorkeurshand gebruikten en de mate van ervaren agency aangaven. De resultaten lieten zien dat de handelingen die werden uitgevoerd met de niet-voorkeurs hand tot een hoger gevoel van agency leidden dan wanneer diezelfde handelingen werden uitgevoerd met een voorkeurshand hand.

Het plannen van onze acties

In de lijn van studies die we presenteren in Hoofdstuk 6 hebben we onderzocht in hoeverre het van te voren plannen van onze *handelingen* onze gevoelens van agency en verantwoordelijkheid beïnvloeden als we deze handelingen uitvoeren. In een reeks van studies waren we in staat aan te tonen dat het van tevoren plannen van toekomstige handelingen is gekoppeld aan een verlaagd gevoel van agency. Dit is een belangrijke bevinding voor ons begrip van agency, omdat eerder onderzoek juist heeft laten zien dat gedachtes en representaties over de *uitkomsten* van handelingen kan leiden tot een hoger gevoel van agency waarbij er enigszins vanuit werd gegaan dat het nadenken over de *handelingen* zelf op dezelfde manier zou werken. Echter, het lijkt erop dat juist omdat we bij het plannen van onze handelingen al een besluit nemen over wat we gaan doen we minder hoeven na te denken als het moment van uitvoering daar is, waardoor ons gevoel van agency naar beneden gaat. Anders gezegd, omdat we al eerder hebben bedacht wat we gingen doen handelen we meer op de automatische piloot. In een verdere reeks studies hebben we aangetoond dat het plannen van je handelingen ook gevoelens van verantwoordelijkheid kan verlagen. Deze studies wijzen daarmee op een belangrijke discrepantie: Hoewel we over het algemeen personen die hun toekomstige handelingen plannen méér verantwoordelijk houden voor hun acties, hebben we zelf na het uitvoeren van onze geplande handelingen juist een verlaagd gevoel van agency en verantwoordelijkheid.

In hoeverre zijn agency ervaringen eigenlijk van belang in ons denken en doen?

In de eerder gepresenteerde onderzoekslijnen is steeds gekeken naar agency of verantwoordelijkheidsgevoel als onze belangrijke afhankelijke variabele; als een eindstadium van de verschillende onderzoeken. In Hoofdstuk 7 beschrijven we echter een onderzoek waarin de relatie tussen agency ervaringen aan de ene kant, en cognitie en gedrag aan de andere kant is onderzocht. Onze gevoelens van agency kunnen afhankelijk van de situatie laag of hoog zijn, maar de vraag is of het voor ons uitmaakt of we weinig of juist veel agency ervaren als het gaat om hoe we nadenken over zaken, en in hoeverre ons gedrag wordt beïnvloed daardoor. In het onderzoek zoals beschreven in Hoofdstuk 7 hebben we onderzocht of onze agency ervaringen bepalen in hoeverre we gevoelig zijn voor externe beïnvloeding, of dat we door onze agency ervaringen juist meer gevoelig worden voor de kracht van onze eigen argumenten. De resultaten laten zien dat individuen met een laag gevoel van agency eerder geneigd om zich te laten overtuigen door de argumentatie van een externe bron dan mensen met een hoog gevoel van agency. Het gevoel dat je regelmatig geen causale factor bent geweest in de dingen die om je heen gebeuren zijn daarmee dus van invloed op je gevoeligheid voor externe krachten. Daarnaast lieten de

resultaten ook zien dat deelnemers met een aantal ervaringen van hoge agency beter in staat waren zichzelf te overtuigen, een techniek die bekend staat als self-persuasion, dan deelnemers een aantal ervaringen van lage agency. Indien we dus juist wel het gevoel hebben dat wij een causale factor zijn in de zaken die om ons heen gebeuren, dan zijn we ook beter in staat om onszelf te overtuigen van de wenselijkheid van bepaalde standpunten en gedrag. Ons gevoel van agency kan dus wel degelijk van invloed zijn op ons denken en doen, en bepaalt hoe gevoelig we zijn voor verschillende methoden van overtuiging.

Conclusie

Het gevoel van agency is een fundamentele ervaring binnen het menselijk bewustzijn. Hoewel het voor ons misschien lijkt alsof de ervaring dat we handelen of iets veroorzaken een intuïtief en duidelijk gevoel is, laten vele onderzoeken (zoals ook de studies beschreven in dit proefschrift) zien dat agency in feite beïnvloedt kan worden door verschillende factoren. Deze factoren kunnen contextueel zijn zoals: de suggesties en aanwezigheid van anderen, maar deze factoren kunnen ook intern zijn, zoals het bewust maken van plannen over toekomstige handelingen, of onze ervaringen van moeite wanneer we handelen. Daarnaast is agency op zijn beurt ook weer in staat om ons te beïnvloeden in ons denken en doen. De huidige bevindingen vergroten daarmee onze kennis over het ontstaan van het gevoel van agency en de mogelijke consequenties van deze intrigerende ervaring.

References

- Aarts, H. (2007). Unconscious authorship ascription: The effects of success and effect-specific information priming on experienced authorship. *Journal of Experimental Social Psychology*, *43*, 119–126. doi:10.1016/j.jesp.2005.12.006
- Aarts, H., & Dijksterhuis, A. (2000). Habits as knowledge structures: Automaticity in goal-directed behavior. *Journal of Personality and Social Psychology*, *78*(1), 53–63. doi:10.1037/0022-3514.78.1.53
- Aarts, H., Custers, R., & Wegner, D. M. (2005). On the inference of personal authorship: Enhancing experienced agency by priming effect information. *Consciousness and Cognition*, *14*, 439–458. doi:10.1016/j.concog.2004.11.001
- Addington, D. W. (1968). The relationship of selected vocal characteristics to personality perception. *Speech Monographs*, *35*(4), 492–503. doi:10.1080/03637756809375599
- Ajzen, I. (1985). From intentions to action: A theory of planned behavior. In J. Kuhl & J. Beckman (Eds.), *Action control: From cognitions to behaviors* (pp. 11–39). New York: Springer.
- Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behaviour*. Prentice-Hall, Englewood Cliffs, NJ.
- Alicke, M. D. (2000). Culpable control and the psychology of blame. *Psychological Bulletin*, *126*(4), 556–574. doi:10.1037/0033-2909.126.4.556
- Aliu, S. O., Houde, J. F., & Nagarajan, S. S. (2009). Motor-induced suppression of the auditory cortex. *Journal of Cognitive Neuroscience*, *21*, 791–802. doi:10.1162/jocn.2009.21055
- Anderson, C., & Galinsky, A. D. (2006). Power, optimism, and risk-taking. *European Journal of Social Psychology*, *36*(4), 511–536. doi:10.1002/ejsp.324
- Annett, M. (2002). *Handedness and Brain Asymmetry: The Right Shift Theory*. Hove, East Sussex: Psychology Press.
- Armitage, C. J. (2007). Effects of an implementation intention-based intervention on fruit consumption. *Psychology and Health*, *22*(8), 917–928. doi:10.1080/14768320601070662
- Aronovitch, C. D. (1976). The voice of personality: stereotyped judgments and their relation to voice quality and sex of speaker. *The Journal of Social Psychology*, *99*(2), 207–220.
- Aronson E. (1999). The power of self-persuasion. *The American Psychologist*, *54*, 873–890. doi:10.1037/h0088188
- Asch, S. E. (1956). Studies of independence and conformity: A minority of one against a unanimous majority. *Psychological Monographs*, *70*, 1–70. doi:10.1037/h0093718
- Avtgis, T. A. (1998). Locus of control and persuasion, social influence, and conformity: A meta-analytic review. *Psychological Reports*, *83*(3), 899–903. doi:10.2466/PRO.83.7.899-903
- Bandura, A. (1986). *Social foundations of thought and action* (pp. 5–107). Prentice Hall.: Englewood Cliffs, NJ.
- Bandura, A. (1997). *Self-efficacy*. New York: Freeman.
- Bandura, A. (1999). Moral disengagement in the perpetration of inhumanities. *Personality and Social Psychology Review*, *3*, 193–209. doi:10.1207/s15327957pspr0303_3
- Bandura, A. (2001). Social cognitive theory: An agentic perspective. *Annual Review of Psychology*, *52*(1), 1–26. doi:10.1111/1467-839X.00024
- Bandura, A., Barbaranelli, C., Caprara, G. V., & Pastorelli, C. (1996). Mechanisms of moral disengagement in the exercise of moral agency. *Journal of Personality and Social Psychology*, *71*, 364–374. doi:10.1037//0022-3514.71.2.364
- Bargh, J. A. (1992). The ecology of automaticity: Toward establishing the conditions needed to produce automatic processing effects. *The American Journal of Psychology*, *105*, 181–199.
- Bargh, J. A. (1994). The four horsemen of automaticity: Awareness, intention, efficiency and control in social cognition. In R. S. Wyer, Jr. & T. K. Srull (Eds.), *The Handbook of Social Cognition: Vol. 2. Basic processes* (pp. 1–40). Hillsdale, NJ: Erlbaum.
- Bargh, J. A., & Chartrand, T. L. (1999). The unbearable automaticity of being. *American Psychologist*, *54*(7), 462–479.

- Bargh, J. A., & Ferguson, M. J. (2000). Beyond behaviorism: on the automaticity of higher mental processes. *Psychological Bulletin*, *126*(6), 925 - 945. doi:10.1037/0033-2909.126.6.925
- Bargh, J. A., & Gollwitzer, P. M. (1994). *Environmental control of goal-directed action: Automatic and strategic contingencies between situations and behavior*. University of Nebraska Press.
- Barlas, Z., & Obhi, S. S. (2013). Freedom, choice, and the sense of agency. *Frontiers in Human Neuroscience*, *7*:514. doi:10.3389/fnhum.2013.00514
- Bayer, U. C., Achtziger, A., Gollwitzer, P. M., & Moskowitz, G. B. (2009). Responding to subliminal cues: do if-then plans facilitate action preparation and initiation without conscious intent? *Social Cognition*, *27*(2), 183-201. doi:10.1521/soco.2009.27.2.183
- Bäb, P., Jacobsen, T., & Schröger, E. (2008). Suppression of the auditory N1 event-related potential component with unpredictable self-initiated tones: Evidence for internal forward models with dynamic stimulation. *International Journal of Psychophysiology*, *70*, 137–143. doi:10.1016/j.ijpsycho.2008.06.005
- Bearden, W. O., Netemeyer, R. G., & Teel, J. E. (1989). Measurement of consumer susceptibility to interpersonal influence. *Journal of Consumer Research*, *15*, 473–481. doi:10.1086/209186
- Belayachi, S., & van der Linden, M. (2010). Feeling of doing in obsessive-compulsive checking. *Consciousness and Cognition*, *19*, 534–546. doi:10.1016/j.concog.2010.02.001
- Biondo, J., & MacDonald, A. P. (1971). Internal-external locus of control and response to influence attempts. *Journal of Personality*, *39*(3), 407–419. doi:10.1111/j.1467-6494.1971.tb00051.x
- Blakemore, S. J., Oakley, D. A., & Frith, C. D. (2003). Delusions of alien control in the normal brain. *Neuropsychologia*, *41*(8), 1058–1067. doi:10.1016/S0028-3932(02)00313-5
- Blakemore, S. J., Wolpert, D. M., & Frith, C. D. (1998). Central cancellation of self-produced tickle sensation. *Nature Neuroscience*, *1*(7), 635–640. doi:10.1038/2870
- Blakemore, S. J., Wolpert, D. M., & Frith, C. D. (1999). The cerebellum contributes to somatosensory cortical activity during self-produced tactile stimulation. *Neuroimage*, *10*, 448–459. doi:10.1006/nimg.1999.0478
- Blakemore, S. J., Wolpert, D. M., & Frith, C. D. (2000). Why can't you tickle yourself? *Neuroreport*, *11*, 11–16. doi:10.1097/00001756-200008030-00002
- Blakemore, S. J., Wolpert, D. M., & Frith, C. D. (2002). Abnormalities in the awareness of action. *Trends in Cognitive Sciences*, *6*(6), 237–242. doi:10.1016/S1364-6613(02)01907-1
- Blass, T. (2004). *The man who shocked the world: the life and legacy of Stanley Milgram*. New York: Basic Books.
- Botvinick, M. M., Braver, T. S., Barch, D. M., Carter, C. S., & Cohen J. D. (2001). Conflict monitoring and cognitive control. *Psychological Review*, *108*, 624–52. doi:10.1037/0033-295x.108.3.624
- Bradac, J. J., & Street, R. L., Jr. (1989). Powerful and powerless styles of talk: A theoretical analysis of language and impression formation. *Research on Language & Social Interaction*, *23*(1-4), 195–241. doi:10.1080/08351818909389321
- Brandstätter, V., Lengfelder, A., & Gollwitzer, P. M. (2001). Implementation intentions and efficient action initiation. *Journal of Personality and Social Psychology*, *81*(5), 946–960. doi:10.1037/0022-3514.81.5.946
- Brass, M., & Haggard, P. (2008). The what, when, whether model of intentional action. *The Neuroscientist*, *14*, 319–325. doi:10.1177/1073858408317417
- Brehm, J. W. (1966). *A Theory of Psychological Reactance*. New York: Academic Press.
- Briñol, P., McCaslin, M. J., & Petty, R. E. (2012). Self-generated persuasion: Effects of the target and direction of arguments. *Journal of Personality and Social Psychology*, *102*(5), 925–940. doi:10.1037/a0027231
- Briñol, P., Petty, R. E., Valle, C., Rucker, D. D., & Becerra, A. (2007). The effects of message recipients' power before and after persuasion: A self-validation analysis. *Journal of Personality and Social Psychology*, *93*, 1040–1053.
- Buehner, M. J., & Humphreys, G. R. (2009). Causal binding of actions to their effects. *Psychological Science*, *20*, 1221–1228. doi:10.1111/j.1467-9280.2009.02435.x
- Buhrmester, M., Kwang, T., & Gosling, S. D. (2011). Amazon's Mechanical Turk: A new source of inexpensive, yet high-quality, data? *Perspectives on Psychological Science*, *6*, 3–5. doi:10.1177/1745691610393980

- Cardoso-Leite, P., Mamassian, P., Schütz-Bosbach, S., & Waszak, F. (2010). A new look at sensory attenuation action-effect anticipation affects sensitivity, not response bias. *Psychological Science, 21*, 1740–1745. doi:10.1177/0956797610389187
- Cashdan, E. (1998). Smiles, speech, and body posture: how women and men display sociometric status and power. *Journal of Nonverbal Behavior, 22*(4), 209–228. doi:10.1023/A:1022967721884
- Chambon, V., & Haggard, P. (2012). Sense of control depends on fluency of action selection, not motor performance. *Cognition, 125*, 441–451. doi:10.1016/j.cognition.2012.07.011
- Chaminade, T., & Decety, J. (2002). Leader or follower? Involvement of the inferior parietal lobule in agency. *Neuroreport, 13*(15), 1975–1978.
- Cialdini, R. B. (2001). *Influence: Science and practice*. Needham Heights, MA: Allyn & Bacon.
- Cohen, A. L., Bayer, U. C., Jaudas, A., & Gollwitzer, P. M. (2008). Self-regulatory strategy and executive control: implementation intentions modulate task switching and Simon task performance. *Psychological Research, 72*(1), 12–26. doi:10.1007/s00426-006-0074-2
- Conner, M., & Higgins, A. R. (2010). Long-term effects of implementation intentions on prevention of smoking uptake among adolescents: a cluster randomized controlled trial. *Health Psychology, 29*(5), 529–538.
- Cravo, A. M., Claessens, P. M. E., & Baldo, M. V. C. (2011). The relation between action, predictability and temporal contiguity in temporal binding. *Acta Psychologica, 136*, 157–166. doi:10.1016/j.actpsy.2010.11.005
- Csikszentmihalyi, M. (1997). *Finding Flow: The Psychology of Engagement with Everyday Life*. New York: Basic Books
- Csikszentmihalyi, M., Abuhamdeh, S., & Nakamura, J. (2005). Flow. In A.J. Elliot & C.S. Dweck (Eds.), *Handbook of Competence and Motivation* (pp. 598–608). New York: Guilford Press.
- Cushman, F. (2008). Crime and punishment: Distinguishing the roles of causal and intentional analyses in moral judgment. *Cognition, 108*(2), 353–380.
- Cushman, F., Young, L., & Hauser, M. (2006). The role of conscious reasoning and intuition in moral judgment testing three principles of harm. *Psychological Science, 17*(12), 1082–1089. doi:10.1111/j.1467-9280.2006.01834.x
- Damen, T. G. E., Dijksterhuis, A., & van Baaren, R. B. (2014). On the other hand: Non-dominant hand use increases sense of agency. *Social Psychological and Personality Science, 1948550614527626*.
- Damen, T. G. E., van Baaren, R. B., & Dijksterhuis, A. (2014). You should read this! Perceiving and acting upon action primes influences one's sense of agency. *Journal of Experimental Social Psychology, 50*, 21–26. doi:10.1016/j.jesp.2013.09.003
- Daprati, E., Franck, N., Georgieff, N., Proust, J., Pacherie, E., Dalery, J., & Jeannerod, M. (1997). Looking for the agent: an investigation into consciousness of action and self-consciousness in schizophrenic patients. *Cognition, 65*(1), 71–86.
- Darley, J. M. (1992). Social organization for the production of evil. *Psychological Inquiry, 3*(2), 199–218. doi:10.1207/s15327965pli0302_28
- David, N., Newen, A., & Vogeley, K. (2008). The “sense of agency” and its underlying cognitive and neural mechanisms. *Consciousness and Cognition, 17*, 523–534. doi:10.1016/j.concog.2008.03.004
- David, N., Stenzel, A., Schneider, T. R., & Engel, A. K. (2011). The feeling of agency: Empirical indicators for a pre-reflective level of action awareness. *Frontiers in Psychology, 2*:149. doi:10.3389/fpsyg.2011.00149
- de Vignemont, F., & Fourneret, P. (2004). The sense of agency: A philosophical and empirical review of the “Who” system. *Consciousness and Cognition, 13*(1), 1–19.
- Demant, J., Muhle-Karbe, P. S., Lynn, M. T., Blotenberg, I., & Brass, M. (2013). Power to the will: How exerting physical effort boosts the sense of agency. *Cognition, 129*(3), 574–578. doi.org/10.1016/j.cognition.2013.08.020
- Desantis, A., Hughes, G., & Waszak, F. (2012). Intentional binding is driven by the mere presence of an action and not by motor prediction. *PLoS One, 7*: e29557. doi:10.1371/journal.pone.0029557
- Desantis, A., Rousset, C., & Waszak, F. (2011). On the influence of causal beliefs on the feeling of agency. *Consciousness and Cognition, 20*, 1211–1220. doi:10.1016/j.concog.2011.02.012

- Dijksterhuis, A., Preston, J., Wegner, D. M., & Aarts, H. (2008). Effects of subliminal priming of self and God on self-attribution of authorship for events. *Journal of Experimental Social Psychology, 44*, 2–9. doi:10.1016/j.jesp.2007.01.003
- Dogge, M., Schaap, M., Custers, R., Wegner, D. M., & Aarts, H. (2012). When moving without volition: implied self-causation enhances binding strength between involuntary actions and effects. *Consciousness and Cognition, 21*(1), 501–506.
- Draine S. C. (2009). Inquisit (version 4.0.2) [Computer software]. Seattle, WA: Millisecond Software.
- Ebert, J. P., & Wegner, D. M. (2010). Time warp: Authorship shapes the perceived timing of actions and events. *Consciousness and Cognition, 19*, 481–489. doi:10.1016/j.concog.2009.10.002
- Eden, D., & Aviram, A. (1993). Self-efficacy training to speed reemployment: Helping people to help themselves. *Journal of Applied Psychology, 78*(3), 352–360.
- Eilan, N., & Roessler, J. (2003). Agency and self-awareness: Mechanisms and epistemology. In J. Roessler & N. Eilan (Eds.), *Agency and self-awareness* (pp. 1–47). Oxford: OUP.
- Engbert, K., Wohlschläger, A., & Haggard, P. (2008). Who is causing what? The sense of agency is relational and efferent-triggered. *Cognition, 107*, 693–704. doi:10.1016/j.cognition.2007.07.021
- Engbert, K., Wohlschläger, A., Thomas, R., & Haggard, P. (2007). Agency, subjective time, and other minds. *Journal of Experimental Psychology: Human Perception and Performance, 33*, 1261–1268. doi:10.1037/0096-1523.33.6.1261
- Epstein, S., Pacini, R., Denes-Raj, V., & Heier, H. (1996). Individual differences in intuitive–experiential and analytical–rational thinking styles. *Journal of Personality and Social Psychology, 71*(2), 390–405.
- Farrer, C., Franck, N., Georgieff, N., Frith, C. D., Decety, J., & Jeannerod, M. (2003). Modulating the experience of agency: a positron emission tomography study. *Neuroimage, 18*(2), 324–333.
- Fennis, B. M., & Aarts, H. (2012). Revisiting the agentic shift: Weakening personal control increases susceptibility to social influence. *European Journal of Social Psychology, 42*, 824–831. doi:10.1002/ejsp.1887
- Festinger, L., & Carlsmith, J. M. (1959). Cognitive consequences of forced compliance. *The Journal of Abnormal and Social Psychology, 58*, 203–210. doi:10.1037/h0041593
- Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention and behavior: An introduction to theory and research*. Reading, MA: Addison-Wesley.
- Fried, I., Katz, A., McCarthy, G., Sass, K. J., Williamson, P., Spencer, S. S., & Spencer, D. D. (1991). Functional organization of human supplementary motor cortex studied by electrical stimulation. *The Journal of Neuroscience, 11*(11), 3656–3666.
- Frith, C. D. (2002). Attention to action and awareness of other minds. *Consciousness and Cognition, 11*(4), 481–487.
- Frith, C. D. (2013). The psychology of volition. *Experimental Brain Research, 229*, 289–299. doi:10.1007/s00221-013-3407-6
- Frith, C. D., Blakemore, S. J., & Wolpert, D. M. (2000). Explaining the symptoms of schizophrenia: abnormalities in the awareness of action. *Brain Research Reviews, 31*(2), 357–363.
- Galinsky, A. D., Magee, J. C., Gruenfeld, D. H., Whitson, J. A., & Liljenquist, K. A. (2008). Power reduces the press of the situation: Implications for creativity, conformity, and dissonance. *Journal of Personality and Social Psychology, 95*(6), 1450–1466. doi:10.1037/a0012633
- Gallagher, S. (2000). Philosophical conceptions of the self: implications for cognitive science. *Trends in Cognitive Sciences, 4*(1), 14–21. doi:10.1016/S1364-6613(99)01417-5
- Gallagher, S. (2007). The natural philosophy of agency. *Philosophy Compass, 2*(2), 347–357.
- Gawrilow, C., & Gollwitzer, P. M. (2008). Implementation intentions facilitate response inhibition in children with ADHD. *Cognitive Therapy and Research, 32*(2), 261–280. doi:10.1007/s10608-007-9150-1
- Gawronski, B., LeBel, E. P., & Peters, K. R. (2007). What do implicit measures tell us? scrutinizing the validity of three common assumptions. *Perspectives on Psychological Science, 2*, 181–193. doi:10.1111/j.1745-6916.2007.00036.x

- Gentsch, A., Kathmann, N., & Schütz-Bosbach, S. (2012). Reliability of sensory predictions determines the experience of self-agency. *Behavioural Brain Research*, 228, 415–422. doi:10.1016/j.bbr.2011.12.029
- Gentsch, A., & Schütz-Bosbach, S. (2011). I did it: Unconscious expectation of sensory consequences modulates the experience of self-agency and its functional signature. *Journal of Cognitive Neuroscience*, 23, 3817–3828. doi:10.1162/jocn_a_00012
- Gentsch, A., Schütz-Bosbach, S., Endrass, T., & Kathmann, N. (2012). Dysfunctional forward model mechanisms and aberrant sense of agency in obsessive-compulsive disorder. *Biological Psychiatry*, 71(7), 652–659.
- Goffman, E. (1971). *Relations in Public*. New York: Basic Books.
- Goldstein, J. H., Rosnow, R. L., Goodstadt, B., & Suls, J. M. (1972). The “good subject” in verbal operant conditioning research. *Journal of Experimental Research in Personality*, 6, 29–33.
- Gollwitzer, P. M. (1999). Implementation intentions: Strong effects of simple plans. *American Psychologist*, 54(7), 493–503. doi:10.1037/0003-066X.54.7.493
- Gollwitzer, P. M., & Sheeran, P. (2006). Implementation intentions and goal achievement: A meta-analysis of effects and processes. *Advances in Experimental Social Psychology*, 38, 69–119. doi:10.1016/S0065-2601(06)38002-1
- Graham, G., & Stephens, G. L. (1994). Mind and mine. In G. Graham & G. L. Stephens (Eds.), *Philosophical psychopathology* (pp. 91–109). Cambridge, MA: MIT Press.
- Gray, K., & Wegner, D. M. (2009). Moral typecasting: Divergent perceptions of moral agents and moral patients. *Journal of Personality and Social Psychology*, 96(3), 505–520. doi:10.1037/a0013748
- Gray, K., Young, L., & Waytz, A. (2012). Mind perception is the essence of morality. *Psychological Inquiry*, 23(2), 101–124. doi:10.1080/1047840X.2012.651387
- Greene, J., & Haidt, J. (2002). How (and where) does moral judgment work? *Trends in Cognitive Sciences*, 6(12), 517–523. doi:10.1016/S1364-6613(02)02011-9
- Gregory, S. W., Jr, & Webster, S. (1996). A nonverbal signal in voices of interview partners effectively predicts communication accommodation and social status perceptions. *Journal of Personality and Social Psychology*, 70(6), 1231–1240. doi:10.1037/0022-3514.70.6.1231
- Haggard, P., & Clark, S. (2003). Intentional action: conscious experience and neural prediction. *Consciousness and Cognition*, 12, 695–707. doi:10.1016/S1053-8100(03)00052-7
- Haggard, P., Clark, S., & Kalogeras, J. (2002). Voluntary action and conscious awareness. *Nature Neuroscience*, 5, 382–385. doi:10.1038/nn827
- Haggard, P., & Eimer, M. (1999). On the relation between brain potentials and the awareness of voluntary movements. *Experimental Brain Research*, 126(1), 128–133. doi:10.1007/s002210050722
- Haggard, P., & Magno, E. (1999). Localising awareness of action with transcranial magnetic stimulation. *Experimental Brain Research*, 127(1), 102–107. doi:10.1007/s002210050778
- Hamilton, V. L. (1978). Who is responsible? Toward a social psychology of responsibility attribution. *Social Psychology*, 41(4), 316–328. doi:10.2307/3033584
- Haslam, N. (2006). Dehumanization: An integrative review. *Personality and Social Psychology Review*, 10(3), 252–264. doi:10.1207/s15327957pspr1003_4
- Haslam, S. A., & Reicher, S. (2007). Beyond the banality of evil: three dynamics of an interactionist social psychology of tyranny. *Personality and Social Psychology Bulletin*, 33(5), 615–622. doi:10.1177/0146167206298570
- Hayes, A. F., & Preacher, K. J. (2006). Bootstrapping specific indirect effects in multiple mediator models of media effects. In *annual conference of the Association for Education in Journalism and Mass Communication*, San Francisco, CA.
- Helm, C., & Morelli, M. (1979). Stanley Milgram and the obedience experiment: Authority, legitimacy, and human action. *Political Theory*, 7, 321–346. doi:10.2307/190944
- Hepper, P. G., McCartney, G. R., & Shannon, E. A. (1998). Lateralised behaviour in first trimester human fetuses. *Neuropsychologia*, 36(6), 531–534. doi:10.1016/S0028-3932(97)00156-5
- Higgins, E. T. (1998). Promotion and prevention: Regulatory focus as a motivational principle. *Advances in Experimental Social Psychology*, 30, 1–46.

- Holland, R. W., Aarts, H., & Langendam, D. (2006). Breaking and creating habits on the working floor: A field-experiment on the power of implementation intentions. *Journal of Experimental Social Psychology, 42*(6), 776-783.
- Hollis, L. J., & Watson, D. P. (1993). The relationship between handedness, mechanism of injury and which hand injured. *The Journal of Hand Surgery: British & European Volume, 18*(3), 394.
- Hommel, B. (2000). The prepared reflex: Automaticity and control in stimulus-response translation. In S. Monsell & J. Driver (Eds.), *Control of cognitive processes: Attention and performance XVIII* (pp. 247-273). Cambridge, MA: MIT Press.
- Hughes, R. (1998). Considering the vignette technique and its application to a study of drug injecting and HIV risk and safer behaviour. *Sociology of Health & Illness, 20*(3), 381-400. doi:10.1111/1467-9566.00107
- Hume, D. (1739). *A Treatise of Human Nature*. Oxford: Oxford University Press.
- Humphreys, G. R., & Buehner, M. J. (2009). Magnitude estimation reveals temporal binding at super-second intervals. *Journal of Experimental Psychology: Human Perception and Performance, 35*(5), 1542-1549. doi:10.1037/a0014492
- Humphreys, G. R., & Buehner, M. J. (2010). Temporal binding of action and effect in interval reproduction. *Experimental Brain Research, 203*(2), 465-470. doi:10.1007/s00221-010-2199-1
- James W. (1890). *The Principles of Psychology*. New York: Henry Holt and Company.
- Jeannerod, M. (1997). *The Cognitive Neuroscience of Action*. Oxford: Blackwell.
- Jeannerod, M. (1999). The 25th Bartlett Lecture. *The Quarterly Journal of Experimental Psychology: Section A, 52*(1), 1-29.
- Jeannerod, M. (2009). The sense of agency and its disturbances in schizophrenia: a reappraisal. *Experimental Brain Research, 192*(3), 527-532.
- Jones, E. E., & Nisbett, R. E. (1971). *The actor and the observer: Divergent perceptions of the causes of behavior* (p. 16). Morristown, NJ: General Learning Press.
- Jones, S. R., de Wit, L., Fernyhough, C., & Meins, E. (2008). A new spin on the Wheel of Fortune: Priming of action-authorship judgements and relation to psychosis-like experiences. *Consciousness and Cognition, 17*, 576-586. doi:10.1016/j.concog.2007.08.008
- Judd, C. M., Kenny, D. A., & McClelland, G. H. (2001). Estimating and testing mediation and moderation in within-subject designs. *Psychological Methods, 6*(2), 115-134. doi:10.1037/1082-989X.6.2.115
- Judge, T. A., Jackson, C. L., Shaw, J. C., Scott, B. A., & Rich, B. L. (2007). Self-efficacy and work-related performance: the integral role of individual differences. *Journal of Applied Psychology, 92*(1), 107-127. doi:10.1037/0021-9010.92.1.107
- Keltner, D., Gruenfeld, D. H., & Anderson, C. (2003). Power, approach, and inhibition. *Psychological Review, 110*(2), 265-284. doi:10.1037/0033-295X.110.2.265
- Keltner, D., van Kleef, G. A., Chen, S., & Kraus, M. W. (2008). A reciprocal influence model of social power: emerging principles and lines of inquiry. *Advances in Experimental Social Psychology, 40*, 151-192. doi:10.1016/S0065-2601(07)00003-2
- Kimble, C. E., & Musgrove, J. I. (1988). Dominance in arguing mixed-sex dyads: Visual dominance patterns, talking time, and speech loudness. *Journal of Research in Personality, 22*(1), 1-16. doi:10.1016/0092-6566(88)90021-9
- Kumar, D., & Srinivasan, N. (2014). Naturalizing sense of agency with a hierarchical event-control approach. *PLoS ONE, 9*, e92431.
- Lagnado, D. A., & Channon, S. (2008). Judgments of cause and blame: The effects of intentionality and foreseeability. *Cognition, 108*(3), 754-770. doi:10.1016/j.cognition.2008.06.009
- Lamb, T. A. (1981). Nonverbal and paraverbal control in dyads and triads: sex or power differences? *Social Psychology Quarterly, 44*(1), 49-53. doi:10.2307/3033863
- Lepper, M. R., Greene, D., & Nisbett, R. E. (1973). Undermining children's intrinsic interest with extrinsic reward: A test of the "overjustification" hypothesis. *Journal of Personality and Social Psychology, 28*, 129-137. doi.org/10.1037/h0035519

- Leube, D. T., Knoblich, G., Erb, M., Grodd, W., Bartels, M., & Kircher, T. T. (2003). The neural correlates of perceiving one's own movements. *Neuroimage*, *20*(4), 2084–2090.
- Lhermitte, F. (1983). 'Utilization behaviour' and its relation to lesions of the frontal lobes. *Brain*, *106*(2), 237–255.
- Libet, B. (1985). Unconscious cerebral initiative and the role of conscious will in voluntary action. *The Behavioral and Brain Sciences*, *8*, 529–566.
- Libet, B., Gleason, C. A., Wright, E. W., & Pearl, D. K. (1983). Time of conscious intention to act in relation to onset of cerebral activity (readiness-potential). The unconscious initiation of a freely voluntary act. *Brain*, *106*(3), 623–642.
- Linsler, K., & Goschke, T. (2007). Unconscious modulation of the conscious experience of voluntary control. *Cognition*, *104*(3), 459–475. doi:10.1016/j.cognition.2006.07.009
- Lynn, S. J., Rhue, J. W., & Weekes, J. R. (1990). Hypnotic involuntariness: A social cognitive analysis. *Psychological Review*, *97*(2), 169–184.
- Magee, J. C., Galinsky, A. D., & Gruenfeld, D. H. (2007). Power, propensity to negotiate, and moving first in competitive interactions. *Personality and Social Psychology Bulletin*, *33*(2), 200–212. doi:10.1177/0146167206294413
- Malle, B. F. (2004). *How the mind explains behavior: Folk explanations, meaning, and social interaction*. MIT Press.
- Mantell, D. M., & Panzarella, R. (1976). Obedience and Responsibility. *British Journal of Social and Clinical Psychology*, *15*(3), 239–245. doi:10.1111/j.2044-8260.1976.tb00030.x
- Marcel, A. J. (2003). The sense of agency: Awareness and ownership of action. In J. Roessler & N. Eilan (Eds.), *Agency and awareness* (pp. 48–93). Oxford: Oxford University Press.
- Marchetti, C., & Della Sala, S. (1998). Disentangling the alien and anarchic hand. *Cognitive Neuropsychiatry*, *3*(3), 191–207.
- Martikainen, M. H. (2004). Suppressed responses to self-triggered sounds in the human auditory cortex. *Cerebral Cortex*, *15*, 299–302. doi:10.1093/cercor/bhh131
- Mendoza, S. A., Gollwitzer, P. M., & Amodio, D. M. (2010). Reducing the expression of implicit stereotypes: Reflexive control through implementation intentions. *Personality and Social Psychology Bulletin*, *36*(4), 512–523.
- Milgram, S. (1963). Behavioral study of obedience. *Journal of Abnormal and Social Psychology*, *67*, 371–378. doi:10.1037/h0040525
- Milgram, S. (1974). *Obedience to Authority*. New York: Harper & Row.
- Miller, A. G. (1986). *The obedience experiments: A case study of controversy in social science*. New York: Praeger.
- Miller, A. G. (2004). What can the Milgram obedience experiments tell us about the Holocaust? Generalizing from the social psychology laboratory. In A. Miller (Ed.), *The Social Psychology of Good and Evil* (pp. 193–239). New York, NY: Guilford.
- Miller, A. G., Collins, B. E., & Brief, D. E. (1995). Perspectives on obedience to authority: the legacy of the milgram experiments. *Journal of Social Issues*, *51*(3), 1–19. doi:10.1111/j.1540-4560.1995.tb01331.x
- Miller, D. T., & Ross, M. (1975). Self-serving biases in the attribution of causality: Fact or fiction? *Psychological Bulletin*, *82*(2), 213–225.
- Miller, N. E., & Dollard, J. (1941). *Social Learning and Imitation*. New Haven, CT: Yale University Press.
- Miller, R. L., & Wozniak, W. J. (2001). Counter-attitudinal advocacy: Effort vs. self-generation of arguments. *Current Research in Social Psychology*, *6*, 46–55.
- Minter, L. (1974). The effect of territory on dominance. Unpublished doctoral dissertation. *Dissertation Abstracts*, *1974*, 35, 2-B, 1026.
- Mohammadi, G., & Vinciarelli, A. (2012). Automatic personality perception: prediction of trait attribution based on prosodic features. *IEEE Transactions on Affective Computing*, *3*(3), 273–284. doi:10.1109/T-AFFC.2012.5
- Moll, J., de Oliveira-Souza, R., Garrido, G. J., Bramati, I. E., Caparelli-Daquer, E. M., Paiva, M. L., et al (2007). The self as a moral agent: Linking the neural bases of social agency and moral sensitivity. *Social Neuroscience*, *2*, 336–352.

- Moore, J. W., & Fletcher, P. C. (2012). Sense of agency in health and disease: A review of cue integration approaches. *Consciousness and Cognition*, *21*, 59–68. doi:10.1016/j.concog.2011.08.010
- Moore, J. W., & Haggard, P. (2008). Awareness of action: Inference and prediction. *Consciousness and Cognition*, *17*(1), 136–144.
- Moore, J. W., Lagnado, D., Deal, D. C., & Haggard, P. (2009). Feelings of control: contingency determines experience of action. *Cognition*, *110*(2), 279–283.
- Moore, J. W., Middleton, D., Haggard, P., & Fletcher, P. C. (2012). Exploring implicit and explicit aspects of sense of agency. *Consciousness and Cognition*, *21*, 1748–1753. doi:10.1016/j.concog.2012.10.005
- Moore, J. W., & Obhi, S. S. (2012). Intentional binding and the sense of agency: a review. *Consciousness and Cognition*, *21*(1), 546–561.
- Moore, J. W., Wegner, D. M., & Haggard, P. (2009). Modulating the sense of agency with external cues. *Consciousness and Cognition*, *18*, 1056–1064. doi:10.1016/j.concog.2009.05.004
- Morsella, E., Wilson, L. E., Berger, C. C., Honhongva, M., Gazzaley, A., & Bargh, J. A. (2009). Subjective aspects of cognitive control at different stages of processing. *Attention, Perception, & Psychophysics*, *71*(8), 1807–1824.
- Müller, B. C., van Baaren, R. B., Ritter, S. M., Woud, M. L., Bergmann, H., Harakeh, Z., et al. (2009). Tell me why... The influence of self-involvement on short term smoking behaviour. *Addictive Behaviors*, *34*(5), 427–431. doi:10.1016/j.addbeh.2008.12.016
- Mussweiler, T., & Neumann, R. (2000). Sources of mental contamination: Comparing the effects of self-generated versus externally provided primes. *Journal of Experimental Social Psychology*, *36*(2), 194–206. doi:10.1006/jesp.1999.1415
- Nachev, P., Wydell, H., O'Neill, K., Husain, M., & Kennard, C. (2007). The role of the pre-supplementary motor area in the control of action. *NeuroImage*, *36*, T155–T163. doi:10.1016/j.neuroimage.2007.03.034
- Nichols, A. L., & Maner, J. K. (2008). The good-subject effect: investigating participant demand characteristics. *The Journal of General Psychology*, *135*, 151–166. doi:10.3200/GENP.135.2.151-166
- Noyes Jr, R., & Kletti, R. (1977). Depersonalization in response to life-threatening danger. *Comprehensive Psychiatry*, *18*(4), 375–384.
- Obhi, S.S., Hall, P. (2011). Sense of agency and intentional binding in joint action. *Experimental Brain Research*, *211*. 655–662.
- Ohtsubo, Y. (2007). Perceived intentionality intensifies blameworthiness of negative behaviors: Blame-praise asymmetry in intensification effect. *Japanese Psychological Research*, *49*(2), 100–110. doi:10.1111/j.1468-5884.2007.00337.x
- Orne, M. T. (1962). On the social psychology of the psychological experiment: With particular reference to demand characteristics and their implications. *American Psychologist*, *17*, 776–783. doi:10.1037/h0043424
- Pacherie, E. (2007). The sense of control and the sense of agency. *Psyche*, *13*(1), 1–30.
- Pacherie, E. (2008). The phenomenology of action: A conceptual framework. *Cognition*, *107*(1), 179–217. doi:10.1016/j.cognition.2007.09.003
- Pacherie, E., & Haggard, P. (2010). What are intentions?. *Conscious Will and Responsibility. A tribute to Benjamin Libet*, 70–84.
- Peters, M. (1981). Handedness: effect of prolonged practice on between hand performance differences. *Neuropsychologia*, *19*(4), 587–590.
- Petersen, P., Petrick, M., Connor, H., & Conklin, D. (1989). Grip strength and hand dominance: challenging the 10% rule. *The American Journal of Occupational Therapy*, *43*(7), 444–447.
- Perry, G. (2012). *Behind the shock machine: The untold story of the notorious Milgram psychology experiments*. Scribe Publications.
- Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, *40*(3), 879–891.

- Preston, J., & Wegner, D. M. (2007). The eureka error: Inadvertent plagiarism by misattributions of effort. *Journal of Personality and Social Psychology*, *92*(4), 575–584. doi:10.1037/0022-3514.92.4.575
- Prestwich, A., Lawton, R., & Conner, M. (2003). The use of implementation intentions and the decision balance sheet in promoting exercise behaviour. *Psychology and Health*, *18*(6), 707–721.
- Prochaska, J. O., & DiClemente, C. C. (1986) Toward a comprehensive model of change. In: W.E. Miller & N. Heather (Eds.), *Treating Addictive Behaviors* (pp. 3–27). London: Plenum Press.
- Pronin, E., Wegner, D. M., McCarthy, K., & Rodriguez, S. (2006). Everyday magical powers: The role of apparent mental causation in the overestimation of personal influence. *Journal of Personality and Social Psychology*, *91*, 218–231. doi:10.1037/0022-3514.91.2.218
- Reiland, M. S. (1984). Leadership impressions and nonverbal communication in a superior-subordinate interaction. *Communication Quarterly*, *32*(1), 41–48.
- Rigoni, D., Kühn, S., Sartori, G., & Brass, M. (2011). Inducing disbelief in free will alters brain correlates of preconscious motor preparation: The brain minds whether we believe in free will or not. *Psychological Science*, *22*, 613–618. doi:10.1177/0956797611405680
- Roessler, J., & Eilan, N. (Eds.). (2003). *Agency and self-awareness: issues in philosophy and psychology*. Oxford University Press.
- Roethlisberger, F. J., & Dickson, W. J. (1939). Management and the worker. *An account of a research program conducted by the Western Electric Co., Hawthorne Works, Chicago*. Harvard University Press, Cambridge, Mass.
- Ross, L. (1977). The intuitive psychologist and his shortcomings: Distortions in the attribution process. *Advances in Experimental Social Psychology*, *10*, 173–220.
- Rothman, A. J., Haddock, G., & Schwarz, N. (2001). How many partners is too many? Shaping perceptions of personal vulnerability. *Journal of Applied Social Psychology*, *31*(10), 2195–2214. doi: 10.1111/j.1559-1816.2001.tb00171.x
- Rotter, J. B. (1966). Generalized expectancies for internal versus external control of reinforcement. *Psychological Monographs (General & Applied)*, *80*(1), 1–28. doi.org/10.1037/h0092976
- Russell, N. J. C. (2011). Milgram's obedience to authority experiments: Origins and early evolution. *British Journal of Social Psychology*, *50*(1), 140–162.
- Russell, N. J. C., & Gregory, R. (2005). Making the undoable doable Milgram, the Holocaust, and modern government. *The American Review of Public Administration*, *35*(4), 327–349. doi:10.1177/0275074005278511
- Sato, A. (2008). Action observation modulates auditory perception of the consequence of others' actions. *Consciousness and Cognition*, *17*, 1219–1227. doi:10.1016/j.concog.2008.01.003
- Sato, A. (2009). Both motor prediction and conceptual congruency between preview and action-effect contribute to explicit judgment of agency. *Cognition*, *117*, 74–83. doi:10.1016/j.cognition.2008.10.011
- Sato, A., & Yasuda, A. (2005). Illusion of sense of self-agency: discrepancy between the predicted and actual sensory consequences of actions modulates the sense of self-agency, but not the sense of self-ownership. *Cognition*, *94*, 241–255. doi:10.1016/j.cognition.2004.04.003
- Schooler, J. W. (2002). Re-representing consciousness: Dissociations between experience and meta-consciousness. *Trends in Cognitive Sciences*, *6*(8), 339–344. doi:10.1016/S1364-6613(02)01949-6
- Shunk, D. H. (1990). Goal setting and self-efficacy during self-regulated learning. *Educational Psychologist*, *25*(1), 71–86. doi:10.1207/s15326985sep2501_6
- Schwarzer, R. (1992). Self-efficacy in the adoption and maintenance of health behaviors: Theoretical approaches and a new model. In R. Schwarzer (Ed.), *Self-efficacy: Thought control of action* (pp. 217–242). Washington, DC: Hemisphere.
- Shaver, K. G. (1985). *The attribution of blame: Causality, responsibility, and blameworthiness*. New York: Springer-Verlag.
- Sheeran, P., & Orbell, S. (1999). Implementation intentions and repeated behaviour: Augmenting the predictive validity of the theory of planned behaviour. *European Journal of Social Psychology*, *29*(23), 349–369.

- Sherman, S. J. (1973). Internal-external control and its relationship to attitude change under different social influence techniques. *Journal of Personality and Social Psychology*, 26(1), 23–29. doi:10.1037/h0034216
- Skinner, E. A. (1996). A guide to constructs of control. *Journal of Personality and Social Psychology*, 71, 549–570. doi:10.1037//0022-3514.71.3.549
- Smith, P. K., & Galinsky, A. D. (2010). The nonconscious nature of power: cues and consequences. *Social and Personality Psychology Compass*, 4(10), 918–938. doi:10.1111/j.1751-9004.2010.00300.x
- Stephens, G. L., & Graham, G. (2000). *When self-consciousness breaks: Alien voices and inserted thoughts*. The MIT press.
- Stroop, J. R. (1935). Studies of interference in serial verbal reactions. *Journal of Experimental Psychology*, 18, 643–662. doi:10.1037/h0054651
- Strother, L., House, K. A., & Obhi, S. S. (2010). Subjective agency and awareness of shared actions. *Consciousness and Cognition*, 19, 12–20.
- Sousa, P., & Swiney, L. (2013). Thought insertion: Abnormal sense of thought agency or thought endorsement?. *Phenomenology and the Cognitive Sciences*, 12(4), 637–654
- Synofzik, M., Vosgerau, G., & Lindner, A. (2009). Me or not me—An optimal integration of agency cues? *Consciousness and Cognition*, 18(4), 1065–1068.
- Synofzik, M., Vosgerau, G., & Newen, A. (2008). Beyond the comparator model: A multifactorial two-step account of agency. *Consciousness and Cognition*, 17, 219–239. doi:10.1016/j.concog.2007.03.010
- Synofzik, M., Vosgerau, G., & Voss, M. (2013). The experience of agency: an interplay between prediction and postdiction. *Frontiers in Psychology*, 4:127. doi:10.3389/fpsyg.2013.00127
- Tsakiris, M., & Haggard, P. (2005). Experimenting with the acting self. *Cognitive Neuropsychology*, 22(3-4), 387–407.
- Tsakiris, M., Prabhu, G., & Haggard, P. (2006). Having a body versus moving your body: How agency structures body-ownership. *Consciousness and Cognition*, 15, 423–432. doi:10.1016/j.concog.2005.09.004
- Vallacher, R. R., & Wegner, D. M. (1987). What do people think they're doing? Action identification and human behavior. *Psychological Review*, 94(1), 3–15. doi:10.1037/0033-295X.94.1.3
- Vallacher, R. R., & Wegner, D. M. (1989). Levels of personal agency: Individual variation in action identification. *Journal of Personality and Social Psychology*, 57(4), 660–671.
- van der Weiden, A., Aarts, H., & Ruys, K. I. (2010). Reflecting on the action or its outcome: Behavior representation level modulates high level outcome priming effects on self-agency experiences. *Consciousness and Cognition*, 19, 21–32. doi:10.1016/j.concog.2009.12.004
- van der Weiden, A., Ruys, K. I., & Aarts, H. (2013). A matter of matching: How goals and primes affect self-agency experiences. *Journal of Experimental Psychology: General*, 142(3), 954–966. doi:10.1037/a0030079
- van Someren, D. H., van Leeuwen, M. L., Gloudemans, R. T. M., Müller, B. C. N., & Greifeneder, R. (2013). *Too much of a good thing: The influence of the amount of self-generated arguments on helping behavior*. Manuscript submitted for publication.
- Verplanken, B. (2005). Habits and implementation intentions. In: *The ABC of behavioural change*. Oxford, UK: Elsevier Science, 99–109.
- Verplanken, B., & Faes, S. (1999). Good intentions, bad habits, and effects of forming implementation intentions on healthy eating. *European Journal of Social Psychology*, 29(5-6), 591–604.
- Vinokur, A. D., Van Ryn, M., Gramlich, E. M., & Price, R. H. (1991). Long-term follow-up and benefit-cost analysis of the Jobs Program: a preventive intervention for the unemployed. *Journal of Applied Psychology*, 76(2), 213–219. doi:10.1037/0021-9010.76.2.213
- Vuoksima, E., Koskenvuo, M., Rose, R. J., & Kaprio, J. (2009). Origins of handedness: a nationwide study of 30161 adults. *Neuropsychologia*, 47(5), 1294–1301.
- Waytz, A., Gray, K., Epley, N., & Wegner, D. M. (2010). Causes and consequences of mind perception. *Trends in Cognitive Sciences*, 14(8), 383–388. doi:10.1016/j.tics.2010.05.006

- Webb, T. L., & Sheeran, P. (2006). Does changing behavioral intentions engender behavior change? A meta-analysis of the experimental evidence. *Psychological bulletin*, *132*(2), 249-268.
- Wegner, D. M. (2002). *The Illusion of Conscious Will*. Bradford Book.
- Wegner, D. M. (2003). The mind's best trick: how we experience conscious will. *Trends in Cognitive Sciences*, *7*, 65-69. doi:10.1016/S1364-6613(03)00002-0
- Wegner, D. M., & Bargh, J. A. (1998). Control and automaticity in social life. In D. T. Gilbert, S. T. Fiske, G. Lindzey (Eds.), *Handbook of social psychology*. (4th ed.). New York: McGraw-Hill.
- Wegner, D. M., & Sparrow, B. (2004). Authorship processing. In M. Gazzaniga (Ed.), *The new cognitive neurosciences*. Cambridge, MA: MIT Press.
- Wegner, D. M., Sparrow, B., & Winerman, L. (2004). Vicarious agency: experiencing control over the movements of others. *Journal of Personality and Social Psychology*, *86*, 838-848. doi:10.1037/0022-3514.86.6.838
- Wegner, D. M., & Wheatley, T. (1999). Apparent mental causation: Sources of the experience of will. *American Psychologist*, *54*, 480-492. doi:10.1037/0003-066X.54.7.480
- Weiner, B. (1995). *Judgments of Responsibility*. Guilford Press.
- Weiss, C., Herwig, A., & Schütz-Bosbach, S. (2011). The self in action effects: Selective attenuation of self-generated sounds. *Cognition*, *121*(2), 207-218.
- Wenke, D., Fleming, S. M., & Haggard, P. (2010). Subliminal priming of actions influences sense of control over effects of action. *Cognition*, *115*, 26-38. doi:10.1016/j.cognition.2009.10.016
- Wenke, D., Waszak, F., & Haggard, P. (2009). Action selection and action awareness. *Psychological Research*, *73*, 602-612. doi:10.1007/s00426-009-0240-4
- Wolpert, D. M. & Flanagan, J. R. (2002). Sensorimotor learning. In M. Arbib (ed.), *The Handbook of Brain Theory and Neural Networks*. Mit Press. 1020-1023.
- Zhao, H., Seibert, S. E., & Hills, G. E. (2005). The mediating role of self-efficacy in the development of entrepreneurial intentions. *Journal of Applied Psychology*, *90*(6), 1265-1272. doi:10.1037/0021-9010.90.6.1265

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Curriculum Vitae

Tom Damen was born on the 22th of March 1985 in 's-Hertogenbosch, The Netherlands. He grew up in 's-Hertogenbosch with his parents and kid brother. In 2007, he received his Bachelor's degree in Social Psychology at Utrecht University, and in 2009, he finished the Research Master Behavioral Sciences (cum laude) at Radboud University Nijmegen. Between september 2009 and februari 2014, he wrote his dissertation on the factors that influence the sense of agency at the Behavioral Sciences Institute (BSI) at the Radboud University Nijmegen. At present, he is an Assistant Professor at the department of Social & Organizational Psychology at Utrecht University.

