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Unconscious authorship ascription: The effects of success and effect-specific information priming on experienced authorship

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Abstract

The experience of authorship arises when we feel that our own actions (e.g., pushing a light-switch) cause possible effects (e.g., the onset of a light). Two experiments tested the idea that authorship experiences may be driven by an unconscious authorship ascription process that relies on cues for a possible link between own actions and effects. Consistent with studies on self-attributions and success, Experiment 1 observed that subliminal priming of success enhanced feelings of control. Experiment 2 demonstrated that success-priming effects on authorship assessment resembled those of effect-specific information priming: Priming the possible effects of an action prior to their occurrence increased experiences of authorship in all participants, and success-priming only increased experienced authorship if effect information was not primed. These findings suggest that feelings of authorship result from expectations of matches that can be guided by enhanced accessibility of effect-specific information or the concept of success itself.

Keywords: Authorship; Unconscious; Causality; Priming; Success; Behavioral effects

The experience of authorship is a fundamental feature of human self-perception. The concept of authorship rests on the notion that humans can and do have an influence on their actions and resulting outcomes. Whether our jokes make our colleagues smile, or lights turn on when we automatically push the switch upon entering the office, the effects of our actions are mostly associated with feelings of control and self-causation.

The experience of authorship is derived in part from sensations of the body's movement that occur both before and after action (Craig, 2003; Frith, Blakemore, & Wolpert, 2000). Such sensations are supplemented by visual and auditory feedback, as we can often see and hear ourselves act. However, these sensory indicators are often overruled by a variety of social and contextual variables that can guide feelings of authorship independently of direct sensation (Wegner, 2002). Rather than observation, authorship is an inference of control and causality. People often represent their actions (e.g., pushing a switch) in terms of their effects (e.g., onset of lights), and hence, effect information is an important cue for authorship inferences. However, as there is always the possibility that effects are caused by some other source, authorship processing may rely on other information. Authorship ascription, then, may depend on processing information that provides cues for a possible link between own actions and observed effects (Gilbert, 1998; Heider, 1958; Kelley, 1972; Miller & Ross, 1975).

Because the feeling of authorship appears quite natural to us, our mind must have a method of signaling that we might have been involved and successful in causing potential effects. The way these experiences occur is likely to operate through a cognitive process that is tuned to easily offer a current agent for action-effects. As this process is thought to rely on accessible mental representations, it should be susceptible to priming of information that serves to inform the person of being the effective control-

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ler of possible action-effects. Such priming could even ensue from subliminal sources, as conscious perception can be guided readily by unconscious primes (e.g., Custers & Aarts, 2005; Strahan, Spencer, & Zanna, 2002). In other words, judgments of authorship may be driven by an unconscious authorship ascription process (Wegner & Sparrow, 2004) that biases self-perceptions of control and causation consistent with accessible information related to these perceptions. This research explored this idea by examining how two types of information implicitly modulate authorship experiences. Specifically, two experiments tested that subliminal priming of success and action-effects can serve as input for the assessment of personal control and causation.

Success and self-attributions of authorship

Research into causal attribution of behavioral outcomes shows that knowledge of success is associated with perceptions of authorship. For instance, several studies have shown that people more readily take credits for success than failure (Miller & Ross, 1975; Whitley & Frieze, 1985). These attributions of success to internal causes are known as self-serving attributions that are said to bolster self-esteem (Taylor & Brown, 1988; Weary-Bradley, 1978). In a related vein, Weiner's (1985) analysis in the domain of achievement motivation indicates that successful goal-attainment is often appreciated in terms of willfulness, effort and control. Following a control motivation perspective (White, 1959), these self-attributions are suggested to be functional in helping us to understand that we can control our surrounding and to predict what will happen in the future. Thus, there is a strong belief that feelings of authorship are strengthened when successful outcomes are accredited to one's own actions (Försterling, 1985). More generally, when attention is drawn to knowledge of success, people tend to experience higher levels of control and causation over possible outcomes resulting from their actions.

Data that speak to this idea come from studies in which participants engage in action-effect contingency tasks in which the action (e.g., pressing a key or not) produces the effect (e.g., the onset of a light) by chance (Alloy & Abramson, 1979; Tennen & Sharp, 1983). These studies show whether participants perceive more control over action-effects if arrangements of the task indicate high probability of success (e.g., if a match between desired and actual effect of light onset happens frequently, regardless of participants' actions). These findings suggest that knowledge of success signals effectiveness of control and biases perceptions of authorship of behavioral outcomes in a situation where the causal link between behavior and outcomes is ambiguous or unclear.

In most studies on self-attributions of success the concept of success is brought to mind explicitly by asking people to imagine past or future events of success, or by stressing knowledge of success by task instructions. Importantly, what these studies have in common is the suggestion that people's tendency to use beliefs and expectations of success as input for judgments of control and causation becomes overlearned, and thus automatic. Accordingly, in line with previous research into automatic knowledge activation effects on perception (Bargh, in press), priming the concept of success may enhance perceptions of authorship when one performs actions to produce potential effects, and such influence may occur outside of a person's conscious awareness. A first goal of the present study was to explore this possibility by testing that subliminal presentation of success-related words leads to stronger assessments of personal authorship when control over the outcomes of one's actions is unclear.

Priming of action-effect information and authorship processing

The present analysis suggests that judgments of authorship are biased by accessible information that represents effectiveness of control. That is, enhancing the accessibility of the concept of success when a person presses a key (action) to control the onset of a light (effect) offers the individual a generalized expectation of being capable of causing the action-effect, because success usually signifies a match between desired and actual outcomes of one's own actions. However, if generalized expectations of a match underlie the success-priming effects on increased self-perceptions of control, then information that is more specific about a match should have the same results. One such piece of information is personal knowledge or foresight about the effects itself. Several lines of research indicate that humans represent most of their actions in terms of their effects (Aarts & Dijksterhuis, 2000; Elsner & Hommel, 2001; Jeannerod, 1997; Vallacher & Wegner, 1985), and that a match between primed and observed action-effect information is a key source for grasping a sense of authorship (Aarts, Custers, & Wegner, 2005; Haggard, Clark, & Kalogeras, 2002).

For instance, Haggard et al. (2002) demonstrate how the perception of actions and effects bind together as part of authorship experiences. In their study, participants were asked to press a key, and on some trials this was followed 250 ms later by an auditory tone. Participants' task was to judge the timing of their key-press and the tone. When the tone was causally linked to the key-press, participants judged the key-press to occur 15 ms later and the tone to occur 46 ms earlier than if the two events occurred alone. In other words, when a person performs an action intended to attain an effect, the perceived times of these two events shift towards each other. This temporal attraction between intentional actions and their observable effects may enhance feelings of authorship.

In the case of intentional action, experienced authorship emerges as the perception of an effect corresponds with the effect that is expected to result from action—i.e., it is clear that the outcomes occur as intended and thus control is successful. However, people regularly claim authorship of observed effects associated with their actions, even though

they do not intentionally perform actions to produce the specified effects (Bargh, in press). This fosters the suggestion that perceptions of causation may be biased merely because the representation of an action-effect is primed just before one performs a given action and then observes the effect. According to Wegner (2002, 2003), in such cases the mind can produce a stronger sense of authorship for its owner, which leads to *apparent mental causation*: the experience of causing events that arises whenever our thoughts are inferred to cause these events—whether we truly caused them or not. Thus, priming the action-effect enhances the feeling that one causes the effect when it actually occurs.

Aarts and co-workers (2005) tested this by designing a computer task in which the participant and the computer each move a gray square independently traversing a rectangular path consisting of 8 white tiles on a display. Participants' task was to press a key to stop the movement of the squares. This action turned one of the eight white tiles black, representing the location of either their square or the computer's at the time they pressed stop. Thus, the task was devised in such a way that both the participant and the computer could have caused the square to stop on the observed position, rendering the exclusivity of the cause of the stop ambiguous (Wegner & Wheatley, 1999). Accordingly, the stopped position of the square could be conceived of as the possible effect resulting from participants' action of pressing the key. The stopped position was subliminally presented just before participants stopped the movement. Since in reality the stopped position was determined by the computer, actual control over causing the stops was absent. Results showed that subliminal priming of the position substantially enhanced feeling of causing the square to stop. Further experimentation showed that the effect priming results were independent of participants' control over causing effects, suggesting that one can experience authorship of action-effects merely because one personally thinks about them just before one acts and they occur.

The research alluded to above shows that people heavily rely on effect-specific information to clarify and assess personal authorship. Furthermore, this research suggests that a primed action-effect operates as a specific expectation that is compared with the actual effect. Consequently, a match between primed and observed action-effect enhances experienced authorship. In a way, then, the feelings of authorship arising from action-effect priming resemble those of success-priming, in the sense that in both cases an expectation of matches is involved—a specific versus general one. Assuming that both types of expectations provide a cue for a possible link between own actions and observed effects, success-priming or effect-priming or both may be sufficient to increase feelings of authorship. A second goal of the present study was to test this intriguing idea.

Experiment 1

The first experiment aimed to gather initial evidence for the hypothesis that subliminal presentation of words representing success increases perceptions of control. Participants performed a lexical decision task in which they had to indicate whether a subliminally presented string of letters was an existing word or not. After the task, they were asked to indicate how strongly they felt to master the task. For half of the participants the lexical decision task comprised success-related words as the existing words, for others these words were replaced by positive words unrelated to success. Thus, this task allows for assessing participants' perceptions of control after subliminal presentation of words related to success while the effectiveness of control is ambiguous (i.e., whether the actual meaning of letter strings matches their response).

Experiment 1 served one further purpose. Priming of success may increase mood, and consequently, change perceptions of task control. Thus, effects of success priming on perceived control may be attributable to variances in subjective experienced mood. Accordingly, in the present study mood was highly relevant to test for mediator effects.

Method

Participants and design

Fifty undergraduates participated in the experiment receiving 2 Euros in return. They were randomly assigned to one of two conditions: success priming vs. no priming.

Experimental task and procedure

Participants worked in separate cubicles on the computer task. They learned that the study was designed to examine feelings of control and how these feelings come and go. Therefore, participants had to assess whether a subliminally presented letter string represented an existing word or not and to indicate their feelings of personal control in this task. It was further told that the computer had stored a large set of existing and non-existing words in memory, and that the computer would randomly select 60 words from this set. Participants thus were led to believe that the subliminally presented letter strings were not necessarily equal in the number of existing and non-existing words. After a few practice trials they started to work on the task.

The task consisted of three identical blocks that each had 20 trials. Half of the trials were existing words and the other half were non-existing words. In each block, the 10 existing word trials were used for priming. In the *success-prime condition* the existing words were two synonyms for success (the words success and succeed; in Dutch "success" and "lukken"). In the *no-success-prime condition* these two words were replaced by two positive existing words unrelated to success (the words beach and friend; in Dutch "strand" and "vriend"). These two positive words were chosen to control for possible affective valence effects.

Each trial began with a random letter string on the computer-screen and had a duration of 500 ms. The random letter string served as a fixation-point. The target letter string (serving as subliminal prime) was then presented for 23 ms,

followed by a mask of random letters for 400 ms (see for a similar subliminal priming method, Aarts, Chartrand et al., 2005). Next, participants were probed to indicate whether or not an existing word was presented on the screen. The probe remained on the screen until a response was made. The inter-trial time was 1.5 s. Within each block the trials were randomly presented. After participants had completed a block they indicated the extent to which they felt to master the task. This judgment of control was measured on a 9-point answer scale with endpoints *low* (1) and *high* (9).

Measurement of mood

Immediately after the task, the mood items from the modified version of Salovey and Birnbaum's (1989) Affect-Arousal Scale were administered. The items aim to differentiate feelings of mood on 10-point scales. The mood items were *bad–good*, *sad–happy*, and *displeased–pleased*. Participants responded to each item in terms of how they felt at that moment ($\alpha = 0.93$).

Debriefing

At the end of the session participants were debriefed. The debriefing indicated that participants did not realize the true nature of the study. Furthermore, they had not seen the primes (see also accuracy of detection, below).

Results and discussion

Effects on control judgments

The average ratings of control judgments across the 3 blocks were subjected to ANOVA. This analysis yielded the expected effect, $F(1,48) = 7.79$, $p = .008$, $\eta^2 = .14$; experienced control was higher in the success-priming condition ($M = 3.94$) than in the no-success-priming condition ($M = 2.48$).

Accuracy of detection

To check whether participants differ in their detection of the two types of primes (success words vs. success-unrelated words), the proportions of accurate responses to the existing and non-existing words were subjected to ANOVA. This analysis showed that success-primed participants did not differ from no-success-primed participants on the accuracy of detecting the existing (prime) words, $F < 1$, and of detecting the non-existing words, $F < 1$. The average proportion of correctly detected targets was 0.503 ($SD = 0.09$), and this proportion did not differ from chance, $t(49) = 0.33$. In short, the effects of subliminal priming of success are not due to conscious attention to success. The subliminal priming treatment merely enhanced the accessibility of the concept of success, which participants readily relied on to assess the feeling of control in the task at hand.

Controlling for mood

To examine the role of mood as a mediator, an ANCOVA was performed on the experienced control score with the mood measure as covariate. This analysis yielded the same pattern of significant results for priming of success, indicating that the observed effects are not attributable to changes in mood.

Experiment 2

Experiment 1 examined authorship ascriptions in a task where participants received no information about the possible effects of their actions (i.e., whether the categorization of letter strings was correct), and showed that success-priming enhances the perceived control over the task. Experiment 2 aimed to replicate and extend these findings in two important ways. First, it studies the role of success-priming in a setting in which participants are primed with, and observe the possible effects of their own actions. Second, rather than reporting general perceptions of control, after each effect-priming event participants indicated whether the observed effect was caused by themselves or by another agent (i.e., the computer).

In Experiment 2, participants performed the computer task designed by Aarts, Chartrand et al. (2005) and Aarts et al. (2005) described earlier. As a brief reminder, in this task both the participant and the computer allegedly could have caused a rotating square to stop on a specific position on a display. The stopped position of the square thus could be conceived of as the possible effect resulting from participants' action of pressing a stop-key. Half of the participants were primed with the word "success" at the moment they had to press the stop-key. Furthermore, the possible effect (i.e., stopped position) of participant's action was primed or not just before they had to press the stop-key. Based on previous work (Aarts, Chartrand et al., 2005; Aarts et al., 2005) and the findings of Experiment 1, effect-priming or success-priming or both should increase feelings of authorship. In particular, it was expected that priming effect-specific information prior to performing the action and observing the effect results in relatively high self-perceptions of causation, and priming of success enhances these perceptions if there is no match between the effect-specific expectation and actual effect, i.e., if effect-specific information is not primed.

Method

Participants and design

Fifty-eight undergraduates participated in the study receiving 3 Euros in return. They were randomly assigned to one of two conditions varying type of success-priming: no vs. yes. In addition, all participants were primed with effect information (the stop location) or not, and this factor thus constituted a within-participants variable.

Experimental task and procedure

Participants worked in separate cubicles on the task. They learned that the study was designed to examine people's feelings of personal control and how these feelings come and go. For this purpose, participants had to move a gray square rapidly traversing a rectangular path in a counterclockwise direction by pressing and holding the S-key.

This path consisted of eight white tiles. The computer independently moved another gray square along the path at the same speed, but in the opposite direction (clockwise). At a certain point in time, participants had stop the movement immediately by pressing the Enter-key (for an illustration of the task see Fig. 1). This action turned one of the eight white tiles black, representing the location of either their square or the computer's at the time they pressed stop. Thus, the black square either did or did not represent the effect of their action. Cues for responding were displayed in the middle of the rectangular path. Participants were instructed to keep focused on it during the task. After each stop, participants indicated whether they had caused the square to land on that position or the computer had caused it. This authorship judgment was measured on a 10-point answer scale [*not at all me* (1)—*absolutely me* (10)]. The stopped location was presented twice on each of the eight tiles of the path. The experimental task thus consisted of 16 trials. Trials were randomly presented.

Events in a trial

Each trial started with a warning signal. Next, the message "start" was presented until participants pressed the S-key. One second after they pressed (and held) the S-key, their and computer's square started to move along the path in alternating motion (that is, the squares were displayed one after the other). Squares were displayed for 60 ms on each position. Thus, the speed of one lap was 960 ms [60 ms ∗ 8 positions ∗ 2 (participant's and computer's square)]. The number of laps in a trial that were completed before the message "stop" ("stoppen" in Dutch) appeared could vary between 8 and 10, and was randomly determined by the computer. From the moment that the message "stop" was presented, only the eight empty white tiles were visible until the participant pressed "Enter." On that response, a black square was presented after 100 ms, for one second. The placement of this square was always four positions farther than the last position of the participants' square before the message "stop" had appeared. So, for example, the black square was presented in the right lower corner position after the participant's last square was presented in the left upper corner position; the black square was presented in the right middle position after the participant's last square was presented in the left middle position, etc. Thus, participants did not have actual control, as the position of the black square did not depend on their action.

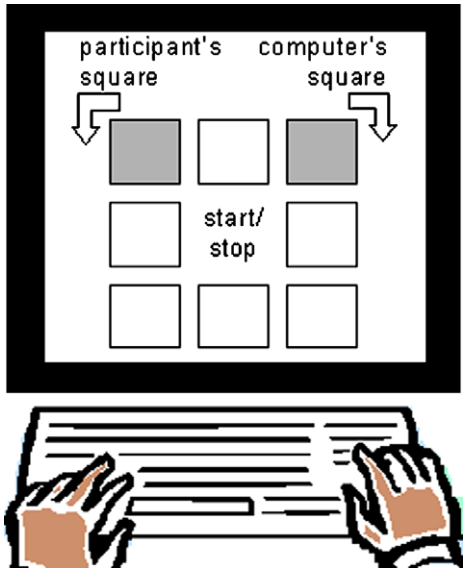

Fig. 1. Illustration of the experimental task showing how the squares move in opposite direction.

Effect-priming

In 8 trials, the black square that would be displayed on a stopped position was flashed on that position before the message "stop." Thus, the primed location always corresponded with the presented location of the black square. The position-prime (e.g., lower corner right) occurred 40 ms after the last presentation of the participant's square (e.g., upper corner left). Position-primes were presented for 34 ms, and were 46 ms later followed by the message "stop" (the total time for the priming event thus is 120 ms). In the no-effect-priming condition the position of the black square was not flashed (the position was presented in white for 34 ms). The priming event was employed for every possible location, resulting in eight replications of the effect-priming condition and the no-effect-priming condition.

Success-priming

In each trial, for half of the participants the word "success" was presented at the moment they had to press the stop key. Specifically, the word "stoppen" was first presented for 100 ms after which "succes" was presented for 23 ms, followed by the word "stoppen." In the no-success-prime condition the prime "beach" was used. The word "stoppen" remained on the screen until participants pressed the ENTER-key.

Measurement of potential control

Participants' potential control over producing the effects was also assessed (Aarts, Chartrand et al., 2005; Aarts et al., 2005). Therefore, the computer measured participants' time (in ms) to push the Enter key in response to the stop-message. Because the location of the black square was always four positions farther than the last presentation of the participant's square, the time from the onset of the last position of the participants' square to the onset of the stop position was 960 ms/2 = 480 ms. Accordingly, the time between the message "stop" and the onset of the presented stop was 300 ms (480 ms minus the 60 ms from the last presentation of the participant's square, and minus 120 ms for the effect-priming event). Therefore, the primary response time required for the participants square to land exactly on the position indicated by the black square at half of its presentation time was 330 ms (300 + 30 ms). For each trial we calculated the absolute difference between the response time after the message to stop and the initial time required

to land exactly on the position of the black square at half of its presentation time (i.e., 330 ms). This way, for each trial a measure of potential control is obtained by estimating how close participants had landed to the presented position. The smaller the absolute difference, the more likely they actually could have caused the square to land on the position.

Measurement of mood

As in the Study 1, the mood-scale was assessed ($\alpha = 0.91$).

Debriefing

As in our earlier work (Aarts, Chartrand et al., 2005; Aarts et al., 2005), debriefing showed that none of the participants had seen the position-primes. They also had not seen the success-primes. Furthermore, none of the participants realized the true nature of the study. One participant indicated to have misunderstood the task instructions, and was omitted from the analyses.

Results and discussion

Effects on experienced authorship

The average ratings of experienced authorship across the 8 no-effect-priming trials and 8 effect-priming trials were subjected to a 2 (Success-priming: no vs. yes) between-participants × 2 (Effect-priming: no vs. yes) within-participants ANOVA. The main effect of effect-priming was reliable, $F(1,55) = 5.14$, $p = .03$, $\eta^2 = .09$; experienced authorship was higher in the effect-priming condition than in the no-effect-priming condition. This effect was qualified by a significant interaction effect, $F(1,55) = 5.79$, $p = .02$, $\eta^2 = .10$. Furthermore, the main effect of success-priming was not reliable, $F < 1.58$. The means of each cell in the design are displayed in Fig. 2.

Follow-up analyses showed that in the no-effect-priming condition experienced authorship was higher in success-priming condition than in the condition where success was not primed, $F(1,55) = 5.90$, $p = .02$, thus replicating the findings of Study 1. However, in the effect-priming condition experienced authorship did not differ reliably between the success-priming and no-success-priming conditions, $F < 1$.

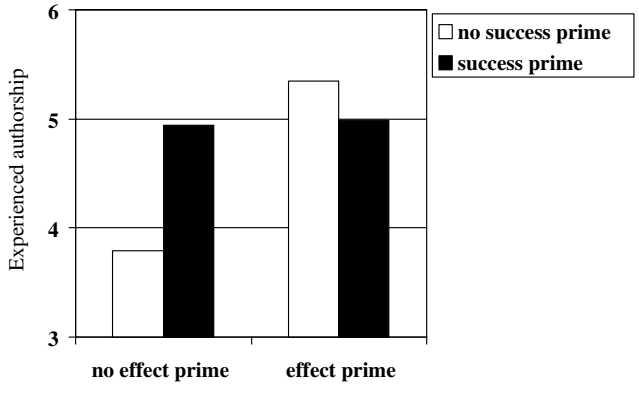

Fig. 2. Mean Authorship ratings as a function of success-primes and action-effect primes.

Comparisons between the effect-priming and no-effect-priming conditions yielded a reliable effect in the no-success-priming group, $F(1,55) = 11.53$, $p = .001$, and a non-significant effect in the success-priming group, $F < 1$.

Potential control

The average absolute difference scores (representing a measure of potential control) across the 8 no-effect-prime trials and 8 effect-prime trials were subjected to the ANOVA. The analysis yielded no reliable effects, Fs < 1.67. The mean absolute difference score was 80 ms ($SD = 29$). These findings indicate that priming did not affect participants' potential control over causing the effects.

Controlling for mood

ANCOVA yielded the same pattern of results after controlling for mood as presented above (including the follow-up analyses), showing that the effects on authorship ascription of success and effect priming were not attributable to changes in subjectively experienced mood.

General discussion

The present study revealed two intriguing findings about the role of implicitly activated information in biasing the experience of authorship of behavioral outcomes. Experiment 1 showed that subliminal priming of the concept of success enhanced the feeling of control in a task where information of effects was absent and control unclear. Experiment 2 replicated these findings in a situation where participants observed potential effects or their actions and the exclusivity of the cause of these effects was ambiguous. Furthermore, this experiment demonstrated that subliminal priming of effect-specific information enhanced the feeling of authorship in all participants, and that success-priming only increased experienced authorship if effect information was not primed. These results thus show that success-priming or outcome-priming or both were sufficient to strengthen feelings of authorship of outcomes that follow from actions to control these outcomes, whereas authorship feelings were relatively low in the absence of these two primes.

The present findings are in line with the suggestion that authorship experiences are driven by an unconscious authorship ascription process (Wegner & Sparrow, 2004) that bias perceptions of controlling effects associated with actions. However, the present data extend this general notion showing how priming of *success* and *effect information* implicitly modulates these self-perceptions. As such, the current studies add new and important insight as to how self-perceptions of control and causation of behavioral outcomes can occur outside a person's awareness.

The observation that effect-priming effects on judgments of personal authorship simulated those of success-priming suggests a common underlying mechanism. As argued in the introduction section, both factors pertain to expectations of a match that may follow from one's own actions.

These expectations may be guided by enhanced accessibility of effect-specific information or the concept of success. In research on human goal-directed behavior, a match between expected and actual goal-states is often conceived of as a successful event (Carver & Scheier, 1998; Geen, 1995; Higgins, 1998). That is, in the case of goal-directed behavior people explicitly look forward to producing the goal-directed effect by performing the proper action. Hence, performance of an action, when properly executed and followed by conscious perception of the effect, is represented in terms of success and expected to be causally related to the effect. Thus, a match between expected and actual action-effect is associated with successful control and, like effect-specific information, the concept of success constitutes a highly relevant cue for a causal link between one's own actions and outcomes.

The present study provides a peek into the unconscious authorship processing of behavioral outcomes. This study still leaves a number of questions open for further examination. First, in the present studies participants were "forced" to produce potential effects and explicitly asked to indicate their feelings of authorship. Accordingly, the present findings do not directly speak to the mechanisms that cause people to more spontaneously establish a sense of authorship. Furthermore, the present data were interpreted as showing evidence for a signal function of expected matches in enhancing authorship feelings that resulted from effect-priming, success-priming or both. However, because this signal function was not directly tested here, future research could explore whether and how this function differ between expectations arising from effect or success priming.

To conclude, the present studies observed that authorship assessment is biased by accessible information that provides cues for a possible link between own actions and observed effects. When we think about a specific effect prior to performing an action and the associated effect occurs we feel more authorship. If a match between expected and actual effects is not directly available, stronger feeling of self-causation may arise from accessible knowledge of success representing general effectiveness of goal-attainment. The unconscious authorship ascription process thus seems to follow basic rules similar to models of goal-directed behavior. Specifically, humans may believe that they can and do control behavioral outcomes because they experience success in attaining intended behavioral outcomes. The present findings suggest, however, that such experiences can occur without intention or actual control, and therefore do not always reflect the true story of life.

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