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Overt Head Movements and Persuasion: A Self-Validation Analysis

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The authors report 3 experiments that examine a new mechanism by which overt head movements can affect attitude change. In each experiment, participants were induced to either nod or to shake their heads while listening to a persuasive message. When the message arguments were strong, nodding produced more persuasion than shaking. When the arguments were weak, the reverse occurred. These effects were most pronounced when elaboration was high. These findings are consistent with the "self-validation" hypothesis that postulates that head movements either enhance (nodding) or undermine (shaking) confidence in one's thoughts about the message. In a 4th experiment, the authors extended this result to another overt behavior (writing with the dominant or nondominant hand) and a different attitude domain (self-esteem).

The current research introduces a new mechanism by which overt head movements can affect attitude change. In the original study on this topic, Wells and Petty (1980) asked participants to move their heads in an up and down (vertical or nodding "yes") manner, in a side to side (horizontal or shaking "no") manner, or gave no instructions about head movements (control) as they listened to music and an editorial over headphones. The ostensible purpose of this was to conduct a consumer test of whether the headphones would perform adequately during walking, jogging, dancing, and so forth. Following the message, participants provided ratings of the headphones as well as attitudes toward the editorial. The results showed that nodders agreed with the message more than shakers. In a conceptual replication of this finding, Tom, Pettersen, Lau, Burton, and Cook (1991) found that nodding resulted in the establishment of increased preference for a previously neutral object, whereas shaking led to a decline in preference for the neutral object (see Epley & Gilovich, 2001; Förster & Strack, 1996, for other applications of this paradigm).

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Explanations for the Effects of Head Movements

To account for the effect of head movements on attitudes, Wells and Petty (1980) speculated that previous experience had made nodding compatible with "approval" and favorable thinking, and shaking compatible with "disapproval" and unfavorable thinking (Darwin, 1872/1965; Eibl-Eibesfeldt, 1972). Thus, when nodding, favorable thoughts to the message would be facilitated and unfavorable thoughts would be inhibited, but when shaking, unfavorable thoughts would be facilitated and favorable thoughts would be inhibited. In essence, Wells and Petty argued that head movements biased the content of people's thoughts about the message and that these biased thoughts made attitudes more favorable in the nodding than in the shaking conditions. Although Wells and Petty did not assess thought content, this hypothesis is compatible with contemporary research that has measured thoughts, and has shown that a number of variables are capable of biasing thinking about a persuasive message especially when the likelihood of thinking is high (see Eagly & Chaiken, 1993; Petty & Cacioppo, 1986b; Petty & Wegener, 1998; for reviews).

Although it is plausible to think that head movements can produce a bias in the valence of thoughts, alternative mechanisms by which head movements affect persuasion are reasonable as well. For example, head movements might induce a simple inference that leads one to agree with or reject the proposal (e.g., "If I shook my head, I must not like it"; Chaiken, 1987). According to self-perception theory (Bem, 1972), one's own behavior could be used to makes the same inferences about one's attitude that observers of the behavior would make (for reviews, see Fazio, 1987; Laird & Bresler, 1992; Olson & Hafer, 1990). Thus, just as nodding to a message might signal to others that one agrees with the message, so too might it signal agreement to oneself. According to current dual process models of persuasion, such as the elaboration likelihood model (Petty & Cacioppo, 1986b; Petty & Wegener, 1999) and the heuristic-systematic model (Chaiken, Liberman, & Eagly, 1989; Chen & Chaiken, 1999), such self-perception processes are more likely to affect attitudes when the likelihood of thinking about the message is relatively low rather than high.

In addition, one might argue that emotive rather than cognitive responses mediated the persuasive effects obtained with nodding and shaking. That is, head movements might induce positive or negative affective states that become associated with the advocacy through a low elaboration classical conditioning process (see Tom et al., 1991, for this point of view). Researchers investigating the impact of other bodily movements on attitudes have attributed their effects to classical conditioning. For example, Cacioppo, Priester, and Berntson (1993) found that participants reported liking neutral stimuli more after they had performed a type of approach behavior (pressing their arms upward against a table) than a type of avoidance behavior (pressing their arms downward on a table).

In the current research, we explore a new mechanism for the impact of head movements on persuasion that has not been considered previously. This proposal, termed the *self-validation hypothesis*, holds that nodding and shaking can signal general approval or disapproval of one's own internal thoughts (Petty, Briñol, & Tormala, 2002). In contrast to all of the prior explanations that posit that vertical head movements invariably increase persuasion relative to horizontal movements, the self-validation framework holds that vertical movements can either enhance or reduce persuasion depending on the valence of the thoughts generated during the message presentation.

The Self-Validation Hypothesis

Consider the following situation. You are giving an important speech and notice that everyone in the audience is nodding their heads vertically. What would you think? This approving audience reaction presumably enhances your confidence in what you are saying by providing consensus or *social validation*. However, what would you think if everyone in the audience was shaking their heads horizontally while you spoke? This disapproving audience reaction would presumably undermine your confidence in the validity of what you were saying. Numerous studies support the idea that external cues to validity can have an impact on our assessment of what we think, believe, say, and do. Much of this evidence can be understood in terms of Festinger's (1954) social comparison theory, which states that people look to other people's reactions and opinions for purposes of self-evaluation.

The main objective of the present research is to test whether one's own head movements can serve as an internal rather than external cue to the validity of one's thoughts, and thereby provide an alternative mechanism by which head movements can affect persuasion. That is, just as vertical movements from others would enhance the perceived validity of one's externally expressed thoughts, one's own vertical head movements might enhance confidence in one's internally expressed thoughts. Similarly, just as horizontal movements from others would undermine the perceived validity of one's external expressions, one's own horizontal head movements might reduce confidence in what one is thinking privately.

The notion that people sometimes assess their inner states for appropriateness is not unique to our self-validation framework. For example, in the domain of clinical psychology, some cognitive therapies require clients to actively critique the appropriateness of their negative thoughts (e.g., "my negative thoughts are misguided"; Ellis, 1962). In cognitive psychology, work on human memory has shown that the stronger one's feeling of knowing something, the longer one will search before giving up (e.g., Costermans, Lories, & Ansay, 1992; Koriat & Goldsmith, 1996; Nelson & Narens, 1990). Metacognitive factors also play a prominent role in some social–cognitive theories. For example, Kruglanski's (1989) lay epistemic theory of attributional inference emphasizes a two-phase sequence of thinking in which hypotheses (beliefs) are first generated and then validated.

According to the self-validation framework, when one's attitude-relevant thoughts are perceived as valid, these thoughts should have a strong impact on attitudes, but when one's attitude-relevant thoughts are perceived as invalid, they should not. Accordingly, when one's thoughts are primarily favorable, increasing confidence in them should enhance persuasion, but when one's thoughts are primarily unfavorable, increasing confidence should reduce persuasion. Initial evidence in support of this self-validation hypothesis was provided in a series of studies by Petty et al. (2002). For example, in one study, following exposure to a strong or weak persuasive message, thoughts, thought confidence, and attitudes were measured. As in much prior research, people generated mostly favorable thoughts to the strong message and mostly unfavorable thoughts to the weak message (see Petty & Cacioppo, 1986a). However, thought confidence moderated the impact of argument quality on attitudes. When the message arguments were strong and thoughts were mostly positive, increased confidence in one's thoughts was positively related to persuasion. However, when the message arguments were weak and thoughts were mostly negative, increased confidence in one's thoughts was associated with reduced persuasion. In another study (Petty et al., 2002, Experiment 3), thought confidence was manipulated directly by inducing participants to think about past situations in which they felt confidence or doubt in their thoughts. This manipulation followed exposure to a strong or weak persuasive message and a thought-listing task. Confidence in one's thoughts to the persuasive message was affected by the confidence manipulation and increased thought confidence was associated with increased persuasion for the strong message and reduced persuasion for the weak message. Although thought confidence was manipulated directly in the initial research on self-validation processes, it is quite possible that various more subtle factors in the persuasion context can influence the extent of attitude change by having an impact on thought confidence.

In particular, self-validation processes might provide a mechanism by which overt head movements can affect attitude change. More specifically, shaking one's head while thinking could produce the sense that something is wrong with one's thoughts, reducing confidence in them. When nodding one's head, however, the perception would be that one's thoughts are fine, enhancing confidence.[1] If head movements in fact have this impact, the key implication is that either nodding or shaking can increase or decrease persuasion depending on the nature of the thoughts elicited by the message. If individuals' thoughts during a persuasive

[1] One's moods have been argued to have a similar, though more global, informational value. That is, negative affective states are theorized to inform individuals that something is wrong with their current environment, whereas positive mood states are believed to signal that the current situation is safe (e.g., see Schwarz, Bless, & Bohner, 1991).

message are predominantly favorable, then nodding should enhance persuasion because such movement would inspire confidence in and use of these favorable thoughts. Shaking should reduce persuasion by signaling disapproval and discounting of one's favorable thoughts. This is the direction of effect found in all prior studies on head movements. That is, nodding led to more favorable attitudes than shaking. Of greater interest, the self-validation hypothesis makes a unique prediction when individuals' thoughts during a message are predominantly negative. Here, nodding should reduce persuasion (or enhance resistance) because such movement would inspire confidence in and use of one's unfavorable thoughts about the communication. However, shaking would enhance persuasion (or undermine resistance) by reducing confidence in and use of one's negative thoughts. This reverses the typical effect observed for head movements in all prior studies.

Comparing Competing Theories

In the prior research on head movements and persuasion, we cannot be sure what mechanism was responsible for the obtained effects because all prior studies used messages that likely elicited primarily favorable thoughts. All of the conceptualizations of head movements predict the same pattern of attitude results for situations in which one's thoughts in response to a message are predominantly favorable. The hypotheses diverge, however, if the message elicits predominantly unfavorable thoughts.

That is, the biased processing view, first articulated by Wells and Petty (1980), holds that head movements facilitate or inhibit the generation of positive or negative thoughts. Thus, when a message elicits predominantly favorable thoughts, nodding should be compatible with and enhance these favorable thoughts, but shaking should be incompatible with and hinder these favorable thoughts. When the message elicits mostly unfavorable thoughts, shaking should enhance but nodding should undermine these thoughts. Thus, the biased processing view holds that regardless of the dominant type of thought, nodding should produce more persuasion than shaking.

The self-perception and classical conditioning accounts make similar main effect predictions (Tom et al., 1991). That is, the simple self-perception that "I must agree (disagree) with the message if I am nodding (shaking)" should hold regardless of the dominant thought. Similarly, if head movements induce affect that serves as a simple cue (or biases thinking), this should occur regardless of whether one's thoughts are predominantly favorable or unfavorable.

Experiment 1

In contrast to the prior theories of the effects of head movements on persuasion, the self-validation hypothesis makes opposite predictions depending on the dominant thought to a message. To provide a preliminary test of the viability of the self-validation account of the effects of head movements, we conducted an experiment in which head movements (nodding and shaking) were manipulated along with the quality of the arguments contained in a persuasive message (Petty, Wells, & Brock, 1976). The self-validation hypothesis is that nodding/shaking will interact with strong/weak arguments to influence persuasion. More specifically, participants exposed to the strong version of the message (who generate predominantly favorable thoughts) are expected to show greater attitude change when nodding than shaking, replicating prior work on head movements. However, participants who are exposed to the weak version of the message (who generate predominantly negative thoughts) are expected to show less change when nodding than shaking, reversing the effect of prior studies.

Method

Participants

Eighty-two undergraduate psychology students were randomly assigned to the cells of a 2 (head movements: vertical or horizontal) $\times$ 2 (argument quality: strong or weak) between-subjects design.

Procedure

Following Wells and Petty (1980), participants were led to believe that they were involved in consumer research on the sound quality of stereo headphones. They were told that the manufacturer was interested in how headphones performed as to sound quality, comfort, and so forth when listeners were engaged in various movements such as dancing and jogging. Two head movement conditions were created. Half of the participants were told that they should move their heads up and down (nodding) about once per second to test the headphones, whereas the other half was told to move their heads from side to side (shaking). After participants were given their instructions, a tape from a purported campus radio program was played. The tape began with music and then the disc jockey introduced a station editorial. Participants heard a strong or a weak version of an editorial advocating that students be required to carry personal identification cards. The students were told that they would be required to give their opinions about the music, message, and headphones at the end of the experiment. Following the radio broadcast, participants rated the headphones on a variety of dimensions, gave their opinions about the music and editorial, listed their thoughts, and rated their own mood.

Independent Variables

Head movements. To test the headphones, participants received instructions either to move their heads up and down (nodding vertically) or from side to side (shaking horizontally). The suggested rate of movement was about one time per second in both nodding and shaking conditions. Participants were told that the movements should not be too vigorous or exaggerated. Before beginning the task, the experimenter provided an example of the way they were to move their heads and asked them to try the movements several times until they achieved a standard rate.

Argument quality. The critical editorial message advocated that all students be required to carry personal identification cards as part of a proposed new university security system. The cards would be required for admittance to classes, the library, and so forth. The topic and messages were developed in a pilot test following the procedures outlined by Petty and Cacioppo (1986a). We conducted a pretest of the messages and found with a sample of 62 students that the strong message elicited predominantly favorable thoughts (74%) about the proposal, whereas the weak message provoked predominantly unfavorable thoughts (82%). Another pretest conducted with a new group of 60 participants demonstrated that the strong and weak messages were equivalent on other relevant characteristics, such as believability, plausibility, comprehensibility, complexity, and familiarity (i.e., no contrast approached statistical significance). Examples of strong arguments for the personal identification card system were that (a) with their new cards, students could check their grades and exam comments securely over the Internet, (b) personal security in the campus area would improve with the new cards, and (c) the new system would be cost effective, saving both time and money for the university. Examples of

weak arguments were that (a) some security guards felt that with the new system in place, they would be able to have twice as much time for lunch, (b) 10 students' parents sent in letters in favor of cards, and (c) the image of the university would be improved.[2]

Dependent Measures

Attitudes. Participants were informed that it was important to assess their attitudes toward the issue "because opinions about the issue might influence one's evaluations of the headphones." To assess attitudes, participants rated the proposed new security system on a series of 11-point semantic differential scales (i.e., *bad–good, foolish–wise, negative–positive, beneficial–harmful, effective–ineffective, useful–not useful*). Next, consistent with the cover story, participants rated the comfort, pleasantness, and overall quality of the headphones, and their attitudes toward the music on 11-point scales.

Thoughts. Following the attitude measures, participants were instructed to list the thoughts that went through their minds as they listened to the editorial. They were told to write one thought per box and not to worry about grammar or spelling. Twenty boxes were provided for their individual thoughts. After listing their thoughts for 3 min, they were instructed to go back and rate their thoughts as being positive, negative, or neutral toward the proposal (see Cacioppo & Petty, 1981, for additional details on the thought-listing and scoring procedure).

Additional measures. Following the thought-listing task, participants recorded the feelings they had during the task. Feelings were rated on a series of 11-point semantic differential scales anchored with the following: *excited–relaxed, sad–happy, bored–interested, depressed–uplifted,* and *unpleasant–pleasant.* Participants were also asked to assess the extent to which they thought that the head movements were difficult to perform. Responses to this question were made on an 11-point scale anchored by 1 = *not at all* and 11 = *extremely.*

Results

All dependent measures were submitted to 2 (head movement) × 2 (argument quality) analyses of variance (ANOVAs).

Attitudes

Responses to the five scales assessing attitudes toward the proposal were scored so that higher values represented more favorable opinions. Ratings on the different scales were highly intercorrelated ($\alpha = .95$) and were averaged to create a composite measure of attitude toward the advocacy. Means for all conditions are presented in Table 1.[3] Results of the 2 × 2 ANOVA revealed a main effect of argument quality such that participants who received strong arguments held more favorable attitudes toward the proposal ($M = 7.72$) than those who received weak arguments ($M = 6.63$), $F(1, 76) = 7.57$, $p < .01$. There was no main effect for the head movement manipulation, $F(1, 76) = 2.24$, $p = .13$. Of most interest, a significant Argument Quality × Head Movement interaction emerged, $F(1, 76) = 14.68$, $p < .01$. This interaction indicated that for the strong arguments message, nodders were more favorable toward the proposal ($M = 8.19$) than shakers ($M = 7.26$), $t(38) = 1.98$, $p < .05$. For the weak arguments message, however, attitudes were more favorable for shakers ($M = 7.69$) than for nodders ($M = 5.57$), $t(38) = -3.30$, $p < .05$. Analyses revealed no significant effects of the independent variables on measures of attitudes toward the headphones or the music featured on the tape (all Fs < 1).

Table 1
Experiment 1: Dependent Measures as a Function of Head Movement and Argument Quality

	Strong message				Weak message			
	Head movement				Head movement			
	Nodding		Shaking		Nodding		Shaking	
Message	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Attitude	8.19	1.18	7.26	1.73	5.57	2.65	7.69	1.10
Index of valenced thoughts	0.59	0.88	0.47	1.11	−0.14	1.10	0.06	1.09

Note. $n = 20$ for each group.

Thoughts

The listed thoughts were coded by two judges unaware of participants' experimental conditions. All thoughts were first classified as to whether they were message related or not, and if message related, were then classified as positive, negative, or neutral in content. Thoughts were coded as favorable when they either mentioned some specific positive feature or consequence of the proposal (e.g., "it will save time and paper"), or they were more globally supportive of the message advocacy (e.g., "I can't wait to have one of the cards"). However, thoughts were coded as unfavorable when they mentioned some specific negative feature or consequence of the proposal (e.g., "it will be chaos if you lose the card"), or they were more globally critical of the message advocacy (e.g., "this shouldn't be a priority"). Judges showed significant agreement in their ratings ($r = .84$, $p < .001$), and disagreements were resolved by discussion. An index of favorability of message-related thoughts was formed by subtracting the number of unfavorable message-related thoughts from the number

[2] Although the goal of the weak message was to elicit mostly negative thoughts by highlighting weak (rather than strong) benefits of the proposal, the weak arguments were still perceived as favoring the proposal. An independent sample of 36 students was given either the strong ($n = 15$) or the weak ($n = 21$) message and asked to indicate whether the message argued in favor of or against the new security card system. All 36 students rated the messages as favoring the new system. Furthermore, in rating on a 7-point scale of how favorable the message was to the proposal, there were no differences in ratings between those who received the strong message ($M = 6.22$, $SD = 0.70$) and those who received the weak message ($M = 6.09$, $SD = 0.94$), $t(34) = 0.59$, $p = .55$. There were also no differences in the rated sincerity of the arguments presented ($M_{strong} = 4.46$ vs. $M_{weak} = 3.76$), $t(34) = 1.43$, $p = .16$.

[3] Although it was not expected that participants would be aware of the relationship between head movements and agreement or disagreement during the experimental session, 2 people were eliminated from the analysis because they reported during the postexperiment interview that horizontal head movements explicitly reminded them of times when they were in disagreement. For the same reason, 2 participants were removed from Experiment 3.

of favorable message-related thoughts and dividing by the total number of message-related thoughts (see Table 1 for all means).[4]

Analysis of the thought index yielded a significant main effect of argument quality, $F(1, 76) = 6.00$, $p < .01$. That is, participants' thoughts were more favorable toward the advocacy after receiving strong arguments ($M = 0.53$) rather than weak arguments ($M = -0.04$). No difference was observed between nodders and shakers ($M = 0.22$ and $M = 0.27$, respectively), $F(1, 76) = 0.39$, $p = .84$. This means that head movements did not affect the overall valence of thoughts.

Mood

Items on the mood scale were intercorrelated ($\alpha = .79$) and were combined to form one overall measure. A 2 × 2 ANOVA yielded no significant effects (all Fs < 1).

Movement Difficulty

It was expected that nodding and shaking involved equal levels of difficulty. As anticipated, no significant difference between nodders ($M = 7.45$) and shakers ($M = 8.1$) was obtained on this measure, $F(1, 75) = 1.12$, $p = .29$.

Discussion

The results of Experiment 1 were consistent with the self-validation hypothesis. Notably, we replicated prior research showing that nodding could increase persuasion over shaking when the message arguments were strong. However, when the message arguments were weak, we showed for the first time that nodding could reduce persuasion over shaking. This result would not be expected by prior accounts of why head movements influence attitudes.

Thus, the results of Experiment 1 provide initial support for the self-validation hypothesis. However, because half of the results from Experiment 1 (from the weak message conditions) conflict with prior findings, and may seem counterintuitive, a replication seemed essential. Furthermore, the self-validation hypothesis predicts that the effects of head movements on attitudes should be most apparent when the likelihood of thinking is high. There are at least two possible reasons for this. First, if people have few thoughts during the message, then there would be few thoughts to validate or invalidate, thereby attenuating any effects. Second, the same factors that would likely motivate high amounts of scrutiny and elaboration of the message (e.g., high personal importance of the topic, accountability, etc.; see Petty & Cacioppo, 1986b) would also likely motivate people to scrutinize and evaluate their thoughts for validity. Because participants in our first experiment were told that their opinions would be assessed after the broadcast and the issue was relevant to the participants' university (Petty & Cacioppo, 1979), we assume that, overall, the likelihood of thinking was high. It would be informative, however, to compare the reactions of individuals who were engaged in much versus little thinking about the message.

Experiment 2

Experiment 2 was designed with two objectives. Our first goal was to replicate the previous findings. In addition, we wanted to examine whether the self-validation effect would be more likely to occur when people were actively thinking about the message than when they were not. So, we manipulated the extent to which people were engaged in thinking about the message.

Method

Participants, Design, and Procedure

One hundred forty-seven undergraduate psychology students participated in a 2 (head movements: nodding or shaking) × 2 (argument quality: strong or weak arguments) × 2 (elaboration: high or low) between-subjects factorial design. The procedure was the same as in Experiment 1, with the addition of a manipulation of elaboration. The measures taken were the same as in Experiment 1, with the addition of measures of perceived elaboration.

Independent Variables

Head movements. Participants were told that to test some new headphones, they needed to move their heads either up and down (nodding vertically) or from side to side (shaking horizontally). The rationale for the movements and instructions about how to make the movements were the same as described for Experiment 1.

Argument quality. Participants heard the same strong or weak editorial messages used in our previous experiment.

Elaboration manipulation. Two factors were varied to manipulate the extent of elaboration: message speed and forewarning of questions about the message content. First, in the low elaboration conditions, participants received a version of the message in which the speaker recorded the editorial at a pace somewhat faster than normal. This should impair their ability to process the message carefully (e.g., Moore, Hausknecht, & Thamodaran, 1986; Smith & Shaffer, 1995). In addition, low elaboration participants were asked to pay attention exclusively to the headphone quality, not to other irrelevant features of the tape. Thus, the motivation to process the arguments in the message was expected to be relatively low. In the high elaboration conditions, participants listened to a version of the message recorded at a regular speed, and thus it was likely that most participants had cognitive resources sufficient to process the information. The high-speed version of the message (3 min in length) was about 25% faster than the low-speed version (4 min in length) used in our previous experiment. An independent sample of 34 participants rated the high-speed version as significantly faster ($M = 7.11$) than the low-speed version ($M = 3.06$), $t(32) = 9.72$, $p < .01$, on an 11-point scale. Also in contrast to the low elaboration participants, high elaboration participants were told that following exposure, they would be required to answer several ques-

[4] Although participants rated the valence of their thoughts, judges' ratings were preferred for the analyses because of various coding "errors" on the part of the participants. First, some participants tended to assess irrelevant/neutral thoughts as favorable or unfavorable toward the proposal of the message. For example, 1 participant wrote "I was not paying attention to the message, but then I decided to attend to it" and coded the thought as positive even though it was not related specifically to the proposal. Another participant wrote "I feel like a rat in this lab" and "it is too hot here," and coded both as negative thoughts, though neither was related to the topic (and thus should have been scored as neutral toward the topic). The opposite case also was true, as some participants coded as neutral thoughts that were positive or negative toward the proposal. For example, 1 participant coded as neutral "parents should have nothing to do or to say about campus issues," which is a thought contrary to one of the arguments in the weak persuasive message.

tions about the content of the message. Thus, their motivation to pay attention to the message was expected to be relatively high.

Dependent Measures

The questionnaire packet included the same items as in Experiment 1. Again, after rating the headphones and the music, participants were informed that it was important to assess their attitudes toward the issue "because opinions about the issue might influence one's evaluations of the headphones." All responses were made on 11-point semantic differential scales. Following the attitude measures, participants were instructed to list the thoughts that went through their minds as they listened to the editorial. The thoughts were then rated as being either positive, negative, or neutral toward the proposal. Finally, participants recorded the feelings they had during the task, the cognitive effort they expended, and other ancillary items.

Results

All dependent measures were submitted to 2 (head movement) × 2 (argument quality) × 2 (elaboration) ANOVAs.

Attitude

Responses to the six attitude scales (i.e., *bad–good, foolish–wise, negative–positive, beneficial–harmful, effective–ineffective, useful–not useful*) were scored so that higher values represented more favorable opinions of the proposal. Ratings on the different scales were highly intercorrelated ($\alpha = 0.88$) and were averaged to create a composite measure of attitude. Means for all conditions are presented in Table 2. Results of the 2 × 2 × 2 ANOVA revealed a marginal main effect of argument quality such that participants who received strong arguments tended to hold more favorable attitudes toward the message ($M = 7.38$) than participants who received weak arguments ($M = 6.84$), $F(1, 146) = 3.17$, $p = .07$.

Of more importance, a significant Argument Quality × Head Movement × Elaboration interaction emerged, $F(1, 146) = 4.24$, $p < .05$. Decomposition of this triple interaction revealed that the pattern of results varied as a function of the elaboration manipulation. First, consistent with the self-validation hypothesis, under high elaboration conditions a significant Argument Quality × Head Movement interaction emerged, $F(1, 73) = 5.70$, $p < .05$. Replicating Experiment 1, this interaction indicated that for the weak message, people were more favorable toward the proposal when shaking ($M = 7.50$) rather than nodding ($M = 6.29$) their heads, $t(34) = 2.07$, $p < .05$. For the strong message, however, attitudes tended to be more favorable for nodders ($M = 7.95$) than for shakers ($M = 7.25$), although this difference was not statistically significant, $t(36) = 1.28$, $p = .20$. When elaboration was relatively low, there were no significant main effects for message, $F(1, 72) = 0.67$, $p = .42$, head movements, $F(1, 73) = 0.24$, $p = .63$, nor any interaction, $F(1, 73) = 0.42$, $p = .52$. Analyses revealed no significant effects on measures of attitudes toward the headphones or the music featured on the tape (all Fs < 1).

Thoughts

As before, cognitive responses were coded by two judges unaware of the participants' experimental conditions. Judges gener-

Table 2
Experiment 2: Dependent Measures as a Function of Head Movement, Argument Quality, and Manipulated Elaboration

	Strong message				Weak message			
	Head movement				Head movement			
	Nodding		Shaking		Nodding		Shaking	
Message	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
	High elaboration							
Attitude	7.95	1.34	7.25	1.96	6.29	2.06	7.50	1.34
Index of valenced thoughts	0.40	0.98	0.41	0.97	0.15	1.08	0.01	1.15
No. of message-relevant thoughts	2.63	2.21	2.68	2.64	2.44	1.78	2.33	2.22
Self-reported elaboration	7.10	1.53	6.68	1.65	6.85	1.30	6.23	1.50
Mood	6.33	1.14	5.66	1.04	6.44	1.16	5.64	1.94
N	19		19		18		18	
	Low elaboration							
Attitude	7.12	2.14	7.19	2.23	7.04	1.98	6.51	1.38
Index of valenced thoughts	0.77	1.18	0.46	0.98	0.23	1.16	0.10	1.31
No. of message-relevant thoughts	1.38	1.61	1.94	1.55	1.94	1.50	1.33	1.23
Self-reported elaboration	5.70	1.64	6.66	1.74	6.19	1.42	5.34	1.68
Mood	6.58	1.24	6.27	1.03	6.35	1.58	5.55	0.90
N	18		18		19		18	

ally agreed on the thoughts coded ($r = .83$, $p < .001$), and disagreements were resolved by discussion. The same index of favorability of message-related thoughts was used as in the prior experiment.

Results of the 2 × 2 × 2 ANOVA revealed a main effect of argument quality, such that participants' thoughts were significantly more favorable ($M = 0.51$) when exposed to strong rather than weak ($M = 0.12$) arguments, $F(1, 146) = 4.48$, $p < .05$. No other main effects or interactions were found on this index (all Fs < 1). To further assess the impact of the elaboration manipulation, thoughts were also classified as message related or unrelated. The 2 × 2 × 2 ANOVA revealed a significant main effect for elaboration on the number of message-relevant thoughts generated. That is, when elaboration was high ($M = 2.52$), more message-related thoughts were generated than when elaboration was low ($M = 1.65$), $F(1, 146) = 7.64$, $p < .01$.

Movement Difficulty

Participants rated the extent to which they thought that their head movements were difficult to perform on a 1 (*not at all difficult*) to 11 (*extremely difficult*) scale. As in Experiment 1, no significant difference between nodders ($M = 8.3$) and shakers ($M = 8.13$) was found, $F(1, 140) = 0.65$, $p = .79$.

Self-Reported Elaboration

Participants were asked to complete several questions that assessed the effectiveness of the manipulation of message elaboration. Perceived elaboration was rated on four 11-point semantic differential scales anchored with the following: *low thinking* versus *high thinking*, *low attention paid* versus *high attention paid*, *low difficulty in following the message* versus *high difficulty in following the message*, and *low difficulty in understanding the message* versus *high difficulty in understanding the message*. The four measures were highly correlated ($\alpha = .74$) and were averaged to form one measure of perceived elaboration (see Table 2 for all means). Results of the 2 × 2 × 2 ANOVA revealed only a main effect of elaboration such that participants in the high-elaboration groups reported significantly higher scores on this index ($M = 6.73$) than those in the low elaboration groups ($M = 6.00$), $F(1, 139) = 7.69$, $p < .01$. There was no main effect for the head movement manipulation $F(1, 139) = 0.76$, $p = .38$, nor any interactions (Fs < 1).

Mood

Items on the mood scale were intercorrelated ($\alpha = .60$) and were combined to form one overall measure (see Table 2). Results of the 2 × 2 × 2 ANOVA revealed a significant main effect for the head movement manipulation, $F(1, 146) = 9.16$, $p < .01$, such that participants in the nodding condition reported higher mood ($M = 6.45$) than those in the shaking condition ($M = 5.89$), $t(142) = 3.10$, $p < .01$. This finding suggests that nodding and shaking, because of their strong association with agreement and disagreement responses, can induce different mood states, though this effect was not found in Experiment 1. The correlation between participants' mood states and their postmessage attitudes was very low ($r = .09$, $p > .05$). We discuss the possibility of mood influences on our results in our General Discussion section.

Discussion

The results of Experiment 2 replicated Experiment 1 when elaboration was high. Specifically, consistent with the self-validation hypothesis, head movements interacted with argument quality to determine attitudes toward a persuasive communication. Of most interest, we again obtained the novel finding that shaking could increase persuasion over nodding when the message contained weak arguments. This result is not consistent with previous interpretations of the persuasive effects of head movements (i.e., biased processing, self-perception, and classical conditioning), all of which would have expected nodding to invariably increase persuasion over shaking.

However, under low elaboration conditions, head movements were ineffective in modifying attitudes. Thus, the extent of elaboration appears to moderate the effects of head movements on attitudes.

Experiment 3

Although the data from our first two experiments provided evidence that was consistent with the self-validation predictions and inconsistent with the alternative accounts, we have not yet shown any link between head movements and confidence in one's thoughts. This mediational question was the focus of Experiment 3. In this experiment, participants engaged in nodding or shaking to strong or weak arguments and then reported their attitudes and thoughts. Of importance, following this, participants reported the confidence that they had in their thoughts. Our hypothesis was that the people engaged in shaking their heads horizontally would express less confidence in their thoughts than people engaged in nodding their heads vertically. Furthermore, the reduced confidence associated with shaking should result in decreased persuasion for the strong message (i.e., favorable thoughts message) and increased persuasion for the weak message (i.e., unfavorable thoughts message) relative to nodding.

Method

Participants, Design, and Procedure

Eighty-nine undergraduate psychology students were randomly assigned to a 2 (head movement: nodding or shaking) × 2 (argument quality: strong or weak) between-subjects factorial design. The procedure and measures were the same as in Experiment 1 with the addition of measures of self-reported elaboration (as in Experiment 2) and confidence in one's thoughts.

Independent Variables

Head movements. As in all prior experiments, participants were told that to test the headphones, they needed to either move their heads up and down (nodding) or side to side (shaking).

Extent of elaboration. Although our intent was to place all participants in a relatively high elaboration condition as in Experiment 1, we also assessed elaboration using two questions of perceived cognitive effort, as Experiment 2 demonstrated that the confidence effect was most pronounced for the participants highest in thinking. Participants rated their

extent of thinking about the message on two 11-point semantic differential scales anchored with the following: *low thinking* versus *high thinking*, and *low attention paid* versus *high attention paid*. The two measures were correlated ($r = .68$, $p < .001$) and were averaged to form one measure of elaboration.

Dependent Measures

The questionnaire packet included basically the same items as in previous experiments. All attitude responses were made on 11-point semantic differential scales. Following the attitude measures, participants were instructed to list the thoughts that went through their minds as they listened to the editorial. After this, participants completed the measures of feelings, head movement difficulty, and extent of thinking.

The critical new measure in this experiment was an assessment of participants' confidence in their own thoughts. After listing cognitive responses, participants were informed that, as an additional control measure, it was important to assess the confidence they had in the validity of the thoughts they just wrote. Confidence in thoughts was rated on five 11-point semantic differential scales anchored with *not at all* versus *extremely confident*, *certain*, *valid*, *defined*, and *clear*. For comparison purposes, we next asked participants to rate their general confidence in themselves on three 11-point semantic differential scales anchored with the following: *not confident at all* versus *extremely confident*, *not certain at all* versus *extremely certain*, and *not secure at all* versus *extremely secure*. We expected head movement effects to relate to thought confidence in particular rather than to self-confidence more generally.

Results

All dependent measures were submitted to a hierarchical regression analysis with argument quality (dummy coded), head movements (dummy coded), and the continuous elaboration measure as the predictors. Following the recommendation of Cohen and Cohen (1983), we first entered the three predictors into a single regression equation, predicting attitudes, and then entered the interactions between these variables (i.e., their product) into a second and third regression equation. See Table 3 for means for key measures based on a median split on elaboration for illustrative purposes.

Attitude

Analysis of the attitude data revealed the expected main effect for argument quality, $\beta = .41$, $t(88) = 4.26$, $p < .0001$, such that participants who received strong arguments held more favorable attitudes toward the proposal ($M = 7.77$) than those who received weak arguments ($M = 6.35$). Also, an effect of reported elaboration emerged, $\beta = .24$, $t(88) = 2.45$, $p < .05$, such that increased elaboration was associated with more favorable attitudes.

Confirming the efficiency of the self-reported measure of elaboration, a significant Argument Quality × Elaboration interaction emerged, $\beta = .20$, $t(88) = 2.10$, $p < .05$. This interaction revealed that argument quality had a larger impact on attitudes as elaboration increased. Viewed differently, the interaction showed that the persuasive impact of the strong message increased with elaboration, $\beta = .48$, $t(38) = 3.32$, $p < .01$, whereas the persuasive effect of the weak message did not vary with elaboration, $\beta = .04$, $t(49) = 0.30$, $p = .76$.

Of greatest importance, consistent with the self-validation hypothesis, a three-way interaction emerged between argument qual-

Table 3
Experiment 3: Dependent Measures as a Function of Head Movement, Argument Quality, and Median Split on Measured Elaboration

	Strong message				Weak message			
	Head movement				Head movement			
	Nodding		Shaking		Nodding		Shaking	
Message	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
	High elaboration							
Attitude	9.14	0.95	7.66	1.57	5.54	1.45	7.66	1.22
Index of valenced thoughts	0.75	0.37	0.18	0.81	−0.46	0.66	−0.47	0.32
No. of message-relevant thoughts	3.66	2.34	3.33	1.73	4.31	2.08	3.61	1.66
Self-reported elaboration	8.22	0.50	7.83	0.35	8.68	0.77	8.19	0.59
Confidence in thoughts	5.40	0.31	4.40	0.83	5.33	0.78	4.21	1.04
Mood	7.07	1.43	7.70	1.60	7.29	2.24	7.20	2.00
N	9		9		16		13	
	Low elaboration							
Attitude	6.96	2.05	7.43	1.94	6.52	1.56	5.94	1.10
Index of valenced thoughts	0.33	0.74	0.27	0.80	−0.59	0.42	−0.28	0.62
No. of message-relevant thoughts	1.66	1.32	1.75	1.05	3.50	2.39	2.07	2.10
Self-reported elaboration	6.05	0.63	5.54	1.46	6.00	1.02	4.84	1.47
Confidence in thoughts	4.51	0.24	4.69	0.82	4.94	0.72	4.04	0.83
Mood	6.25	0.54	6.66	0.55	7.37	1.52	6.30	1.76
N	9		12		8		13	

ity, head movement, and extent of elaboration, $\beta = -.35$, $t(88) = -3.72$, $p < .0001$. To examine the basis of this interaction, strong and weak message groups were analyzed separately. In consonance with the self-validation hypothesis, for the strong arguments, a two-way interaction appeared between elaboration and head movements, $\beta = -.27$, $t(38) = -1.86$, $p = .07$. This interaction indicated that the persuasive advantage of nodding over shaking became larger as elaboration increased. There was also an interaction between elaboration and head movements for the weak message, $\beta = .48$, $t(49) = 3.89$, $p < .0001$, but the pattern was opposite. That is, for the weak message, the persuasive advantage of shaking over nodding increased with elaboration. Analyses revealed no significant effects on measures of attitudes toward the headphones or the music featured on the tape (all ps $> .25$).

Thoughts

As in the prior experiments, cognitive responses were coded by two judges unaware of participants' experimental conditions. Thoughts were classified as positive, negative, or neutral in content, and as message related or unrelated. Judges agreed on most of the thoughts coded ($r = .82$, $p < .001$) and disagreements were resolved by discussion. The same index of message favorability was formed as in the prior experiments.

Analysis of the thought index yielded only a significant main effect of argument quality, $\beta = -.55$, $t(79) = 5.80$, $p < .0001$. That is, participants' thoughts were more favorable toward the advocacy after receiving strong ($M = 0.37$) rather than weak ($M = -0.44$) arguments. In addition, a hierarchical regression analysis on the mere number of message-relevant thoughts generated revealed only a significant effect for reported elaboration, $\beta = .38$, $t(88) = 3.80$, $p < .0001$. As elaboration increased, participants generated more message-relevant thoughts.

Confidence

Responses to the five specific items of confidence in one's thoughts were highly intercorrelated ($\alpha = .89$) and were averaged to create a composite measure. As expected, results of the hierarchical regression analysis revealed a significant main effect of head movements, $\beta = -.35$, $t(88) = 3.67$, $p < .0001$, such that nodders showed higher confidence in their thoughts ($M = 5.06$) than shakers ($M = 4.38$). Also, a significant effect of reported elaboration emerged, $\beta = .28$, $t(88) = 2.94$, $p < .01$, showing that as elaboration increased, thought confidence increased.

The three measures of general confidence in oneself were not highly intercorrelated and no effects of head movements were obtained on any of them individually or in a combined measure (all ps $> .41$).[5]

Mood

Items on the mood scale were intercorrelated ($\alpha = .67$) and were combined to form one overall measure. No significant effects emerged on this measure (all ps $> .13$).

Mediation of Head Movement Effects

To provide evidence that the attitude effects were mediated at least in part by the feelings of confidence induced by the head movements, a regression analysis was conducted for high elaboration participants (i.e., those above the median on this measure; see Table 3). The attitude data were submitted to a mediational analysis using the technique recommended by Baron and Kenny (1986). For simplicity and to maximize power for this analysis, we reverse coded the attitude data for the weak arguments condition, so that this group would have the same direction of effect as the strong arguments group. We then examined the extent to which the effect of head movements (coded 1 for shakers and 2 for nodders) on attitudes was mediated by thought confidence. First, there was a significant effect of head movements on both attitudes, $\beta = .56$, $t(46) = 4.55$, $p < .001$, and confidence in thoughts, $\beta = .56$, $t(46) = 4.54$, $p < .001$ (standardized regression coefficients). There was also a significant positive relationship between confidence in thoughts and attitudes, $\beta = .57$, $t(46) = 4.72$, $p < .001$. When both head movement and confidence in thoughts were entered as predictors in the regression equation, confidence in thoughts still predicted attitudes significantly, $\beta = .38$, $t(46) = 2.73$, $p < .01$, as did head movements, $\beta = .34$, $t(46) = 2.50$, $p = .02$. Of most importance, using a version of the Sobel test (Sobel, 1982) recommended by Baron and Kenny, the reduction in the direct effect of head movements on attitudes from the nonmediated model to the mediated model was significant ($z = 2.49$, $p = .01$). Thus, thought confidence played an important mediational role in determining the impact of overt behavior (head movements) on attitudes.

Discussion

The results of Experiment 3 replicated our previous patterns for the strong and weak messages. First, as in Experiment 2, the persuasive effect of head movements increased as elaboration increased. Second, as elaboration increased, nodding enhanced persuasion over shaking only for the strong message. When the message was weak, as elaboration increased, more persuasion was found for shakers than nodders. Third, head movements did not affect the direction of the thoughts generated by the participants. Fourth, head movements affected participants' confidence in the validity of their own thoughts. Finally, thought confidence served as a significant mediator of the effect of head movements on attitudes.

Thus, Experiment 3 provided additional support for the self-validation account for the effects of head movements on persuasion. In a final experiment we had the following three goals: (a) to provide additional evidence of the potential of the self-validation hypothesis to explain the impact of overt behavior on attitudes, (b) to extend self-validation effects to a new attitude domain, and (c) to further distinguish between the self-validation and the self-perception points of view.

Experiment 4

In our initial series of studies on self-validation processes in persuasion (Petty et al., 2002), the critical issue was whether

[5] The impact of head movements on thought confidence and the absence of an effect on self-confidence may reflect a difference in the reliability of the two measures, though the head movement effect was significant on some of the individual measures of thought confidence and none of the individual measures of general confidence.

confidence in one's thoughts mattered at all for attitude change. Thus, in these initial studies we used some very direct manipulations of confidence, such as getting people to think of past situations in which they were confident or telling them that other people had explicitly accepted or rejected their thoughts. Furthermore, these manipulations always *followed* the generation of thoughts so that participants had to reassess their thoughts after generating them. These fairly direct and blatant postthought manipulations were successful in demonstrating that people's confidence in their thoughts could be manipulated, and that thought confidence was consequential for persuasion. Thus, these studies demonstrated that the self-validation framework had some promise. The studies were less successful, however, in demonstrating that people would naturally think about the confidence in their thoughts as they were generated. The current experiments are more revealing in this regard. That is, in contrast to the prior manipulations, the head movement manipulation used in Experiments 1–3 is rather subtle. No specific mention of confidence is made and no explicit external acceptance or rejection of participants' thoughts is made. Participants have to self-generate inferences of confidence. But are the confidence effects we observed unique to head nodding, or can other behavioral responses associated with thought generation have similar effects? This is one key issue addressed in Experiment 4.

A second issue addressed by Experiment 4 concerns the target of attitude change. In the original work on self-validation processes (Petty et al., 2002) as well as in Experiments 1–3, the topic of change involved a campus issue (i.e., instituting comprehensive exams or requiring a new security card). Although these issues are important to students, and they are typically eager to think about them, the issues are not of longstanding concern, nor are they likely to be of high issue-specific knowledge. Thus, it may be that thought confidence effects are especially likely on such issues. To examine this, in Experiment 4 we changed the target of influence to one that is of longstanding importance and of high knowledge—the self (see Baumeister, 1998).

Finally, in Experiment 4 we wanted to provide a more rigorous test of the self-perception explanation of the confidence and persuasion effects that stem from overt behavior. The traditional self-perception explanation holds that self-perception processes can account for the data if naïve observers of the overt behavior would draw the same conclusions about attitudes as would the participants themselves (Bem, 1967). Because all observers to the head movement experiments could see would be head nodding or shaking, we presumed that they would generate a main effect prediction (i.e., more presumed persuasion with nodding rather than shaking). But, observers would have no knowledge of what people were thinking while they were nodding and shaking. If observers had access to participants' thoughts, could they intuit the self-validation results? This issue is addressed in Experiment 4.

To accomplish our goals, in Experiment 4 overt behavior and thought direction were both manipulated differently than in the prior experiments. Participants were induced to think that they were enrolled in an experiment designed to test the validity of graphology to predict professional performance. Thought direction was manipulated by asking participants to think and to write down three good or three bad traits or skills that they believe they possessed. We asked half of the participants to write their qualities with their right hand, and the other half were required to do so with their left hand. We selected this specific behavior on the basis of the intuition that whatever is written with the nondominant hand does not look good, or does not appear very confident, and might thus reduce the confidence with which the written thoughts are held. Writing with one's nondominant hand literally produces thoughts that appear shaky. However, because we expected people to generate the trait in a similar manner whether they had to write it with their dominant or nondominant hand, we expected no differences in the content of the traits produced. After writing their qualities, all participants rated their confidence in the thoughts that they had just generated, and then completed a self-esteem scale as a measure of their attitudes toward themselves.

We hypothesized that the hand manipulation would affect the confidence with which participants held the positive and negative traits listed. Because of this, we expected the hand manipulation to influence the extent to which participants relied on their self-generated qualities when responding to the self-esteem scale. Thus, we expected that the effect of the direction of thoughts on current self-esteem would be greater when people are engaged in a behavior associated with confidence (writing with their dominant hand) than with doubt (writing with their less dominant hand).

To examine the self-perception alternative, we had naïve judges examine the traits listed by the participants and asked them to rate the self-esteem of the person who generated the traits. In this paradigm, the observers have two critical pieces of information: They can see the content of the thoughts and the appearance of the thoughts. One possibility is that naïve judges would focus primarily on the appearance of the thoughts (shaky or neat) and hypothesize that people with shaky writing have less self-esteem than people with neat writing. This main effect prediction would be comparable with the main effect prediction we derived from self-perception theory for the head movement effect. However, because naïve judges in Experiment 4 will also have access to the content of people's thoughts about themselves, it is possible that they will intuit the self-validation pattern of an interaction of right or left hand with direction of thoughts.[6]

Method

Participants and Design

Sixty-five undergraduate students participated in partial fulfillment of an introductory psychology course requirement. They were randomly assigned to the experimental conditions in a 2 (thought direction: positive or negative) × 2 (hand: right or left) between-subjects factorial design.

[6] We did not provide the judges with the information that people wrote the thoughts with either their right or left hand. We presumed that if we provided this cogent explanation for the shaky or neat handwriting, it would undermine any possible inferences of confidence that stemmed from the writing (e.g., Schwarz & Clore, 1983). We expected the generators of the traits to show the self-validation effect because although they were aware of which hand produced the thoughts, they were not expected to be aware of the biasing effect of the hand manipulation on their thought confidence. Thus, they would not be expected to correct for this bias (Wegener & Petty, 1997). Similarly, although participants in the head movement experiments were aware of *why* they were shaking their heads (i.e., they were instructed to by the experimenter), they were presumably unaware of the biasing effect that the head movements had on their thought confidence.

Procedure

Participants were told that they were going to participate in research designed to study the validity of graphology in predicting future professional performance. To keep the likelihood of elaboration relatively high for all participants, the experimental session was introduced as part of a larger study in which their potential as professionals was going to be assessed. To manipulate the direction of the thoughts, participants were asked to first think about and then to write down three good or bad qualities that they thought they had as potential professionals. Half of the participants were told that they had to write down their positive or negative skills with their right hand. The remaining participants were told that they had to write their traits with their left hand. Then, as an apparent control measure, participants were required to answer several questions with respect to the confidence they had in those thoughts. Finally, as an additional control measure, participants were asked to complete a few questions about their personality (i.e., the self-esteem scale).

Independent Variables

Direction of the thoughts. Participants were instructed to first think about and then to write down three good or bad qualities that they thought they had as potential professionals. That is, they were to record the strengths, skills, and abilities (or the weaknesses and flaws) they thought they had with respect to their planned careers. They were provided with three blank boxes to describe these attributes during a 3-min period. Some examples of good abilities participants wrote included the following: "positive attitude," "hard-worker," "polite," "flexibility," and "self-control." Some examples of flaws listed included the following: "impatient," "bad mood," "shy," "lazy," "envious," and "rigid." Previous research has found that asking people to think about and write positive or negative behaviors and qualities can influence self-esteem (e.g., Hermann, Leonardelli, & Arkin, 2002). Of course, we expected this influence to be greater when the traits were written with the dominant rather than the nondominant hand.

Manipulation of thought confidence. Participants received instructions either to use their right or left hand to write down their attributes. Participants were told that they could take as long as needed to write their future professional qualities. Because participants were induced to think that they were collaborating in graphology research, asking them to use a specific hand was consonant with the cover story. There was one student for whom the right hand was not the dominant hand (assessed at the end of the experiment). This student was deleted from the analyses.

Dependent Measures

Confidence in thoughts. Before measuring self-esteem (i.e., attitudes toward oneself), participants were asked to think back to the thoughts they listed about their professional qualities and to rate their overall confidence in them. Confidence was assessed by asking participants to rate how confident they were in their thoughts on a scale from 1 (*not at all*) to 7 (*extremely*).

Attitudes. Participants were informed that it was important to assess additional information about them as their personality might have influenced their responses to other items. Self-attitudes were assessed using the Rosenberg (1979) self-esteem scale. The items of the 5-point scale were highly intercorrelated ($\alpha = .77$) and were averaged to create a composite self-esteem measure.

Quality of traits. Because the actual quality of the traits participants listed could influence their thought confidence ratings, we analyzed the quality of the participants' positive and negative thoughts. This was to guard against the possibility that participants wrote less extremely positive or negative traits when writing with the left than the right hand. Participants' traits were rated on an 7-point scale by two judges unaware of the experimental hypotheses. The judges rated the thoughts on the extent to which they were *high quality or very desirable traits* (7) to *low quality or very undesirable traits* (1).

Observers' Data: Test of Self-Perception

As noted earlier, the classic test of self-perception theory is to see if "observers" would come to the same inferences as the individuals themselves when witnessing behavior. Thus, the self-perception test would be to have observers examine what participants wrote and then guess what attitudes they had about themselves (e.g., see Bem, 1965, 1967). To examine this, we had 65 judges, unaware of the experimental hypotheses, examine what participants wrote and estimate participants' self-esteem. The observers were from the same population as the participants and were given the same cover story, though they were not informed about the hand manipulation (see Footnote 6). We used one observer to rate each participant's qualities. After looking at the qualities participants wrote (including both content and appearance), the judges estimated participants' self-esteem on a 7-point scale (1 = *low self-esteem*, 7 = *high self-esteem*).

Results

Participants' Data: Test of the Self-Validation Effect

All dependent measures were submitted to a 2 (thought direction: strong or weak qualities) × 2 (hand: right or left) between-subjects ANOVA.

Attitudes. Responses to the self-esteem scale were scored so that higher values represented more favorable opinions of oneself. Results of the 2 × 2 ANOVA revealed a significant main effect of thought direction, $F(1, 65) = 3.77$, $p = .05$. That is, participants who wrote strong qualities reported higher self-esteem ($M = 3.58$, $SD = 0.53$) than those who wrote negative or weak qualities ($M = 3.28$, $SD = 0.66$).

Of most interest, and consistent with the self-validation hypothesis, a significant Thought Direction × Hand interaction emerged, $F(1, 65) = 7.34$, $p < .01$. This interaction showed that the effect on self-esteem induced by writing favorable ($M = 3.84$, $SD = 0.48$) versus unfavorable ($M = 3.15$, $SD = 0.62$) qualities was more pronounced for those writing thoughts with their right hand, $t(31) = 3.45$, $p < .01$, than for those writing with their left hand ($M = 3.28$, $SD = 0.42$ vs. $M = 3.39$, $SD = 0.70$, respectively), $t(30) = 0.51$, $p = .60$. Viewed differently, the interaction also showed that for participants who thought about their strong qualities, more self-esteem was found when traits were written with the right ($M = 3.84$, $SD = 0.44$) rather than the left ($M = 3.28$, $SD = 0.42$) hand, $t(26) = 3.20$, $p < .01$. For participants who thought about their weak qualities, however, self-esteem tended to be higher with the left ($M = 3.39$, $SD = 0.70$) rather than the right ($M = 3.15$, $SD = 0.62$) hand, although this difference was not statistically significant, $t(35) = 1.09$, $p = .28$.

Confidence in thoughts. For the thought confidence index, the 2 × 2 analysis revealed two main effects. First, a main effect for the hand manipulation, $F(1, 65) = 61.31$, $p < .001$, indicated that participants reported more confidence in their thoughts when they wrote them with the right ($M = 5.30$, $SD = 1.44$) rather than the left ($M = 2.69$, $SD = 1.35$) hand. Second, a main effect for thought direction, $F(1, 65) = 12.97$, $p < .01$, showed that participants who thought about their strong qualities reported greater confidence in their traits ($M = 4.75$, $SD = 1.87$) than those who wrote about their weak qualities ($M = 3.46$, $SD = 1.77$).

Mediation of the hand effect. To test to what extent confidence in traits *mediated* the effect of behavior on self-esteem, we used the technique recommended by Baron and Kenny (1986). Prior to analysis, the attitude data for the negative trait conditions were reversed scored, so that this group would have the same direction of effect as the positive trait groups. We found evidence for the effect of overt behavior (coded 1 for left hand and 2 for right hand) on self-esteem to be mediated by trait confidence. There was a significant positive effect of the behavior induction on both trait confidence, $\beta = .68$, $t(64) = 7.51$, $p < .001$, and self-esteem, $\beta = .28$, $t(64) = 2.33$, $p < .05$ (standardized regression coefficients). Moreover, there was a significant positive relationship between confidence in traits and self-esteem, $\beta = .68$, $t(64) = 7.51$, $p < .001$. However, when both behavior and confidence in thoughts were included as predictors in the regression equation, confidence in traits still predicted self-esteem, $\beta = .65$, $t(64) = 4.47$, $p < .001$, but the manipulation did not, $\beta = -.16$, $t(64) = -1.14$, $p = .25$. The Sobel test (Sobel, 1982) showed that the decrease in the direct effect of behavior on self-esteem was statistically significant ($z = 4.90$, $p < .01$). In other words, the effect of the hand manipulation on self-esteem was mediated by the confidence participants had in their listed traits. This finding is consistent with self-validation theory and conceptually replicates the findings from Experiment 3.

Quality of traits. The quality of participants' positive and negative skills was coded by two judges who were unaware of the participants' experimental conditions. Judges' ratings were highly correlated ($r = .79$, $p < .001$) and were combined to form an index of trait quality. As expected, the 2 × 2 ANOVA conducted on this measure revealed only a significant main effect of thought direction, $F(1, 65) = 7.69$, $p < .01$. That is, judges rated the quality of the positive skills as significantly higher ($M = 4.85$, $SD = 0.70$) than the quality of the negative skills ($M = 4.38$, $SD = 0.97$) listed. Of more importance, however, there was neither a significant main effect for the hand manipulation, $F(1, 65) = 0.66$, $p = .41$, nor an interaction, $F(1, 65) = 0.87$, $p = .35$. This finding is consistent with the idea that participants first generated the trait and then wrote it down, with the hand manipulation not affecting the quality of the traits listed.

Observer's Data: Test of the Self-Perception Account

To test the self-perception alternative explanation for the impact of the hand manipulation on self-esteem, 65 judges from the same pool of individuals as the participants were asked to examine what participants wrote and to estimate participants' self-esteem. Participants' own ratings and observers' ratings of self-esteem were standardized to create the dependent variable for analysis. As expected, a 2 (right or left hand) × 2 (positive or negative trait) × 2 (participants or observers) ANOVA conducted on this measure revealed a significant three-way interaction, $F(1, 130) = 5.25$, $p < .05$, revealing that the hand and trait manipulations had a different impact on the self-esteem ratings of participants and observers. In particular, in contrast to the Hand × Trait interaction obtained for participants (described earlier), only a significant main effect of the hand manipulation emerged for observers, $F(1, 65) = 5.68$, $p < .05$. Observers rated the self-esteem of participants who wrote with their right hand as significantly higher ($M = 4.64$, $SD = 1.55$) than those who wrote with their left hand ($M = 3.53$, $SD = 1.91$). The interaction between hand and trait did not approach significance, $F(1, 65) = 0.31$, $p = .57$.

Discussion

The results of Experiment 4 conceptually replicated our previous findings, and extended our results to a new paradigm. Consistent with the self-validation hypothesis, overt behavior interacted with trait direction to determine attitudes. Using the dominant hand increased the impact of one's self-relevant thoughts on self-esteem compared with the nondominant hand. As was the case with head nodding, using the dominant hand affected participants' attitudes by influencing their confidence in the validity of their own thoughts.

Experiment 4 also showed that the self-validation framework might be extended from understanding attitudes about issues (as in Experiments 1–3) to other attitude domains, such as attitudes about oneself (Experiment 4). Thus, not only research on attitude change can benefit by considering thought confidence but so might self-esteem and self-certainty research (e.g., Hermann et al., 2002; Wright, 2001).

As with our first three experiments, the interaction of the manipulation of handwriting with trait direction argues against various main effect theories. For example, we argued that self-perception theory might have expected a main effect of hands on self-esteem. That is, if people write poorly, they might infer lower self-esteem than if they wrote the same content in a normal fashion. One of the defining notions of Bem's (1972) self-perception theory is that people infer their own internal states (e.g., attitudes) from their external behavior in the same way that they do for other people. For this reason, we had observers examine what participants wrote and then guess what attitudes the participants had about themselves. Consistent with our prediction from self-perception theory, observers reported lower self-esteem for participants who wrote qualities that looked messy (i.e., with the nondominant hand) than for those who wrote qualities in a nicer way (i.e., with the dominant hand). However, observers did reproduce the interaction effect obtained with the experimental participants. Thus, the self-validation process appears to be different from a simple self-perception process and is a mechanism that does not appear to be easily replicated by observers as would be required by self-perception theory.[7]

[7] It was somewhat surprising that the observers did not consider the valence of the traits when making judgments of self-esteem, $F(1, 65) = 1.54$, $p = .21$. We suspected that this might have been due to the fact that the "graphology" cover story focused them on the appearance rather than the content of the thoughts. To examine this, we had a second group of 65 judges estimate the writer's self-esteem without providing them with the graphology cover story provided to the actual participants. This group of judges produced only a main effect for valence of thought, $F(1, 65) = 35.19$, $p < .0001$, such that people who wrote positive traits were assumed to have higher self-esteem ($M = 4.80$, $SD = 0.61$) than those who wrote negative traits ($M = 3.51$, $SD = 1.00$). This group of judges produced no effect for the hand manipulation, $F(1, 65) < 1$, $p = .97$, nor any interaction, $F(1, 65) = 0.43$, $p = .51$. Thus, regardless of the instructions used, naïve observers were unable to replicate the key self-validation finding. Judges appear to focus either on content or on the style in making their attributions.

General Discussion

The current research has provided a new look at the question of how behavioral responses can have an impact on attitude change. We focused our analysis on the effects of head movements. In the course of doing this, we introduced a new empirical finding (i.e., vertical head movements reducing persuasion over horizontal movements), we established a new mechanism by which head movements can have an impact on persuasion (i.e., self-validation), and we provided a moderator of the head movement effect (i.e., extent of thinking) that is compatible with the new mechanism. In addition, we extended the original paradigm of head movements to another overt behavior (i.e., handwriting) and another attitude domain (i.e., self-esteem).

Prior research had shown that head nodding could enhance the favorability of attitudes over shaking (Tom et al., 1991; Wells & Petty, 1980), but the present research is the first to suggest and demonstrate that shaking can sometimes enhance persuasion over nodding. To explain the diverse effects of head movements, we used the self-validation hypothesis (Petty et al., 2002). This hypothesis holds that variables, such as head movements and other overt behaviors, can influence the extent of perceived validity or confidence in one's own thoughts, and thereby affect attitudes. Nodding is postulated to induce more confidence in thoughts than shaking. If confidence in favorable thoughts is increased, persuasion should be enhanced, but if confidence in counterarguments is increased, persuasion should be reduced. Conversely, if confidence in favorable thoughts is undermined, persuasion should be reduced, but if confidence in counterarguments is undermined, persuasion should be increased.

In several investigations, we not only replicated the prior finding that nodding could enhance attitude change relative to shaking when people were generating predominantly favorable thoughts (strong arguments conditions), but we also showed that nodding could reduce attitude change relative to shaking when people were generating predominantly unfavorable thoughts (weak arguments conditions). As noted previously, this interaction result is not consistent with prior interpretations of the persuasive effects of head movements, as these would have expected only a main effect of head movements on attitudes.

In Experiment 4, we demonstrated another overt behavior that could influence the confidence people had in their thoughts—whether the thoughts were written with the right or left hand. This result further suggests that people are attentive to not only the valence of the thoughts generated, but also to the perceived validity of those thoughts. Further it suggests that there may be a variety of behavioral and other factors that can influence the validity of one's thoughts. Among the behavioral manipulations that might be explored in this regard are arm flexion versus extension (Cacioppo et al., 1993) and smiling versus frowning (e.g., Strack, Martin & Stepper, 1988). In one study, for instance, Stepper and Strack (1993) found that when people recalled behaviors of self-assurance when smiling rather than frowning, they felt more self-assured, but when they recalled behaviors of low self-assurance, they felt less self-assured when smiling than frowning. If smiling enhances confidence in the recalled behaviors compared with frowning, the self-validation hypothesis can explain these results.

Another contribution of the present research is that the results of the "observers" from Experiment 4 provide additional evidence that self-perception mechanisms are not sufficient to account for self-validation effects. Observers may be unable to reproduce the self-validation pattern because they are missing the experiential component that comes from the overt behavior. Another difference of potential importance is that the observers did not generate the thoughts or traits and thus may have had little concern about their validity. In this regard, it is interesting to note that in one prior study, the effects of head movements on self-generated and externally provided information was compared. In a study using the anchor and adjust paradigm (see Tversky & Kahneman, 1974), Epley and Gilovich (2001) had participants either self-generate an anchor or supplied one to them. A manipulation of head nodding impacted use of the anchor only when the anchors were self-generated. This is consistent with the idea that head nodding impacts confidence in and use of self-generated information, not information that originates externally. Thus, the manipulation of head movements affects confidence in the validity of one's thoughts, not confidence in the validity of the persuasive message per se.

Alternative Explanations for Head Movements?

Do Head Movements Affect the Amount of Thinking?

Although the data from our experiments clearly favor the self-validation hypothesis over those based on self-perception, classical conditioning, and biased elaboration, are there any other possible explanations for the findings that we obtained? One possible alternative is that head movements affected the amount of thinking about the persuasive messages. Because shakers were less favorable to a strong message and more favorable to a weak message than nodders, the attitudes of shakers were less sensitive to argument quality than were nodders. Reduced sensitivity of attitudes to argument quality often indicates that people have engaged in less processing of the message (e.g., see Petty & Cacioppo, 1986b). Thus, could it be that our effects were due to the fact that shakers processed the message less either because they were less able or less motivated to think about the message? For example, it might have been that shaking movements were more difficult to make than nodding movements. However, we measured self-reported movement difficulty, and this did not vary between shaking and nodding groups. Alternatively, extent of thinking might have been affected by use of head movements as input to an information processing "stop rule" (Martin, Ward, Achee, & Wyer, 1993). For example, if people were using the stop rule "process until I no longer enjoy thinking," shaking might induce less thinking than nodding because shaking might indicate that thinking was no longer enjoyable.[8]

Despite the plausibility of these possibilities, there are several reasons to disfavor the notion that our results stemmed from the fact that shakers engaged in any less thinking about the messages than nodders. First, if shaking reduced the extent of thinking about the messages (because of motivational or ability reasons), one would have expected to find a Head Movement × Argument Quality interaction on the measure of valenced thinking. In virtually all previous studies manipulating argument quality and measuring both attitudes and thoughts, manipulations affecting think-

[8] However, if people were using the stop rule "stop until I have done enough," shaking might induce more thinking than nodding because shaking might indicate that not enough thinking has been done.

ing such as personal relevance (Petty & Cacioppo, 1979), distraction (Petty et al., 1976), message repetition (Cacioppo & Petty, 1989), and so forth that produce an interaction of elaboration with argument quality on the attitude measure also produce an interaction on the measure of valenced thoughts. Thus, if head movements influenced the extent of thinking, one would have expected a Head Movement × Argument Quality interaction on the index of valenced thoughts. But, none of the individual experiments that produced an interaction on the attitude measure produced an interaction on the thought measure. Furthermore, when for maximum power we combined the data from all of the conditions expected to produce the strongest Head Movement × Argument Quality interaction on attitudes (Experiment 1, and high elaboration conditions of Experiments 2 and 3), we never observed an interaction on any plausible valenced thought index (e.g., mere number of favorable and unfavorable thoughts; simple difference between favorable and unfavorable thoughts). In the collapsed data set, although the interaction of head movements and argument quality was highly significant on the attitude measure, $F(1, 199) = 33.29$, $p < .001$, none of the thought indices approached significance (all ps $> .26$). Rather, all that was typically observed was a main effect of argument quality.

Second, although a measure of the number of message-related thoughts generated was sensitive to both manipulated (Experiments 2) and measured (Experiment 3) elaboration, this measure yielded no effects for head movements, even when the data were collapsed across experiments. Third, even though a measure of perceived elaboration was sensitive to a manipulation of elaboration in Experiment 2 as it was in prior research (e.g., Petty, Harkins, & Williams, 1980), no effects of head movements were apparent on this measure. Fourth, this explanation does not account for why head movements affected confidence in Experiment 3, and why confidence proved to be a better mediator of the effect of head movements on attitudes than valenced thinking (i.e., because valenced thinking was not affected by head movements but confidence was).[9]

Are Head Movement Effects Explained by Mood?

Finally, an interpretation based on mood might be considered. We have already noted that using mood as an input to a classical conditioning, self-perception, or biased information processing account would not explain the interaction of head nodding with argument quality that we observed repeatedly.[10]

However, mood might serve as affective input to a thought evaluation process (e.g., see Martin, Abend, Sedikides, & Green, 1997). That is, individuals might use any feelings induced by the head movements as a source of information about their thoughts (rather than the attitude object). Nodders might conclude that they "like" what they are thinking, and therefore rely on their thoughts, whereas shakers might conclude that they "dislike" what they are thinking and therefore not rely on their thoughts. If this process were operating, then the "mood as information" approach (e.g., Martin et al., 1997; Schwarz & Clore, 1983) when applied to thoughts would predict the same pattern of results as the self-validation hypothesis. In essence, the explanations would converge in that mood would, in essence, be another variable that could serve as a validating cue.

Although it is certainly reasonable that mood might serve a validating role in some situations (e.g., Clore, Schwarz, & Conway, 1994; Wyer, Clore, & Isbell, 1999), we do not think it did so in the current experiments. That is, we only found head movements to influence mood in one of the three experiments (Experiment 2). Collapsing the data for all three experiments (as we did for the valenced thought analyses previously) failed to produce an effect of head movements on mood. Nevertheless, we further examined the possibility of mediation in Experiment 2 where head movements did affect mood. Similar to the confidence mediation tests reported for Experiment 3, the attitude data for the weak conditions were reversed scored, standardized regression coefficients were computed, and analyses were restricted to high elaboration conditions. As expected, there was a significant positive effect of head movements on attitudes, $\beta = .22$, $t(73) = 1.92$, $p = .05$, and mood, $\beta = .26$, $t(73) = 2.88$, $p < .05$. However, there was no relationship between mood and attitudes, $\beta = .46$, $t(64) = 0.39$, $p = .69$. When both head movements and mood were included as predictors in the regression equation, head movements still predicted attitudes marginally, $\beta = .22$, $t(73) = 1.86$, $p = .06$, and mood remained without effect, $\beta = -.01$, $t(73) = -0.09$, $p = .92$. These results are inconsistent with mood being a mediator of the effects of head movements on attitudes in Experiment 2. Thus, although one might derive predictions from a mood-as-information model that are compatible with our self-validation predictions, and we believe that mood is one among many variables that can serve as an input to a self-validation process (Petty & Briñol, 2002), the absence of empirical effects for mood in our data cause us to disfavor any role for mood in explaining head movement effects.[11]

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[9] A reviewer of an earlier version of this article expressed concern about another alternative. That is, could it be that people who engaged in "yes" movements to weak arguments and "no" movements to strong arguments might be more confused or have a higher cognitive load than individuals who engaged in "yes" movements to strong and "no" movements to weak arguments because of the greater incompatibility of responses in the former than the latter case? If so, one might have expected the "confused" or "load" group to show less differentiation of argument quality than the "unconfused" group. This was not the case in any of the experiments, nor across experiments. Second, in no individual experiment, nor across the experiments combined, did the presumably "confused" participants generate fewer message-relevant thoughts than the presumably "unconfused" participants. Neither did the "confused" participants indicate more negative affect than the "unconfused" participants in any experiment or across experiments. Thus, the confusion hypothesis does not provide a good account of the data.

[10] Nor is it likely that mood affected the extent of thinking. If affect influenced the extent of message processing, then horizontal movements (negative affect) should have induced greater processing of the message than vertical movements (positive affect; see Bless, Bohner, Schwarz, & Strack, 1990; Mackie & Worth, 1989) especially given that the message topic was not one that participants expected to be overly positive (Wegener, Petty, & Smith, 1995). This also did not occur (see Petty, Fabrigar, & Wegener, 2003, for a review of the effects of affect on persuasion).

[11] An interpretation based on mood should be also considered for the handwriting experiment. Unfortunately, mood was not assessed in that experiment and cannot be definitively ruled out. But, even if mood were playing some role, it appeared to do so by affecting the confidence that people had in their thoughts, consistent with the self-validation hypothesis.

Future Research

There are a number of avenues of future research suggested by the current investigations. For example, future research might address whether nodding increases and shaking decreases confidence compared with a no-movement control. In the initial Wells and Petty (1980) study, relative to a no-movement control group, shaking led to significantly less agreement ($p < .05$), whereas nodding led to a marginally significant increase in agreement ($p < .06$) when a persuasive message took a counterattitudinal position with strong arguments. Thus, although we did not include a no-movement control group in the present research, prior research suggests that both nodding and shaking conditions can differ from controls in their persuasive impact. In accord with the self-validation hypothesis, whether nodding or shaking would have more impact would likely depend on whether the baseline level of thought confidence in the situation was relatively high or low. This might be determined by the nature of the issue under consideration (e.g., high vs. low knowledge) or the type of participants in the study (e.g., high or low self-esteem). For example, if the topic was such that people had high knowledge, confidence in the no-movement control group might be high, making the shaking condition more different from the control. However, if the topic was such that people had low knowledge, making the baseline level of thought confidence low, the nodding condition might be more different from the control. Future research might examine such moderators.

Future research might also profitably examine whether there are individual differences in susceptibility to self-validation processes. For example, our previous research on self-validation (Petty et al., 2002) has shown that individuals who chronically engage in thought—those high in need for cognition (Cacioppo & Petty, 1982)—show greater self-validation effects than those who eschew effortful cognitive activity. In addition, individual differences in self-monitoring (Snyder, 1974) might be related to self-validation effects. Because internal states are more important to low self-monitors, for example, it is possible that they would be especially influenced by their own head movements. However, if the impact of head movements stems from a generalization linked to social agreement and disagreement (i.e., social validation), then high self-monitors might be more influenced, because they are more attentive to social cues (cf., Kendzierski, 1987).

Final Conclusions

The self-validation hypothesis, supported by the results of the current experiments, suggests that more research attention should be paid to people's perceptions of their own thoughts. Although people's thoughts or "cognitive responses" (Greenwald, 1968) in response to a persuasive message have been the focus of much work on persuasion, just two aspects of thinking have been emphasized (see Petty, Ostrom, & Brock, 1981): the *extent* of thinking (i.e., whether thinking is extensive or minimal) and the *content* of thinking (i.e., whether thinking is favorable or unfavorable; see Eagly & Chaiken, 1993; Petty & Wegener, 1998; Petty et al., 1981, for reviews). In line with previous research on self-validation (Petty et al., 2002; Tormala, Petty, & Briñol, 2002), the current research suggests that to better understand the phenomenon of attitude change, it is necessary to take into account another dimension of cognitive responses—people's evaluation of or confidence in their thoughts. In the current research, even when the amount and content of thoughts were held constant, additional variance in attitudes was determined by how head movements and handwriting influenced people's perceptions of their thoughts. This suggests that researchers interested in the thoughtful mediation of persuasion and other judgments might profitably collect measures of thought confidence or validity in addition to assessing the number and valence of thoughts. In fact, research on "thought strength" might become as profitable as research on attitude strength (Petty & Krosnick, 1995).

References

Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51,* 1173–1182.

Baumeister, R. F. (1998). The self. In D. T. Gilbert & S. T. Fiske (Eds.), *The handbook of social psychology* (4th ed., Vol. 1, pp. 680–740). New York: McGraw-Hill.

Bem, D. J. (1965). An experimental analysis of self-persuasion. *Journal of Personality and Social Psychology, 1,* 199–218.

Bem, D. J. (1967). Self-perception: An alternative interpretation of cognitive dissonance phenomena. *Psychological Review, 74,* 183–200.

Bem, D. J. (1972). Self-perception theory. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (pp. 1–62). New York: Academic Press.

Bless, H., Bohner, G., Schwarz, N., & Strack, F. (1990). Mood and persuasion: A cognitive response analysis. *Personality and Social Psychology Bulletin, 16,* 331–345.

Cacioppo, J. T., & Petty, R. E. (1981). Social psychological procedures for cognitive response assessment: The thought listing technique. In T. Merluzzi, C. Glass, & M. Genest (Eds.), *Cognitive assessment* (pp. 309–342). New York: Guilford Press.

Cacioppo, J. T., & Petty, R. E. (1982). The need for cognition. *Journal of Personality and Social Psychology, 42,* 116–131.

Cacioppo, J. T., & Petty, R. E. (1989). Effects of message repetition on argument processing, recall, and persuasion. *Basic and Applied Social Psychology, 10,* 3–12.

Cacioppo, J. T., Priester, J. R., & Berntson, G. G. (1993). Rudimentary determinants of attitudes II: Arm flexion and extension have differential effects on attitudes. *Journal of Personality and Social Psychology, 65,* 5–17.

Chaiken, S. (1987). The heuristic model of persuasion. In M. P. Zanna, J. M. Olson, & C. P. Herman (Eds.), *Social influence: The Ontario symposium* (Vol. 5, pp. 3–39). Hillsdale, NJ: Erlbaum.

Chaiken, S., Liberman, A., & Eagly, A. H. (1989). Heuristic and systematic processing within and beyond the persuasion context. In J. S. Uleman & J. A. Bargh (Eds.), *Unintended thought* (pp. 212–252). New York: Guilford Press.

Chen, S., & Chaiken, S. (1999). The heuristic-systematic model in its broader context. In S. Chaiken & Y. Trope (Eds.), *Dual-process theories in social psychology* (pp. 73–96). New York: Guilford Press.

Clore, G. L., Schwarz, N., & Conway, M. (1994). Affective causes and consequences of social information processing. In R. S. Wyer & T. K. Srull (Eds.), *Handbook of social cognition* (Vol. 1, pp. 323–419), Hillsdale, NJ: Erlbaum.

Cohen, J., & Cohen, P. (1983). *Applied multiple regression/correlation analysis for the behavior sciences* (2nd ed.). Hillsdale, NJ: Erlbaum.

Costermans, J., Lories, G., & Ansay, C. (1992). Confidence level and feeling of knowing in question answering: The weight of inferential processes. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 18,* 142–150.

Darwin, C. (1965). *The expression of emotions in man and animals.* Chicago: The University of Chicago Press. (Original work published 1872)

Eagly A. H., & Chaiken, S. (1993). *The psychology of attitudes*. Fort Worth, TX: Harcourt Brace.

Eibl-Eibesfeldt, I. (1972). Similarities and differences between cultures in expressive movement. In R. A. Hinde (Ed.), *Nonverbal communication* (pp. 297–314). Cambridge, England: Cambridge University Press.

Ellis, A. (1962). *Reason and emotion in psychotherapy*. New York: Lyle Stuart.

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.

Fazio, R. (1987). Self-perception theory: A current perspective. In M. P. Zanna, J. M. Olson, & C. P. Herman (Eds.), *Social influence: The Ontario symposium* (Vol. 5, pp. 129–150). Hillsdale, NJ: Erlbaum.

Festinger, L. (1954). A theory of social comparison processes. *Human Relations*, *7*, 117–140.

Förster, J., & Strack, F. (1996). Influence of overt head movements on memory for valence words: A case of conceptual-motor compatibility. *Journal of Personality and Social Psychology*, *71*, 421–430.

Greenwald, A. G. (1968). Cognitive learning, cognitive response to persuasion, and attitude change. In A. G. Greenwald, T. C. Brock, & T. M. Ostrom (Eds.), *Psychological foundations of attitudes* (pp. 147–170). New York: Academic Press.

Hermann, A. D., Leonardelli, G. J., & Arkin, R. M. (2002). Self-doubt and self-esteem: A threat from within. *Personality and Social Psychology Bulletin*, *28*, 395–408.

Kendzierski, D. (1987). Effects of positive and negative behavioral feedback on subsequent attitude-related action. *Journal of Personality*, *55*, 55–74.

Koriat, A., & Goldsmith, M. (1996). Monitoring and control processes in the strategic regulation of memory accuracy. *Psychological Review*, *103*, 490–517.

Kruglanski, A. W. (1989). *Lay epistemics and human knowledge: Cognitive and motivational bases*. New York: Plenum Press.

Laird, J. D., & Bresler, C. (1992). The process of emotional experience: A self-perception theory. In M. S. Clard (Ed.), *Review of personality and social psychology* (Vol. 13, pp. 213–234). Newbury Park, CA: Sage.

Mackie, D. M., & Worth, L. T. (1989). Cognitive deficits and the mediation of positive affect in persuasion. *Journal of Personality and Social Psychology*, *57*, 27–40.

Martin, L. L., Abend, T., Sedikides, C., & Green, J. D. (1997). How would it feel if . . . ? Mood as input to a role fulfillment evaluation process. *Journal of Personality and Social Psychology*, *73*, 242–253.

Martin, L. L., Ward, D. W., Achee, J. W., & Wyer, R. S. (1993). Mood as input: People have to interpret the motivational implications of their moods. *Journal of Personality and Social Psychology*, *64*, 317–326.

Moore, D. L., Hausknecht, D., & Thamodaran, K. (1986). Time compression, response opportunity, and persuasion. *Journal of Consumer Research*, *13*, 85–99.

Nelson, T. O., & Narens, L. (1990). Metamemory: A theoretical framework and new findings. In G. Bower (Ed.), *The psychology of learning and motivation* (pp. 125–173). New York: Academic Press.

Olson, J. M., & Hafer, C. L. (1990). Self- inference processes: Looking back and ahead. In J. M. Olson and M. P. Zanna (Eds.), *Self-inference processes: The Ontario symposium* (Vol. 6, pp. 293–320). Hillsdale, NJ: Erlbaum.

Petty, R. E., & Briñol, P. (2002). Attitude change: The elaboration likelihood model of persuasion. In G. Bartels & W. Nielissen (Eds.), *Marketing for sustainability: Towards transactional policy making* (pp. 176–190). Amsterdam: IOS Press.

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., & Cacioppo, J. T. (1979). Issue involvement can increase or decrease persuasion by enhancing message-relevant cognitive responses. *Journal of Personality and Social Psychology*, *37*, 1915–1926.

Petty, R. E., & Cacioppo, J. T. (1986a). *Communication and persuasion: Central and peripheral routes to attitude change*. New York: Springer-Verlag.

Petty, R. E., & Cacioppo, J. T. (1986b). The elaboration likelihood model of persuasion. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 19, pp. 123–205). New York: Academic Press.

Petty, R. E., Fabrigar, L. R., & Wegener, D. T. (2003). Emotional factors in attitudes and persuasion. In R. J. Davidson, K. Scherer, & H. H. Goldsmith (Eds.), *Handbook of affective sciences* (pp. 752–772). Oxford, England: Oxford University Press.

Petty, R. E., Harkins, S. G., & Williams, K. D. (1980). The effects of group diffusion of cognitive effort on attitudes: An information processing view. *Journal of Personality and Social Psychology*, *38*, 81–92.

Petty, R. E., & Krosnick, J. A. (Eds.). (1995). *Attitude strength: Antecedents and consequences.* Mahwah, NJ: Erlbaum.

Petty, R. E., Ostrom, T. M., & Brock, T. C. (Eds.) (1981). *Cognitive responses in persuasion.* Hillsdale, NJ: Erlbaum.

Petty, R. E., & Wegener, D. T. (1998). Attitude change: Multiple roles for persuasion variables. In D. Gilbert, S. Fiske, & G. Lindzey (Eds.), *The handbook of social psychology* (4th ed., pp. 323–390). New York: McGraw-Hill.

Petty, R. E., & Wegener, D. T. (1999). The elaboration likelihood model: Current status and controversies. In S. Chaiken & Y. Trope (Eds.), *Dual-process theories in social psychology* (pp. 37–72). New York: Guilford Press.

Petty, R. E., Wells, G. L., & Brock, T. C. (1976). Distraction can enhance or reduce yielding to propaganda: Thought disruption versus effort justification. *Journal of Personality and Social Psychology*, *34*, 874–884.

Rosenberg, M. (1979). *Conceiving the self*. New York: Basic Books.

Schwarz, N., Bless, H., & Bohner, G. (1991). Mood and persuasion: Affective states influence the processing of persuasive communications. *Advances in Experimental Social Psychology*, *24*, 195–202.

Schwarz, N., & Clore, G. L. (1983). Mood, misattribution, and judgments of well-being: Informative and directive functions of affective states. *Journal of Personality and Social Psychology*, *45*, 512–523.

Smith, S. M., & Shaffer, D. R. (1995). Speed of speech and persuasion: Evidence for multiple effects. *Personality and Social Psychology Bulletin*, *21*, 1051–1060.

Snyder, M. (1974). The self-monitoring of expressive behavior. *Journal of Personality and Social Psychology*, *30*, 526–537.

Sobel, M. E. (1982). Asymptotic intervals for indirect effects in structural equations models. In S. Leinhart (Ed.), *Sociological methodology* (pp. 290–312). San Francisco: Jossey Bass.

Stepper, S., & Strack, F. (1993). Proprioceptive determinants of emotional and nonemotional feelings. *Journal of Personality and Social Psychology*, *64*, 211–220.

Strack, F., Martin, L., & Stepper, S. (1988). Inhibiting and facilitating conditions of the human smile: A nonobtrusive test of the facial feedback hypothesis. *Journal of Personality and Social Psychology*, *54*, 768–777.

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., Petty, R. E., & Briñol, P. (2002). Ease of retrieval effects in persuasion: A self-validation analysis. *Personality and Social Psychology Bulletin*, *28*, 1700–1712.

Tversky, A., & Kahneman, D. (1974, September). Judgment under uncertainty: Heuristics and biases. *Science*, *185*, 1124–1131.

Wegener, D. T., & Petty, R. E. (1997). The flexible correction model: The role of naive theories of bias in bias correction. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 29, pp. 141–208). San Diego, CA: Academic Press.

Wegener, D. T., Petty, R. E., & Smith, S. M. (1995). Positive mood can increase or decrease message scrutiny: The hedonic contingency view of mood and message processing. *Journal of Personality and Social Psychology, 69,* 5–15.

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.

Wright, R. (2001). Self-certainty and self-esteem. In T. J. Owens, S. Stryker, & N. Goodman (Eds.), *Extending self-esteem theory and research: Sociological and psychological currents* (pp. 101–134). Cambridge, England: Cambridge University Press.

Wyer, R. S., Jr., Clore, G. L., & Isbell, L. M. (1999). Affect and information processing. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 31, pp. 1–77). San Diego, CA: Academic Press.

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