Journal of Experimental Social Psychology 46 (2010) 350–355

Contents lists available at ScienceDirect

Journal of Experimental Social Psychology

journal homepage: www.elsevier.com/locate/jesp

Reports

Doubting one's doubt: A formula for confidence?

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ARTICLE INFO

Article history:
Received 9 October 2008
Revised 9 October 2009
Available online 31 October 2009

Keywords:
Meta-cognition
Embodiment
Uncertainty
Self-doubt
Confidence

ABSTRACT

People feel, think, and act differently when doubt rather than confidence is accessible. A traditional perspective on the accessibility of doubt holds that multiple sources of doubt activation should lead to increased levels of uncertainty. In contrast, we find that under some conditions two sequential sources of doubt activation result in *decreased* levels of uncertainty. We suggest that this follows from a meta-cognitive process in which people come to "doubt their doubt." In Study 1, individuals with chronically accessible uncertainty who were further exposed to an uncertainty manipulation paradoxically reported reduced uncertainty. In Study 2, participants were first primed with doubt or certainty and then exposed to a manipulation associated with either confidence (i.e., head nodding) or doubt (head shaking). Supporting the idea that people can either trust or doubt their own doubts, head nodding (vs. shaking) accentuated (vs. attenuated) the impact of the initial doubt vs. certainty manipulation. These findings advance the literature on meta-cognition, self-doubt, and embodiment, and may have clinical applications.

Doubt can be paralyzing, and often is associated with other negative consequences as well. For instance, those high in self-doubt or uncertainty about the causes of events exhibit greater symptoms of depression (see Weary, Tobin, and Edwards (2010), for a review). Social anxiety also is associated with self-doubt (e.g. Oleson, Poehlmann, Yost, Lynch, & Arkin, 2000).[1] Because uncertainty often is an undesirable state of mind, people who feel uncertain spend considerable effort attempting to manage these feelings. For example, self-handicapping (Berglas & Jones, 1978), procrastination (e.g. Van Eerde, 2000), defensive pessimism (Norem & Cantor, 1986), and intense information processing (Briñol, Petty, & Wheeler, 2006) all can be considered to stem from doubt management efforts (Wichman & Hermann, 2010). Given its many effects, it is unsurprising that uncertainty is of interest in domains of psychology ranging from decision making (Griffin & Tversky, 1992) to self-efficacy (e.g. Bandura, 1997) to attitudes and persuasion (Gross et al., 1995; Tormala & Rucker, 2007).

Uncertainty can be conceptualized in a variety of ways. If uncertainty is treated as a perceived trait held by a person, it is considered a primary cognition. An example of this would be: "I am doubtful." In this role as a primary cognition, uncertainty operates much as any belief about a trait would (e.g. I am intelligent.) However, in addition to serving as a primary cognition, uncertainty can play an important role as a secondary cognition. A secondary cognition is a cognition about a primary cognition. For example, a person might think: "I am uncertain about my intelligence." In this case, uncertainty exerts its influence as a secondary cognition to cause doubt in one's personal belief of intelligence. In general, secondary cognitions can have considerable impact on how people use their primary cognitions (see Petty, Briñol, Tormala, and Wegener (2007), for a review). Logically, the meta-cognitive meaning of the secondary cognition for the primary cognition will vary, depending on the contents of the respective cognitions (e.g. being uncertain or certain about one's intelligence).

A general framework for understanding many effects of uncertainty and confidence is provided by the *self-validation hypothesis* (Petty, Briñol, & Tormala, 2002). The self-validation hypothesis holds that uncertainty or confidence has its impact on whatever cognitions are accessible. A general principle of meta-cognition is that uncertainty attenuates the influence of accessible primary cognitions on judgment whereas confidence amplifies their influence (Clarkson, Tomala, & Rucker, 2008; Petty et al., 2007). To date, studies on self-validation have shown that inducing confidence in *positive* primary cognitions strengthens their impact and thereby produces more positive evaluations than inducing doubt. By the same token, inducing confidence in *negative* primary cognitions strengthens their impact and produces more negative evaluations than inducing doubt (see Briñol and Petty (2009), for a review).

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[1] The terms confidence and certainty as well as doubt and uncertainty are treated as synonyms in the literature (e.g. Gross, Holtz, & Miller, 1995; Tormala & Rucker, 2007), and we use them interchangeably here as well.

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doi:10.1016/j.jesp.2009.10.012

This meta-cognitive approach suggests an intriguing possibility. What happens if both primary and secondary cognitions are about doubt? That is, a doubtful person exposed to an uncertainty induction paradoxically might feel *less* uncertain than a person with the same level of initial doubt who received no additional uncertainty activation. If doubt is either chronically or situationally active as a primary cognition, it presumably could be impacted by secondary doubt in the same way as any other primary cognition. Secondary doubt might *undermine* rather than enhance primary doubt. People may be able to "doubt their doubt."

This proposal is a departure from traditional thinking about cognitive content activation. The traditional approach is that multiple sources of activation are additive (e.g. Bargh, Bond, Lombardi, & Tota, 1986; Srull & Wyer, 1980). For example, in one study, high (vs. low) chronic accessibility of smoking-related thoughts added together with exposure to a situational cigarette prime to cause increased urges to smoke (Palfai, 2002). In another study, participants high in chronic alcohol usage who were given an alcohol prime gave the most alcohol-related responses in a controlled association task (Stacy, Leigh, & Weingardt, 1994). Other research has shown that participants high in chronic gender role identity used more gender-related language after a situational activation of their gender role, as compared to those low in chronic gender role identity (Palomares, 2004). In each case, chronic and situational sources of cognitive accessibility combined additively.

Although the findings just reviewed are consistent with the additive approach to cognitive construct accessibility, they do not appear to have considered the possible meta-cognitive consequences of cognition. A meta-cognitive perspective predicts that the effects of simultaneous cognitive concept accessibility will be a function of the meaning of the primary and secondary cognitions for each other. In the examples above (e.g. gender), the secondary cognition (the situational activation of the cognitive concept) had no meta-cognitive implications for the first activation. That is, if a person's primary (and chronic, for the addict) cognition is to smoke cigarettes, exposure to a cigarette prime is unlikely to cause that person to do anything but desire a cigarette. However, with respect to the activation of certainty or uncertainty, a different outcome is possible. A person who is doubtful of her need for a cigarette is less likely to smoke than one who is confident in her need for a cigarette. The principle here is that secondary doubt (confidence) can weaken (strengthen) the effect of primary cognition, regardless of its content. When both primary and secondary cognitions are doubt related, can people doubt their doubt? Or do the two sources of doubt combine to create even more doubt?

Study 1

Consider a person who suffers from some type of chronic self-doubt, conceptualized and measured as a primary belief about oneself (e.g. "I often feel I am an insecure person"). If people with such chronic primary beliefs additionally are given a situational induction of uncertainty, does this magnify or attenuate their overall level of self-doubt? To investigate this, in our first study we used an individual difference approach to assess primary chronic uncertainty (Weary & Edwards, 1994). We then induced additional doubt in some participants to examine whether it increased or decreased the impact of their primary uncertainty.

Method

Participants and design

Participants ($N = 37$; 19 males) for this study were enrolled from introductory psychology classes at Ohio State University. All participants were randomly assigned to the uncertainty or control priming condition and had their chronic causal uncertainty measured. Thus, the design was a (chronic causal uncertainty; measured continuously) $\times$ 2 (prime: control, uncertainty). In both studies we report, participants received partial course credit for their participation.

Procedure

Participants first were informed they would be engaged in multiple studies. They then completed a scrambled sentence task (SST) to prime uncertainty or not. Following this, the dependent measure assessing their current level of causal judgment uncertainty was administered. Finally, they completed the causal uncertainty scale to measure their chronic level of causal uncertainty just before being debriefed.

Predictor variables

Chronic causal uncertainty

To assess participants' chronic level of uncertainty, we used the causal uncertainty (CU) scale (Weary & Edwards, 1994). CU measures the extent to which individuals are chronically uncertain about why things happen and contains 14 items such as "When bad things happen, I do not know why." Individuals high in CU possess chronically accessible uncertainty beliefs (e.g. Edwards, Wichman, & Weary, 2009; see Weary et al. (2010), for a review). It is important to note that CU is a particular type of self-doubt (about causes) that in this case was assessed as an individual difference. These chronic cognitions about causal uncertainty were expected to be the thoughts under evaluation in any meta-cognitive assessment following the uncertainty prime.

Uncertainty prime

We used a previously-validated (Wichman, Brunner, & Weary, 2008) SST to activate doubt or not. Participants were given 20 word lists composed of five words each. Their task was to rearrange four of the words to make a sentence, and to cross out the one word that did not fit. The SST included groups of words such as: (a) "her speaker doubt I explanations" and (b) "favors doing uncertain beneficial is." In the uncertainty prime condition, 10 of the sentences were uncertainty related, whereas the others were fillers. In the control condition, all 20 sentences were unrelated to uncertainty. This manipulation was induced to invalidate the type of self-doubt (CU) described above through a self (in)validation process.

Dependent measure of uncertainty in causal judgments

We used an established paradigm to assess participants' current uncertainty in their causal judgments (Wichman et al., 2008). Participants read two scenarios that each described some outcome such as getting a raise or performing well in a footrace. After each scenario, participants indicated how likely each of four causes was to have determined the observed outcome. They then rated their certainty in these likelihood judgments on a 9-point scale (anchored with 1 = absolutely certain; 9 = absolutely uncertain). The key dependent measure (*likelihood uncertainty*) was computed by taking the participants' average uncertainty ratings in the 8 likelihood judgments they had made (i.e., four for each scenario).

Results

As expected, the uncertainty prime had no effect on participants' chronic CU levels, $F(1, 35) = .55$, $p = .46$ ($M_{prime} = 33.9$, $SD_{prime} = 12.17$; $M_{control} = 33.3$, $SD_{control} = 8.7$). This is consistent with the nature of CU as a chronic individual difference construct (c.f. Weary & Edwards, 1994). To assess our hypothesis, participants' likelihood uncertainty scores were regressed on dummy

coded prime condition, standardized CU score, and the interaction. As shown in Fig. 1, this analysis revealed a prime × CU interaction, $t(33) = 2.2$, $\beta = -.76$, $p = .036$. Although individuals in general tended to report relatively low levels of likelihood uncertainty in absolute terms, our hypotheses were supported by the presence of relative differences between conditions. In the neutral prime condition as CU increased, participants expressed more uncertainty in their likelihood judgments, $t(33) = 3.0$, $\beta = .89$, $p = .005$, replicating prior work on CU (Weary & Edwards, 1994). However, when doubt was primed, CU was not significantly related to uncertainty in likelihood judgments; $p = .46$. Notably, for high CU individuals (1 SD above the mean; see Aiken & West, 1991) there was a significant *decrease* in likelihood uncertainty as a function of the uncertainty prime, $t(33) = 2.5$, $\beta = 1.21$, $p = .017$. This contrast was nonsignificant for individuals 1 SD below the mean of CU ($p = .50$). These differences between conditions support the idea of "doubting one's doubt."

Discussion

Study 1 provided initial support for our meta-cognitive perspective on secondary uncertainty by showing that the combination of chronic and situational forms of uncertainty could decrease (rather than increase) uncertainty. However, though providing some evidence for our hypothesis, this first study also raises several potential issues. First, the use of CU as an individual difference predictor cannot definitively exclude other constructs as causal in the double-doubt finding. Experimental control of primary uncertainty accessibility would be desirable. Moreover, the dependent measure used in Study 1 did not isolate the effect to uncertainty-relevant outcomes. Participants might have reported reduced levels of *any* judgment if they had been given the chance. Such a finding would be inconsistent with our thinking that doubt should interact with the type of primary cognition one has.

Study 1 also lacked a certainty induction. If our results are the consequence of a general meta-cognitive process in which secondary cognitions have different effects depending on what the primary cognitions are, a certainty induction would provide evidence for the generality of this effect. It also would more clearly specify the manner in which primary and secondary cognitions interact. In our first study, we suggested that situational doubt undermined chronic doubt, but it also could be possible for chronic doubt to have undermined the situational doubt induction. As long as both primary and secondary cognitions are about doubt, it remains unclear which form of doubt invalidates the other. Our second study aimed to shed more light on this issue. Our prediction was that secondary confidence in the form of a certainty induction would increase levels of primary confidence, but also increase levels of primary doubt, if doubt previously had been primed.

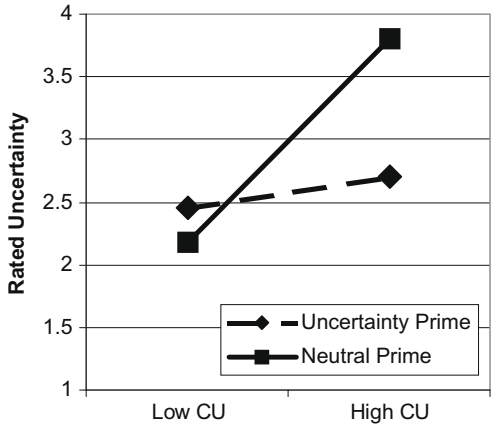

Fig. 1. Effect of CU and CU prime on causal judgment uncertainty; primary doubt on *X*-axis.

We conducted a second study to address these issues, in which primary uncertainty was manipulated rather than measured, secondary confidence was primed along with doubt, and general evaluation measures unrelated to uncertainty also were included. This use of evaluative measures unrelated to certainty allowed us to test a potential concern arising from Study 1. This concern was that the uncertainty induction would have resulted in reduced scores on any dependent measure. Of course, this idea does not explain the full pattern of results from Study 1. Regardless, from a meta-cognitive perspective, we would predict that sequential doubt inductions would negate each other on uncertainty-related measures, leading to relatively greater perceived certainty (or, less uncertainty). On measures that did not tap into perceptions of certainty, we would not expect to see this pattern.

This expectation follows from the relatively different applicability of primary and secondary cognitions for certainty relevant and irrelevant measures. In the priming literature, an activated concept (e.g. "hostile") can be applied to a variety of mental content, whether it is the self (e.g. DeMarree, Wheeler, & Petty, 2005) or another person (e.g. Higgins, Rholes, & Jones, 1977), but only if it is applicable (e.g. Higgins et al., 1977). In our work, because participants' personal state of confidence or doubt is not applicable to certainty-irrelevant judgments, these judgments are more likely to be assimilated to the valence alone (positive for the certainty prime; negative for the uncertainty prime) of the situationally-activated secondary cognition. If the primary cognition is semantically related to the dependent measure, secondary confidence or doubt should respectively strengthen or weaken the impact of this primary cognition on the measure. If the dependent measure is semantically unrelated to the primary cognition, however, only semantically irrelevant elements (such as valence) of the ultimately accessible cognitive construct potentially will be applicable. We note that even without finding these predicted effects on certainty-irrelevant measures, however, a finding of an interaction between primary and secondary cognitions on certainty-relevant measures would support our meta-cognitive perspective.

Finally, instead of assessing the impact of our manipulations on one's own level of certainty as in Study 1, Study 2 measured perceptions of another person's certainty. Perception of others' certainty is important in domains ranging from interview settings to medical school training (Blanch, Hall, Roter, & Frankel, 2008) and the evaluation of eyewitness testimony (Slovenko, 1999). The person-impression task used in Study 2 further helped to increase the generalizability of our findings, but also helped rule out self-enhancement or protection motives as a possible cause for double-doubt effects in Study 1. Even if participants defensively claimed less uncertainty in Study 1 in response to the high amount of uncertainty they could have been experiencing in the double-doubt condition, judgments about another person should be less likely to be affected by such self-enhancement motives.

Although judgments of others should not be affected by self-enhancement concerns, person impression judgments should still be affected by construct accessibility changes induced by a double-doubt manipulation. Construct accessibility influences judgment whether judgments are about the self or others (e.g. Higgins, King, & Mavin, 1982; Kuiper & Derry, 1982; Catrambone & Markus, 1987). Consequently, a double-doubt induced change in the relative accessibility of uncertainty cognitions should impact judgments in a person-impression task much as it might impact judgments about the self (c.f. Bargh, Bond, Lombardi, & Tota, 1986).

Study 2

In our second study, participants completed either an uncertainty or certainty-inducing task, followed by a head nodding or shaking task. Prior research has shown that head nodding is related to certainty in that it causes participants to be confident in whatever their primary cognitions are, whereas head shaking causes participants to doubt their primary cognitions (Briñol & Petty, 2003).

In the current study, we predicted that head nodding (confidence) should increase the impact of our initial certainty/doubt manipulation (our manipulation of participants' primary cognition), relative to a condition where head shaking (doubt) followed an initial certainty/doubt manipulation. This pattern of results would show that instilling doubt (head shaking) in one's initial doubt decreased uncertainty, relative to instilling confidence (head nodding) in one's initial doubt. We also included some general evaluation measures that were unrelated to certainty in order to test our expectation that accessible doubt/confidence-related cognitions would influence only certainty-related judgments.

Method

Procedure

Participants ($N = 62$; 41 males) were introductory psychology students who were randomly assigned to conditions in a 2 (uncertainty vs. certainty induction) × 2 (head nodding vs. shaking) design. Allegedly as part of separate studies, participants first completed a writing task to activate initial uncertainty or certainty, and then moved on to a head movement task designed to activate meta-cognitive doubt or confidence in their primary uncertainty or certainty. Participants then completed the dependent measures and were debriefed.

Independent variables

The initial writing task used to prime uncertainty asked participants to write about either a time they were uncertain/doubtful, or a time they were certain/confident (adapted from Petty et al. (2002)). Following this task, participants completed the head movement confidence or doubt induction (e.g. Briñol & Petty, 2003), described as a study on "motor-eye coordination." Participants followed a ball moving either vertically (nodding condition) or horizontally (shaking condition) on the computer screen with their heads for 2 min, at a rate of approximately 50 times per minute. This manipulation reliably affects participants' sense of confidence (e.g. Study 3; Briñol & Petty, 2003).

Dependent variables

Following the experimental inductions, participants read a brief paragraph about "Donald" (Higgins et al., 1977) and then indicated their perceptions of him. Some items assessed uncertainty or certainty relevant behaviors, whereas other items assessed general evaluations and were unrelated to uncertainty or certainty. As explained above, these were not expected to show double-doubt type effects. The control items are indicated below by an asterisk. Participants first indicated on a 1 (not at all characteristic of Donald) to 9 (extremely characteristic of Donald) scale how likeable*, angry*, and puzzled Donald appeared. They then indicated on scales ranging from 1 (not at all) to 9 (extremely) how likely they thought it would be for Donald to get into an argument*, act in a puzzled way, not understand something he was doing, donate money*, and be very confident. Uncertainty and certainty-related items were appropriately reverse scored and averaged together so that higher values indicated greater perceived target *uncertainty*. Control items also were averaged together so that higher scores indicated a more negative impression.

Results

The dependent measures were analyzed with a 2 (certainty prime vs. uncertainty prime) × 2 (head nodding vs. shaking) × 2 (uncertainty relevant measure or not) mixed ANOVA. Because a three way interaction, $F(1, 58) = 7.88$, $p = .007$, partial $\eta^2 = .12$, indicated that the results varied by type of measure, we analyzed each measure separately with a 2 × 2 ANOVA. Supporting the effectiveness of our primary doubt induction, the ANOVA on uncertainty-related items showed a significant main effect of prime condition, $F(1, 58) = 6.74$, $p = .012$, partial $\eta^2 = .10$, such that writing about uncertainty (i.e., priming uncertainty) increased perceptions of Donald's uncertainty – a classic priming effect.

More importantly, this main effect of the prime was qualified by a 2-way interaction (see Fig. 2; $F(1, 58) = 10.69$, $p = .002$, partial $\eta^2 = .16$). Consistent with the meta-cognitive approach, nodding increased the use of the primed construct relative to shaking. As predicted, shaking (vs. nodding) resulted in increased uncertainty in the certainty prime condition, $F(1, 58) = 6.07$, $p = .017$, but *decreased* uncertainty in the uncertainty prime condition, $F(1, 58) = 4.83$, $p = .032$. Viewed differently, shaking eliminated the significant difference between the uncertainty and certainty writing conditions ($p = .60$) that was observed in the nodding condition, $F(1, 58) = 14.51$, $p = .000$.

As expected, the predicted interaction (double-doubt) effect was confined to the uncertainty-related items. For the control items, there was only a main effect of head movement, $F(1, 58) = 8.19$, $p = .006$, partial $\eta^2 = .12$, such that participants had more negative evaluations of Donald in the shaking conditions ($M_{\text{UncertaintyWriting}} = 5.17$, SD = 0.96; $M_{\text{CertaintyWriting}} = 4.96$, SD = 1.47), compared to the nodding ($M_{\text{UncertaintyWriting}} = 3.95$, SD = 1.14; $M_{\text{CertaintyWriting}} = 4.36$, SD = 1.16) conditions. The sensitivity of these control items to head movements shows the evaluative component associated with this form of embodiment (e.g. nodding is not only more certain, but also more positive than shaking; Wells & Petty, 1980).

Discussion

These findings indicate that a secondary source of doubt following an initial doubt prime can undermine the initial primed doubt. When participants who had previously written about doubt subsequently shook their heads, they reported *lower* levels of perceived target uncertainty as compared to participants who subsequently

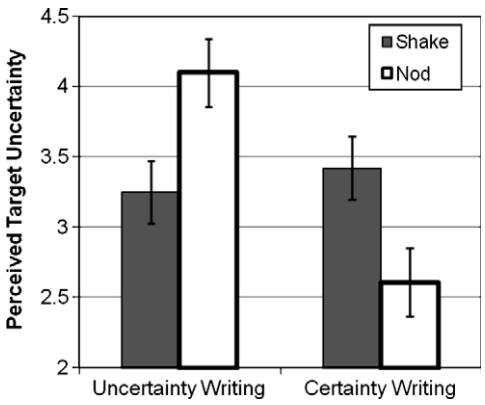

Fig. 2. Perceptions of target uncertainty: effects of head movement and writing; primary doubt on *X*-axis.

nodded their heads. This is the mirror-image of the effect obtained for those who first wrote about confidence. Thus, Study 2 demonstrates that a second manipulation of certainty or uncertainty can interact with an initial induction in a manner specified by our meta-cognitive framework rather than in the additive way that would be expected from prior work.

The main effects of shaking and nodding on certainty-irrelevant dependent measures suggest that, as is the case for other variables (Petty & Cacioppo, 1996), the same head movement induction can operate either through meta-cognitive processes (interacting with our initial doubt induction for uncertainty-related measures), or through more simple mechanisms related to primary cognition (for uncertainty-irrelevant measures; see Briñol and Petty (2008), for a review). Head movement implies at least two kinds of information-valence and approval/certainty. We found evidence for both head movement valence effects (e.g. the main effect of head movement on the control or general evaluation items) and head movement certainty effects (e.g. the interaction of head movements with primary certainty/uncertainty inductions on certainty-relevant items). The effects of head movements depended on how the movements were applicable to specific target attributes. This is what our meta-cognitive approach would predict.

In addition to advancing the literature on meta-cognition and doubt, Study 2 offers support for the notion that bodily responses can influence judgments by different processes depending on the circumstances (Briñol & Petty, 2008). Consider the original research on head nodding and persuasion that had assumed that nodding one's head in a vertical (vs. horizontal) manner produced more positive attitudes either because vertical head nodding biased thinking in a favorable direction (Wells & Petty, 1980) or because head nodding served as a relatively simple affective cue (Tom, Pettersen, Lau, Burton, & Cook, 1991). The findings obtained for the control items in our second study are consistent with these main effects, showing more positive evaluations for Donald in the nodding rather than in the shaking conditions. It seems clear that head movements can influence judgments in a direct, valence-based form.

However, the self-validation hypothesis suggested another possibility – that just as vertical head movements from others give us confidence in what we are saying, our own vertical head movements could give us confidence in what we are thinking. Thus, as was the case with head nodding affecting confidence in thoughts to a persuasive message (Briñol & Petty, 2003), so too did it appear to affect the validity and use of doubt related thoughts induced by priming. As a consequence, head nodding did not have a simple, main effect for certainty-related items, but rather produced an interaction. The most parsimonious explanation of this interaction pattern stems from the idea that head movements either validated or invalidated the content of primary cognition. This idea also is consistent with findings in some other research paradigms. For instance, the effects of self-generated anchors in an anchor and adjust paradigm (Epley & Gilovich, 2001) are larger when nodding than shaking, and the effects of emotional thoughts (Tamir, Robinson, Clore, Martin, & Whitaker, 2004) have been found to be larger when nodding than shaking. Nodding often appears to validate one's mental content, whereas shaking seems to invalidate it.

General discussion

Given that meta-cognitive confidence can be applied to different cognitions, in the present research we examined the paradoxical case in which people have confidence (or doubt) in their own doubts. That is, doubt can be the content of primary cognition, and therefore people can vary in the extent to which they have confidence or doubt in the original doubt (i.e., secondary cognition). Our first study examined people who suffer from chronic self-doubt, as conceptualized and measured by causal uncertainty. When individuals with chronic doubt were given a situational doubt induction, they applied this sense of uncertainty to the accessible chronic doubt—paradoxically undermining their chronic doubt (e.g. "I'm not confident that I am insecure; therefore, I might be certain"). Using a different paradigm, Study 2 provided further evidence for this ironic phenomenon by showing that a person in whom doubt had been primed and who then was given a second doubt induction (head shaking) made judgments that were less consistent with doubt than a person with the same initial doubt who was given a certainty induction (head nodding). These findings stand in stark contrast to what would be predicted from an additive combination of chronic and state uncertainty (i.e., "double-doubt" would be associated with extreme uncertainty).

One might wonder whether some contrast mechanism, perhaps theory-based (Petty & Wegener, 1993; Wilson & Brekke, 1994), might provide an alternative explanation for our results. We think this is unlikely for a number of reasons. One is that our uncertainty prime used in Study 1 previously has been shown to operate outside participants' conscious awareness (Wichman et al., 2008). Similarly, the meaning and potential effect of the head movement induction used in Study 2 is rarely detected by participants (e.g. see, Briñol & Petty, 2003). Even if participants had somehow recognized the content of the primes in Studies 1 and 2, they still would have needed to perceive the prime as a relevant biasing factor. Not only would participants have had to detect the prime as a biasing factor, but they also would have needed to estimate the direction and magnitude of its potential bias, presumably as a function of a naïve theory regarding the prime (see Wegener and Petty (1997), for a review). The subtle nature of our manipulations combined with the novel nature of our hypotheses suggests that such a naïve theory was unlikely to be used by participants in these studies.

One might also wonder about other explanations underlying contrast effects. For example, a dissimilarity testing interpretation (see Mussweiler, 2003) would appear to predict the finding that sequential activations of doubt resulted in contrast. However, this contrast based interpretation does not predict the double confidence cell of the design. In this condition, two inductions of confidence should also have resulted in contrast (leading to greater uncertainty). The current findings revealed the opposite effect. Consistent with our meta-cognitive account, a confidence induction, followed by head nodding, was associated with greater confidence. Although other explanations might predict particular cells of the design, the self-validation hypothesis represents the most succinct explanation for the complete pattern of results.

The present research advances previous work on self-validation in several ways. The first generation of studies flowing from the self-validation hypothesis focused mainly on the effects of these meta-cognitive processes in traditional persuasion settings (Briñol & Petty, 2009). The self-validation view implies that meta-cognitive confidence can magnify the effect of not just attitude-relevant thoughts, but *any* mental content that is currently accessible. That is, confidence can be applied to whatever the salient or available mental contents are. Following a persuasive message, for example, what is most salient are the thoughts that just came to mind. However, in other circumstances, the content and nature of available cognitions will be different. As we find in this research, doubt itself appears susceptible to meta-cognitive influence.

This work may have potential clinical implications. It suggests a novel approach to reduce doubt and thus, the negative consequences that sometimes follow from uncertainty (c.f. Wichman & Hermann, 2010). This idea of using doubt to improve peoples' outcomes breaks from previous research, which most commonly conceptualizes confidence as a good thing. For instance, research on

self-efficacy (e.g. Bandura, 1997) has suggested that to meet objectives, it is necessary not only to have thoughts directed toward these objectives (e.g. positive thoughts) but also to have confidence in one's ability to achieve these objectives. The notion of *epistemic authority* (confidence in one's expertise) proposed by Kruglanski et al. (2005) also suggests that confidence is necessary for learning and performance.

Instead of arguing that confidence is always good, our meta-cognitive perspective suggests that in some cases, instilling momentary doubt might lead to more desirable outcomes than confidence. The treatment of cognitive distortions may be such a case. For instance, the difference between certainty that one *is going to* fail and concern that one *might* fail could be the difference between hopelessness and careful preparation for success. One might also speculate that the difference between being certain of one's agonizing insecurity and lack of worth and being uncertain of it may mean the difference between suicide and scheduling an appointment for psychological therapy. Sometimes, self-doubt reduction might be achieved by instilling doubt in one's doubt.

These studies reveal that people's primary beliefs about themselves and others can be qualified by a situational uncertainty induction in an ironic way consistent with the self-validation logic. As noted, this line of research builds on the idea that meta-cognitive confidence/doubt can be associated with any type of cognition, including one's own doubts. Whether the validating manipulations involved head movements or primes, and whether the primary cognitions were about causal uncertainty or memories related to doubt, the self-validation logic suggests that people often look for ways to validate whatever mental contents have been activated. This idea provides a useful framework for understanding how a wide variety of variables can influence judgment and behavior through meta-cognitive processes. Sometimes, we may doubt even doubt itself.

Acknowledgement

This research was supported in part by NSF Award Number 0847834 to the third author.

References

Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions*. Newbury Park, CA: Sage.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: Freeman.

Bargh, J. A., Bond, R. N., Lombardi, W. J., & Tota, M. E. (1986). The additive nature of chronic and temporary sources of construct accessibility. *Journal of Personality and Social Psychology, 50*, 869–878.

Berglas, S., & Jones, E. E. (1978). Drug choice as a self-handicapping strategy in response to noncontingent success. *Journal of Personality and Social Psychology, 36*(4), 405–417.

Blanch, D. C., Hall, J. A., Roter, D. L., & Frankel, R. M. (2008). Medical student gender and issues of confidence. *Patient Education and Counseling, 72*, 374–381.

Briñol, P., & Petty, R. E. (2003). Overt head movements and persuasion: A self-validation analysis. *Journal of Personality and Social Psychology, 84*, 1123–1139.

Briñol, P., & Petty, R. E. (2008). Embodied persuasion: Fundamental processes by which bodily responses can impact attitudes. In G. R. Semin & E. R. Smith (Eds.), *Embodiment grounding: Social, cognitive, affective, and neuroscientific approaches* (pp. 184–207). Cambridge, England: Cambridge University Press.

Briñol, P., & Petty, R. E. (2009). Persuasion: Insights from the self-validation hypothesis. In M. P. Zanna (Ed.). *Advances in experimental social psychology* (Vol. 41, pp. 69–118). New York: Academic Press.

Briñol, P., Petty, R. E., & Wheeler, S. C. (2006). Discrepancies between explicit and implicit self-concepts: Consequences for information processing. *Journal of Personality and Social Psychology, 91*, 154–170.

Catrambone, R., & Markus, H. (1987). The role of self-schemas in going beyond the information given. *Social Cognition, 5*, 349–368.

Clarkson, J. J., Tomala, Z. L., & Rucker, D. D. (2008). A new look at the consequences of attitude certainty: The amplification hypothesis. *Journal of Personality and Social Psychology, 95*, 810–825.

DeMarree, K. G., Wheeler, S. C., & Petty, R. E. (2005). Priming a new identity: Self-monitoring moderates the effects of nonself primes on self-judgments and behavior. *Journal of Personality and Social Psychology, 89*, 657–671.

Edwards, J. A., Wichman, A., & Weary, G. (2009). Causal Uncertainty as a chronically accessible construct. European Journal of Social Psychology. Published online 13 September, 2008; doi:10.1002/ejsp.567.

Epley, N., & Gilovich, T. (2001). Putting adjustment back in the anchoring and adjustment heuristic. Differential processing of self-generated and experimenter-provided anchors. *Psychological Science, 12*, 391–396.

Griffin, D., & Tversky, A. (1992). The weighing of evidence and the determinants of confidence. *Cognitive Psychology, 24*, 411–435.

Gross, S. R., Holtz, R., & Miller, N. (1995). Attitude certainty. In R. E. Petty & J. A. Krosnick (Eds.), *Attitude strength: Antecedents and consequences* (pp. 215–246). Mahwah, NJ: Erlbaum.

Higgins, T. E., King, G. A., & Mavin, G. H. (1982). Individual construct accessibility and subjective impressions and recall. *Journal of Personality and Social Psychology, 43*, 35–47.

Higgins, E. T., Rholes, W. S., & Jones, C. R. (1977). Category accessibility and impression formation. *Journal of Experimental Social Psychology, 13*, 141–154.

Kruglanski, A. W., Raviv, A., Bar-Tal, D., Raviv, A., Sharvit, K., Ellis, S., et al. (2005). Says who? epistemic authority effects in social judgment. In M. P. Zanna (Ed.). *Advances in experimental social psychology* (Vol. 37, pp. 345–392). San Diego, CA: Elsevier.

Kuiper, N. A., & Derry, P. A. (1982). Depressed and nondepressed content self-reference in mild depressives. *Journal of Personality, 50*, 67–80.

Mussweiler, T. (2003). Comparison processes in social judgment: Mechanisms and consequences. *Psychological Review, 110*, 472–489.

Norem, J. K., & Cantor, N. (1986). Defensive pessimism: Harnessing anxiety as motivation. *Journal of Personality and Social Psychology, 51*, 1208–1217.

Oleson, K. C., Poehlmann, K. M., Yost, J. H., Lynch, M. E., & Arkin, R. M. (2000). Subjective overachievement: Individual differences in self-doubt and concern with performance. *Journal of Personality, 68*, 491–524.

Palfai, T. P. (2002). Positive outcome expectancies and smoking behavior: The role of expectancy accessibility. *Cognitive Therapy and Research, 26*, 317–333.

Palomares, N. A. (2004). Gender schematicity, gender identity salience, and gender-linked language use. *Human Communication Research, 30*, 556–588.

Petty, R. E., Briñol, P., & Tormala, Z. L. (2002). Thought confidence as a determinant of persuasion: The self-validation hypothesis. *Journal of Personality and Social Psychology, 82*, 722–741.

Petty, R. E., Briñol, P., Tormala, Z. L., & Wegener, D. T. (2007). The role of meta-cognition in social judgment. In E. T. Higgins & A. W. Kruglanski (Eds.), *Social psychology: Handbook of basic principles* (2nd ed., pp. 254–284). New York: Guilford Press.

Petty, R. E., & Cacioppo, J. T. (1996). *Attitudes and persuasion: Classic and contemporary approaches*. Boulder, CO: Westview Press.

Petty, R. E., & Wegener, D. T. (1993). Flexible correction processes in social judgment: Correcting for context induced contrast. *Journal of Experimental Social Psychology, 29*, 137–165.

Slovenko, R. (1999). Testifying with confidence. *Journal of the American Academy of Psychiatry and the Law, 27*, 127–131.

Srull, T. K., & Wyer, R. S. Jr., (1980). Category accessibility and social perception: Some implications for the study of person memory and interpersonal judgment. *Journal of Personality and Social Psychology, 38*, 841–856.

Stacy, A. W., Leigh, B. C., & Weingardt, K. R. (1994). Memory accessibility and association of alcohol use and its positive outcomes. *Experimental and Clinical Psychopharmacology, 2*, 269–282.

Tamir, M., Robinson, M. D., Clore, G. L., Martin, L. L., & Whitaker, D. J. (2004). Are we puppets on a string? The contextual meaning of unconscious expressive cues. *Personality and Social Psychology, 30*, 237–249.

Tom, G., Pettersen, P., Lau, T., Burton, T., & Cook, J. (1991). The role of overt head movement in the formation of affect. *Basic and Applied Social Psychology, 12*, 281–289.

Tormala, Z. L., & Rucker, D. D. (2007). Attitude certainty: A review of past findings and emerging perspectives. *Social and Personality Psychology Compass, 1*, 469–492.

Van Eerde, W. (2000). Procrastination: Self-regulation in initiating aversive goals. *Applied Psychology: An International Review, 49*, 372–389.

Weary, G., & Edwards, J. A. (1994). Individual differences in causal uncertainty. *Journal of Personality and Social Psychology, 64*, 308–318.

Weary, G., Tobin, S. J., & Edwards, J. A. (2010). The causal uncertainty model revisited. In R. M. Arkin, K. C. Oleson, & P. J. Carroll (Eds.), *Handbook of the uncertain self* (pp. 78–100). Mahwah, NJ: Lawrence Erlbaum.

Wegener, D. T., & Petty, R. E. (1997). The flexible correction model: The role of Naïve Theories in Bias Correction. In M. P. Zanna (Ed.). *Advances in experimental social psychology* (Vol. 29, pp. 141–208). San Diego, CA: Academia.

Wells, G. L., & Petty, R. E. (1980). The effects of overt head movements on persuasion: Compatibility and incompatibility of responses. *Basic and Applied Social Psychology, 1*, 219–230.

Wichman, A. L., Brunner, R. P., & Weary, G. (2008). Immediate and delayed effects of causal uncertainty inductions on uncertainty accessibility. *Journal of Experimental Social Psychology, 44*, 1106–1113.

Wichman, A. L., & Hermann, A. D. (2010). Deconstructing the link between self-doubt and self-worth: Ideas to reduce maladaptive coping. In R. M. Arkin, K. C. Oleson, & P. J. Carroll (Eds.), *Handbook of the uncertain self* (pp. 321–337). Mahwah, NJ: Lawrence Erlbaum.

Wilson, T. D., & Brekke, N. (1994). Mental contamination and mental correction: Unwanted influences on judgments and evaluations. *Psychological Bulletin, 116*, 117–142.