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The impact of perceived message complexity and need for cognition on information processing and attitudes

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ABSTRACT

Need for cognition (NC) is a much studied personality trait that refers to an individual's chronic tendency to engage in and enjoy effortful cognitive activities [Cacioppo, J. T., & Petty, R. E. (1982). The need for cognition. *Journal of Personality and Social Psychology*, *42*, 116–131]. Our research examines whether tailoring a message to an individual's NC is effective due to differences in motivation or ability for processing. Therefore, we use a novel assessment of information processing that holds ability constant. Results showed as NC increased, processing became more likely for messages labeled as complex rather than simple. These findings demonstrate that the mere perception of message complexity is sufficient to impact processing among individuals who vary in NC. This indicates that motivational differences are sufficient to generate processing differences for individuals who vary in NC.

Introduction

Since the cognitive revolution in psychology, theories in numerous domains including attribution (e.g., Gilbert, Pelham, & Krull, 1988; Trope, 1986), person perception (e.g., Brewer, 1988; Fiske & Neuberg, 1990), persuasion (e.g., Chaiken, Liberman, & Eagly, 1989; Kruglanski & Thompson, 1999; Petty & Cacioppo, 1986) and others (see Chaiken & Trope, 1999) have proposed that the extent of thinking plays an important role in determining the outcomes of interest. Within each of these areas of inquiry, both individual and situational factors affecting the extent of thinking have been identified. The current research examines a much studied individual difference variable – need for cognition – and investigates whether in the context of persuasion, differences in thinking can be modified by situationally induced expectations regarding the complexity of the message. We predict that situationally induced expectancies will interact with need for cognition to determine the extent of information processing.

Need for Cognition (NC) refers to an individual's chronic tendency to engage in and enjoy effortful cognitive activities (Cacioppo & Petty, 1982). There is much evidence that various objective features of a task or a persuasive message interact with NC to influence various outcomes. One of the most documented situation x NC interaction effects involves the relationship between differences in NC and reliance on arguments versus simple cues in persuasion (see Petty, Briñol, Loersch, & McCaslin, 2009, for a review). As NC increases, people are generally more likely to be influenced by the quality of the substantive message arguments (e.g., Cacioppo, Petty, & Morris, 1983). On the other hand, in the absence of any special incentives to think, as NC decreases, people become less likely to engage in careful processing and are more likely to be influenced by simple cues that allow evaluation without assessing the merits of the arguments presented. For example, Axsom, Yates, and Chaiken (1987) found that when the personal relevance of a message was low, the audience's purported enthusiasm for the message had a greater impact on attitudes as NC decreased. In other research, as NC decreased, people were more influenced by the endorser's attractiveness (Haugtvedt, Petty, & Cacioppo, 1992) or the humor in the message (Zhang, 1996) rather than by argument quality. Therefore, the accumulated findings demonstrate that as NC becomes lower, people become more persuaded by cues that require minimal effort to process such as the audience's response, the endorser's attractiveness and the message's humor. In contrast, as NC increases, people are more persuaded by their careful analysis of the substantive merits of the evidence presented in a message. Thus, manipulations of the objective quality of the arguments in the message have a greater impact on attitudes as NC increases.

In the current research, we wanted to examine the implications of these processing differences for matching effects involving NC. In the persuasion literature, matching refers to providing recipients with a message that is tailored for some aspect of the person (e.g., telling women that the issue is of special concern to women, or providing arguments that address particular concerns the person has). There is much evidence that messages that are matched to

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individual differences are more effective than those that are mismatched (see Petty, Wheeler, & Bizer, 2000, for a review). For example, several studies have examined individual differences in self-monitoring and have shown that messages with an image-oriented focus became more effective than advertisements containing a quality-oriented focus as self-monitoring increased (Snyder & DeBono, 1985). More recent research has examined matching effects involving other personality differences. One such personality characteristic is the tendency to rely on affect versus cognition in attitudes. Huskinson and Haddock (2004) found that individuals who chronically rely on cognition in their attitudes developed more positivity toward a novel beverage when they were exposed to a beliefs-focused appeal (i.e. attributes about the beverage) than an affect-focused appeal (i.e. taste of the beverage) whereas the reverse tended to be true for those who chronically rely more on affect. Matching effects have also been obtained with promotion focused and prevention focused individuals. Promotion focus refers to an orientation toward ideals whereas prevention focus refers to an orientation toward responsibilities (see Higgins, 1998). In a final example, promotion focused individuals were more positive toward an activity (eating fruits and vegetables) or issue (a new student after-school program) after receiving a message that discussed accomplishments than after a message that emphasized responsibilities (Cesario, Grant, & Higgins, 2004). In contrast, prevention focused individuals showed the reverse pattern.

One underlying mechanism for matching effects is that recipients process a message to a greater extent when the message is tailored to their individual characteristics than when the message is mismatched. Since the messages used in the research described above were usually designed to be persuasive, they are likely to contain strong arguments such that they are more effective when processed to a greater extent. This means that if a message contains weak arguments, greater processing from matching would actually result in less persuasion. In the first research to directly examine the role of processing in matching effects, Petty and Wegener (1998) varied the quality of the arguments in addition to whether the message was tailored to individual differences or not. Specifically, individuals with varying levels of self-monitoring were presented with strong or weak messages that were tailored to focus on image or merit. Messages that were tailored for low self-monitors discussed how well a shampoo cleaned hair whereas messages that matched high self-monitors emphasized the benefits of the shampoo for one's appearance. But, these dimensions were supported with strong or weak arguments. As hypothesized, individuals' attitudes toward the shampoo were more impacted by the quality of the message when the message matched their self-monitoring level than when it mismatched. This implies that cogent messages that are matched to a recipient's individual characteristic are more persuasive than mismatched messages because they are processed to a greater extent by the recipient.

We posit that in addition to personality factors such as self-monitoring, differences in NC would also predict individuals' processing of tailored messages. Furthermore, we investigate *why* tailoring a message to an individual's NC would increase processing. Given the prevalent finding that information processing tends to increase as NC increases, we ask whether this effect is necessarily due to processing *ability*, or whether the effect can be explained by processing *motivation.* One possible reason for the processing difference observed in prior studies is that the typical persuasive message employed tends to be rather dense and complex and thus, is a closer match to the information processing proclivities of individuals on the higher end of the NC continuum.

There is some evidence in support of the notion that ability to process increases with increasing NC. Specifically, intellectual skills and knowledge are positively related to NC, making it easier for those who score higher in NC to think about a variety of topics, and especially about relatively complex messages. For example, prior research has shown that higher NC is associated with greater knowledge about politics (e.g., Cacioppo, Petty, Kao, & Rodriguez, 1986), and better understanding of relatively difficult coursework (e.g., Leone & Dalton, 1988). Furthermore, NC is also modestly correlated with verbal intelligence (meta-analysis $r_{ave} = -.34$; see Cacioppo, Petty, Feinstein, & Jarvis, 1996). Therefore, one potential explanation for why tailoring a message to an individual's NC would work is because of *ability matching* (i.e., a complex message is a better fit for those who score higher in NC because they are better able to process it). In other words, individuals process a tailored message more because the message does not place too much or too little cognitive demand on the individual. Returning to the self-monitoring example, it might be that higher self-monitoring is associated with greater processing of image-oriented rather than quality-oriented advertisements because individuals who are higher in self-monitoring have had more experience attending to image-related information and thus, have the optimal level of processing ability for such information. This means that given a strong message, higher self-monitors would be more persuaded by the image-oriented version than the quality-oriented appeal. This ability account of the greater effectiveness of tailored messages compared to non-tailored messages is consistent with *resource-matching theory* (Anand & Sternthal, 1989). According to this theory, persuasion is maximal when the amount of cognitive resources required to process the message neither exceeds nor falls short of what the message recipient is capable of providing. Thus, when the cognitive demands of a strong message matches an individual difference such as NC, people should be more persuaded than when the required amount of mental resources is incongruent with NC. Note that the resource matching perspective suggests that individuals scoring lower in NC might process a message more than individuals scoring higher in NC if it matched their own information processing abilities (e.g., if the message was actually very simple to process).

However, despite some link between NC and ability factors, other findings suggest that the differing processing proclivities of individuals varying in NC cannot be attributed entirely to processing ability. These findings demonstrate that when an incentive is provided for thinking, such as when the issue is important or surprising or no salient cues are available, those who score lower in NC engage in as much mental effort as those scoring higher in NC (see Petty et al., 2009). For instance, in research by Axsom and colleagues (1987), individuals who scored relatively low in NC generated more message-relevant thoughts when they were told that the experiment was about an important issue than when they were told that the study was a preliminary test. In another example, Priester and Petty (1995) found that the post-message attitudes of lower NC individuals were impacted by argument quality and correlated with their thoughts to the same extent as higher NC individuals when the message source was perceived as dishonest, but not when the source was honest. When the source was dishonest, lower NC participants could not rely on the source's credibility as a cue to validity and thus they chose to process the message. In other research, lower NC individuals' attitudes were predicted by argument quality and thoughts when the message violated their expectations (Smith & Petty, 1996; see also Priester, Godek, Nayakankuppum, & Park, 2004). In summary, past research suggests that when lower NC individuals have an incentive to think, such as when the issue is important or surprising or they cannot rely on a salient cue, they do engage in as much mental effort as higher NC individuals.

Therefore, based on prior research, and the original conceptualization of NC as tapping into motivational rather than ability differences (see Cacioppo & Petty, 1982), we propose that matching a message's purported (rather than actual) cognitive demands to a

recipient's level of NC would be a sufficient condition for affecting the extent of message processing. Our hypothesis is also based on prior NC research showing that different tasks are of interest to those varying in NC. Specifically, higher NC individuals are more motivated by tasks that are actually complex rather than simple (i.e., high cognitive resources required) whereas lower NC individuals are more motivated by tasks that are actually simple (i.e., low cognitive resources required). In a prior study, Cacioppo and Petty (1982) exposed individuals who varied in NC to a puzzle task that was actually simple or complex. Higher NC individuals reported enjoying the complex over the simple puzzle but lower NC individuals reported the reverse pattern of enjoyment. In later work, higher NC was related to greater influence by a message that contained more (rather than less) detailed information (Williams-Piehota, Schneider, Pizarro, Mowad, & Salovey, 2003). In the current research, we examine whether simply *framing* messages as simple or complex would be sufficient to produce information processing differences among individuals who vary in NC.

In summary, the current research examined the possibility that ability matching is not necessary to affect the motivation to process among individuals who vary in NC. Rather, mere perceptions of a match are expected to be sufficient to enhance motivation. We assessed how differences in NC would predict processing motivation when the actual cognitive demands of the message were held constant while the mere perception of the cognitive resources required was varied. Therefore, in Experiment 1 we investigated how subjective perceptions of complexity would affect the reported motivation of individuals who varied in their NC. In Experiment 2 we examined how mere perceptions of complexity would affect information processing and persuasion of individuals who varied in NC.

Experiment 1

The primary goal of Experiment 1 was to examine the motivational impact of differences in NC on stimuli merely described as simple or complex rather than varying in their actual complexity. To the extent that mere perceptions have the expected effect, the manipulation would prove suitable for testing our hypotheses about information processing and persuasion in Experiment 2. For the simple message condition, we wanted participants to perceive a message to be simple but not so simple that even lower NC individuals would find it insulting. Similarly, we wanted participants in the complex message condition to expect a message to be complex but not so difficult to process that even higher NC individuals would not think they would be able to do it.

After receiving the manipulation of perceived rather than actual message complexity, participants in Experiment 1 did not engage in any processing of the message so their motivation was assessed prior to any actual performance. In contrast, participants in prior work reported their task enjoyment after they actually completed a task that varied in complexity (Cacioppo & Petty, 1982). This means that unlike in prior work, differences in reported motivation among individuals with varying levels of NC in Experiment 1 could not be due to their ad hoc explanations for their task performance, which could have differed as a function of their ability to do the task.

A second difference in the current research is the measure of motivation we used. Rather than ask participants directly about task enjoyment as in prior research (Cacioppo & Petty, 1982), we measured participants' self-reported arousal as a relatively subtle operationalization of motivation to engage in the task. This is to reduce influence from participants' efforts to be consistent about their reported task enjoyment and their need for cognition. In past research, participants completed the NC scale and the task enjoyment measure during the same experimental session. Higher NC individuals might have reported higher task enjoyment for complex tasks and lower NC individuals might have claimed to enjoy the simple task more just so their preference for a specific task was consistent with their self-reported NC, which was likely to be highly accessible when they completed the dependent measures. In the current experiment, we also had participants complete the NC scale during the same experiment session but we assessed enjoyment less directly via self-reported arousal.

In previous research, physiological arousal has been conceptualized as tapping into the motivation to exert effort on a task. For example, in work on the energization model of motivation (see Wright & Brehm, 1988), physiological arousal (e.g., increase in heart rate and systolic blood pressure) has been used as a measure of motivational intensity for a task (i.e., motivation in anticipation of a task that is at an optimal difficulty level). In the current experiment, we used items adapted from the Self-Assessment Manikin (SAM; Lang, 1980) as a measure of participants' motivation to read the message. SAM is a widely-used measure that assesses perceived arousal and has been shown to correlate with physiological arousal indices such as skin conductance and heart rate (e.g., Lang, Greenwald, Bradley, & Hamm, 1993).

Method

Participants and design

Thirty-seven introductory psychology students at the Ohio State University were randomly assigned to one of two perceived message complexity conditions: simple or complex. Need for cognition was also assessed. The students received partial course credit for their participation.

Procedure

Participants were told that they would be completing two separate studies. The first study's stated purpose was to look at relationships among personality questionnaires. Participants completed the NC scale and a distracter questionnaire. The order in which they completed the questionnaires was counterbalanced. Then participants went on to an ostensibly separate study. To minimize participants' knowledge of the connection between completing the NC scale and reading the report, we told participants that the second study's purpose was to assess the readability of various reports. To further engage participants in the "second study," they were told that they would receive two pieces of candy upon successful comprehension of the report. The final instructions constituted the perceived message complexity manipulation. After reading a description of the message that was presumed to be presented shortly, participants completed a manipulation check for complexity and the key measure of arousal. At the conclusion of the study, all participants were debriefed and thanked for their participation.

Independent variables

Need for cognition. All participants completed the 18-item short version of the need for cognition scale (Cacioppo, Petty, & Kao, 1984). The scale contains items such as "The notion of thinking abstractly is appealing to me," and "Thinking is not my idea of fun (reverse-coded)." All items were completed on a 5-point scale anchored at (1) *extremely uncharacteristic of me* and (5) *extremely characteristic of me* (Cronbach's $\alpha = .81$). Participants' mean NC score was 60.16 ($SD = 9.35$).

Perceived message complexity. Participants in the simple message condition read that the report contained "elementary wording." They were also told that no specialized knowledge was required to understand the report. Participants in the complex message condition were told that the report contained "technical wording" that only people with specialized knowledge would be able to understand.

Dependent measures

Perceived message complexity manipulation check. As a manipulation check, participants indicated how simple or complex they expected the report to be on a 9-point Likert-type scale with endpoint labels of very simple-very complex.

Self-reported arousal. After reading the message description, participants reported their arousal on six 9-point semantic-differential items. The six items were stimulated-relaxed (reverse coded), excited-calm (reverse-coded), sluggish–frenzied, dull–jittery, wide awake–sleepy (reverse coded), and unaroused–aroused. These items were adapted from the Self-Assessment Manikin (SAM; Lang, 1980) and were designed to assess general arousal in anticipation of reading either the simple or complex message. Participants' responses to the six items were summed to form an overall arousal index (Cronbach's $\alpha = .70$).

Results

Participants' standardized need for cognition score, perceived message complexity (dummy coded; 0 = simple versus 1 = complex), and the interaction term were entered as predictors in a regression analysis. Main effects were interpreted in the first step and the two-way interaction in the second step (see Cohen & Cohen, 1983).

Manipulation check

Regression analyses showed that the manipulation was effective in influencing participants' perception of message complexity. That is, only a significant main effect of perceived message complexity on the manipulation check was obtained, $B = 2.64$, $t(34) = 4.25$, $p < .001$, such that participants who were told that the message had technical language and required specialized knowledge expected the message to be more complex than those who were told that the message had elementary language and did not require specialized knowledge. There was no main effect of NC, $B = .00$, $t(34) = .00$, $p = .1.00$. Importantly, perceived message complexity did not interact with participants' NC, $B = .18$, $t(33) = .29$, $p = .78$. This suggests that within each task difficulty condition, perceptions of complexity did not vary as a function of NC.

Self-reported arousal

As we hypothesized, on the measure of arousal there was a significant interaction between participants' NC and perceived message complexity, $B = 7.35$, $t(33) = 3.43$, $p < .01$. There were no main effects of participants' NC, $B = .67$, $t(34) = .55$, $p = .59$, or perceived message complexity, $B = .55$, $t(34) = .23$, $p = .82$. Table 1 contains values for change in R^2, overall R^2, and overall F-test for each step in the hierarchical regression.

We decomposed the interaction by performing separate regression analyses for participants who expected the message to be simple versus those who perceived the message as complex. Results showed that the higher a participant's NC, the more aroused he or she reported being after reading the complex message description, $B = 4.56$, $t(15) = 3.89$, $p = .001$. In contrast, when the message was described as simple, there was a non-significant trend for arousal to decrease as NC increased, $B = -2.79$, $t(18) = -1.63$, $p = .12$.[1]

Table 1
Hierarchical regression analyses.

	B	ΔR^2	R^2	F
Step 1	–	.01	.01	.17
NC	.67	–	–	–
Perceived complexity	.55	–	–	–
Step 2	–	.26	.27	4.07*
NC x perceived complexity	7.35	–	–	–

$n = 37$.
* $p < .01$.

Discussion

The results of Experiment 1 suggest that our manipulation of expected message complexity interacted with NC to produce different levels of motivation as assessed with a measure of arousal. As intended, our manipulation did not interact with NC to influence perceptions of complexity. Importantly, unlike past research that used tasks varying in actual complexity, the current results were obtained with a description of complexity that manipulated participants' subjective perceptions of information complexity prior to performing the task. These results are the first to suggest that actual complexity differences may not be required to obtain differences in motivation for individuals who vary in need for cognition. But, since they are based on self-report, Experiment 2 sought behavioral evidence of different motivation based on mere descriptions of task complexity.

Experiment 2

In Experiment 2, we examined the impact of NC and perceived message complexity on information processing behavior. We predicted an interaction of NC with perceived message complexity such that for individuals with a higher level of NC, the message described as complex should be processed more than the message described as simple. In contrast, for individuals with a lower level of NC, the message described as simple would be processed more than the message described as complex. Viewed differently, this interaction pattern would suggest that with a message labeled as complex, the traditional finding would hold such that as NC increases, processing would increase. In contrast, for a message labeled as simple, a reversal of the traditional finding would occur with greater information processing being associated with decreased levels of NC. In order to minimize influence from participants' efforts to engage in behavior that is consistent with their self-reported level of NC, we prescreened participants for NC in an earlier separate session.

In addition, we developed a new procedure to assess message processing in which participants first learned information in one session that would help them evaluate the persuasive message in a second session. Specifically, if the information in the first session was retrieved and used to evaluate the persuasive message, the message would seem either cogent or specious. To instantiate this procedure, participants were invited to two experimental sessions, which occurred 2–8 weeks after the prescreening. In the first session, participants acquired fictitious background knowledge about their university – Ohio State. About a day later, participants returned for the second session, during which they read a report that discussed the implementation of senior comprehensive exams. The report was described as either simple or complex using the materials developed in Study 1. Regardless of whether participants received a description of a simple or complex message, everybody actually received exactly the same information to process. This

[1] We also decomposed the interaction by performing separate simple slope analyses for lower NC and higher NC individuals at 1 SD below and above the mean. (see Aiken & West, 1991). Results showed that among lower NC individuals, arousal was greater when the message was described as simple than when it was described as complex, $B = -6.72$, $t(33) = -2.24$, $p = .03$. The opposite occurred for higher NC individuals, who were more aroused when the message was perceived as complex than when it was seen as simple, $B = 7.98$, $t(33) = 2.64$, $p = .01$.

ensures that we can attribute any differential information processing to be the consequence of perceptions of complexity rather than anything about the actual information per se.

The new procedure described above is ideal for the current research for two additional reasons. In the typical argument quality manipulation (e.g., Petty, Wells, & Brock, 1976), participants in the strong and weak argument conditions receive *different* arguments that are pretested to elicit mostly positive or negative thoughts if people think about them carefully (see Petty & Cacioppo, 1986). Although the traditional argument quality paradigm has proven useful to distinguish the extent of processing in many past studies, one limitation is if the strong message about comprehensive exams happens to feature more attribute information (e.g., statistics on starting salaries for graduates from schools with exams) than the weak message, then participants might distinguish between the strong and weak message not because they are effortfully processing the merits of the information but because they are relying on the heuristic that the more statistics in the message, the more persuasive it is. This is especially relevant in the current study as past research suggests that variations in NC are associated with differences in attraction to cognitive as opposed to affective information, with higher NC leading to greater relative interest in cognitive messages (Haddock, Maio, Karin, & Huskinson, 2008; Venkatraman, Marlino, Kardes, & Sklar, 1990). However, in the new procedure we introduce, people are given prior knowledge that is designed to make the subsequent message appear weak or strong if this prior knowledge is retrieved. With this procedure, all participants receive the *same* message at the time of processing. Because all participants receive exactly the same message at the time of processing, differences in attitudes can be attributed to the application (or not) of one's prior knowledge rather than irrelevant features of the current message.

Another reason a typical argument quality manipulation is less appropriate for the current research is that it could be that as NC increases, individuals can assess message quality with relatively little cognitive effort because processing messages is highly practiced for them. As mentioned before, higher NC is associated with possessing more knowledge on various issues (see Cacioppo et al., 1996, for a review), and such knowledge differences could contribute to ability differences in processing. In the current method, everyone within the same argument quality condition is provided with the identical amount of issue-specific knowledge prior to message exposure so all participants are similarly equipped to evaluate the unfamiliar message regardless of NC. Furthermore, we varied the background information as function of argument quality condition. This background information, if used to evaluate the message, would make the message that recipients received seem either strong or weak. In summary, background information differed across argument quality conditions but did not differ across varying levels of NC. If we can ensure that all individuals have the same prior knowledge available at the time of message processing regardless of level of NC, but NC still influences use of this knowledge depending on the perceived complexity of the message, we can be more confident that differences in attitudes arise from processing motivation rather than ability.

In sum, in Experiment 2, individuals who differed in their level of NC received a message that was framed as simple or complex. Furthermore, before message exposure, all participants received prior knowledge that, if used, would make the message seem strong or weak. We predicted that when the message was described as complex, higher NC would be associated with more use of prior knowledge to evaluate the message because the complex message would motivate careful processing. However, when the same message was described as simple, higher NC would be associated with *less* use of prior knowledge to evaluate the message because the simple message would be less motivating. This pattern should result in a three-way interaction of perceived message complexity X prior knowledge X NC. As mentioned earlier, this interaction pattern would also demonstrate that for those higher in NC, information processing occurs more for a complex than a simple message whereas for those lower in NC, the reverse is the case.

Method

Participants and design

Ninety-six introductory psychology students at the Ohio State University who had been prescreened at the beginning of the quarter on the NC scale were randomly assigned to the 2 (Perceived Message Complexity: simple or complex) X 2 (Prior Knowledge: weak or strong) between-participants design. The students received partial course credit for their participation.

Procedure

Session one: knowledge acquisition. Participants were told that they would be involved in various separate studies in two experimental sessions. During session one, participants first completed a distracter questionnaire that presumably assessed participants' personality. Then, participants completed a separate study ostensibly for the Ohio State Admissions Office. Participants were told that the researchers were assisting the Admissions Office in revising materials provided to prospective students. Thus, participants' task was to learn certain information in an admissions brochure that contained the key prior knowledge manipulation. Participants were asked to copy six highlighted statements three times in an attempt to memorize them. This was to ensure that both high and low NC individuals would have similar recall ability when it came time for message processing. Unbeknownst to the participants, among the six statements, four would be relevant to assessing the quality of the arguments in a report that would be presented in session two. Importantly, participants either read information that would make the arguments they read later appear weak or strong. Participants studied the material until they could recall it successfully.

Session two: message processing. Approximately 24 h later, participants returned to the laboratory to complete the remaining study. They were then asked to provide their opinions on some information as part of a study being conducted by the "Curriculum Committee on Undergraduate Education." Participants either read that the report was simple or that it was complex. Thus, participants' perception of the report's complexity was manipulated. Everybody read a report that contained four arguments describing how the implementation of senior comprehensive exams would influence factors such as the tutor-to-student ratio and the acceptance rate at graduate schools. As mentioned before, participants read the same arguments regardless of whether they expected the arguments to be complex or simple. After reading the report, participants indicated their attitudes toward the exams. They then completed the manipulation check for perceived message complexity, before completing surprise recall and recognition tests. Finally, participants were debriefed and thanked for their participation.

Independent variables

Need for cognition (NC). The students were invited to participate in the experiment because they had completed the NC scale (Cacioppo et al., 1984) during a mass prescreening session at the beginning of the academic quarter. Participants' mean NC score was 57.09 (SD = 13.23).

Argument quality from prior knowledge. In session one, participants were exposed to information that would make the arguments they were going to read in session two appear weak or strong. Participants were instructed to read and copy six highlighted statements in order to memorize those statements. Two of the statements were consistent across prior knowledge conditions. The other four statements comprised the manipulation. Each statement presented a (fictional) statistical fact regarding Ohio State University that could later be used to evaluate a corresponding statement in the report.

In the information presented to participants in session one, statements in the Weak Knowledge condition described Ohio State University in such a way that implementing comprehensive exams would seem detrimental if these facts were compared to facts in the message. In the Strong Knowledge condition, the facts described the university in such a way that implementing comprehensive exams would seem beneficial if these facts were compared to arguments in the message. For instance, one statement in the Strong Knowledge condition was "Right now, there is one university tutor available for every 1000 students at The Ohio State University." Because the message claimed that the implementation of comprehensive exams would be followed by the availability of one university tutor for every 100 students, the prior information makes the argument seem strong as implementation of the exams will lead to a marked improvement. In contrast, the corresponding statement in the Weak Knowledge condition was "Right now, there is one university tutor available for every 10 students at The Ohio State University." This background statement makes the subsequent message argument seem quite weak in comparison. Importantly, the message will seem strong or weak only if participants use this background information during message processing. The remaining background information and message information are contained in the Appendix A.

Perceived message complexity. Before reading the report that was provided in session two, participants received instructions that constituted the perceived message complexity manipulation. These instructions were the same as those in Experiment 1.

Dependent measures

Attitudes. After participants read the arguments in the message, they reported their attitudes toward the implementation of senior comprehensive exams at Ohio State University. Attitudes toward the exams were reported on six 9-point semantic-differential scales with the anchors unfavorable–favorable, good–bad (reverse-coded), harmful–beneficial, positive–negative (reverse-coded), pleasant–unpleasant (reverse-coded), and foolish–wise. Participants' mean attitudes were computed as the average of the six items (Cronbach's $\alpha = .89$).

Perceived message complexity manipulation check. After the attitude measure, participants indicated how simple or complex they expected the report to be before they read it. Responses were made on a 9-point Likert-type scale with endpoint labels of very simple–very complex.

Recall and recognition. After indicating their attitudes and completing the manipulation checks, participants were asked to write down the six facts that they had memorized the day before. This was to ensure that NC did not have an impact on learning at the time of message exposure. Holding background knowledge constant across levels of NC ensures that any effects observed for NC could be attributed to differential efforts to retrieve and use the information rather than to the availability of the information. Participants' scores on the recall of the message were based on the number of statements they wrote down correctly out of the four statements that were relevant to evaluating the report summary. Participants then completed a multiple-choice test regarding the six memorized facts. Participants' scores on this recognition measure were based on the number of questions they answered correctly out of four questions regarding facts relevant to the report. Although prior studies have shown that increasing levels of NC lead to enhanced recall of information, we attempted to avoid this result by having all participants learn the information perfectly at the initial session.

Results and discussion

Participants' standardized NC, perceived message complexity (dummy coded; 0 = simple versus 1 = complex), prior knowledge (dummy coded; 0 = weak versus 1 = strong), and all interaction terms were entered as predictors for all analyses. As in Experiment 1, main effects were interpreted in the first step, two-way interactions in the second step, and the three-way interaction in the third step.

Perceived message complexity manipulation check

As intended, participants expected the report that was framed as requiring specialized knowledge to be more complex than the report that was framed as not requiring specialized knowledge, $B = 2.21$, $t(92) = 4.89$, $p < .001$.[2]

Recall and recognition checks on memory

Regression analyses did not reveal any significant main effects or interactions on either recall or recognition. On average, participants recalled 3.23 out of the 4 statements, and they got a score of 3.75 out of 4 on the recognition test. It is especially noteworthy that NC did not predict participants' recall or recognition. Neither did NC interact with perceived complexity to influence recall or recognition. These findings imply that any effects observed on attitudes could not be due to differential ability to retrieve information in order to judge the arguments as strong or weak. This was as intended because the experimental procedure, unlike prior research on NC, was designed to get all participants to learn the material equally well.

Attitudes

Results showed a significant main effect of Prior Knowledge for participants' mean attitudes, $B = 1.46$, $t(92) = 4.04$, $p < .001$, such that those who received prior knowledge designed to make the message appear strong had more favorable attitudes toward the exams than those who received prior knowledge designed to make the message appear weak. No other main effect or two-way interactions were significant. Most relevant to our hypothesis was the appearance of a significant three-way interaction, $B = 2.04$, $t(88) = 2.93$, $p < .01$. Table 2 contains values for change in R^2, overall R^2, and overall F-test for each step in the hierarchical regression.

To decompose this interaction, we examined the Prior Knowledge X Complexity interaction separately for individuals lower and higher in NC (computed at 1 standard deviation below and above the mean, respectively). These analyses revealed significant perceived message complexity X prior knowledge interactions for both lower NC individuals, $B = -10.79$, $t(88) = -2.87$, $p = .01$, and higher NC individuals, $B = -6.71$, $t(88) = -2.78$, $p = .01$. To examine

[2] We also found a significant effect of NC on perceptions of message complexity, such that overall, high NC individuals viewed the message to be less complex than low NC individuals, $B = -.54$, $t(92) = -2.39$, $p < .05$. This effect was not obtained in Experiment 1 presumably because participants did not receive a message in that study. Notably, this effect was not qualified by manipulated Perceived Message Complexity. That is, the manipulation of participants' expectations of message complexity worked equally well regardless of level of NC.

Table 2
Hierarchical regression analyses in Experiment 2.

	B	ΔR^2	R^2	F
Step 1	–	.17*	.17	6.32*
NC	−.02	–	–	–
Perceived complexity	−.54	–	–	–
Prior knowledge	1.46*	–	–	–
Step 2	–	.05	.21	3.93*
NC × perceived complexity	.68	–	–	–
NC × prior knowledge	.29	–	–	–
Perceived complexity × prior knowledge	.06	–	–	–
Step 3	–	–	–	4.88*
NC × perceived knowledge × perceived complexity	2.04*	.07*	.28	–

$n = 96$.
* $p < .01$.

how perceived message complexity interacted with prior knowledge across varying levels of NC, we obtained simple slopes of the regression of prior knowledge on attitudes at each perceived message complexity condition within lower NC individuals and higher NC individuals, respectively. Results for lower NC individuals, showed that prior knowledge predicted attitudes when participants perceived the message as simple, $B = 2.03$, $t(46) = 3.11$, $p < .01$, but not when the participants expected the message to be complex, $B = .04$, $t(42) = .06$, $p = .95$. In contrast, among higher NC individuals, prior knowledge predicted attitudes when the message was complex, $B = 2.65$, $t(46) = 4.03$, $p < .001$, but not when it was simple, $B = .56$, $t(42) = .77$, $p = .45$ (see Fig. 1).

These results suggest that lower NC participants put in more effort to use their prior knowledge to process the report when they expected it to be simple than when they believed it was going to be complex, whereas higher NC participants expended more cognitive effort to apply the information that they had learned when they expected the message to be complex than when they thought the message was going to be simple.[3] These findings are consistent with the notion that subjective perceptions of a message's complexity is an aspect of the persuasion context that can be matched or mismatched to an individual's NC, such that matching leads to increased processing.

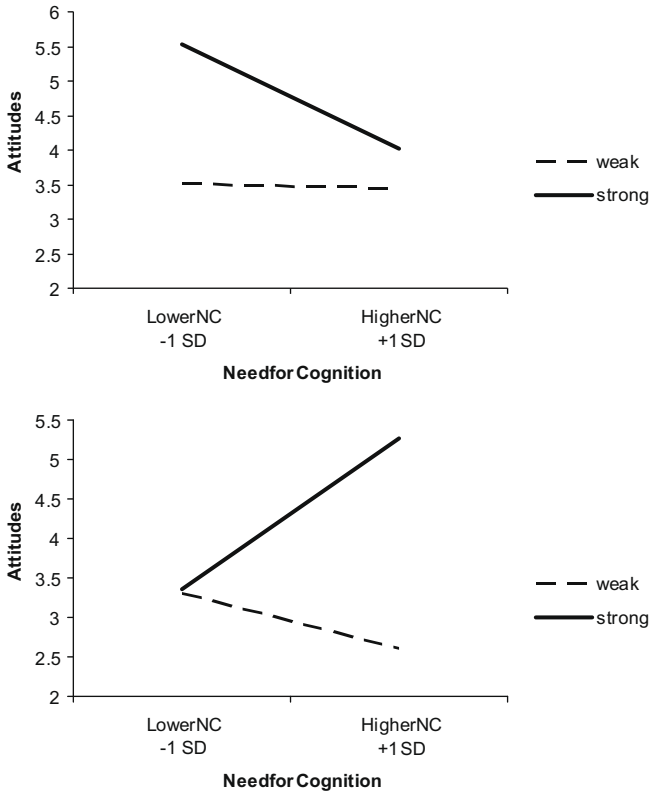

Fig. 1. Top panel: attitude as a function of need for cognition and background information when the message was perceived as simple. Lower NC individuals are at one standard deviation below the mean; higher NC individuals are at one standard deviation below the mean. Bottom panel: attitude as a function of need for cognition and background information when the message was perceived as complex. As before, lower NC and higher NC individuals are at one standard deviation below and above the mean, respectively.

General discussion

The current findings provide evidence that individual differences in NC determine whether people are more motivated to process messages that are merely perceived to be simple or complex. That is, people who were relatively high in their NC were more motivated to process a message labeled as complex rather than simple, but people who were relatively low in their NC were more motivated to process a message labeled as simple rather than complex. This effect was shown in two ways. In Experiment 1, NC interacted with perceived message complexity such that when the message was described as complex, NC was positively correlated with self-reported arousal but when the message was described as simple, NC tended to be negatively correlated with self-reported arousal. In Experiment 2, individuals who were relatively high in NC effortfully applied their background knowledge when they expected the message to be complex but not when they expected it to be simple. In contrast, individuals who were relatively low in NC exerted mental effort when they expected the message to be simple but not when they expected it to be complex. Unlike in prior research, which focused mainly on objective features of a message (e.g., arguments versus cues; actual task complexity), the present findings emphasize how NC interacts with subjective perceptions of a message feature (i.e., perceived complexity) in the absence of any real differences. As discussed later, the present focus on subjective perceptions has implications for our understanding of matching effects related to NC and possibly to other individual differences.

The present research also enhances our understanding of the variable need for cognition, as the findings suggest that the common assumption of most individuals, regardless of their NC, appears to be that most information or cognitive tasks they encounter will be complex. Such perceptions can explain the dominant finding in the literature that NC is positively related to information processing such that people who score at the low end of the NC scale consistently refrain from cognitive effort unless provided with incentives, but those higher in NC persist in their mental exertion even in the absence of incentives. In other words, given information that is of ambiguous complexity, both lower and higher NC individuals assume that the information is complex such that the lower NC individuals elaborate upon the information only when there is some need or incentive to do so (e.g., to scrutinize an untrustworthy source; Priester & Petty, 1995). In contrast, higher NC individuals process the information regardless of any incentives. Our conclusions imply that the dominant finding regarding the relationship between NC and processing would be reversed when people consider the information to be simple. That is, when

[3] We performed separate regression analyses for participants who perceived the message to be simple versus those who expected the message to be complex. That is, for each perceived message complexity group, we computed the two-way NC X prior knowledge interaction. This interaction was significant in the complex message condition, $B = 1.31$, $t(46) = 2.67$, $p = .01$, and marginal within the simple message condition, $B = -.74$, $t(42) = -1.49$, $p = .14$. Critical to our hypothesis is how lower and higher NC individuals responded differently to simple versus complex messages, as demonstrated in the statistical comparisons described in the text.

the message is regarded as simple, lower NC individuals will process a message regardless of incentives such as source trustworthiness whereas higher NC individuals might process a message only when such external incentives are present. Findings in support of this hypothesis would mean that NC interacts with situational incentives and perceived message complexity to influence extent of information processing as well as the resultant attitudes and their properties such as stability and resistance (see Krosnick & Petty, 1995, for a review).

Because the current procedure holds the required cognitive resources constant, it suggests that tailoring a message to an individual's motivation for processing is sufficient to cause processing behavior differences as a function of individuals' NC. In other words, the match between individuals' processing capacity and the actual cognitive demands of the information is not a necessary condition to produce differences in information processing and consequently, persuasion. Our findings indicate that the information in a message does not have to actually vary in complexity, it only has to be *perceived* by the individuals to vary in complexity for information processing differences to occur.

As explained earlier, one novel aspect of the current research is our method of assessing information processing. In past research, strong versus weak arguments were actually different. In our paradigm, everybody reads the same arguments but the arguments appear strong or weak depending on individuals' use of their background knowledge. One advantage of the current procedure is that differences in persuasion could not be attributed to irrelevant features of the arguments, such as the affective–cognitive quality of the arguments or use of statistics. Also relevant to the present studies is that using this paradigm means that differences in attitudes could not be due to processing ability. The current paradigm ensures that intellectual resources, a variable that is potentially confounded with individual differences in cognitive motivation, were held constant as all individuals, regardless of NC level, learned the same background information within each argument quality condition. As shown in Experiment 2, our procedure of requiring all participants to learn the information to the same extent was effective in wiping out the typical relationship between NC and memory. Furthermore, NC did not interact with perceived message complexity to influence memory, thus demonstrating we were successful in holding ability constant so that we could examine the motivational consequences of perceived message complexity on individuals who varied in NC.

Limitations

Although the present experiments distinguish between motivation and ability accounts in explaining matching effects involving NC, it is possible to make further distinctions in the motivation account in terms of precisely where the motivation comes from. For example, in Study 1, one can wonder whether the enhanced arousal at the matched task represented excitement at performing well at the matched task or perhaps anxiety at the prospect of failure at the matched task. Future research will be needed to address this question. Other motivational questions could also be raised. For example, it could be that lower NC individuals are more motivated to process the presumably simple rather than complex message because they view their behavior to the simple message as more diagnostic of their self-concept whereas higher NC individuals regard their reactions to the complex message as more diagnostic.[4] Another possibility is that lower NC individuals prefer to base their attitudes on simple rather than complex information because they think simple information leads to more accurate judgments whereas higher NC individuals prefer to rely on complex information in their attitudes because they perceive such attitudes to be more accurate. Further research could be conducted to examine the more specific processes that might account for the present findings. For instance, one could examine whether the present findings will be replicated when participants are told that both simple and complex tasks could be informative for their self-understanding.

Implications for tailoring messages to individual differences

Our argument raises the question of the extent to which perceived information complexity played a role in past research documenting processing and persuasion differences as a function of NC. For example, in one study by Bakker (1999), as NC decreased, persuasion was greater after exposure to a cartoon format message than a written format message. However, as NC increased, persuasion was greater for the written message than the cartoon version. Presumably, both formats contained strong arguments, but as NC decreased, individuals were primarily persuaded by the convincing cartoon and failed to appreciate the cogent arguments in the written message. The opposite occurred as NC increased, because individuals were more likely to recognize the merits of the strong arguments in the written message, but not the merits in the cartoon. One possible explanation is that the cartoon was perceived as containing simple information so that higher NC was associated with lower motivation to think about the information, whereas the written information was perceived to be complex so that higher NC predicted *greater* motivation to think. Thus, it is possible that these results would be reversed if the cartoon was perceived as complex but the written information was perceived as simple, such that the purportedly simple written information would lead to a negative relationship between NC and information processing whereas the presumably complex cartoon would produce a positive relationship between NC and information processing.

In another demonstration of matching effects involving NC, the framing of the message was manipulated in addition to the quality of the arguments the message contained (Wheeler, Petty, & Bizer, 2005). When the message was framed as targeting people who like to think, NC was positively related to processing. However, when the same message was said to be for people who do not like to think, processing was greater among lower than higher NC individuals. Although it is not entirely clear how participants interpreted this frame, one possibility is that they inferred that the message for thinkers would be complex and that the message for non-thinkers would be simple.

Future research could adapt the current paradigm to assess the role of motivation for processing in matching effects for other personality characteristics. For example, consider the construct of self-monitoring (Snyder & DeBono, 1985). In prior work on information processing as a function of self-monitoring and message type by Petty and Wegener (1998), the strong versions of a message actually differed in its contents depending on whether it was tailored to a higher self-monitor or a lower self-monitor. The same was true for the weak versions. Therefore, it was unclear if persuasion was greater at higher levels of self-monitoring for the strong message that discussed image-oriented benefits only because higher self-monitoring was associated with greater ability to process image-related information. The same argument applies to the different versions of the weak message. Using the current paradigm, one could examine whether differences in processing motivation are sufficient for self-monitoring matching effects.

Implications for other differences involving NC

Our focus on perceived complexity also has the potential to explain other differences found for individuals who vary in NC.

[4] We thank an anonymous reviewer for highlighting this possibility.

Consider research on media preferences. NC was found to be negatively correlated with attention to television dramas (Hawkins et al., 2001), but positively correlated with exposure to government news reports (Perse, 1992). Such relationships could be due to the perception of certain television programs such as dramas to be relatively simple and government news reports to be relatively complex. Indeed, in a pilot study, we found that given different ways to acquire information about local election issues, participants tended to rank listening to a debate on radio and listening to a panel discussion by City Council members ($M = 2.44$, $SD = 1.15$) as more difficult than reading a newspaper cartoon strip and watching a segment on The Daily Show with Jon Stewart ($M = 4.96$, $SD = 1.30$), $t(24) = -5.83$, $p < .001$. Furthermore, NC was negatively related to interest in the media that contained simple information, partial $r = -.35$, $p = .05$, but positively related to preference for media that contained complex information, partial $r = .45$, $p = .01$.[5]

The importance of perceived complexity might also be generalizable to cognitive tasks other than message processing. One example is the use of various schemata when thinking about one's attitude-relevant beliefs. Past research has demonstrated that when given explicit instructions as well as ample opportunity to think about their attitudes or the relevant attitude object itself, higher NC was related to a tendency to moderate (rather than polarize) attitudes, thus suggesting that individuals who scored higher in NC employed multiple schemata including attitudinally inconsistent ones in their elaboration of their attitude-relevant beliefs (e.g., Lassiter, Apple, & Slaw, 1996, Study 2; Leone & Ensley, 1986). Perhaps when given explicit instructions to think about their attitudes or when given ample time to do so, participants expected that thinking about their attitudes would be a cognitively complex task, such that higher NC individuals but not lower NC individuals were motivated to go beyond a single schema to think about their attitudes.

Future research could test the role of perceived complexity in explaining how NC predicts differences as a function of message format, media type, or task instructions, by directly manipulating perceived complexity. For example, the task of thinking about one's attitude could be explicitly framed as being extremely demanding on one's mental resources or requiring minimal cognitive effort. Moreover, the current paradigm could be modified such that individuals of varying levels of NC are similarly equipped with knowledge that enables the use of various schemata. This would help us determine whether the relationship between thought-induced attitude attenuation and NC that was obtained in prior research was due to the availability of multiple schemata or the willingness to exert the mental effort necessary to use various schemata in one's attitudes.

Conclusions

In summary, the present research provides several contributions. First, and most importantly, our work suggests that differences in motivation provide a sufficient explanation for why individuals who vary in NC differ in their tendencies to process simple versus complex messages. Second, we introduced a new procedure to assess effortful information processing in a persuasion paradigm. This manipulation has some advantages over the commonly used argument quality paradigm as it minimizes influence from confounding variables that may occur due to an individual's NC (e.g., attraction to different message types and the ability for elaboration). As discussed earlier, the current findings have implications for (1) our understanding of NC-related persuasion differences that were obtained in past research, (2) the role of processing motivation in matching effects involving other personality characteristics, and (3) other NC-related differences from past research such as media exposure, and the use of multiple schemata in one's attitudes.

[5] The partial correlation controls for the relationship between interest in simple media and interest in complex media.

Appendix A. Prior knowledge and message

Excerpted information in weak (strong) prior knowledge condition:

- Presently, 20% (90%) of all undergraduate courses at The Ohio State University are taught in lecture halls that seat over 100 students.
- Currently, 80% (20%) of Ohio State University students find a job in their most preferred field immediately after graduation.
- Currently, 8 (2) out of 10 Ohio State University students who apply to graduate or professional schools (e.g., law school, medical school, etc.) are accepted.

Excerpted information in message:

Summary section on senior comprehensive exams:

Senior comprehensive exams cover all previous coursework in a student's major and are taken at the end of the student's senior year in college. The following four areas of academic life would be most affected by the implementation of senior comprehensive exams:

***JOBS: fifty percent (50%) of students at Big 10 universities could expect to find a job immediately after graduation if the exams were instituted.

***LECTURE SIZE: big 10 universities would find that 55% of their undergraduate courses would be taught in lecture halls that seat over 100 students if the exams were used.

***ACCEPTANCE RATE: the exams would also benefit students from large public universities such that 5 out of 10 students who apply to graduate and professional schools would be accepted.

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