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# Motivation to Think and Order Effects in Persuasion: The Moderating Role of Chunking

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*Two studies examined the hypothesis that chunking—defined as the degree to which information is grouped into explicitly labeled categories of distinct valence—moderates the impact of motivation to think on order effects in persuasion. Studies 1 and 2 examined motivation to think in terms of perceived personal relevance and need for cognition, respectively. In both studies, participants read arguments for and against a hypothetical exam policy. These arguments were presented in varying orders and in either a chunked or an unchunked format. Results were consistent with the predictions: Under chunked conditions, participants who were highly motivated to think were more susceptible to primacy effects than were those low in motivation to think. Under unchunked conditions, this pattern was reversed—those highly motivated to think were more susceptible to recency effects than those low in motivation to think.*

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Imagine a pharmaceutical company is preparing a television commercial in which it presents both the benefits and unpleasant side effects of a new drug. One of the most fundamental issues facing the company is which information to present first. Ever since Asch (1946) discussed the impact of information order on person perception judgments, there has been widespread interest in this topic in social psychology. In his work, Asch found that people tended to weigh most heavily the information presented at the beginning of a sequence when they were trying to form impressions of others. These primacy effects are typically drawn in contrast with recency effects, which exist when judgments are most influenced by the information presented later, or most recently.

## *Motivation to Think and Persuasion*

The current research is concerned with the message recipient's motivation to think as a moderator of primacy and recency effects in persuasion. Recently, researchers have conducted a number of studies examining motivation to think as a moderator of primacy versus recency in attitude change. The available literature appears to be rather clear and consistent. That is, results have consistently shown that when presented with two conflicting persuasive messages, people who are highly motivated to think tend to be more influenced by the first than the second message (primacy effect), whereas those low in motivation to think show reduced primacy effects (or even recency effects).

Kassin, Reddy, and Tulloch (1990), for instance, conducted a mock jury study in which an ambiguous videotaped confession was introduced by one side (defense or prosecution) along with a brief set of comments providing an interpretation of the videotape as being consistent with that side.

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After the videotape, there was a brief statement by the opposing side of the trial stating that the videotaped evidence actually supported their own view. Motivation to think was operationalized in terms of need for cognition (Cacioppo & Petty, 1982), which is an assessment of the general tendency for people to engage in and enjoy effortful information-processing activity (see Cacioppo, Petty, Feinstein, & Jarvis, 1996, for a review). Kassin et al. (1990) found that people high in need for cognition (i.e., those highly motivated to think) gave verdicts that were more aligned with the initial introduction of the evidence (primacy). In contrast, people low in need for cognition (i.e., those less motivated to think) provided verdicts that agreed more with the second interpretation of the evidence. Kassin et al. (1990) speculated that because people high in need for cognition actively process information, they likely formed opinions early (opinions that were typically in line with the initial description of the evidence) and then engaged in confirmatory hypothesis testing. This biased processing was presumed to enable discounting of the later (opposing) description of the evidence. People low in need for cognition, on the other hand, were not thinking extensively and presumably were not forming opinions early. They eventually made decisions based on whatever information was most accessible when asked to decide, which would have included the most recent description of the evidence. Although this explanation was speculative and post hoc, recent research has generally proved supportive of the results obtained by Kassin and colleagues (1990).

For example, Haugtvedt and Petty (1992) conducted research investigating the impact of need for cognition on reactions to initial and subsequent messages. In particular, Haugtvedt and Petty sought to show that people disposed toward high levels of thought about an attitude object would be likely to form strong attitudes toward that object that would be resistant to change (Petty, Haugtvedt, & Smith, 1995). They exposed participants first to a strong message arguing that a certain food additive was unsafe and then to a relatively weak countermessage (i.e., weak arguments that the additive was actually safe). They found that high and low need for cognition participants were equally persuaded by the first set of arguments. After being exposed to the countermessage, however, the attitudes for these two groups differed. Specifically, people high in need for cognition resisted the countermessage more than did people low in need for cognition and remained more persuaded by the first message than did those low in need for cognition. That is, high need for cognition individuals showed a relative primacy effect compared with those low in need for cognition.

Haugtvedt and Wegener (1994) manipulated motivation to think to examine its impact on order effects in persuasion. Motivation to think was varied by making the attitude object either personally relevant or irrelevant to the participants (Johnson & Eagly, 1989; Petty & Cacioppo, 1979, 1990). In the high-relevance condition, messages described the building of nuclear power plants as being proposed for the participants' own state and several nearby states. In the low-relevance condition, the new power plants were proposed for distant states. Participants either received a message favorable to building the plants followed by an unfavorable message or an unfavorable message following a favorable message. Consistent with the previous need for cognition work, Haugtvedt and Wegener (1994) found that when people were motivated to think, they were more persuaded by the first message (i.e., primacy effects), but when they were not motivated to think, people were more persuaded by the second message (i.e., recency effects).<sup>1</sup>

As just described, the research on motivation to think and message order effects in persuasion, although limited, has been quite consistent in its findings. Manipulations and individual difference measures of motivation to think have consistently moderated message order effects (see also Note 1). High levels of motivation to think have been associated with primacy effects and low levels have been associated with reduced primacy (or increased recency) effects. Nevertheless, there is reason to believe that these findings do not tell the full story. Several crucial qualities of the persuasion settings might have fostered these results, and these qualities can differ not only across potential persuasion paradigms but also across persuasion and other related order effect literatures. For example, following Asch (1946), one domain in which order effects have received a great deal of attention is impression formation. In fact, as we review next, the findings and conclusions about order effects developed by impression formation researchers stand in stark contrast with those developed in the persuasion domain.

In the impression formation literature, several studies have examined the moderating role of thinking in determining primacy and recency effects. It is interesting that these studies have consistently pointed to a conclusion that is opposite to that of the persuasion studies. That is, in the impression formation literature, it has been found that low levels of thinking are associated with enhanced primacy (or reduced recency) effects, whereas high levels of thinking are associated with reduced primacy (or enhanced recency) effects. In other words, the propensity to think about the information presented has moderated order effects in exactly opposite ways in the persuasion and impression formation literatures. The impression formation pattern has been demonstrated repeatedly by Kruglanski and colleagues. Webster, Rich-

ter, and Kruglanski (1996), for instance, examined two manipulations of extent of thinking: mental fatigue and accountability. They found that when participants were relatively low in thinking, either because they were fatigued or because they would not be held accountable for their impressions, they were highly susceptible to primacy effects. When participants were more likely to think, however, these effects were largely erased. They explained these findings as resulting from the heightened tendency to “freeze” on early information when processing motivation is low (see also Kruglanski & Freund, 1983).

Ahlering and Parker (1989) also conducted research in this area using need for cognition as the operationalization of motivation to think. Participants received eight positive and eight negative trait adjectives about a single person, with all the positive traits either preceding or following all of the negative traits. Results showed that people who were low in need for cognition were more susceptible to primacy effects than were people who were high in need for cognition. Similar to Kruglanski and colleagues, Ahlering and Parker (1998) concluded that this effect resulted from the fact that people who were not motivated to think (i.e., low in need for cognition) formed impressions early and then ceased to pay much attention to further information, thus yielding primacy effects. Highly motivated thinkers, on the other hand, were thought to pay greater attention to all of the relevant information, thereby attenuating primacy effects.

Of importance, several additional inquiries in the impression formation domain have confirmed these findings using a diverse array of operationalizations of extent of thinking (e.g., Heaton & Kruglanski, 1991; Kruglanski & Freund, 1983; Tetlock, 1983; Ybarra, Schaberg, & Keiper, 1999). Thus, in contrast with the persuasion literature, impression formation studies often have suggested that conditions unfavorable to thinking lead to primacy effects in judgments, whereas conditions favorable to thinking lead to reduced primacy, or recency effects.

#### *Chunking as a Moderator*

In sum, in the persuasion domain, the consistent finding is that high motivation to think is associated with primacy (or reduced recency), whereas low motivation to think is associated with recency (or less primacy). In the impression formation domain, on the other hand, the typical finding is that low levels of thinking are associated with primacy (or less recency) and high levels of thinking are associated with recency (or less primacy).<sup>2</sup>

This intriguing empirical conflict has been noted previously (Petty & Jarvis, 1996; Petty & Wegener, 1998) but has yet to be addressed empirically in either domain. In

the present research, we examined one conceptual difference that appeared to exist across these domains as providing a potential moderator of the impact of motivation to think on message order effects.

Specifically, the two lines of research differ in the degree to which they used “chunked” versus “unchunked” information (Miller, 1956), with persuasion studies typically using chunking and impression formation studies not using chunking. In an evaluation context, we use chunking to refer to the extent to which information is blocked or grouped into clearly defined segments of opposite valence (e.g., a pro message and a con message; a prosecution and a defense message). As a result of chunking of messages, participants in persuasion studies knew exactly when one set of information was ending and the other beginning. Moreover, because such messages often included a summary statement at the beginning of the passage, recipients could anticipate what type of information they were about to receive in the rest of that message before they actually received it. In the relevant impression formation literature, however, the information has consistently been unchunked such that it has come in an uninterrupted and uncategorized stream (e.g., a list of positive traits followed by negative ones). That is, category distinctions (e.g., positive and negative attributes) have not been made explicit and people received no summary statements that marked the coming of blocks of positive or negative information.

To refer back to our pharmaceutical company example, one can imagine the benefits and side effects of a new drug being presented in either a chunked or an unchunked format. If chunked, a speaker in the commercial might first state that there are many benefits and then present the benefits. A subsequent speaker might say something such as, “There are also some side effects that you should be aware of” and go on to explain what they are. Alternatively, if unchunked, a speaker might begin by saying, “This new drug has many effects” and then discuss the benefits followed by the side effects in an uninterrupted stream of information.

#### *Expected Effects of Chunking*

##### *CHUNKED CONDITIONS*

By definition, chunking increases the extent to which a series of informational elements appears to be broken or divided into two (or more) separately valenced segments. Thus, it can serve as a signal that there is a change in the nature of the information being presented. Depending on the amount of thinking taking place, this signal might be used differently.

For individuals who are motivated to think, for instance, the break between segments could serve as a signal to stop and consolidate the information just

encountered. This consolidation might result in initial attitude formation and an altered interpretation of subsequent information. Consistent with the conceptualization of persuasion researchers, a highly motivated thinker might read the first segment of information, form an attitude consistent with it, and then process later information in a biased fashion (e.g., counterarguing or dismissing opposing information). The result of such a process is likely to be a primacy effect.

Past research has shown that merely having an attitude can bias the interpretation of evidence (e.g., Lord, Ross, & Lepper, 1979) and that this effect is larger when the attitude in question is stronger (Houston & Fazio, 1989; Pomerantz, Chaiken, & Tordesillas, 1995). Because thinking enhances the strength of one's attitudes (Petty et al., 1995), it follows that individuals high in motivation to think should show more biased processing of a second message than should individuals low in motivation to think, but only after forming an attitude about the initial information. The most likely point at which to form or consolidate an attitude in a chunked presentation is after the first segment of information (i.e., one side of the issue) has been presented.

For individuals who are low in motivation to think, chunking also might serve as a signal. Specifically, the break that it creates between segments should be noticed and should briefly increase attention to later information that might otherwise be ignored. Because individuals who are not thinking are likely to be reading along without actually devoting too much attention, chunking might say something such as, "Hey, wake up! New information is coming!" and bring their attention back to the initial level at which they began. In fact, Harkins and Petty (1981, 1987) showed that when people were not ordinarily inclined to think, their message processing could be increased if the arguments were presented in discrete segments from multiple sources rather than a single source. The momentary increase in attention to a chunked message should elevate the impact of later information that might not have been processed otherwise.

#### *UNCHUNKED CONDITIONS*

When information is unchunked, different psychological processes should occur. Even when individuals are highly motivated to think, if there is no chunking, no signal exists to stop and consolidate. Instead, individuals who are thinking should attend to and process all of the information and, perhaps, only consolidate at the end. Because they have been processing the most recent information when the time to consolidate an opinion arrives, this information is likely to be the most salient and have the largest impact on judgment. The result, then, should be a recency effect or a substantial reduc-

tion in primacy because thoughts about the most recent information should be the most accessible and because little counterarguing or biased processing of later information occurs.

When information is unchunked, a different response pattern is also expected from those not motivated to think. Again, without chunking, the reminder to pay attention does not occur. As a result, those not thinking extensively should freeze on early information (as argued in the impression formation literature) and be relatively uninfluenced by later information. This tendency would result in a primacy effect. This argument is supported by much of the attention decrement literature (for a review, see Anderson, 1981), which suggests that primacy effects occur when individuals simply afford less and less attention to each successive item in a sequence of information. Because less attention is paid to later items, these items are not weighted as heavily in one's attitude. Consistent with this notion, numerous studies (e.g., Crano, 1977; Dreben, Fiske, & Hastie, 1979; Hendrick & Constantini, 1970; Kashima & Kerekes, 1994) indicate that experimental manipulations that at least temporarily elevate one's level of attention reduce primacy effects or even produce recency effects when the information is not chunked.

#### *SUMMARY*

In essence, we argue that chunking has the potential either to facilitate or to disrupt the natural, default sort of processing in which individuals highly and not-so-highly motivated to think engage. Specifically, chunking might facilitate high thinkers' ability to stop and process early information, resulting in attitude formation and biased processing of later information. Furthermore, chunking might interfere with nonthinkers' tendency to ignore later information and instead cause them to consider it. Thus, under chunked conditions, high motivation to think should be associated with more primacy (or less recency) than low motivation to think, but under nonchunked conditions, high motivation to think should be associated with less primacy (or more recency) than is low motivation to think.

#### *Prior Research on Chunking*

It is important to note that there is an existing literature on chunking-type variables and order effects. Three caveats should be considered, however. First, although the chunking manipulations used in this literature do not mirror the present conception of chunking exactly, they are similar in many cases and could therefore prove informative. Second, this chunking literature has not included persuasion studies; nonetheless, the work is suggestive as to what might be expected in a persuasion context. Third, although none of this work has exam-

ined the effects of chunking and motivation to think, it consistently supports the role of chunking as a possible moderator of order effects, and some reasonable assumptions bring the results into general accord with our hypotheses.

The prior literature on chunking-type variables can be summarized quickly. In each of the studies conducted in this area, recency effects have been obtained under chunked conditions and primacy effects have been obtained under unchunked conditions. As far back as 1957, Luchins conducted a series of studies in which he used manipulations approximating the present distinction between chunked and unchunked information. In several of his experiments, Luchins (1957b) had participants read two paragraphs describing the behaviors of a target person. One paragraph contained information suggesting that the person was friendly and sociable, whereas the other contained information suggesting that he was shy and introverted. These paragraphs, however, ran together continuously with no indentation marking the end of the first and the beginning of the second. Using these unchunked stimuli, Luchins found evidence for primacy effects in three experiments.

In a set of follow-up studies, Luchins (1957a) attempted to locate conditions that would lead to the attenuation of primacy effects. Reasoning that the lack of paragraph separation in the previous research may have given the information a singular or unitary appearance, Luchins hypothesized that a more obvious differentiation between the paragraphs might inhibit primacy by causing participants to pay greater attention to all of the information. In these studies, Luchins placed the paragraphs on separate pages and inserted a filler task between them. In support of his predictions, Luchins found that in these chunked conditions, reduced primacy effects or accentuated recency effects were obtained. Similar interpolated task manipulations used by others have produced similar results (e.g., Dreben et al., 1979; Hogarth & Einhorn, 1992; Kashima & Kerekes, 1994; Rywick & Schaye, 1974; see also Richter & Kruglanski, 1998).

Although these past studies used manipulations that only approximate the notion of chunking that we use in this article, the findings do provide a reasonable foundation for some of our hypotheses. In particular, the results of the previous studies on chunking and order effects closely parallel the outcome we hypothesize when one's motivation to think is relatively low. Although prior studies did not address this issue explicitly, it seems likely that the experimental tasks used in these studies were relatively uninvolved for participants. Because they typically described the everyday behaviors of an unknown target individual, participants were probably not highly moti-

vated to think about the information. If this assumption is correct, these findings are consistent with the notion that when information is unchunked (as in much of the existing impression formation work), individuals not motivated to think are susceptible to primacy effects. When the information is chunked (as in the existing persuasion literature), individuals who are not motivated to think are less susceptible to primacy and are more susceptible to recency effects. Unfortunately, because motivation to think was not explicitly considered in the past chunking research, our predictions remain largely untested.

#### *Overview of the Present Research*

Past work on message order effects in persuasion has shown that increasing motivation to think accentuates primacy effects and reducing motivation to think reduces primacy effects and promotes recency. The present research addresses the issue of whether these robust persuasion findings are dependent on the information in the persuasive messages being chunked. Our review of the impression formation literature on primacy/recency suggested that these typical persuasion effects might be reversed if the information in the persuasive communication was not chunked. In two experiments, we directly manipulated chunking to test the hypothesis that it moderates the relationship between motivation to think and order effects. More specifically, college students who were relatively motivated or unmotivated to think were exposed to a persuasive communication containing arguments both in favor of and against a new university policy requiring comprehensive exams for seniors as a requirement for graduation. The arguments were either chunked, such that pro and con arguments were presented in separate messages, or unchunked, such that pro and con arguments were presented as if they were part of the same message.

In the first study, motivation to think was examined with a personal relevance manipulation. When information is perceived as personally relevant, people are generally more motivated to think about it. On the contrary, when information is perceived as irrelevant, people tend to expend less cognitive effort in dealing with it (Johnson & Eagly, 1989; Petty & Cacioppo, 1979, 1990). In the second study, motivation to think was examined by classifying participants with respect to their need for cognition (Cacioppo & Petty, 1982). Considerable prior research suggests that individuals high in need for cognition are more motivated to think about a wide variety of information (Cacioppo et al., 1996). In both studies, our hypothesis would be supported by a three-way interaction between chunking, motivation to think, and presentation order. This interaction would involve both a

replication of the past persuasion findings (with chunking) and a reversal of these findings (with no chunking).

## STUDY 1

### *Method*

#### *PARTICIPANTS AND DESIGN*

The study included 378 male and female undergraduates enrolled in introductory psychology courses at The Ohio State University who participated in partial fulfillment of a course requirement. They were recruited using sign-up sheets posted outside of their classrooms. Participants were randomly assigned to a 2 (chunking: chunked, unchunked)  $\times$  2 (personal relevance: low, high)  $\times$  2 (presentation order: pro/con, con/pro) between-participants design.

#### *PROCEDURE*

When participants arrived, they were welcomed, seated in a room with 10 cubicles, and asked to read over some basic instructions. Cubicles were partitioned such that visual contact between participants was not permitted. Participants were led to believe that the study was designed to compare the effectiveness of different modes of presentation of information (e.g., written, video, and audio). They were told that they were participating in the written part of the study and that they should focus on how clearly the information was being communicated in writing.

All participants read two sets of arguments. Both sets contained four arguments relating to the topic of senior comprehensive examinations as an undergraduate requirement for graduation. The exams were described as tentative proposals designed to increase the standards of American education. The con arguments included four statements opposed to the idea of comprehensive exams, including, for example, a statement that the exams would have a negative impact on creativity and critical thinking skills, which would ultimately decrease students' success in obtaining high-salary jobs. The pro arguments supported the exams, for example, by stating that the exams would enhance the level of teaching at the university and thus elevate students' overall level of enjoyment and knowledge. The pro arguments were adapted from those reported by Petty and Cacioppo (1986). The con arguments were derived from those used by Haugtvedt and Wegener (1994).

Following the arguments, participants completed a questionnaire that contained the key attitude items and manipulation checks. After completing these materials, participants were debriefed, thanked, and assigned credit for their introductory psychology courses.

#### *INDEPENDENT VARIABLES*

*Chunking.* In the chunked conditions, participants read two separate pages of arguments: one with the pro arguments and one with the con arguments. Each page contained only one type of argument, and a heading at the top of the page described which type it was (i.e., pro or con). The con arguments, for example, were preceded by a passage stating that the following arguments would be "against instituting comprehensive exams." The pro arguments were labeled as being "in favor of the exams."

In the unchunked conditions, participants read arguments that were identical to those read in the chunked conditions. They differed, however, in that they lacked the pro/con headings and were not separated by page. That is, although the arguments in this condition did fall on two pages, they simply followed each other and ran continuously from one page to the next. In this condition, arguments were introduced with a single heading that simply noted that the following material was compiled as a part of a report on comprehensive exams.

*Personal relevance.* In the high-relevance conditions, participants were told that the exams were being considered for implementation by a specially appointed committee at their own university (Ohio State) during the next academic year. In the low-relevance conditions, participants were led to believe that the exams were being considered for implementation 10 years in the future at another university (Indiana University; see Petty & Cacioppo, 1979).

*Presentation order.* In the pro/con conditions, participants first read the four arguments in favor of the exams and then read the four arguments against the exams. In the con/pro conditions, participants read the four arguments against the exams before reading the four arguments in favor of the exams.

#### *DEPENDENT MEASURES*

*Manipulation check.* One question was asked that was designed to assess the extent to which the personal relevance manipulation was successful in eliciting different levels of involvement. This question used a 7-point scale (anchored at 0 and 6) and asked participants how personally involved they felt with the issue raised (i.e., the topic of senior comprehensive exams). Scale anchors were labeled *not at all involved* and *very involved*. No manipulation checks were included for the presentation order or chunking manipulations.

*Attitude index.* Participants' attitudes toward the comprehensive exams issue were assessed using ratings on nine 7-point semantic differential scales. These scales had the following labels: *bad to good*, *wise to foolish*, *positive to negative*, *unfavorable to favorable*, *beneficial to harmful*,

*unpleasant to pleasant, fair to unfair, unnecessary to necessary, and intelligent to stupid.* Responses to the scales were standardized and averaged to form one overall attitude index.

### Results and Discussion

#### MANIPULATION CHECK

The manipulation check for personal relevance was submitted to a  $2 \times 2 \times 2$  between-participants ANOVA with chunking, personal relevance, and presentation order as the independent variables. A main effect for personal relevance was obtained,  $F(1, 370) = 4.22, p < .05$ , such that participants in the high-relevance condition found the issue of comprehensive exams to be somewhat more involving ( $M = 4.43$ ) than did those in the low-relevance condition ( $M = 4.11$ ). All other effects were nonsignificant.

#### ATTITUDES

The primary dependent variable in this study was the overall attitude toward the senior comprehensive exam proposal. These data also were submitted to a  $2 \times 2 \times 2$  ANOVA, with chunking, personal relevance, and presentation order as the independent variables. The two-way interaction between chunking and presentation order was the only significant effect to emerge,  $F(1, 369) = 12.92, p < .001$ . This interaction revealed that when arguments were unchunked, participants had a more favorable attitude toward the exams when the con arguments preceded the pros ( $M = 0.35$ ) than when the pro arguments preceded the cons ( $M = -0.16$ ; a recency effect). Conversely, when the arguments were chunked, this recency was attenuated such that participants reported a slightly more favorable attitude toward the exams when the pros preceded the cons ( $M = -0.04$ ) than when the cons preceded the pros ( $M = -0.14$ ).

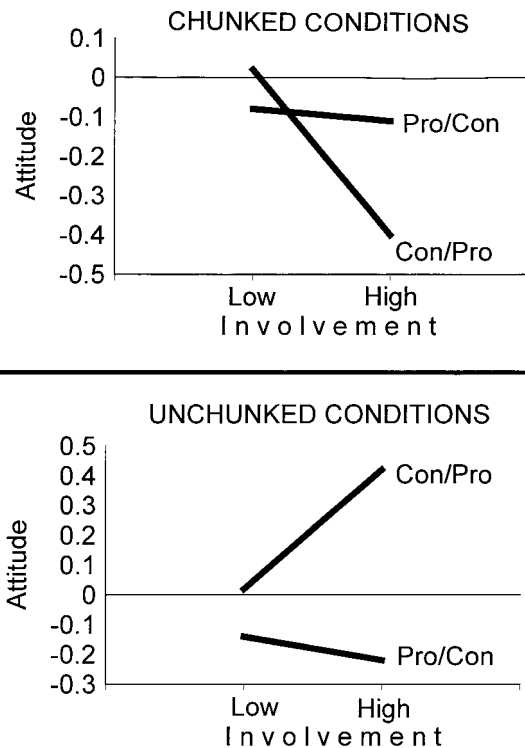
It is interesting that the pattern of this two-way interaction was consistent with our expectations for the high-thinking conditions only. Our results may have been more consistent with our expectations for high- than low-thinking conditions because the overall motivation to think about senior comprehensive exams may be relatively high (and higher than the motivation to think about the characteristics of unknown target individuals, which comprised the stimuli in past impression formation research on chunking).

A more important question, however, is why a two-way chunking by presentation order interaction was obtained rather than the predicted three-way interaction between chunking, personal relevance, and presentation order. The most obvious possibility was that the predicted three-way interaction was not obtained because we were unsuccessful in establishing two sufficiently different levels of motivation to think with our

personal relevance manipulation. First, consider that the means on the manipulation check item for perceived involvement for the high- and low-relevance conditions were 4.43 and 4.11, respectively. Although this difference is statistically significant, it is quite small—a difference of only 3/10 of a point on a 7-point scale. In addition, the mean levels of involvement for both conditions are well above the midpoint of the scale (i.e., each of the means differs significantly from the scale midpoint of 3),  $t(189) = 12.57, p < .001$ , and  $t(187) = 10.51, p < .001$ , for the high- and low-relevance conditions, respectively. This result is consistent with our suggestion that most of the participants found the topic of comprehensive exams to be somewhat involving and were thus motivated to think about it. As a consequence, conditions were not optimal to find the predicted three-way interaction.

To further explore the possibility that a weak personal relevance manipulation contributed to the absence of the predicted three-way interaction, we conducted an internal analysis to categorize participants on the basis of their responses to the personal involvement measure (i.e., the manipulation check item). To achieve a clear difference in perceived involvement, we performed a quartile split on these responses and again submitted the data to a  $2 \times 2 \times 2$  ANOVA using the upper and lower quartiles in place of the relevance manipulation. The cutoff scores for the lower and upper quartiles were 3.75 and 5.00, respectively. The fact that even the lower quartile had a mean response of 3.75 on a 0 to 6 scale lends further support to the idea that a vast majority of the participants found the comprehensive exam topic to be highly involving. Nevertheless, in this case, the three-way interaction between chunking, reported involvement, and presentation order was of marginal significance,  $F(1, 189) = 3.41, p < .07$ . It is interesting that this analysis again uncovered a two-way interaction between chunking and presentation order,  $F(1, 189) = 3.96, p < .05$ , but no other interactions or main effects were significant.

The three-way interaction is graphed in Figure 1, and it conforms to the predicted pattern. That is, the three-way interaction is due to the fact that the effect of motivation to think on order effects is opposite in the chunked and unchunked conditions. As presented in the top panel of Figure 1, we conceptually replicated the typical pattern obtained in prior persuasion research on motivation to think and order effects in the conditions that most closely duplicated prior persuasion studies. Specifically, when the pro and con messages were chunked, there was evidence of primacy when personal relevance was rated as relatively high, as indicated by more favorable attitudes when the pro arguments preceded the cons ( $M = -0.11, SD = 0.87, n = 25$ ) than when the con arguments preceded the pros ( $M = -0.40, SD =$



**Figure 1** Top panel: Effects of presentation order and self-reported personal involvement on attitudes when arguments are chunked. Bottom panel: Effects of presentation order and self-reported personal involvement on attitudes when arguments are unchunked.

0.71,  $n = 26$ ). This primacy pattern was attenuated, however, when perceived relevance was low, as indicated by very similar attitudes when the pro arguments came first ( $M = -0.08$ ,  $SD = 0.68$ ,  $n = 29$ ) than when the con arguments came first ( $M = 0.02$ ,  $SD = 0.82$ ,  $n = 20$ ).

Of importance, the bottom panel of Figure 1 shows that this pattern was completely reversed, as predicted, when information was unchunked. In the unchunked conditions, there was evidence of recency when personal relevance was rated as relatively high, as indicated by more favorable attitudes when the con arguments preceded the pros ( $M = 0.42$ ,  $SD = 1.02$ ,  $n = 26$ ) than when the pro arguments preceded the cons ( $M = -0.22$ ,  $SD = 1.08$ ,  $n = 23$ ). This recency was attenuated when perceived relevance was low, as indicated by the more similar attitudes when the con arguments came first ( $M = 0.00$ ,  $SD = 0.62$ ,  $n = 19$ ) than when the pro arguments came first ( $M = -0.14$ ,  $SD = 0.79$ ,  $n = 29$ ).

Study 1 provided some support for our key hypothesis. Specifically, a marginal three-way interaction of chunking, order, and perceived relevance suggested that chunking might, in fact, moderate the impact of motivation to think on order effects in persuasion. Under chunked conditions, highly involved participants

showed a pattern of primacy effects as in past persuasion research. This primacy was attenuated and in the direction of recency among participants who were less involved in the topic. Of importance, this effect was reversed when the same arguments were unchunked. That is, when the arguments were presented in one continuous stream, highly involved participants showed a recency pattern, and this recency was attenuated for those less involved. These findings are consistent with our primary hypothesis about the moderating role of chunking. However, the results are somewhat weak because of our failed manipulation and the marginal significance of the critical three-way interaction.

## STUDY 2

The primary objective of Study 2 was to retest the initial hypothesis using a different operationalization of motivation to think: need for cognition (NC). As noted earlier, NC is an individual difference assessment that reflects the general tendency to engage in and enjoy effortful thought (Cacioppo & Petty, 1982). People who are high in NC tend to engage in effortful thinking with great frequency, whereas those who are low in NC tend to avoid it (Cacioppo et al., 1996). NC was a desirable way to vary motivation to think because prior research had examined NC in both chunked conditions (Kassin et al., 1990) and unchunked conditions (Ahlering & Parker, 1989), although never together in a single study.

Thus, in Study 2, we conducted a replication of our first study with this new operationalization of the motivation to think. The key prediction of a three-way interaction was identical. That is, under chunked conditions, high-NC (high motivation to think) participants were expected to show evidence of primacy effects, whereas low-NC (low motivation to think) participants were expected to show reduced primacy (or recency) effects. Conversely, under unchunked conditions, high-NC participants were expected to show evidence of recency effects, whereas low-NC participants were expected to show reduced recency (or primacy). In short, when conditions replicated those from prior persuasion research (i.e., chunked), we expected to replicate the typical persuasion pattern of order effects. When we changed these conditions to simulate the typical impression formation paradigms (i.e., unchunked), we expected to reverse this pattern.

## Method

### PARTICIPANTS AND DESIGN

The study included 139 male and female introductory psychology students from The Ohio State University who participated in partial fulfillment of a course requirement. The experiment used a 2 (chunking: chunked,



unchunked)  $\times$  2 (need for cognition: low, high)  $\times$  2 (presentation order: pro/con, con/pro) between-participants design. Participants were randomly assigned to the chunking and presentation order conditions.

#### PROCEDURE

In keeping with the first experiment, participants were seated in cubicles after arriving and then were asked to read over some basic instructions. Participants were again told that the study was designed to compare the effectiveness of different modes of presentation of information and that they should focus on how clearly the information was being communicated in the written form.

All participants read two sets of arguments. Both sets contained four arguments relating to the topic of senior comprehensive examinations as an undergraduate requirement for graduation. These arguments were exactly the same as those used in the first study. Following the passages, participants completed questionnaires that contained both the aforementioned attitude measures and the 18-item Need for Cognition Scale (Cacioppo, Petty, & Kao, 1984). After completing these materials, participants were debriefed, thanked for their participation, and assigned credit for their course.

#### INDEPENDENT VARIABLES

The chunking and presentation order manipulations were identical to those developed for Study 1. Participants were categorized as high or low in NC as determined by a median split on their NC scores. The range of scores for these participants was 26 to 88 (possible range is 18 to 90), and the median score was 61. NC scores were not affected by either of the experimental manipulations ( $F_s < 1$ ).

#### DEPENDENT MEASURES

Participants' attitudes toward the comprehensive exams were assessed using ratings on the same nine 7-point semantic differential scales as used in Study 1. These scales were anchored at  $-3$  and  $+3$  and had the following labels: *bad to good*, *wise to foolish*, *positive to negative*, *unfavorable to favorable*, *beneficial to harmful*, *unpleasant to pleasant*, *fair to unfair*, *unnecessary to necessary*, and *intelligent to stupid*. The items were standardized and averaged to form one overall attitude index. No manipulation checks were included in this experiment.

#### Results

As in Study 1, the key dependent variable in Study 2 was the overall attitude toward the exams. These data were submitted to a  $2 \times 2 \times 2$  ANOVA with chunking, NC, and presentation order as the independent variables. The predicted three-way interaction among these variables was significant,  $F(1, 131) = 5.69$ ,  $p < .02$ . As the top panel of Figure 2 illustrates, under the chunked condi-

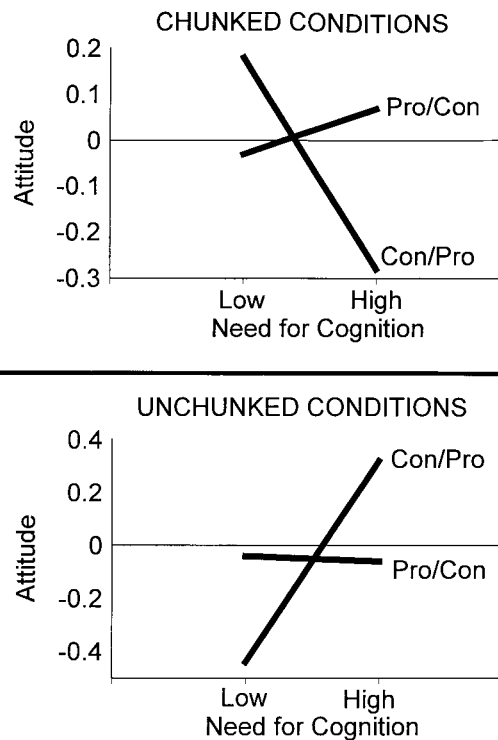


Figure 2 Top panel: Effects of presentation order and need for cognition on attitudes when arguments are chunked. Bottom panel: Effects of presentation order and need for cognition on attitudes when arguments are unchunked.

tions, we again replicated the typical persuasion pattern of effects. That is, under chunked conditions, we found a primacy pattern when NC was high, as indicated by more favorable attitudes when the pro arguments preceded the cons ( $M = 0.07$ ,  $SD = 0.90$ ,  $n = 16$ ) than when the con arguments preceded the pros ( $M = -0.28$ ,  $SD = 0.94$ ,  $n = 16$ ). On the other hand, a recency pattern was obtained when NC was low, as indicated by more favorable attitudes when the con arguments came first ( $M = 0.18$ ,  $SD = 0.72$ ,  $n = 21$ ) than when the pro arguments came first ( $M = -0.03$ ,  $SD = 0.71$ ,  $n = 17$ ).

More interesting, we were able to reverse this pattern when the arguments were unchunked. That is, as illustrated in the bottom panel of Figure 2, when NC was high, there was a recency pattern as indicated by the more favorable attitudes when the con arguments preceded the pros ( $M = 0.32$ ,  $SD = 0.77$ ,  $n = 21$ ) than vice versa ( $M = -0.06$ ,  $SD = 0.70$ ,  $n = 15$ ), but when NC was low, a primacy pattern was present as indicated by the more favorable attitudes when pro arguments came first ( $M = -0.04$ ,  $SD = 0.87$ ,  $n = 19$ ) than when cons came first ( $M = -0.44$ ,  $SD = 0.92$ ,  $n = 13$ ). Aside from a marginally significant two-way interaction between chunking and NC,  $F(1, 131) = 3.77$ ,  $p < .06$ , no additional effects were close to significance.

## GENERAL DISCUSSION

In Study 1, we obtained tentative support for the present hypothesis that chunking moderates the relationship between motivation to think and order effects. In that study, we found a marginally significant three-way interaction between chunking, presentation order, and rated involvement in the persuasive issue. This interaction first replicated the typical findings from prior research in persuasion when the arguments were chunked and then reversed these findings when arguments were unchunked (see Figure 1).

In Study 2, we attempted to obtain stronger support for the role of chunking in moderating the relationship between motivation to think and order effects by replacing the failed personal relevance manipulation with a reliable individual difference measure (need for cognition) that had been used in previous order effects investigations under both chunked and unchunked conditions. In this study, a significant three-way interaction was obtained. Again, we successfully replicated the persuasion pattern when the message arguments were chunked and then reversed this pattern when the arguments were not chunked (see Figure 2).

The conditions that have typically been present in traditional persuasion studies of message order (i.e., separate opposing messages) have been quite consistent in suggesting primacy under high-thought conditions and reduced primacy or recency under low-thought conditions (e.g., Haugtvedt & Petty, 1992; Haugtvedt & Wegener, 1994; Kassin et al., 1990). Of importance, however, the current research shows that this is not the only possible message order effect in persuasion. At the very least, according to the current data, these robust previous results crucially depend on the fact that the two sides of the issue are clearly separated into distinct units (e.g., pro/con, prosecution/defense). When the same information appears in a more continuous stream, with no salient denotation of a change in sources or sides of the issue, the pattern of results is actually reversed.

Indeed, the pattern of results across Studies 1 and 2 clearly suggests that the three-way interaction among chunking, motivation to think, and presentation order is not based simply on a two-way interaction in one context and its attenuation in another. On the contrary, the pattern of results suggests two opposing two-way interactions. To illustrate this striking reversal, we collapsed the data from both studies to achieve maximum power and tested the three-way interaction among chunking, motivation to think (based on the quartile split on reported involvement from Study 1 and the median split on NC from Study 2), and presentation order. Of importance, we also included a variable for "study" in this analysis. The study variable produced neither a main effect nor any interactions with any other variables in the analy-

sis. Thus, the three-way interactions did not differ across studies.

It is not surprising that the overall three-way interaction in the collapsed analysis was significant,  $F(1, 328) = 9.06, p < .01$ . Of even greater interest, we found that this three-way interaction seemed attributable to two different two-way (Thought  $\times$  Order) interactions: one under chunked conditions,  $F(1, 328) = 3.67, p < .06$ , and one under unchunked conditions  $F(1, 328) = 5.45, p < .03$ . As depicted in the figures, these interactions are in opposite patterns. To further explore these findings, we analyzed the simple order effects under each level of chunking and motivation to think. Because of the specific nature of the direction of our predictions, we used one-tailed tests for these analyses. We found that the two-way interaction under chunked conditions was driven primarily by an absolute primacy effect for individuals who were motivated to think,  $F(1, 328) = 3.15, p < .04$ , and its attenuation (or slight recency) for individuals who were not motivated to think,  $F < 1$ . The two-way interaction under unchunked conditions, on the other hand, was driven primarily by an absolute recency effect for individuals who were motivated to think,  $F(1, 328) = 8.75, p < .01$ , and its attenuation (or slight primacy) for those who were not motivated to think,  $F < 1$ .<sup>3</sup>

While opening the door for new questions and research, the present experiments also answer an important question regarding the moderation of the relationship between motivation to think and order effects in persuasion. First, we replicated prior persuasion studies examining the effects of motivation to think on order effects when our conditions resembled that of prior persuasion studies (i.e., chunked messages). However, we found that when the typical message order paradigm in persuasion settings is changed to resemble the paradigm used in impression formation studies (i.e., unchunked messages), the typical persuasion results are reversed and come to resemble the typical impression formation results. Therefore, the current studies not only conceptually replicated results that have been found in the persuasion literature but also extended those results by showing when this pattern would be reversed.

Although our explanation for these effects seems to aptly account for the present findings, future research would be useful to further address some of the issues raised by this research. For instance, the chunking approach we investigated in these studies addresses but one potential moderator of order effects in persuasion. There are a variety of features of the experimental setting that might ultimately prove crucial for the present pattern of results. For example, as noted in our earlier discussion, it might make a difference whether additional information on the topic is expected, especially in chunked conditions. If people expect to receive oppos-

ing information in the two messages, it might be possible for our high-motivation participants to withhold judgment and not show the pronounced primacy effects that have consistently occurred in chunked conditions. Also, if low-motivation participants know that an opposing message is coming, this might decrease any surprise-induced attention to the second message and might therefore reduce any observed recency effects. Another potentially crucial factor might be the length or extensiveness of the message as a whole. For example, "freezing" on early information might be more likely if it seems that processing all the information would be too effortful (i.e., that it is not worth the effort to process all of the information). If it is clear from the beginning that the information is quite brief, however, even low-motivation message recipients might be less likely to freeze on early information.

Future research should also explore chunking using an impression formation paradigm. The present studies have drawn from an interdomain discrepancy to test a new moderator of the relationship between motivation to think and order effects in persuasion. Yet, it would be interesting and useful to determine the extent to which the chunking variable also moderates effects in an impression formation paradigm. Although it seems reasonable to suppose that chunking will similarly moderate findings in the persuasion and impression formation domains, this hypothesis has yet to be tested. Furthermore, it also would be useful to conduct additional research on this question using experimental manipulations of the motivation to think. Although the present work primarily addresses chunking rather than the motivation to think *per se*, and although previous research in this area has produced similar results for need for cognition and experimental manipulations of thinking, causal conclusions regarding the thought variable are limited given our current operationalizations. Experimentally manipulating chunking, motivation to think, and presentation order could prove informative.

The current work holds some interesting implications for some existing attitude effects. For example, consider the idea that high levels of processing can bring about recency effects when information is presented in a constant stream. In a recent study, Kruglanski and Thompson (1999) presented research participants with a brief summary argument that was either strong (compelling) or weak (specious). This brief argument was followed by more extensive arguments that were either strong or weak. Kruglanski and Thompson (1999) found greater impact by the extensive than brief arguments when issue involvement was high but greater impact by brief than extensive arguments when issue involvement was low (consistent with both Kruglanski and Thompson's [1999] "Unimodel" and the Elaboration Likelihood

Model) (Petty & Cacioppo, 1986; for additional discussion, see Petty, Wheeler, & Bizer, 1999; Wegener & Claypool, 1999). Although Kruglanski and Thompson (1999) focused on the brevity versus extensiveness of the various arguments, the results they obtained fit quite well with the present results. That is, the arguments presented at the end of a relatively constant stream (i.e., the arguments were all part of the same message attributed to the same source) had a greater effect under high-thought conditions (recency) but the arguments presented first had a greater effect under low-thought conditions (primacy). It is interesting that the current perspective suggests that a similar effect could have been obtained even if the initial arguments were just as extensive as the later arguments as long as the information presentation was unchunked.

The present perspective also is relevant to work on argument integration in attitude change. For example, Friedrich, Fetherstonhaugh, Casey, and Gallagher (1996) tested cognitive-response models of attitude change by placing both strong and weak arguments in a message and varying the number of strong versus weak arguments included (see also Petty & Cacioppo, 1984). Although Friedrich et al. (1996) constructed their study so that order effects would be unlikely (i.e., with strong and weak arguments distributed throughout the message), the current work suggests that presentation order could serve as an important moderator of their results. That is, if recency effects occur when high levels of processing are given to unchunked information, then placing weak arguments at the end of the message could actually lead to less persuasion than when the same weak arguments are placed at the beginning of the message. Given that real-world persuasive messages might only include any potentially weak arguments after all of the strongest arguments have been presented, such an order effect could have potentially important consequences in communication.

Finally, it is interesting to note that high levels of processing often have been treated as implying an "online" updating of evaluations or judgments (e.g., Mackie & Asuncion, 1990). Although such updating and elaboration might often occur online as information is received and processed, the chunking results suggest that an opportunity to consolidate or crystallize one's view is crucial for that view to be held strongly enough to influence future judgments and processing. In this regard, it is important to point out that the current results and theory argue for a separation between outcome and process. In the present case, it would be unwise to generally assume that a given order effect (e.g., primacy) is invariably a high-effort or low-effort effect (see Petty & Jarvis, 1996). That is, primacy might sometimes result from effortful processing of an initial message followed by

effortful counterarguing of conflicting views (chunked conditions of the current studies) (e.g., Haugtvedt & Wegener, 1994). But, primacy also can be the result of low-effort freezing on early information (unchunked conditions of the current studies) (e.g., Kruglanski & Freund, 1983). Likewise, recency can be the result of effortful processing of a continuous stream of information (unchunked conditions of the current studies) or low-effort recall of recently presented information (Haugtvedt & Wegener, 1994; cf. Haugtvedt & Petty, 1992). Therefore, future research on order effects would benefit from increased attention to the cognitive effort involved in bringing about the observed effects and, perhaps, to identifying the level of processing required by the many specific processes hypothesized in past order effect research.

One such question that could be addressed would involve the level of cognitive effort involved in various online versus memory-based judgments. As noted by Petty and Wegener (1998), the number of arguments recalled from a persuasive message, for example, could be used as a cue to validity (a relatively low-effort process) (Petty & Cacioppo, 1984) or the arguments could be scrutinized when they are recalled prior to judgment (a more effortful process). Although recall of message arguments has primarily played a role in persuasion when initial processing of message content is quite low (e.g., Haugtvedt & Petty, 1992; Haugtvedt & Wegener, 1994; Mackie & Asuncion, 1990), it is not clear in these cases whether message recipients engaged in considerable scrutiny of the information after it was recalled. Similarly, one might think about different instances of online evaluation as differing in amount of effort.

It is our hope that the current work will provide an impetus for a dual-process focus on the various ways in which primacy or recency effects can arise. By doing so, greater insight can be gained in determining and predicting which order effects are most likely to persist over time and which are likely to form more temporary influences on social judgment (Petty et al., 1995). Moreover, this dual-process focus could enhance our understanding of order effects in more applied settings such as presidential debates, medication or health behavior advertisements, jury trials, and so forth. Given that the social perceiver's motivation to thoughtfully process information can vary dramatically from one setting to another, the present findings may have important implications for persuasion in these diverse domains.

#### NOTES

1. It is interesting that there was a thriving literature on order effects in the late 1950s and early 1960s that can be viewed as consistent with the more contemporary results. For example, in a series of studies,

Lana (1961, 1963a, 1963b) found evidence of primacy effects when recipients were dealing with highly familiar issues, highly controversial issues, and issues for which participants reported high levels of interest. In contrast, Lana found recency effects when issues were unfamiliar or uninteresting to participants. Although Lana proposed no general conceptualization to account for these findings, the results are clearly consistent with more recent research in persuasion if one assumes that people are more likely to think about issues that are familiar, controversial, and interesting (see Haugtvedt & Wegener, 1994).

2. We state these findings in relative terms (e.g., "enhanced primacy or reduced recency") because whether absolute primacy or recency is obtained in any given context can be determined by a myriad of factors. Of importance for the current purposes is the direction of effect; that is, enhancing primacy is the same direction of effect as reducing recency (i.e., the earlier information is increasing in weight in both effects) and enhancing recency is the same direction of effect as reducing primacy (i.e., the later information is increasing in weight in both effects).

3. We also analyzed the simple two-way interactions within each study, and although they were in the same direction, they were of marginal significance given the lower power to detect effects.

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