Apparent Mental Causation

Sources of the Experience of Will

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The experience of willing an act arises from interpreting one's thought as the cause of the act. Conscious will is thus experienced as a function of the priority, consistency, and exclusivity of the thought about the action. The thought must occur before the action, be consistent with the action, and not be accompanied by other causes. An experiment illustrating the role of priority found that people can arrive at the mistaken belief that they have intentionally caused an action that in fact they were forced to perform when they are simply led to think about the action just before its occurrence.

Conscious will is a pervasive human experience. We all have the sense that we do things, that we cause our acts, that we are agents. As William James (1890) observed, "the whole sting and excitement of our voluntary life . . . depends on our sense that in it things are *really being decided* from one moment to another, and that it is not the dull rattling off of a chain that was forged innumerable ages ago" (p. 453). And yet, the very notion of the will seems to contradict the core assumption of psychological science. After all, psychology examines how behavior is caused by mechanisms—the rattling off of genetic, unconscious, neural, cognitive, emotional, social, and yet other chains that lead, dully or not, to the things people do. If the things we do are caused by such mechanisms, how is it that we nonetheless experience willfully doing them?

Our approach to this problem is to look for yet another chain—to examine the mechanisms that produce the experience of conscious will itself. In this article, we do this by exploring the possibility that the experience of will is a result of the same mental processes that people use in the perception of causality more generally. Quite simply, it may be that *people experience conscious will when they interpret their own thought as the cause of their action.* This idea means that people can experience conscious will quite independent of any actual causal connection between their thoughts and actions (cf. Brown, 1989; Harnad, 1982; Kirsch & Lynn, 1997; Langer, 1975; Libet, 1985; Spanos, 1982; Spence, 1996). Reductions in the impression that there is a link between thought and action may explain why people get a sense of involuntariness during motor automatisms, hypnosis, and some psychological disorders. Inflated perceptions of this link, in turn, may explain why people experience conscious will at all—when psychological science suggests that all behavior can be ascribed to mechanisms that transcend human agency.

The Experience of Will

Conscious will is an experience like the sensation of the color red, the perception of a friend's voice, or the enjoyment of a fine spring day. David Hume (1739/1888) appreciated the will in just this way, defining it as "nothing but *the internal impression we feel and are conscious of, when we knowingly give rise to any new motion of our body, or new perception of our mind*" (p. 399). Hume realized that the will, like causal force more generally, is not a thing that inheres in objects or people, but rather is a perception that follows from the constant conjunction of events:

> Some have asserted, that we feel an energy, or power, in our own mind. . . . But to convince us how fallacious this reasoning is, we need only consider, that the will being here consider'd as a cause, has no more a discoverable connexion with its effects, than any material cause has with its proper effect. . . . In short, the actions of the mind are, in this respect, the same with those of matter. We perceive only their constant conjunction; nor can we ever reason beyond it. No internal impression has an apparent energy, more than external objects have. (pp. 400–401)

The person experiencing will, in this view, is in the same position as someone perceiving causation as one billiard ball strikes another. Causation is inferred from the conjunction of ball movements, and will is inferred from the conjunction of events that lead to action. In the case of billiard balls, however, the players in the causal analysis are quite simple: one ball and the other ball. What are the items that seem to click together in our minds to yield the perception of will? One view of this was provided by

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Ziehen (1899), who suggested that thinking of self before action yields the sense of agency. He proposed that "we finally come to regard the ego-idea as the cause of our actions because of its very frequent appearance in the series of ideas preceding each action" (p. 296). Current evidence indicates that self-attention may indeed be associated with perceived control or responsibility for action (Duval & Wicklund, 1973; Gibbons, 1990), but this effect seems to be a general feature of a more specific process.

This specific process is the perception of a causal link between one's own thought and action. It makes sense that we would tend to see ourselves as the authors of an act primarily when we had experienced relevant thoughts about the act at an appropriate interval in advance, and so could infer that our own mental processes had set the act in motion. Actions we perform that are not presaged in our minds, in turn, would appear not to be caused by our minds. In essence, then, this view suggests a connection between what Michotte (1963) identified as the two forms of conscious evidence we have for the causality of self in any action: "The first is our ability to foresee the result before it actually takes place, the second the presence of a feeling of 'activity' " (p. 10). The feeling of activity may derive from the perception of our own foresight.[1]

The important point in this analysis is that the will is not a psychological force that causes action. Rather, as a perception that results from interpretation, it is a conscious experience that may only map rather weakly, or perhaps not at all, onto the actual causal relationship between the person's cognition and action. Thus, as Searle (1983) has put it,

> It is always possible that something else might actually be causing the bodily movement we think the experience [of acting] is causing. It is always possible that I might think I am raising my arm when in fact some other cause is raising it. So there is nothing in the experience of acting that actually guarantees that it is causally effective. (p. 130)

In essence, then, this is an example of the basic disconnection between mental process and the perception and verbal report of that process. As Nisbett and Wilson (1977) have observed, the occurrence of a mental process does not guarantee the individual any special knowledge of the mechanism of this process, and instead it may be that the individual commonly uses a priori causal theories to account for his or her own psychological operations. The conscious will may arise from a theory designed to account for the regular relationship between thought and action.

The possibility that the conscious will does not reflect an actual causal link has been captured in several research findings. Perhaps the most compelling are Libet's (1985) studies of the role of unconscious cerebral initiative in voluntary action. He took advantage of the finding that a brain readiness potential (RP), a scalp-recorded slow negative shift in electrical potential, begins up to a second or more before a self-paced, apparently voluntary motor act (Kornhuber & Deecke, 1965). In spontaneous, intentional finger movement, Libet found that this RP preceded the movement (measured electromyographically) by a minimum of about 550 milliseconds. This finding by itself indicates only that some sort of brain activity reliably precedes the onset of voluntary action. The further step Libet took was to ask participants to recall the position of a clock at their initial awareness of intending to move their finger. The awareness of intention followed the RP by about 350–400 milliseconds, even when adjustment was made for the time it took people to monitor the clock. So, although the conscious intention preceded the finger movement, it occurred well after whatever brain events were signaled by the RP. These findings are compatible with the idea that brain events cause intention and action, whereas conscious intention itself may not cause action.

Another relevant study investigated voluntary finger movement that is accompanied by actual causal forces of which the individual is unaware. Brasil-Neto, Pascual-Leone, Valls-Solé, Cohen, and Hallett (1992) exposed participants to transcranial magnetic stimulation of the motor area of the brain as the participants chose whether to move their right or left index finger. Although participants showed a marked preference to move the finger contralateral to the site stimulated, particularly at short response times, they continued to perceive that they were voluntarily choosing which finger to move. This study did not include

[1] The idea that we can sense our activity directly has been investigated in the study of muscle sense. This literature indicates that the sensation of action effort arises from a combination of inputs, including efference (signals from brain to muscles) and afference (signals from muscles, joints, vision, and other peripheral sites to the brain; cf. Jeannerod, 1997; Scheerer, 1987). However, because conscious will can be experienced for purely mental activities, such as thinking or concentrating, just as surely as it is for physical movement, any analysis of the sensations of muscle activity cannot be the full answer to the question of how we experience conscious will.

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a detailed report of how the experience of voluntariness was assessed, but it is suggestive that the experience of will can proceed independent of actual causal forces influencing a behavior.

There are a variety of other findings that lend themselves to similar interpretations. The striking absence of the experience of will in the case of motor automatisms such as table-turning, Ouija-board spelling, automatic writing, pendulum divining, and the like (cf. Ansfield & Wegner, 1996; Carpenter, 1888; Spitz, 1997; Wegner, in press; Wegner & Fuller, 1999), for example, suggests that there are circumstances that can produce actions with all the signs of voluntariness—but that nonetheless feel unwilled. There also exist neuropsychological anomalies in which people perform voluntary actions while reporting no intention or feeling of will. In the case of alien hand syndrome, for example, a person may experience one hand as acting autonomously, often at cross purposes with conscious intention. Banks et al. (1989) reported such a patient whose "left hand would tenaciously grope for and grasp any nearby object, pick and pull at her clothes, and even grasp her throat during sleep. . . . She slept with the arm tied to prevent nocturnal misbehavior. She never denied that her left arm and hand belonged to her, although she did refer to her limb as though it were an autonomous entity" (p. 456). The sense of will, in short, is a variable quantity that is not tied inevitably to voluntary action—and so must be accounted for as a distinct phenomenon.

A model of a mental system for the production of an experience of conscious will that is consistent with these various findings is shown in Figure 1. The model represents the temporal flow of events (from left to right) leading up to a voluntary action. In this system, unconscious mental processes give rise to conscious thought about the action (e.g., intention, expectation), and other unconscious mental processes give rise to the voluntary action.[2] There may or may not be links between these underlying unconscious systems (as designated by the bidirectional unconscious potential path), but this is irrelevant to the perception of the apparent path from conscious thought to action. There need be no actual path here, as it is the perception of the apparent path that gives rise to the experience of will: When we think that our conscious intention has caused the voluntary action that we find ourselves doing, we feel a sense of will. We have willfully done the act.

The degree of correspondence between the perceived conscious will and the actual mechanisms linking thought and behavior is, of course, an essential problem in its own right, the topic of intriguing theorizing (e.g., Brown, 1989; Dennett, 1984; Libet, 1985; Spence, 1996). But the degree of conscious will that is experienced for an action is not a direct indication of any causal link between mind and action. Rather, our analysis suggests that conscious will results from a causal illusion that is the psychological equivalent of the third-variable problem in causal analysis. We can never be sure that *A* causes *B*, as there could always be a third variable, *C*, that causes both of them. In the same sense, we can never be sure that our thoughts cause our actions, as there could always be unconscious causes that have produced them both. The impression that a thought has caused an action rests on a causal inference that is always open to question—yet this impression is the basis of the experience of will.

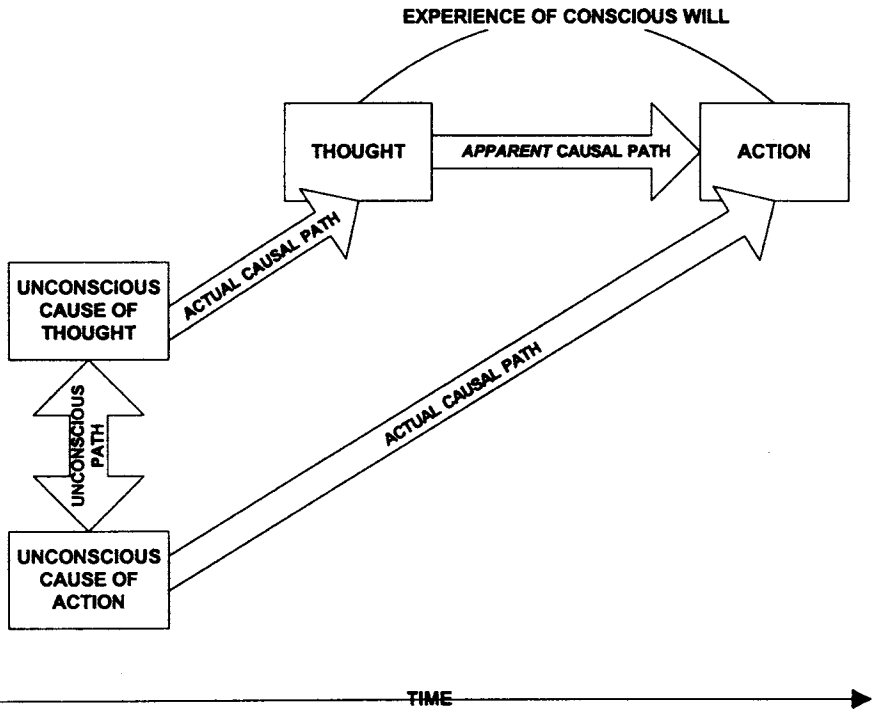
Sources of Experienced Will

Imagine for a moment that you are in a park, looking at a tree. It is a windless day, and yet you get the idea that a particular limb you are gazing at is going to move at just a certain moment. Then it does. Zowie. You look away and then a bit later you look back at the limb and think it is going to move again—and darn it, the thing moves again just in the way you thought it would. At this point, you would probably have the distinct feeling that you are somehow moving the limb. With a tree limb, of course, all this would be quite strange, but in fact, this is the very position we are in with regard to our own limbs, not to mention the rest of our bodies and even our minds. We get ideas of what they are going to do, and when we find that these doings actually occur, we perceive that we have willed the actions.

There are important limits to this effect. If the magic limb moved before we thought of it moving, for example, there would be nothing unusual and we would experience no sense of willful action. The thought of movement would simply be a memory or a perception of what had happened. If we thought of the tree limb moving and then something different moved (say, a nearby chicken dropped to its knees),

[2] Voluntary action is defined here not in terms of perceptions of voluntariness but instead as it is in the animal literature—as behavior that can be initiated or inhibited in response to instruction or reinforcement (e.g., Kimble & Perlmuter, 1970; Passingham, 1993).

Figure 1
A Model of Conscious Will



Note. Will is experienced to the degree that an apparent causal path is inferred from thought to action.

again there would be no experience of will. The thought would be irrelevant. And if we thought of the tree limb moving but noticed that something other than our thoughts had moved it (say, a passing lumberjack), no will would be sensed. There would be only the perception of an external causal event. These observations point to three sources of the experience of conscious will—the *priority, consistency,* and *exclusivity* of the thought we have about the action. The thought should occur before the action, be consistent with the action, and not be accompanied by other potential causes.

Studies of how people perceive physical events (Michotte, 1963) indicate that the perception of causality is highly dependent on these features of the relationship between the potential cause and potential effect. The candidate for the role of cause must come first or at least at the same time as the effect, it must yield movement that is consistent with its own movement, and it must be unaccompanied by rival causal events. The absence of any of these conditions tends to undermine the perception that causation has occurred. Similar principles have been derived for the perception of causality for social and everyday events (Einhorn & Hogarth, 1986; Kelley, 1972, 1980; McClure, 1998) and have also emerged from analyses of how organisms respond to patterns of stimulus contingency in conditioning paradigms (Alloy & Tabachnik, 1984; Young, 1995). The application of these principles to the experience of conscious will provides a context for explaining the phenomena of volition across a number of areas of psychology.

Priority: The Thought Should Precede the Action at a Proper Interval

Causal events precede their effects, usually in a timely manner. So, for example, in Michotte's (1963) studies of cause perception, when one object moves along and appears to strike another, which then immediately begins to move in the same direction, people perceive a causal event. The first object has launched the second. If the second object sits there for a bit after the first has touched it, however, and only then begins moving, the sense that this is a causal event is lost, and the second object is perceived to have started moving on its own. Then again, if the second object begins to move before the first even comes to touch it, the perception of causation is also absent. To be perceived as a truly worthy cause, the event can't start too soon or start too late—it has to be on time just before the effect.

These observations suggest that the experience of will may also depend on the timely occurrence of thought prior to action. Thought that occurs too far in advance of an action is not likely to be seen as the cause of it; a person

who thinks of dumping a bowl of soup on her boss's head, for example, and then never thinks about this again until doing it some days later during a quiet dinner party is not likely to experience the action as willful. Thought that occurs well after the relevant action is also not prone to cue an experience of will. The person who discovers having done an act that was not consciously considered in advance—say, getting in the car on a day off and absently driving all the way to work—would also feel little in the way of conscious will.

Somewhere between these extreme examples exist cases in which conscious will is regularly experienced. Little is known about the parameters of timing that might maximize this experience, but it seems likely that thoughts occurring just a few seconds before an action would be most prone to support the perception of willfulness. Thoughts about an action that occur earlier than this might not be linked with the action in a perceived causal unit (Heider, 1958) because thought and act were not in mind simultaneously. The time it usually takes the mind to wander from one topic to another could be the basic limit, then, for experiencing intent as causing action. The mind does wander regularly (cf. Pöppel, 1997; Wegner, 1997); for example, a reversible figure such as a Necker cube that is perceived from one perspective will naturally tend to change to the other in about three seconds (Gomez, Argandona, Solier, Angulo, & Vazquez, 1995). Such wandering suggests that a thought occurring under three seconds prior to action could stay in mind and be linked to action, whereas a thought occurring before that time might shift to something else before the act (in the absence of active rehearsal, at any rate) and so undermine the experience of will.

Another estimate of the maximum interval from intent to action that could yield willfulness is based on short-term memory storage time. The finding of several generations of research is that people can hold an item in mind to recall for no longer than about 30 seconds without rehearsal and that the practical retention time is even shorter when there are significant intervening events (Baddeley, 1986). If the causal inference linking thought and act is primarily perceptual, the shorter (3 seconds) estimate based on reversible figures might be more apt, whereas if the causal inference can occur through paired representation of thought and act in short-term memory, the longer estimate (30 seconds) might be more accurate. In whatever way the maximum interval is estimated, though, it is clear that there is only a small window prior to action in which relevant thoughts must appear if the action is to be felt as willed.

This brief window reminds us that even long-term planning for an action may not produce an experience of will unless the plan reappears in mind just as the action is performed. Although thinking of an action far in advance of doing it would seem to be a signal characteristic of a premeditated action (cf. Brown, 1996; Vallacher & Wegner, 1985), our analysis suggests that such distant foresight yields less will perception than does immediately prior apprehension of the act. In the absence of thought about the action that occurs just prior to its performance, even the most distant foresight would merely be premature and would do little to promote the feeling that one had willed the action. In line with this suggestion, Gollwitzer (1993) has proposed that actions intended far in advance to correspond with a triggering event (e.g., "I'll go when the light turns green") may then tend to occur automatically without conscious thought, and thus without a sense of volition, when the triggering event ensues.

The priority principle also indicates that thoughts coming after action will not prompt the experience of will. But again, it is not clear just how long following action the thought would need to occur for will not to be experienced. One indication of the lower bound for willful experience is Libet's (1985) observation that in the course of a willed finger movement, conscious intention precedes action by about 200 milliseconds. Perhaps if conscious thought of an act occurs past this time, it is perceived as following the act, or at least as being too late, and so is less likely to be seen as causal. Studies of subjective simultaneity have examined the perceived timing of external events and actions (e.g., McCloskey, Colebatch, Potter, & Burke, 1983), but research has not yet tested the precise bounds for the perception of consecutiveness of thought and action. Researchers do know, however, that people benefit from even minimal priority information in making causal inferences, beyond the mere association of events (see Young, 1995, for a review). It seems safe to say that thoughts occurring some seconds or minutes after an action would rarely be perceived as causal—and could thus not give rise to an experience of will during the action.

There are, of course, exceptions to the priority principle. Most notably, people may sometimes claim their acts were willful even if they could only have known what they were doing after the fact. These exceptions have been widely investigated for the very reason that they depart from normal priority. Such postaction justification is the central phenomenon of the theories of cognitive dissonance (Festinger, 1957) and self-perception (Bem, 1972), in which people change their attitudes to be consistent with willful action even when the action was not intended. Postaction presumptions of prior intention occur in young children (Schult, 1996), in adults whose actions are disrupted (Wegner, Vallacher, Macomber, Wood, & Arps, 1984), and under certain conditions in commissurotomized patients (Gazzaniga, 1983). These findings indicate that priority of intent is not the only source of the experience of will and that other sources of the experience (such as consistency and exclusivity) may come forward to suggest willfulness even when priority is not present.

Consistency: The Thought Should Be Compatible With the Action

When a billiard ball strikes another, the struck ball moves in the same general direction that the striking ball was moving. We do not perceive causality very readily if the second ball takes off in a direction that, by the laws of physics, is inconsistent with the movement of the first (Michotte, 1963). In the social attribution realm, too, consistency is evident in the inclination perceivers have to

attribute causality for behaviors to people whose personalities are seen as consistent with the behaviors (e.g., Jones & Davis, 1965). Causes consistent with effects are more likely to be perceived as causal (Einhorn & Hogarth, 1986; Nisbett & Ross, 1980).

The principle of consistency in the experience of will draws on the observation that the thoughts that serve as potential causes of actions typically have semantic associations with the actions. A thought that is perceived to cause an act is often the name of the act or an image of its stimulus, execution, or consequence (Vallacher & Wegner, 1985). Consistency of thought and act depends on a cognitive process whereby the thoughts occurring prior to the act are compared with the act as subsequently perceived. When people do what they think they were going to do, there exists consistency between thought and act, and the experience of will is enhanced. When they think of one thing and do another—and this inconsistency is observable to them—their action does not feel as willful.[3]

A number of empirical demonstrations of this phenomenon appear in studies of the perception of contingency between behavior and outcomes (e.g., Alloy & Tabachnik, 1984; Jenkins & Ward, 1965). One such demonstration comes from the observation that when people perform a task that could result in success or failure, they typically envision success. Thus, when success occurs, the consistency between the prior thought and the observed action produces an experience of will. So, for example, Langer and Roth (1975) found that people were likely to perceive that they controlled a chance event when they received a large number of initial successes in predicting that event. Jenkins and Ward (1965) similarly found that the perception that one is causing a successful outcome is enhanced merely by the increased frequency of that outcome. It makes sense, then, that depressed individuals—who think less often of success—are not as likely as others to overperceive control of successful outcomes (Alloy & Abramson, 1979). It might even be that in those instances when people really do expect the worst and so think about it as they act, they might have a perverse experience of conscious will when the worst happens.

The consistency principle also extends to more arcane and puzzling cases of the loss of will. Motor automatisms such as dowsing, for example, appear to derive their lack of perceived voluntariness from the inconsistency of thought and action. People who have dowsed for water with a forked stick often report that the stick moves by itself rather than by their will. In the classic study of this phenomenon, Vogt and Hyman (1959) observed that a person holding a Y-shaped dowsing rod in both palms typically moves the wrists together or apart and that this produces pressure on the rod that can yield rapid upward or downward rotation of the rod's point. The movement of the rod is hard to predict from the movement of one's wrists, however, and thus people readily lose track of the relationship between their intention and what they find themselves doing. This leads to the sense of involuntariness. Another sort of dowsing device is the L rod, which is held in a pistol grip and swivels inside a tube held in the palm, ostensibly to point toward water or lost objects. Again, the translation from variations in levelness of the hand to the rotation of the rod yields confusion that makes it difficult to sense one's own causal role. Tracing back from the movement, one cannot find a prior thought in memory that is consistent with the movement and that so could have caused it. The movement of the rod is then attributed to forces outside the self that presumably have knowledge that is guiding the movement.

The Chevreul pendulum is another automatism that depends on obscuring the relationship between intention and action. When people hold a bob on a chain in one hand, they often get the sense that the pattern or frequency of the pendulum movement is occurring without their volition (Ansfield & Wegner, 1996; Carpenter, 1888). Occult guidance is sometimes attributed to the pendulum as a result, or the movement is interpreted as caused by the person's unconscious. Typically, however, the pendulum tends to move as the person expects it to move (Easton & Shor, 1975) and is particularly likely to do this when the person is trying to prevent the expected movement (Wegner, Ansfield, & Pilloff, 1998).

The perceived involuntariness of the movement seems to derive from thought–action inconsistency arising in the sheer unwieldiness of the pendulum. Moving the hand in one direction produces an impulse to the pendulum in the opposite direction, so the control of the movement is like trying to write while looking at one's hand in a mirror. And once a movement gets started, it seems difficult to know just what needs to be done to stop it. How do you stop a pendulum that is swinging in an oval? For that matter, even slight errors of timing can cause one's attempts to stop the pendulum to start it instead, and in just the wrong direction. The lack of consistency between intention and action of the pendulum promotes the sense that the pendulum's movement is not controlled by the will. The involuntariness of a variety of the motor automatisms appears traceable to movement confusion that interferes with perceptions of consistency (Wegner, in press).

The consistency principle also offers a way of understanding the experiences of involuntariness reported by people with some forms of schizophrenia. Phenomena of alien control such as thought insertion and auditory hallucinations that can occur in schizophrenia involve thoughts, images, and actions that occur with marked feelings of unintendedness. In the case of hearing voices, for example, although neuropsychological evidence indicates that the voices are self-generated (e.g., McGuire, Shah, & Murray, 1993), schizophrenic patients with this symptom describe the voices as coming from someone other than themselves. Hoffman (1986) has proposed that this experience occurs when people find that their thoughts do not match their current conscious goals for thinking. The thoughts come to mind without a clear preview, and in fact may be highly

[3] Some kinds of behavior may be outside the range of plausible voluntary action. Behaviors such as tics or reflexes may not be felt as willful even with consistent prior thoughts (e.g., "I believe I'm going to sneeze"), perhaps because the person has learned that such behaviors typically occur without thoughts.

discordant with the person's thoughts of what to think or say next. In the context of a conversation about the weather, for example, the person might experience the thought "Eat the wax fruit." The inconsistency produces such a strong sense that the self did not will the thought that the thought is judged to be the action of an outside agent—and so is heard as a "voice."

These experiences may be particularly profound in schizophrenia because of a specific deficit in prospective memory for intention. Studies of the relationship between thought and motor control have suggested that thoughts of what one is doing are poorly represented in some forms of schizophrenia. Malenka, Angel, Hampton, and Berger (1982) found that people with schizophrenia have trouble correcting their own movement errors without visual feedback, perhaps because of the absence of a concurrent mental representation of the movement. Frith and Done (1989) suggested that such problems in "central monitoring" might underlie experiences of alien control. They found that schizophrenic individuals who report alien control experiences, as compared with those without such experiences, were less able to correct their movement errors on a video game in the absence of visual feedback. Apparently, they didn't know what they were doing.

A deficit in the mental representation of action that occurs during the action, then, may yield profound disturbance in conscious will. Without a thought in mind that is consistent with the observed action, and presented instead with inconsistency, the individual may be placed in the position of feeling that the self could not have performed the action. The next step that occurs when will is not experienced, then, may be the inference that some other agent must be responsible. This inference anticipates a third principle of the experience of will, to which we now turn.

Exclusivity: The Thought Should Be the Only Apparent Cause of Action

A basic principle of causal inference is that we tend to discount the causal influence of one potential cause if there are others available (Kelley, 1972; McClure, 1998). So, for instance, in the case of those well-worn billiard balls, the causal influence of one on another can be called into question by the arrival of a third just at the time of impact. Applied to the experience of will, this principle suggests that people will be particularly sensitive to the possibility that there are other causes of an action besides their own thoughts. When their own thoughts do not appear to be the exclusive cause of their action, they experience less conscious will. And when other plausible causes are less salient, in turn, they experience more conscious will.

The causes that compete with thoughts are of two kinds—internal and external. The plausible internal causes for an action might include one's emotions, habits, traits, or other unconscious action tendencies. Whenever we become aware of one of these unconscious tendencies, we may lose some of the sense of will even though we have a prior, consistent thought of the action. Knowing that we are going to eat a large bag of potato chips may not contribute to the sense that this is willful when we do it, for example, if we also realize that we are big, fat, compulsive chip-hounds. At the same time, if a thought not to eat those chips occurs and does predict effective abstinence, the precedence of this thought over our disposition toward free feeding may lead us to feel that a special surge of will has caused our successful self-control. The experience of will may arise both in thoughts that initiate behaviors and in thoughts that stop them—and may be particularly strong when we find that thoughts consistent with stopping a behavior seem to have overridden a pressing impulse and kept the behavior from occurring.

The exclusivity of thought as a cause of action can also be challenged by external causes. Plausible external causes for an action might include other people or external forces that impinge on us even when we are thinking of the action in advance. The extensive contemporary literature on causal attribution in social situations (e.g., Gilbert, 1995) has suggested that the presence of others and of situational forces provides an intricate causal context that could influence the individual's experience of will in a variety of ways. Other people with whom we interact, of course, are also thinking and acting, so our perceptions of the causal relations between their thoughts and actions can enter into our interpretation of their willfulness, which may, then, have implications for the degree to which our behavior in interaction with them is interpreted as willful as well.

The interplay of these factors in the experience of will is illustrated in the phenomenon of action projection (Wegner & Fuller, 1999). Action projection occurs when a person performs a voluntary action and yet believes that this action was done by someone else. Although such an error sounds bizarre, it turns out the effect can be produced readily. The initial indications of this effect were found in the practice of facilitated communication, a technique of helping people with communication disorders to communicate by holding or bracing their hands while they are at a computer keyboard. Although such facilitation does not actually promote accurate communication (Jacobson, Mulick, & Schwartz, 1995; Spitz, 1997; Twachtman-Cullen, 1997), it does leave people who have served as facilitators with the profound sense that they have helped someone to communicate—even though the content that is communicated is fully traceable to the facilitator (Burgess et al., 1998).

To assess action projection more directly, Wegner and Fuller (1999) asked college student participants to attempt to "read the unconscious muscle movements" of a confederate participant whose fingers were placed atop their own on "yes" and "no" response keys. The participant then heard easy yes–no questions (e.g., "Is the capital of the United States Washington, DC?") while under the impression that the confederate was also hearing them, and the participant was asked to answer by pressing keys for the confederate. The confederate actually heard no questions at all, and so made no relevant movements, but participants nonetheless answered correctly 87% of the time and attributed 37% of the influence for the answers to the confeder-

ate. They answered correctly, in other words, but did not have a strong sense of willfully having done so and instead thought the confederate had played a significant part. The pattern of findings across six experiments suggests that the correct answers are produced automatically. The participants do not discern that their thoughts are the cause of these answers, however, because they were led to believe that the confederate was a plausible cause. In short, the lack of exclusivity helped to undermine the experience of conscious will.

Ambiguous exclusivity may also underlie the sense of involuntariness that occurs in hypnosis. As a rule, there is a common sensation among people who are hypnotized that their suggested behaviors occur without conscious will (Lynn, Rhue, & Weekes, 1990). When people are induced to experience arm levitation ("Your arm feels very light, and it is rising up, rising up"), for example, in addition to the arm actually rising, people often report that it does so without benefit of their conscious will. Although people who experience involuntariness indeed have thoughts of what their arm will do that are consistent with their action and prior to their action, they may well be having trouble discerning whether those thoughts are the exclusive cause of the action.

People in hypnosis consent to follow instructions from the hypnotist, so their thoughts do not appear as the exclusive cause of their actions. But unlike everyday social interaction, in which people typically can follow instructions without losing the sense of will, it seems that the process of hypnosis undermines will perception. To understand this, it is useful to note that in hypnotic induction, the hypnotist suggests a series of actions, many of which are difficult to perceive in oneself (e.g., "try to relax") and many of which are so innocuous that the person sees no difficulty in complying (e.g., "close your eyes"). Each time the hypnotist gives an instruction, the person then thinks about that action and subsequently performs the action or receives no bodily feedback to the contrary. Over the course of several repetitions, it could be that the hypnotist's suggestions come to be interpreted as the primary causes of the person's behavior, and the person's thoughts as only echoes of what the hypnotist has said.

This analysis suggests that people in hypnosis come to interpret their thoughts as only part of a causal chain, rather than as the immediate cause of their actions. There is evidence of a general tendency to attribute greater causality to earlier rather than later events in a causal chain—a causal primacy effect (Johnson, Ogawa, Delforge, & Early, 1989; Vinokur & Ajzen, 1982). Moreover, this effect may gain influence with repetition of the sequence (Young, 1995). The development of involuntariness in hypnosis may occur, then, through the learning of a causal interpretation for one's action that leaves out any role for one's own thoughts. This view is consistent with the longstanding notion that hypnosis is an interpretive exercise in which people are encouraged to view their actions as events caused by the hypnotist rather than by their own thoughts (Bowers, 1992; Kihlstrom, 1985; Kirsch & Lynn, 1997). As suggested by Spanos (1982), "Interpreting behavior as an action involves attributing causality to the self (e.g., I did it), while interpreting it as a happening requires that causality be attributed to sources other than the self (e.g., It happened to me)" (p. 200).

The problem of understanding "whodunit" is an important one in social life more generally, and it often amounts to sorting out matters of exclusivity. As long as there are other possible agents around, whether real or imagined, one's actions may at times be attributed to them, and fluctuations in the sense of one's own will may follow. This is what Milgram (1974) was speaking of in his suggestion that obedience to authority is accompanied by an *agentic shift,* a change in the perceived source of agency for actions that occur when one obeys another. A further complication arising in dyads and groups is that a group level of agency may also be constructed, such that there are things "we" do independent of what "you" do or what "I" do. One might experience the will of one's group rather than that of the self, for example, as a result of knowing that the group was thinking of doing something and that the group action had ensued. The computation of will in social life begins with the principle of exclusivity, but then blossoms into a variety of interesting formats quite beyond the basic sense of self as agent.

An Illustrative Experiment: The *I Spy* Study

If will is an experience fabricated from perceiving a causal link between thought and action, it should be possible to lead people to experience willful action when in fact they have done nothing. We conducted an experiment to learn whether people will feel they willfully performed an action that was actually performed by someone else when conditions suggest their own thought may have caused the action. The study focused on the role of priority of thought and action when there is consistency between the thought and action and when the exclusivity of thought as a cause of action is ambiguous. To create this circumstance, we were inspired by the ordinary household Ouija board. We tested whether people would feel they had moved a Ouija-like pointer if they simply thought about where it would go just in advance of its movement—even though the movement was in fact produced by another person.

Undergraduates (23 men and 28 women) from the University of Virginia participated in exchange for credit in introductory psychology. Each arrived for the experiment at about the same time as a confederate who was posing as another participant. Both were greeted by the experimenter and seated facing each other across a small table. On the table between them was a 12-centimeter square board, mounted atop a computer mouse. Both participant and confederate were asked to place their fingertips on the side of the board closest to them (see Figure 2) so that they could move the mouse together. They were asked to move the mouse in slow sweeping circles and, by doing so, to move a cursor around a computer screen, which was visible to both. The screen showed a photo called "Tiny Toys" from the book *I Spy* (Marzollo & Wick, 1992), picturing about 50 small objects (e.g., plastic dinosaur, swan, car).

Figure 2
Experimental Setting for the I Spy *Study*

The experimenter explained that the study would investigate people's feelings of intention for acts and how these feelings come and go. It was explained that the pair were to stop moving the mouse every 30 seconds or so and that they would rate each stop they made for personal intentionality. That is, they each would rate how much they had intended to make each stop, independent of their partner's intentions. The participant and confederate made these ratings on scales, which they kept on clipboards in their laps. Each scale consisted of a 14-centimeter line with endpoints *I allowed the stop to happen* and *I intended to make the stop,* and marks on the line were converted to percentage intended (0–100).

The participant and confederate were told that they would hear music and words through headphones during the experiment. Each trial would involve a 30-second interval of movement, after which they would hear a 10-second clip of music, which would indicate that they should make a stop. They were told that they would be listening to two different tracks of an audio tape, but that they would hear music at about the same times and should wait a few seconds into their music before making the stops to make sure they both were ready. Participant and confederate were also told that they would hear words over the headphones, ostensibly to provide a mild distraction and that the reason for the separate audio tracks was so that they would hear different words. To emphasize this point, the experimenter played a few seconds of the tape and asked the participant and confederate which word they heard in their headphones. The confederate always reported hearing a different word from the participant. Thus, participants were led to believe that the words they heard were not heard by the confederate.

The words served to prime thoughts about items on the screen for the participant (e.g., "swan"), and one was presented for each trial. The confederate, on the other hand, heard neither words nor music, but instead heard instructions to make particular movements at particular times. For four of the trials, the confederate was instructed to move to an object on the screen. A countdown followed until the time the confederate was to stop on the object. These forced stops were timed to occur midway through the participant's music. Each of these stops (e.g., to land on the swan) was timed to occur at specific intervals from when the participant heard the corresponding word (i.e., "swan"). The participant heard the word consistent with the stop either 30 seconds before, 5 seconds before, 1 second before, or 1 second after the confederate stopped on the object. By varying the timing, we thus manipulated priority. Each of these four stops was on a different object. These forced stops were embedded in a series of other trials for which the confederate simply let the participant make the stops.[4] For these unforced stops, the participant heard a word 2 seconds into the music, whereas the confederate did not hear a word. The word corresponded to an object on the screen for about half of these trials, and was something not on screen for the others.

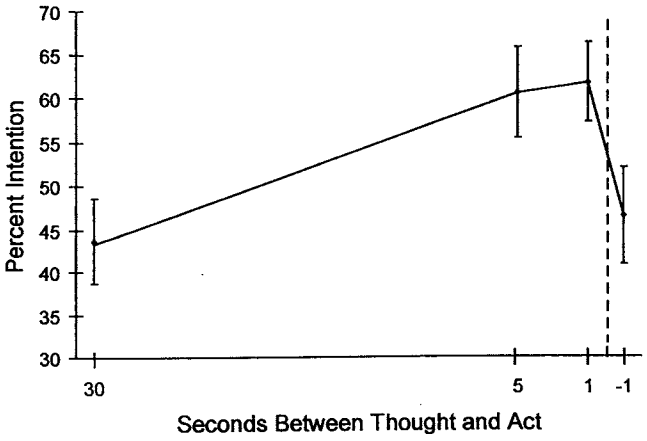
[4] There were 23 embedding trials for the first 17 participants, and 32 for the remaining participants.

We performed an initial analysis of the unforced stops to see whether participants might naturally stop on the primed objects when the confederate could not have participated. If such an effect were observed, it would suggest that participants might also have played some part in the forced stops—and we wished to assess this. Distances between stops and objects on the screen were computed for all unforced stops (i.e., all trials in which the confederate heard no instruction and simply let the participant make the stop). The mean distance onscreen between the stop and an object (e.g., dinosaur) was measured separately for stops when that object was the primed word and for stops when the primed word was something not shown onscreen (e.g., "monkey"). The mean distance between stop and object when the prime word referred to the object was 7.60 centimeters (SD = 1.85), and this was not significantly closer than the distance of 7.83 centimeters (SD = 0.82) when the prime word did not refer to the object, $t(50) = 0.86$, $p = .39$. Thus, simply hearing words did not cause participants to stop on the items. The forced stops created by the confederate were thus not likely to have been abetted by movement originated by the participant.

On the forced stops, a pattern of perceived intention emerged as predicted by the priority principle. Although there was a tendency overall for participants to perceive the forced stops as intended (M = 52%, SD = 23.95), there was a marked fluctuation in this perception depending on when the prime word occurred. As shown in Figure 3, perceived intentionality was lower when the prime word appeared 30 seconds before the forced stop, increased when the word occurred 5 seconds or 1 second before the stop, and then dropped again to a lower level when the word occurred 1 second following the stop. This quadratic polynomial effect was significant in an analysis of variance, $F(1, 47) = 5.00$, $p < .05$, whereas other polynomial effects were not.[5] Compared with trials when thought consistent with the forced action was primed 30 seconds before or 1 second after the action, there was an increased experience of intention when the thought was primed 1–5 seconds before the forced action. The mean percentage of intention reported on all the unforced stops—when participants were indeed free to move the cursor anywhere—was 56.09 (SD = 11.76), a level in the same range as that observed for the forced stops in the 1-second and 5-second priming trials.

In postexperimental interviews, we learned that participants often searched for items onscreen that they had heard named over their headphones. Perhaps this sense of searching for the item, combined with the subsequent forced stop on the item, was particularly helpful for prompting the experience of intending to stop on the item. We do not know from these data just what feature of having the object in mind prior to the forced stop produced the sense of will, but it is clear that the timing of the thought in relation to the action is important. When participants were reminded of an item on the screen just 1 or 5 seconds before they were forced to move the cursor to it, they reported having performed this movement intentionally. Such reminding a full 30 seconds before the forced movement or 1 second after the movement, in turn, yielded less of this sense of intentionality. The parallel observation that participants did not move toward primed objects on unforced trials suggests that participants were unlikely to have contributed to the movement on the forced trials. Apparently, the experience of will can be created by the manipulation of thought and action in accord with the principle of priority, and this experience can occur even when the person's thought cannot have created the action.

Figure 3
Mean Percentage of Intentionality Rated for Forced Stops on Objects Primed 30 Seconds Before, 5 Seconds Before, 1 Second Before, or 1 Second After the Stop



Note. Error bars are standard errors.

Conclusion: Real and Apparent Mental Causation

The experience of will is like magic. As Harold Kelley (1980) observed, a magic trick involves disguising a real causal sequence (e.g., a rabbit is placed in the hat when the audience is looking elsewhere) and presenting instead an apparent causal sequence (i.e., a nice floppy-eared bunny is extracted from an empty hat). The magician creates the

[5] It was sometimes hard for the confederate to force a stop (e.g., the cursor was far from the object or just passing the object), and trials on which the appropriate stop could not be forced were not included in the analysis. Stops for which the forced object turned out not to be the closest object to the cursor were also excluded. Because of the sporadic nature of the missing data, only 27–40 responses from the 51 participants were valid at each time point (and only eight participants had valid responses across all four trials). Thus, a standard analysis of variance estimation routine was not possible. Instead, we used a structural equation modeling algorithm that assumes the data were missing at random. The model we estimated placed each participant in a group based on his or her pattern of missing data and estimated the polynomial effects as invariant across all groups (see McArdle & Hamagami, 1992).

illusion by managing events so that the apparent causal sequence is far more conspicuous than the real one. The experience of conscious will is a comparable illusion produced by the perception of an apparent causal sequence relating one's conscious thought to one's action. In reality, this may not be the causal mechanism at all.

The real and apparent causal sequences relating thought and action probably do tend to correspond with each other some proportion of the time. After all, people are pretty good information processors when given access to the right information. The occurrence of conscious intention prior to action provides a fine clue as to how things that are on the person's mind might pertain to what the person does. In fact, the mental system that introduces thoughts of action to mind and keeps them coordinated with the actions is itself an intriguing mechanism. However, if as we suggest, conscious will is an experience that arises from the interpretation of cues to cognitive causality, then apparent mental causation is generated by an interpretive process that is fundamentally separate from the mechanistic process of real mental causation. The experience of will can be an indication that mind is causing action, especially if the person is a good self-interpreter, but it is not conclusive.

The experience of will is the way our minds portray their operations to us, then, not their actual operation. Because we have thoughts of what we will do, we can develop causal theories relating those thoughts to our actions on the basis of priority, consistency, and exclusivity. We come to think of these prior thoughts as intentions, and we develop the strong sense that the intentions have causal force even though they are actually just previews of what we may do. The real causal mechanism is the marvelously intricate web of causation that is the topic of scientific psychology. The sense of will is not directly connected to this web and instead is an expression of our tendency to take what Dennett (1987) has called an "intentional stance" toward people. The intentional stance involves viewing psychological causation not in terms of causal mechanism but rather in terms of agents who have desires and beliefs that cause their acts. Conscious will is part of the process of taking an intentional stance toward oneself.

This analysis suggests that the real causal mechanisms underlying behavior are never present in consciousness. Rather, the engines of causation are unconscious mechanisms of mind. Much of the recent research suggesting a fundamental role for automatic processes in everyday behavior (e.g., Bargh, 1997) can be understood in this light. The real causes of human action are unconscious, so it is not surprising that behavior could often arise—as in automaticity experiments—without the person having conscious insight into its causation. Conscious will arises from a set of processes that are not the same as those that cause the behavior to which the experience of will pertains, however, so even processes that are not automatic—mental processes described as "controlled" (Posner & Snyder, 1975) or "conscious" (Wegner & Bargh, 1998)—have no direct expression in a person's experience of will. These processes may be less efficient than automatic processes and require more cognitive resources, but even if they occur along with an experience of control or conscious will, this experience is not a direct indication of their real causal influence.[6]

The unique human convenience of conscious thoughts that preview our actions gives us the privilege of feeling we willfully cause what we do. In fact, unconscious and inscrutable mechanisms create both conscious thought about action and create the action as well, and also produce the sense of will we experience by perceiving the thought as the cause of action. So, although our thoughts may have deep, important, and unconscious causal connections to our actions, the experience of conscious will arises from a process that interprets these connections, not from the connections themselves. Believing that our conscious thoughts cause our actions is an error based on the illusory experience of will—much like believing that a rabbit has indeed popped out of an empty hat.

[6] The experience of conscious will may be more likely to accompany inefficient processes than efficient ones because there is more time available prior to action for inefficient thoughts to become conscious, so as to prompt the formation of causal inferences linking thought and action. This might explain why controlled or conscious processes are often linked with feelings of will, whereas automatic processes are not.

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