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Dispositional Differences in Cognitive Motivation: The Life and Times of Individuals Varying in Need for Cognition

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Need for cognition in contemporary literature refers to an individual's tendency to engage in and enjoy effortful cognitive endeavors. Individual differences in need for cognition have been the focus of investigation in over 100 empirical studies. This literature is reviewed, covering the theory and history of this variable, measures of interindividual variations in it, and empirical relationships between it and personality variables, as well as individuals' tendencies to seek and engage in effortful cognitive activity and enjoy cognitively effortful circumstances. The article concludes with discussions of an elaborated theory of the variable, including antecedent conditions; interindividual variations in it related to the manner information is acquired or processed to guide perceptions, judgments, and behavior; and the relationship between it and the 5-factor model of personality structure.

> Speaker A: "If we don't accomplish reform, health care costs will soar, ballooning our deficits. But it doesn't seem like any of these reform plans cut costs convincingly. As soon as any plan seems to cut costs, some lobby group clobbers it with scare TV ads. We seem incapable as a society of coherently discussing the substance of our economy. The actual numbers are so big, so complex. . . ."
> Speaker B: "Get real!"
> Speaker A: "I am! I'm talking about reality! I'm talking about substance!"
> Speaker B: "Substance isn't real! Polls are real! Election results are real! Who's up. Who's down. That's what's real! Substance is incomprehensible! The purpose of substance is to provide statistical factoids to politicians to toss at one another in partisan battles. Whichever one sounds best wins. And that's what's real!" (Stamaty, 1994, p. 17)

Psychology, with its emphasis on information processing, is replete with theories based on the notion that people, if not commonly enjoying, are at least commonly engaging in active information search and effortful problem solving as they steer their course through their environment (e.g., Fishbein & Ajzen, 1975; Whitley & Frieze, 1985). Nearly equally prevalent are psychological theories based on the notion that information acquisition, problem solving, and judgments result much of the time from automatic or preattentive processes or from only cursory attention to the substantive details of the informative environment (e.g., Langer, Blank, & Chanowitz, 1978; Santos, Leve, & Pratkanis, 1994; Uleman & Bargh, 1989). For the most part, these contrasting views emerged from research on general laws of cognition and behavior, even though it is recognized that neither view is universally applicable (e.g., Petty & Cacioppo, 1981; Shiffrin & Schneider, 1977). Furthermore, most research has focused on the situational factors that determine when individuals think effortfully about people and events in their world and when they think more superficially or heuristically (Kahneman, Slovic, & Tversky, 1982). A common additional source of variance in this area of research is individual differences: Some individuals tend to act as cognitive misers in circumstances that call forth effortful problem solving in most individuals, whereas others tend to be concentrated cognizers even in situations that lull most individuals into a cognitive repose. Even when situational factors evoke comparable effortful cognitive processing across individuals, individual differences may still manifest in their enjoyment (or disaffection) in thinking. In the present article, we review the extant literature on need for cognition, defined by the continuum of individual differences that stretches from cognitive misers to cognizers.

Contemporary research on this individual difference began with Cacioppo and Petty's (1982) proposal that there were stable individual differences in people's tendency to engage in and enjoy effortful cognitive activity. Individuals possessing low intrinsic motivation to engage in effortful cognitive endeavors were characterized as chronic cognitive misers, whereas individuals possessing high intrinsic motivation to exercise their mental faculties were thought to be chronic cognizers. These individual differences were further conceived as derived from past experience, buttressed by accessible memories and behavioral histories, manifest in current experience, and influential in the acquisition or processing of information relevant to dilemmas or problems. Cacioppo and Petty's (1982) initial factor analytic studies indicated that much of the interindividual variation in people's tendency to engage in and enjoy effortful cognitive endeavors could be represented in terms of a single factor, which was called *need for cognition.*

According to Cacioppo and Petty's conceptualization (e.g.,

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Cacioppo & Petty, 1982, 1984; Cacioppo, Petty, Kao, & Rodriguez, 1986; Cacioppo, Petty, & Morris, 1983), both individuals low in need for cognition and individuals high in need for cognition must make sense of their world, but they tend to derive meaning, adopt positions, and solve problems by somewhat different means. Individuals high in need for cognition were proposed to naturally tend to seek, acquire, think about, and reflect back on information to make sense of stimuli, relationships, and events in their world. Individuals low in need for cognition, in contrast, were characterized as more likely to rely on others (e.g., celebrities and experts), cognitive heuristics, or social comparison processes to provide this structure. Accordingly, individuals high, as compared with low, in need for cognition were conceptualized as likely to have more positive attitudes toward stimuli or tasks that require reasoning or problem solving (e.g., reading and comprehensive exams) but comparable attitudes toward nonintellective stimuli (e.g., pets and sports), more frequent or extensive experiences using resources or technologies that require or involve effortful thinking or reasoning (e.g., library use and computer-aided instruction), and, thus, richer behavioral histories of cognitively effortful endeavors and effective problem solving (Cacioppo & Petty, 1984; Cacioppo et al., 1983). Furthermore, a chronic tendency to process information effortfully may result in more, or more accessible, information on a range of topics and more knowledgeable and substantive responding on those topics.

Since 1982, a sizable literature has emerged on individual differences in need for cognition in fields ranging from social, personality, developmental, and cognitive psychology to behavioral medicine, education, journalism, marketing, and law. We conducted our literature search of journals on *PsycLIT* (1982–1995) using the keyword *need for cognition,* and we used the *Social Science Citation Index* (1982–1995) to identify publications that cited any scale for measuring need for cognition. We begin the review of this literature with a brief description of the theory and history of need for cognition. We next review the published research on scaling interindividual variations in need for cognition. Among the issues examined in this literature are the psychometric properties of the scales, features of the assessment context that may be important for obtaining psychometrically sound data, and the adequacy of a single factor to capture the bulk of the variance in chronic individual differences in people's tendency to engage in and enjoy effortful cognitive activity.

Considerable research exists relating need for cognition to other personality and demographic variables. We surveyed this research to examine the convergent and discriminant validity for the construct of need for cognition and to provide information about the location of need for cognition within the landscape of personality processes and individual differences. Much of the research on need for cognition bears on the hypotheses that individuals who differ in terms of their need for cognition also differ in terms of their tendency to seek detailed information about their world, engage in effortful cognitive activity, and enjoy more or are less stressed by cognitively effortful problems, life circumstances, or tasks. These investigations include research in specific domains (e.g., attitudes, health psychology, political science, and social cognition) in which interindividual variations in need for cognition have contributed to an understanding of the manner in which information is acquired or processed to guide perceptions, judgments, and behavior. We survey these studies in the penultimate section and conclude by examining the relationship between need for cognition and unified frameworks of personality such as the five-factor model. To foster comprehension, we express all effect sizes involving need for cognition and personality variables as correlation coefficients whether the original research reported correlations or analyses of variance.

Scaling of Interindividual Variations in Need for Cognition

The term *need for cognition* originated in Cohen and his colleagues' early work on individual differences in cognitive motivation (Cohen, 1957; Cohen, Stotland, & Wolfe, 1955). Cohen et al. (1955), however, conceptualized need for cognition as "a need to understand and make reasonable the experiential world" (p. 291) and argued that "stronger needs lead people to see a situation as ambiguous even if it is relatively structured, indicating that higher standards for cognitive clarity are associated with greater need for cognition" (p. 292). Cohen et al. (1955) further distinguished their conceptualization from a gestalt formulation by stating that "the latter conceptualization does not incorporate a need and tension reduction sequence" (p. 291). Thus, Cohen and his colleagues' conceptualization of need for cognition emphasized ambiguity intolerance and tension reduction and, as such, appears closer to contemporary scales that measure tolerance of ambiguity (Shaffer & Hendrick, 1974), need for structure (Neuberg & Newsom, 1993), or need for cognitive closure (Webster & Kruglanski, 1994). Indeed, an early study supporting Cohen's conceptualization of need for cognition was based on the notion that individuals high in need for cognition would avoid ambiguity and achieve an integrated and meaningful world by using heuristics and by relying on the advice of experts rather than by carefully scrutinizing incoming information (Adams, 1959). Cohen and his colleagues never published their need for cognition scale, however, and copies of their scale were no longer available when Cacioppo and Petty (1982) began their research. Therefore, although need for cognition was conceptualized somewhat differently, Cacioppo and Petty (1982) adopted the term *need for cognition* in deference to the early work of Cohen and his colleagues on cognitive motivation in social and personality psychology.

Cacioppo and Petty (1982; Cacioppo et al., 1986) proposed that need for cognition was a stable individual difference in people's tendency to engage in and enjoy effortful cognitive activity. Interindividual variations in need for cognition were conceptualized as falling along a bipolar continuum (from low to high) because low need for cognition was defined as the relative absence of a person's chronic tendency to engage in and enjoy effortful cognitive activities. Thus, just as cold is the relative absence of heat and darkness is the relative absence of brightness, low need for cognition is the relative absence of the motivation for effortful cognitive activities that defines high need for cognition. In this sense, the contemporary conceptualization of need for cognition is more similar to Fiske's (1949) notion of inquiring intellect or Murray's (1938) notion of need for understanding than to Cohen and his colleagues' notion of need for cognitive clarity. Effortful thinking and problem solving can

vary along multiple dimensions, of course, including the number of dimensions of a problem or stimulus that are considered, the extent of thought or elaboration performed on each dimension, and so forth. Need for cognition was conceptualized by Cacioppo and Petty (1982) at a macrolevel to represent interindividual variations in general tendency to engage in and enjoy effortful cognitive endeavors rather than as chronic tendencies toward processing information in particular domains or as individual differences in cognitive complexity. In this sense, Cacioppo and Petty's (1982) conceptualization of need for cognition embraces White's (1959) thesis that there are directed and persistent behaviors that have a motivational aspect that cannot be wholly derived from sources of energy conceptualized as needs, drives, or instincts. Individuals low in need for cognition were viewed as being cognitive misers (S. E. Taylor, 1981) relative to individuals high in need for cognition, and this difference was conceived as the consequence of developing a sense of competence and self-satisfaction from repeated or prolonged episodes of effortful problem solving.

Need for cognition was thus conceptualized as reflecting a stable (although not invariant) intrinsic motivation that can be developed or changed rather than a true need. Furthermore, the emphasis was process oriented—on individuals' enjoyment and tendency to engage in effortful cognitive activity—rather than outcome oriented (e.g., individuals' need for an unambiguous, understandable, or well-organized world). This is not to suggest that to reduce the tension or stress of a problem, individuals high in need for cognition would not be more likely than individuals low in need for cognition to engage in effortful, issue-relevant thinking; indeed, individuals high in need for cognition are thought to be more likely to expend effort on information acquisition, reasoning, and problem solving to cope with a wide variety of predicaments in their world. However, individuals high in need for cognition are characterized generally by active, exploring minds and, through their senses and intellect, reach and draw out information from their environment. If individuals could be thought of as magnets, information in daily life as fields of iron filings, and the acquisition, scrutiny, and retention of this information as the movement of the filings toward the magnets, then interindividual variations in need for cognition would be the strength of the magnetic fields.

To the extent that individuals are intellectually talented, they are likely to also receive personal as well as material and social reinforcement for and competence feedback regarding their problem solving. However, need for cognition is thought to reflect a cognitive motivation rather than an intellectual ability and, thus, to be related to but distinguishable from ability indexes. In this sense, need for cognition is analogous to individual differences in people's motivation to engage in effortful physical endeavors, which is related to but not the same thing as physical ability. Finally, individuals can differ dispositionally in the extent to which effortful thinking is intrinsically reinforcing, and they can differ in the reasons effortful thinking is intrinsically reinforcing. Variations in the former reflect individual differences in need for cognition, whereas variations in the latter reflect idiosyncratic antecedents of need for cognition. We return to this latter issue in the final section of the article.

The Need for Cognition Scale (NCS) was developed in a series of studies by Cacioppo and Petty (1982). In the original study, a pool of 45 items designed to assess people's tendencies to engage in or to enjoy effortful cognitive endeavors generally was administered by means of a known groups methodology: Members of a university faculty served as participants in the high need for cognition group, and assembly-line workers served as participants in the low need for cognition group. NCS items are presented in the Appendix. Participants were instructed to indicate, on a 9-point Likert-type scale, the degree to which each item characterized them. Because of the face-valid nature of the items and the potential for response distortion, Cacioppo and Petty (1982) had participants complete the scale anonymously and embedded the NCS in other items. The responses by the faculty and assembly-line workers to the 45 items were subjected to the criteria of ambiguity, irrelevance, and internal consistency, resulting in 34 items for subsequent study. A principal-components analysis and a scree test of these data revealed one dominant factor (i.e., Factor 1 accounted for 30.1% of the variance; Factor 2, 6.8%; and Factor 3, 5.4%). No gender differences in need for cognition were found. In Study 2 (Cacioppo & Petty, 1982), the 34-item NCS was administered to a more homogeneous population—419 undergraduate students—to cross validate the factor structure. With the more homogeneous sample of participants and the consequent narrower range of need for cognition scores in Study 2, the factor analysis accounted for slightly less variance. As in Study 1, multiple factors emerged with latent roots greater than one, but the application of a scree test again revealed one dominant factor: The first factor accounted for 20.0% of the variance, the second factor accounted for 5.7%, and the third factor accounted for 4.6%. Despite the differences in participant populations in Studies 1 and 2, the structure of the first factor proved to be quite stable, with the factor loadings of the items across the two studies correlated .76.

The research to date on scaling individual differences in need for cognition, including sample sizes and summary statistics, is summarized in Table 1. This research has focused primarily on two related issues. Given that need for cognition was conceptualized at a macro level to represent a single continuum of interindividual variations in general tendency to engage in and enjoy effortful cognitive endeavors, investigators have sought a short form of the NCS that possessed adequate psychometric properties. Other investigators sought to find subscales in the longer NCS in an attempt to identify individual differences in specific information-processing tendencies.

Factor Structure of the Need for Cognition Scale

A short form of the NCS was first developed by Cacioppo, Petty, and Kao (1984) on the basis of reanalyses of data from Cacioppo and Petty (1982) and a replication and extension involving 527 undergraduates. Cacioppo et al. (1984) found that the Cronbach alpha reached an asymptote after entering the 18 items in the 34-item scale that had the highest factor loadings. Reliability and factor analyses confirmed that the 18-item NCS was highly correlated with the original 34-item NCS ($r = .95, p < .001$), possessed high internal consistency (Cronbach $\alpha = .90$), and was characterized by one dominant factor (accounting for 37% of the variance).

The factor structure and internal consistency of the long

Table 1
Psychometric Properties of the Need for Cognition Scale (NCS)

Study	Sample information	Need for cognition measure	Reliability	Factor structure
Berzonsky & Sullivan (1992)	163 female undergraduates	18-item NCS	$\alpha = .91$	
Booth-Butterfield & Booth-Butterfield (1990)	94 working adults	34-item NCS	$\alpha = .90$	
Cacioppo & Petty (1982), Study 1	53 factory workers (33 male, 20 female) and 47 university faculty (27 male, 20 female)	34-item NCS	split-half = .87, $p < .001$	Principal-components analysis revealed a single dominant factor that accounted for 30.1% of the total scale variance. Second and third factors accounted for 6.8% and 5.4% of scale variance, respectively. Scree plot supported single-factor solution
Cacioppo & Petty (1982), Study 2	419 undergraduates	34-item NCS		Principal-components analysis revealed a dominant first factor that accounted for 20% of total scale variance. Second and third factors accounted for 5.7% and 4.6%, respectively. Loadings correlated highly with those obtained in Study 1 ($r = .76$)
Cacioppo, Petty, & Kao (1984)	527 undergraduates	18-item NCS and 34-item NCS	$\alpha = .90$ (18-item NCS), $\alpha = .91$ (34-item NCS)	Principal-components analyses revealed a single dominant factor for both the 18-item and 34-item NCS. The first factor accounted for 37% of 18-item NCS variance and 27% of 34-item NCS variance. The efficiency of the 18-item NCS was supported
Chaiken (1987)	3 samples of undergraduates (*ns* = 341, 367, 174)	20 items selected from 34-item NCS, 8 additional items generated by authors to measure individual differences in the use of heuristics		In each sample, a single dominant factor emerged as indicated by scree tests. Items generated to measure individual differences in heuristic processing loaded negatively and strongly on this single "need for cognition" factor
Dornic, Ekehammar, & Laaksonen (1991)	70 undergraduates	Mental Effort Tolerance Questionnaire (40 items based on 34-item NCS)	$\alpha = .89$, split-half = .79, $p < .001$	Principal-components analysis revealed one dominant factor (eigenvalue = 9.12)
Furlong (1993)	61 adults (8 nonstudents, 34 undergraduates, 19 graduate students)	18-item NCS	$\alpha = .88$	
Kernis, Grannemann, & Barclay (1992)	95 undergraduates completed (33 male, 62 female)	18-item NCS	$\alpha = .87$	
Leary, Sheppard, McNeil, Jenkins, & Barnes (1986)	416 undergraduates; unspecified subset filled out NCS	30 items selected from 34-item NCS	$\alpha = .89$	
Manfredo & Bright (1991)	368 wilderness travelers	9 items "sampled" from 45 items in Cacioppo & Petty (1982)	$\alpha = .76$	
Miller, Omens, & Delvadia (1991)	98 undergraduates (45 male, 53 female)	18-item NCS	$\alpha = .85$	
Peltier & Schibrowsky (1994)	130 marketing undergraduates	18-item NCS	$\alpha = .97$	
Perri & Wolfgang (1988)	95 mail survey respondents, from 155 who were selected from physicians' log books	16 items with highest loadings from 34-item NCS	$\alpha = .88$, average interitem $r = .32$	Principal-components analysis revealed a single dominant factor that accounted for 38.8% of the total scale variance
Pieters, Verplanken, & Modde (1987), Sample 1	87 Dutch adults with minimal formal education (76 male, 11 female)	15-item Dutch translation of 18-item NCS; 3 items were dropped as a result of low item–total correlations	$\alpha = .83$	In a principal-components analysis, dominant first factor emerged accounting for 24.8% of the 18-item scale variance and 30.6% of the 15-item scale variance. Second and third factors accounted for 10.9% and 9.6% of the 18-item scale variance, respectively

Table 1 (*continued*)

Study	Sample information	Need for cognition measure	Reliability	Factor structure
Pieters, Verplanken, & Modde (1987), Sample 2	253 Dutch undergraduates (87 male, 165 female)	15-item Dutch translation of 18-item NCS	$\alpha = .75$	In a principal-components analysis, dominant first factor again emerged accounting for 23.9% of the 15-item scale variance. Second and third factors accounted for 10.2% and 7.9% of the variance, respectively
Sadowski (1993)	1,218 undergraduates (510 male, 708 female)	18-item NCS	$\alpha = .86$, interitem correlations ranged from .17 to .34	Principal-components analysis revealed a single dominant factor that accounted for 30.9% of the total scale variance. The second factor accounted for 9.0%. Scree test also supported the single-factor solution
Sadowski & Gulgoz (1992b)	71 undergraduates	18-item NCS	$\alpha = .91$ (Time 1), $\alpha = .92$ (Time 2), 7-week test–retest = . $p <$ .001 ($n = 69$)	
Spotts (1994), Sample 1	201 community residents	18-item NCS	$\alpha = .81$, average interitem correlation = .19	
Spotts (1994), Sample 2	155 community residents	18-item NCS	$\alpha = .91$, average interitem correlation = .37	
Tanaka, Panter, & Winborne (1988), Sample 1	288 undergraduates (139 male, 149 female)	45-item NCS (all original items) but with a dichotomous true–false response format; 25-item NCS proposed with subscales: cognitive persistence, confidence, complexity; some items reworded	$\alpha = .77$ (overall), .72 (persistence), .57 (complexity), .59 (confidence)	Generalized least squares method revealed that three factors accounted for 25% of the total scale variance. No other details given
Tanaka, Panter, & Winborne (1988), Sample 2	130 undergraduates (56 male, 174 female)	25-item NCS (as proposed from Sample 1)	$\alpha = .80$ (overall), .68 (persistence), .66 (complexity), .63 (confidence)	
M. M. Thompson & Zanna (1995), Sample 1	61 Canadian female undergraduates	34-item NCS	$\alpha = .65$, interitem correlations ranged from −.30 to .42	
M. M. Thompson & Zanna (1995), Sample 2	91 Canadian undergraduates (54 male, 37 female)	34-item NCS	$\alpha = .78$, interitem correlations ranged from −.02 to .51	
Venkatraman & Price (1990)	326 undergraduates	34-item NCS	$\alpha = .88$	
Venkatraman, Marlino, Kardes, & Sklar (1990b)	78 undergraduates	18-item NCS	$\alpha = .83$	
Verplanken (1989)	2,439 Dutch respondents from a mail survey (3,300 solicited)	15-item Dutch translation of 18-item NCS (Pieters, Verplanken, & Modde, 1987)	$\alpha = .85$ with removal of one item	
Verplanken (1991)	2,439 Dutch respondents from a mail survey (3,300 solicited)	6 highest loading items from 15-item Dutch translation (Pieters, Verplanken & Modde, 1987)	$\alpha = .82$ (.85 with one item deleted), 8-month test–retest = .66, $p < .001$ ($n = 289$)	

(*table continues*)

Table 1 (*continued*)

Study	Sample information	Need for cognition measure	Reliability	Factor structure
Verplanken (1993)	90 Dutch citizens and 30 Dutch undergraduates	15-item Dutch translation (Pieters, Verplanken, & Modde, 1987)	$\alpha = .80$	
Verplanken, Hazenberg, & Palenewen (1992)	53 Dutch undergraduates (16 male, 37 female)	11 highest loading items from 15-item Dutch translation (Pieters, Verplanken, & Modde, 1987)	$\alpha = .74$	Factor analysis performed on 15 items of the Dutch translation (Pieters, Verplanken, & Modde, 1987). Scree test supported single dominant factor. Assuming that the analysis was principal components, the first factor accounted for 22.1% of the total scale variance
Waters & Zakrajsek (1990), Sample 1	207 undergraduates (87 male, 120 female)	34-item NCS	$\alpha = .89$ (overall; .88 for 18-item NCS), .81 (persistence), .66 (complexity), .63 (confidence)	Examined intercorrelations between subscales proposed by Tanaka, Panter, & Winborne (1988). Results revealed high relatedness: persistence–complexity, $r = .66$; persistence–confidence, $r = .59$; complexity–confidence, $r = .47$
Waters & Zakrajsek (1990), Sample 2	160 undergraduates (38 male, 122 female)	34-item NCS	$\alpha = .85$ (overall; .84 for 18-item NCS), .74 (persistence), .71 (complexity), .68 (confidence)	Again, examined intercorrelations between subscales proposed by Tanaka, Panter, & Winborne (1988). Results again revealed high relatedness: persistence–complexity, $r = .57$; persistence–confidence, $r = .45$; complexity–confidence, $r = .21$
Wolfe & Grosch (1990)	50 undergraduates	15 items selected from 34-item NCS	$\alpha = .88$	

(Cacioppo & Petty, 1982) and short forms of the NCS (Cacioppo et al., 1984) have been replicated with various subsets of the items. Sadowski (1993) conducted a replication of Cacioppo et al. (1984), for instance, and found the same one-factor solution using the 18-item NCS (see Table 1). Perri and Wolfgang (1988) selected the 16 items with the highest factor loadings from Cacioppo and Petty (1982) and administered the scale via a mail questionnaire to a random sample of 155 patients of four physicians. Ninety-four patients completed and returned the scale. The factor analysis revealed four factors with latent roots greater than one, and application of the scree test confirmed that one factor was dominant, accounting for 38.8% of the variance. The coefficient alpha for the scale was .88. Thus, despite a very different sample and method of administration, the results of Perri and Wolfgang (1988) replicated the factor structure and high internal consistency of the NCS. Similarly, Pieters, Verplanken, and Modde (1987) translated the Cacioppo et al. (1984) NCS into Dutch and, in two different studies, found one factor to be dominant (accounting for 24.8% of the variance vs. 10.9% and 9.6% of the variance for the second and third factors in Study 1 and accounting for 23.9% of the variance vs. 10.2% and 7.9% of the variance for the second and third factors in Study 2). Verplanken, Hazenberg, and Palenewen (1992) similarly found the scale to be characterized by one dominant factor in their factor analysis, and Dornic, Ekehammar, and Laaksonen (1991) found one dominant factor in their study of their 40-item mental effort tolerance questionnaire (the majority of the questionnaire items came from the 34-item NCS; see Table 1).

Chaiken (1987) sought to determine whether high and low need for cognition represented two separate factors (i.e., systematic processing and heuristic processing) in three studies of a total of 882 undergraduates. Chaiken (1987) used 20 items from the 34-item NCS (Cacioppo & Petty, 1982) and an additional 8 items that were generated to tap more specifically individual differences in tendencies toward heuristic processing. The items in each study loaded on a single dominant factor: Individuals low in need for cognition were likely to endorse items depicting heuristic rather than vigilant or effortful information processing, whereas individuals high in need for cognition were likely to endorse items depicting effortful rather than heuristic information processing.

Although the bulk of evidence indicates that the NCS is characterized by a single dominant factor, Tanaka, Panter, and Winborne (1988) have suggested that the NCS contains three subscales (Cognitive Persistence, Cognitive Confidence, and Cognitive Complexity). The 45-item pool from which Cacioppo and Petty (1982) developed the original 34-item NCS was administered to samples of 288 undergraduates (Study 1) and 130 undergraduates (Study 2). Tanaka et al. (1988) reported that three factors accounted for 25% of the total observed variance and that the internal consistency of these three factors was satisfactory in both studies (Cronbach alphas ranged from .57 to .72). However, the factor loadings for each factor (i.e., subscale) across the two scaling studies reported by Tanaka et al. (1988) were not highly correlated, even though similar samples were used in these studies. (The factor loadings in Tanaka et al.'s Table 1 make it possible to examine the consistency of

the loadings in their two studies.) The correlations in Tanaka et al. (1988) across samples of the factor loadings were −.01 on Factor 1 (Cognitive Persistence), .70 on Factor 2 (Cognitive Complexity), and .28 on Factor 3 (Cognitive Confidence). These correlations can be contrasted with the correlation of .76 for the factor loadings of the items on the first factor observed by Cacioppo and Petty (1982, Studies 1 and 2).

It is not clear whether this three-factor solution actually differs from research reporting that responses to the NCS can be characterized by one dominant factor because no information was provided by Tanaka et al. (1988) about the variance accounted for by each factor. If one factor was not dominant, however, there are several methodological differences that may account for these results. For instance, Tanaka and his colleagues began with the 45-item pool rather than the 34-item NCS that was developed by Cacioppo and Petty (1982) and shortened to 18 items, with consequent improvements in the one-factor solution, by Cacioppo et al. (1984). In addition, the college students who served as participants in the studies by Tanaka and his colleagues were instructed to respond to the items using a dichotomous true–false format. The use of this dichotomous response format is less sensitive to differences among respondents in terms of the extent to which they engage in or enjoy effortful thinking. This feature may be particularly important when studying a sample such as undergraduate students, who by the nature of their role as college students tend to engage in effortful cognitive tasks. Consistent with this reasoning, Waters and Zakrajsek (1990) calculated a total scale score and Tanaka et al.'s (1988) subscale scores in two studies based on participants' responses to the 34-item NCS using a 7-point response format. Although they did not factor analyze these responses, Waters and Zakrajsek (1990) found that, in Study 1, the correlations among the three subscales ranged from .47 to .66, with a median correlation of .59; in Study 2, the correlations among the subscales ranged from .21 to .57, with a median of .45. As Waters and Zakrajsek (1990) noted, these intercorrelations "suggested that the subscales were strongly related to a higher order need for cognition construct" (p. 215).

It is also unknown whether the subscales provide any differential predictions. Tanaka et al. (1988, Study 3), for instance, reported that number of years in college was unrelated to all three subscales and to the total score, a result that Tanaka et al. (1988) interpreted as indicating that need for cognition is a relatively enduring individual-differences variable. Waters and Zakrajsek (1990) found that the three subscales suggested by Tanaka et al. (1988) were related similarly to personality measures such as sex role orientation and American College Test (ACT) scores. Ferrari (1992) found responses to the adult inventory for procrastination to be negatively and significantly correlated with the total score as well as all three subscales; procrastination due to sensation seeking was uncorrelated with the total score as well as all three subscales. Neuberg and Newsom (1993) found the personal need for structure scale to be related similarly to the total score and to the three subscales (see Table 2). Thus, to date these subscales have not been shown to be reliable or differentially predictive. The one exception is Tanaka, Panter, and Winborne's (1986; Tanaka et al., 1988) finding that women score higher than men on the Cognitive Persistence subscale, but this result was not replicated by Waters and Zakrajsek (1990). More research is therefore needed to determine whether the item loadings in the subscales proposed by Tanaka et al. (1988) are reliable and whether the subscales provide unique information about the differences between individuals high versus low in need for cognition.

There is only one other report of more than one dominant factor in the NCS. Davis, Severy, Kraus, and Whitaker (1993) stated, in their method section, that a varimax rotation factor analysis of responses of 230 students to the 18-item NCS yielded two factors, "one relating to the amount of effort an individual enjoyed putting forth when thinking and the other relating to a preference for solving problems" (p. 459). However, no procedural or analytical details were provided, no statistics were given, and no differential associations to the factors were reported. Instead, the authors selected two items from each of their factors and formed a single four-item need for cognition scale with a Spearman–Brown coefficient of .64.[1]

Reliability of the Need for Cognition Scale

As a perusal of Table 1 further reveals, studies using either the original 34-item NCS or the 18-item short form have confirmed the high internal consistencies of the scale (i.e., Cronbach alphas typically ≥ .85; e.g., Berzonsky & Sullivan, 1992; Kernis, Grannemann, & Barclay, 1992; Leary, Sheppard, McNeil, Jenkins, & Barnes, 1986; Miller, Omens, & Delvadia, 1991; Venkatraman, Marlino, Kardes, & Sklar, 1990b; Venkatraman & Price, 1990; Verplanken, 1989, 1993). Comparable Cronbach alphas have also been reported for the Dutch translation of the NCS (e.g., Pieters et al., 1987; Pieters & Verplanken, in press), and adequate to high internal consistencies have been reported in studies using subsets of the items from the 18-item or 34-item NCS. Manfredo and Bright (1991) used 9 items "sampled" from the 34-item NCS in a mail survey of 368 participants and reported a Cronbach alpha of .76; Wolfe and Grosch (1990) used 15 items from the 34-item NCS in a study of undergraduates and reported a Cronbach alpha of .88; Verplanken et al. (1992) used 11 items from the Dutch translation of the short form of the NCS and found a Cronbach alpha of .74; and Verplanken (1991) used 6 items from the Dutch NCS on two separate occasions and found Cronbach alphas of .82 and .85. Studies of split-half reliability have also verified the reliability of the NCS (i.e., $rs = .87$ and .79, $ps < .001$ [Cacioppo & Petty, 1982, Study 1, and Dornic et al., 1991, respectively]).

(*text continues on page 213*)

[1] In a possible exception, Stark, Bentley, Lowther, and Shaw (1991) administered the 18-item Need for Cognition scale but treated responses to the 9 items that are reverse scored as one scale and responses to the 9 items that are not reverse scored as a second scale (cf. Appendix). They reported that factor analyses of each of these scales yielded one factor and that the Cronbach alphas for these 9-point scales were .81 and .83, respectively. The correlation between these 9-point components of the NCS was not reported, and apparently all 18 items in the NCS were never subjected to a single factor analysis. Although it is unclear whether a one-factor solution would have sufficed, it is clear that this possible multifactor solution is different than that reported by Tanaka et al. (1988) and by Davis et al. (1993). Thus, no multifactor solution to date has proven to be replicable.

Table 2
Relation of Need for Cognition (NCS) to Other Individual Differences

Source	Study	Sample information	Need for cognition measure	Correlation
Absorption (high scores indicate an ability to devote attentional processes exclusively to any ongoing cognitive task)				
Absorption Scale (Tellegen & Atkinson, 1974)	Osberg (1987), Sample 2	66 undergraduates (28 male, 38 female)	34-item NCS	$r = .37, p < .01$
Affect intensity (high scores indicate a tendency to experience intense emotional states)				
Affect Intensity (Larsen, Diener, & Emmons, 1986)	Petty & Jarvis (1996)	25 undergraduates	18-item NCS	$r = -.22$, *ns*
Affect orientation (high scores indicate the degree to which individuals are aware of and use affect cues to guide communication)				
Affect Orientation Scale (Booth-Butterfield & Booth-Butterfield, 1990)	Booth-Butterfield & Booth-Butterfield (1990)	94 working adults, mostly public school teachers	34-item NCS	$r = .07$, *ns*
		Age[b]		
	Davis, Severy, Kraus, & Whitaker (1993)	453 juvenile justice workers (240 male, 213 female)	4 items selected from the 18-item NCS	$r = -.06$, *ns*
	M. Johnson (1993)	38 undergraduates and 41 seniors from a local elderly center	18-item NCS	$r = -.16$,[a] *ns*
	Mueller & Johnson (1990)	20 undergraduates, 20 elderly people from the community	18-item NCS	$r = -.14$,[a] *ns*
	Petty & Jarvis (1996)	155 undergraduates with an age range of 17 to 26	18-item NCS	$r = .10$, *ns*
	Salthouse, Kausler, & Saults (1988), Sample 1	129 undergraduates and community residents with an age range of 20 to 79	11 items selected from the 34-item NCS	$r = -.18$, *ns*
	Salthouse, Kausler, & Saults (1988), Sample 2	233 undergraduates and community residents with an age range of 20 to 79	11 items selected from the 34-item NCS	$r = -.18, p < .05$
	Spotts (1994), Sample 1	201 community residents with an age range of 23 to 87	18-item NCS	$r = -.45, p < .001$
	Spotts (1994), Sample 2	155 community residents with an age range of 20 to 91	18-item NCS	$r = -.45, p < .001$
	Tolentino, Curry, & Leak (1990)	57 undergraduates (19 male, 38 female)	18-item NCS	*ns* (r not reported)
	Verplanken (1993)	120 Dutch citizens and students (38 male, 82 female) with an age range of 16 to 72	15-item Dutch translation of 18-item NCS	$r = -.06$, *ns*
Alexithymia (high scores indicate difficulty in identifying and communicating feelings as well as in discriminating them from bodily sensations, an impaired emotional and fantasy life, and a preference for focusing on external events)				
Revised Toronto Alexithymia Scale (G. J. Taylor, Bagby, & Parker, 1992)	G. J. Taylor, Bagby, & Parker (1992)	401 Canadian undergraduates (159 male, 242 female)	18-item NCS	$r = -.52, p < .01$
Toronto Alexithymia Scale (G. J. Taylor, Ryan, & Bagby, 1985)	G. J. Taylor & Bagby (1988)	81 Canadian undergraduates	18-item NCS	$r = -.42, p < .001$
Ambivalence (high scores indicate a tendency to experience conflicting evaluative reactions toward attitude objects)				
	M. M. Thompson & Zanna (1995), Sample 1	61 Canadian female undergraduates	34-item NCS	$r = -.41, p < .001$
	M. M. Thompson & Zanna (1995), Sample 2	91 Canadian undergraduates (54 male, 37 female)	34-item NCS	$r = -.33, p < .001$
		American College Test[c] (high scores indicate high aptitude for college performance)		
	Cacioppo & Petty (1982), Study 3	104 undergraduates (35 male, 69 female)	34-item NCS	$r = .39, p < .01$
	Cacioppo & Petty (1984)	498 undergraduates	34-item NCS	$r = .30, p < .01$
	Dollinger & McMorrow (1992)	118 undergraduates (59 male, 58 female, 1 unknown)	18-item NCS	$r = .11$, *ns*
	Fletcher, Danilovics, Fernandez, Peterson, & Reeder (1986)	81 undergraduates (33 male, 48 female)	34-item NCS	$r = .20, p < .05$
	Olson, Camp, & Fuller (1984)	140 undergraduates	34-item NCS	$r = .31, p < .05$
	Petty & Jarvis (1996)	137 undergraduates	18-item NCS	$r = .20, p < .01$

Table 2 (*continued*)

Source	Study	Sample information	Need for cognition measure	Correlation
		American College Test[c] (high scores indicate high aptitude for college performance) (cont'd)		
	Waters & Zakrajsek (1990)	207 undergraduates (87 male, 120 female)	34-item NCS	$r = .18, p < .05$ (.16, .15, .08 for persistence, complexity, confidence)
		Anger (state; high scores indicate a high level of acute anger)		
State–Trait Personality Inventory (Spielberger, 1979)	Olson, Camp, & Fuller (1984)	140 undergraduates	34-item NCS	$r = -.03$, *ns*
		Anger (trait; high scores indicate a high level of chronic anger)		
State–Trait Personality Inventory (Spielberger, 1979)	Olson, Camp, & Fuller (1984)	140 undergraduates	34-item NCS	$r = -.11$, *ns*
		Anxiety (state; high scores indicate a high level of acute anxiety)		
State–Trait Personality Inventory (Spielberger, 1979)	Olson, Camp, & Fuller (1984)	140 undergraduates	34-item NCS	$r = -.23, p < .05$
		Anxiety (trait; high scores indicate a high level of chronic anxiety)		
State–Trait Personality Inventory (Spielberger, 1979)	Olson, Camp, & Fuller (1984)	140 undergraduates	34-item NCS	$r = -.27, p < .05$
		Attributional complexity (high scores indicate a tendency to generate complex attributions for human behavior)		
Attributional Complexity (Fletcher, Danilovics, Fernandez, Peterson, & Reeder, 1986)	Fletcher, Danilovics, Fernandez, Peterson, & Reeder (1986)	81 undergraduates (33 male, 48 female)	34-item NCS	$r = .36, p < .001$
Attributional Complexity; Intrinsic Motivation subscale (Fletcher, Danilovics, Fernandez, Peterson, & Reeder, 1986)	Petty & Jarvis (1996)	95 undergraduates	18-item NCS	$r = .51, p < .001$
		Authoritarianism[d] (high scores indicate a preference for obedience, subordination, and acceptance of authority)		
Authoritarianism (Byrne & Lambreth, 1971)	Sorrentino, Bobocel, Gitta, Olson, & Hewitt (1988), Study 1	211 undergraduates	18-item NCS	$r = -.20, p < .002$
Authoritarianism (Adorno, Frenkel-Brunswik, Levinson, & Sampson, 1950)	Petty & Jarvis (1996)	25 undergraduates	18-item NCS	$r = .10$, *ns*
		Causal uncertainty (high scores indicate a chronic uncertainty regarding cause-and-effect relationships in the social world)		
Causal Uncertainty Scale (Weary & Edwards, 1994)	Weary and Edwards (1994)	105 undergraduates	34-item NCS	$r = -.42, p < .001$
		Cognitive innovativeness (high scores indicate a desire for new experiences that stimulate thinking)		
Cognitive Innovativeness Scale (Pearson, 1970)	Venkatraman, Marlino, Kardes, Sklar (1990a)	78 undergraduates	34-item NCS	$r = .40, p < .05$
Cognitive Innovativeness Scale (Venkatraman & Price, 1990)	Venkatraman & Price (1990)	326 undergraduates	34-item NCS	$r = .26, p < .01$
		Communication apprehension (high scores indicate low apprehension regarding interpersonal communication)		
Personal report of communication apprehension (Wheeless, 1975)	Wycoff (1992)	50 undergraduates	18-item NCS	$r = .33, p < .05$

(*table continues*)

Table 2 (*continued*)

Source	Study	Sample information	Need for cognition measure	Correlation
		Desire for control (high scores indicate a motive to maintain control over one's environment)		
Desire for control (Burger & Cooper, 1979)	Thompson, Chaiken, & Hazlewood (1993)	1,318 participants, no details given	18-item NCS	$r = .48, p < .001$
		Diffuse-avoidant style orientation (high scores indicate a tendency to ignore problems and self-relevant information)		
Style Orientation (Berzonsky, 1989)	Berzonsky & Sullivan (1992)	163 female undergraduates	18-item NCS	$r = -.35, p < .01$
		Dogmatism (high scores indicate the closedness of one's belief systems)		
Dogmatism Scale (Troldahl & Powell, 1965)	Cacioppo & Petty (1982), Study 3	104 undergraduates (35 male, 69 female)	34-item NCS	$r = -.23, p < .05$
Dogmatism Scale (Troldahl & Powell, 1965)	Cacioppo & Petty (1982), Study 4	97 undergraduates (29 male, 68 female)	34-item NCS	$r = -.23, p < .05$
Dogmatism Scale (Troldahl & Powell, 1965)	Fletcher, Danilovics, Fernandez, Peterson, & Reeder (1986)	81 undergraduates (33 male, 48 female)	34-item NCS	$r = -.24, p < .05$
		Education[a] (years)		
	Davis, Severy, Kraus, & Whitaker (1993)	453 juvenile justice workers (240 male, 213 female)	4 items selected from 18-item NCS	$r = .13, p < .001$
	Tanaka, Panter, & Winborne (1988)	79 female undergraduates 38 in Years 1 and 2 and 41 in Years 3 and 4	25-item scale (Tanaka, Panter, & Wilborne, 1988)	*ns*
	Spotts (1994), Sample 1	201 community residents	18-item NCS	$r = .46, p < .001$
	Spotts (1994), Sample 2	155 community residents	18-item NCS	$r = .43, p < .001$
		Extraversion (high scores indicate a tendency to direct one's energies outward to attain gratification from the social and physical environment)		
Eysenck Personality Inventory (Eysenck, 1975)	Crowley & Hoyer (1989)	96 upper-level undergraduates	18-item NCS	$r = .03$, *ns*
Eysenck Personality Inventory (Eysenck, 1975)	Dornic, Ekehammar, & Laaksonen (1991)	59 Swedish undergraduates (17 male, 42 female)	40-item scale (Dornic, Ekehammar, & Laaksonen, 1991)	$r = .11$, *ns*
		Family income		
	Tolentino, Curry, & Leak (1990)	57 undergraduates (19 male, 38 female)	18-item NCS	*ns* (r not reported)
		Fear of invalidity (high scores indicate a chronic concern with potential error in judgment)		
Personal Fear of Invalidity (M. M. Thompson, Naccarato, & Parker, 1992)	M. M. Thompson & Zanna (1995), Sample 1	61 Canadian female undergraduates	34-item NCS	$r = -.08$, *ns*
	M. M. Thompson & Zanna (1995), Sample 2	91 Canadian undergraduates (54 male, 37 female)	34-item NCS	$r = -.02$, *ns*
		Field dependence (high scores indicate a tendency to think about events in a piecemeal rather than holistic manner)		
Group Embedded Figures Test (French, Ekstrom, & Price, 1963)	Cacioppo & Petty (1982), Study 2	419 undergraduates	34-item NCS	$r = .19, p < .001$
		Functional flexibility (high scores indicate a capability to perform behaviors demanded by or appropriate for particular situations)		
Battery of Interpersonal Capabilities (Paulhus & Martin, 1988)	Miller, Omens, & Delvadia (1991)	98 undergraduates (45 male, 53 female)	18-item NCS	$r = .01$, *ns*
		Gender role orientation		
Androgeny (high scores indicate a balance of traditional male and female traits) Personal Attributes Questionnaire (Spence, Helmreich, & Stapp, 1974)	Osberg (1987), Sample 1	151 undergraduates (46 male, 105 female)	34-item NCS	$r = -.13$, *ns*

Table 2 (*continued*)

Source	Study	Sample information	Need for cognition measure	Correlation
		Gender role orientation (cont'd)		
Femininity (high scores indicate a dominance of traditionally female traits)				
Personal Attributes Questionnaire (Spence, Helmreich, & Stapp, 1974)	Osberg (1987), Sample 1	151 undergraduates (46 male, 105 female)	34-item NCS	$r = .08$, *ns*
Bem Sex-Role Inventory (Bem, 1974)	Waters & Zakrajsek (1990)	207 undergraduates (87 male, 120 female)	34-item NCS	$r = .07$, *ns* (.08, .05, −.02 for persistence, complexity, confidence)
Masculinity (high scores indicate a dominance of traditionally male traits)				
Personal Attributes Questionnaire (Spence, Helmreich, & Stapp, 1974)	Osberg (1987), Sample 1	151 undergraduates (46 male, 105 female)	34-item NCS	$r = .38$, $p < .001$
Bem Sex-Role Inventory (Bem, 1974)	Waters & Zakrajsek (1990)	207 undergraduates (87 male, 120 female)	34-item NCS	$r = .07$, *ns* (.08, .05, −.02 for persistence, complexity, confidence)
Masculinity (high scores indicate a dominance of traditionally male traits)				
Personal Attributes Questionnaire (Spence, Helmreich, & Stapp, 1974)	Osberg (1987), Sample 1	151 undergraduates (46 male, 105 female)	34-item NCS	$r = .38$, $p < .001$
Bem Sex-Role Inventory (Bem, 1974)	Waters & Zakrajsek (1990)	207 undergraduates (87 male, 120 female)	34-item NCS	$r = .34$, $p < .01$ (.22, .33, .30 for persistence, complexity, confidence)
		Grade point average (high school; high scores indicate effective academic performance)		
	Petty & Jarvis (1996)	164 undergraduates	18-item NCS	$r = .26$, $p < .01$
		Grade point average[f] (undergraduate; high scores indicate effective academic performance)		
	Cacioppo & Petty (1984)	515 undergraduates	34-item NCS	$r = .14$, $p < .05$
	Petty & Jarvis (1996)	164 undergraduates	18-item NCS	$r = .14$, $p < .05$
	Tolentino, Curry, & Leak (1990)	57 undergraduates (19 male, 38 female)	18-item NCS	$r = .34$, $p < .05$
	Waters & Zakrajsek (1990)	207 undergraduates (87 male, 120 female)	34-item NCS	$r = .21$, $p < .01$ (.21, .11, .15 for persistence, complexity, confidence)
		Information style orientation (high scores indicate a tendency to seek out and elaborate self-relevant information under problem-solving conditions)		
Style orientation (Berzonsky, 1989)	Berzonsky & Sullivan (1992)	163 female undergraduates	18-item NCS	$r = .50$, $p < .01$
		Inner–other directedness (high scores indicate a tendency to look to one's own [vs. others'] standards for appropriate behavior)		
Inner–Other Social Preference Scale (Kassarjian, 1962)	Crowley & Hoyer (1989)	96 upper-level undergraduates	18-item NCS	$r = .19$, $p < .03$
		Intelligence (abstract reasoning; high scores indicate a high level of abstract reasoning ability)		
Shipley–Hartford Abstract Reasoning Test (Shipley, 1940)	Cacioppo, Petty, & Morris (1983)	131 undergraduates	34-item NCS	$r = -.03$, *ns*
		Intelligence[g] (verbal reasoning; high scores indicate a high level of verbal ability)		
Shipley–Hartford Vocabulary Test (Shipley, 1940)	Cacioppo, Petty, Kao, & Rodriguez (1986), Study 1	185 undergraduates	18-item NCS	$r = .32$, $p < .001$
Shipley–Hartford Vocabulary Test (Shipley, 1940)	Cacioppo, Petty, & Morris (1983)	132 undergraduates	34-item NCS	$r = .15$, *ns*

(*table continues*)

Table 2 (*continued*)

Source	Study	Sample information	Need for cognition measure	Correlation
Internal–external correspondence (high scores indicate a preference to assume that behaviors are a result of external or situational causes)				
Internal–external correspondence (Ickes & Teng, 1987)	Ickes & Teng (1987)	235 undergraduates	34-item NCS	$r = .12, p < .05$
Internal–external locus of control (high scores indicate a belief that one is not in control of one's own life events [i.e., external locus])				
Internal–external locus of control (Rotter, 1966)	Fletcher, Danilovics, Fernandez, Peterson, & Reeder (1986)	81 undergraduates (33 male, 48 female)	34-item NCS	$r = -.32, p < .001$
Intolerance of ambiguity (high scores indicate a preference for clarity and an aversion to ambiguity)				
Intolerance of ambiguity (Eysenck, 1954)	Petty & Jarvis (1996)	25 undergraduates	18-item NCS	$r = -.31$, *ns*
Intrinsic motivation (high scores indicate a desire to seek out activity or information relevant to a given general or specific domain without concern for extrinsic reward contingencies)				
Academic curiosity (Vidler & Rawan, 1974)	Olson, Camp, & Fuller (1984)	140 undergraduates	34-item NCS	$r = .68, p < .05$
Melbourne State Curiosity Scale (Naylor, 1981)				$r = .45, p < .05$
Melbourne Trait Curiosity Scale (Naylor, 1981)				$r = .55, p < .05$
Ontario Test of Intrinsic Motivation (Day, 1971)				
Specific Curiosity subscale				$r = .50, p < .05$
Ambiguity subscale				$r = .45, p < .05$
Complexity subscale				$r = .50, p < .05$
Novelty subscale				$r = .45, p < .05$
Outdoor subscale				$r = .17, p < .05$
Mechanical subscale				$r = .33, p < .05$
Computational subscale				$r = .44, p < .05$
Scientific subscale				$r = .44, p < .05$
Persuasive subscale				$r = .29, p < .05$
Artistic subscale				$r = .19, p < .05$
Literary subscale				$r = .40, p < .05$
Musical subscale				$r = .25, p < .05$
Social Service subscale				$r = .47, p < .05$
Clerical subscale				$r = .39, p < .05$
Thinking subscale				$r = .59, p < .05$
Consultation subscale				$r = .37, p < .05$
Observation subscale				$r = .44, p < .05$
Diversive Curiosity subscale				$r = .01$, *ns*
Work Preference Inventory (Amabile, Hill, Hennessey, & Tighe, 1994)	Amabile, Hill, Hennessey, & Tighe (1994)	207 undergraduates and working adults	34-item NCS	
Extrinsic motivation (high scores indicate a basis for one's motivation to work)				$r = -.27, p < .001$
Compensation subscale				$r = -.13$, *ns*
Outward subscale				$r = -.31, p < .001$
Intrinsic motivation (high scores indicate a basis for one's motivation to work)				$r = .69, p < .001$
Challenge subscale				$r = .71, p < .001$
Enjoyment subscale				$r = .49, p < .001$
Introspectiveness (high scores indicate a tendency to engage in inward, self-directed thought)				
Introspectiveness (Hansell, Mechanic, & Brondolo, 1986)	Berzonsky & Sullivan (1992)	163 female undergraduates	18-item NCS	$r = .16, p < .05$
Knowledge (high scores indicate knowledge regarding current events)				
Knowledge questionnaire regarding wide variety of current events	Cacioppo & Petty (1984)	527 undergraduates	34-item NCS	For all issues, *r*s ranged from .10 to .36, all *p*s < .05
Logical Reasoning Test (high scores indicate an individual's cognitive development)				
Burney (1974)	Allen, Walker, Schroeder, & Johnson (1987)	415 undergraduates	34-item NCS	$r = .06$, *ns*

Table 2 (*continued*)

Source	Study	Sample information	Need for cognition measure	Correlation
		Loneliness (high scores indicate perceived loneliness)		
Loneliness (Russell, Peplau, & Cutrona, 1980)	Osberg (1987), Experiment 2	66 undergraduates	34-item NCS	$r = -.10$, *ns*
		Market maven tendency (high scores indicate a desire to attain information regarding many facets of the marketplace)		
Market maven tendency (Feick & Price, 1987)	Inman, McAlister, & Hoyer (1990)	96 marketing students—upper and lower tertiles—cash and product incentives	18-item NCS	$r = .36, p < .0001$
		Need for closure (high scores generally indicate a motive to attain answers [any answers as opposed to uncertainty or ambiguity])		
Need for closure (Webster & Kruglanski, 1994)	Petty & Jarvis (1996)	87 undergraduates	18-item NCS	$r = -.25, p < .01$
	Webster & Kruglanski (1994)	157 undergraduates	34-item NCS	$r = -.28, p < .01$
Preference for Order subscale[h] (high scores indicate a desire for order in one's life)	Petty & Jarvis (1996)	87 undergraduates	18-item NCS	$r = -.16$, *ns*
	Webster & Kruglanski (1994)	157 undergraduates	34-item NCS	$r = -.31, p < .01$
Preference for Predictability subscale[i] (high scores indicate a preference for predictable events)	Petty & Jarvis (1996)	87 undergraduates	18-item NCS	$r = -.30, p < .01$
	Webster & Kruglanski (1994)	157 undergraduates	34-item NCS	$r = -.14$, *ns*
Decisiveness subscale[j] (high scores indicate a desire to be decisive)	Petty & Jarvis (1996)	87 undergraduates	18-item NCS	$r = .24, p < .05$
	Webster & Kruglanski (1994)	157 undergraduates	34-item NCS	$r = .11$, *ns*
Discomfort with Ambiguity subscale (high scores indicate a discomfort with ambiguous events)	Petty & Jarvis (1996)	87 undergraduates	18-item NCS	$r = -.11$, *ns*
	Webster & Kruglanski (1994)	157 undergraduates	34-item NCS	$r = -.13$, *ns*
Closed-mindedness subscale (high scores indicate a tendency to be closed-minded)	Petty & Jarvis (1996)	87 undergraduates	18-item NCS	$r = -.38, p < .01$
	Webster & Kruglanski (1994)	157 undergraduates	34-item NCS	$r = -.32, p < .01$
		Need to evaluate (high scores indicate a chronic motive to engage in evaluative responding)		
Need to evaluate (Jarvis & Petty, 1996)	Jarvis & Petty (1996)	88 undergraduates	18-item NCS	$r = .35, p < .05$
		Neuroticism (high scores indicate a tendency to be emotionally unstable, moody, touchy, anxious, restless, and so forth)		
Eysenck Personality Inventory (Eysenck, 1975)	Dornic, Ekehammar, & Laaksonen (1991)	59 Swedish undergraduates (17 male, 42 female)	40-item scale (Dornic et al., 1991)	$r = -.24, p < .05$
		Normative style orientation (high scores indicate a tendency to rely on the standards of referent groups in problem-solving situations)		
Style orientation (Berzonsky, 1989)	Berzonsky & Sullivan (1992)	163 female undergraduates	18-item NCS	$r = .00$, *ns*
		Objectivism (high scores indicate the tendency to base one's judgments and beliefs on empirical information and rational considerations)		
Objectivism Scale (Leary, Sheppard, McNeil, Jenkins, & Barnes, 1986)	Leary, Sheppard, McNeil, Jenkins, & Barnes (1986)	416 undergraduates; unspecified subset filled out NCS	30 items based on 34-item NCS	$r = .47, p < .001$
		Openness to experience (high scores on each subscale indicate high levels of openness and receptivity to that domain)		
Openness to Experience Scale (Costa & McCrae, 1978)	Berzonsky & Sullivan (1992)	163 female undergraduates	18-item NCS	
Actions subscale				$r = .39, p < .01$
Fantasy subscale				$r = .07$, *ns*
Feelings subscale				$r = .31, p < .01$
Ideas subscale				$r = .78, p < .01$
Values subscale				$r = .29, p < .05$

(*table continues*)

Table 2 (*continued*)

Source	Study	Sample information	Need for cognition measure	Correlation
		Perceived stress (high scores indicate high levels of perceived stress in one's life)		
Perceived Stress Scale	Petty & Jarvis (1996)	25 undergraduates	18-item NCS	$r = -.36, p < .05$
		Personal identity orientation (high scores indicate the importance of personal values to one's identity)		
Personal identity orientation (Cheek, 1983)	Berzonsky & Sullivan (1992)	163 female undergraduates	18-item NCS	$r = .38, p < .01$
		Personal need for structure (high scores indicate a desire to cognitively structure the world into a simplified, manageable form)		
Personal need for structure[k] (Neuberg & Newsom, 1993)	Neuberg & Newsom (1993), Sample 1	191 undergraduates	34-item NCS	$r = .01$, *ns* (.04, .04, −.10 for persistence, complexity, confidence)
	Neuberg & Newsom (1993), Sample 2	360 undergraduates	34-item NCS	$r = -.23, p < .001$ (−.20, −.15, −.23 for persistence, complexity, confidence)
	Petty & Jarvis (1996)	95 undergraduates	18-item NCS	$r = -.20, p < .05$
Desire for structure subscale[l] (high scores indicate a desire for simple structure in one's life)	Neuberg & Newsom (1993), Sample 1	191 undergraduates	34-item NCS	$r = .01$, *ns* (.03, −.03, −.04 for persistence, complexity, confidence)
	Neuberg & Newsom (1993), Sample 2	360 undergraduates	34-item NCS	$r = -.11, p < .05$ (−.11, −.06, −.09 for persistence, complexity, confidence)
	Petty & Jarvis (1996)	95 undergraduates	18-item NCS	$r = -.13$, *ns*
Response to lack of structure subscale[m] (high scores indicate an aversion to lack of structure in one's life)	Neuberg & Newsom (1993), Sample 1	191 undergraduates	34-item NCS	$r = .02$, *ns* (.05, .08, −.12 for persistence, complexity, confidence)
	Neuberg & Newsom (1993), Sample 2	360 undergraduates	34-item NCS	$r = -.27, p < .001$ (−.23, −.18, −.29 for persistence, complexity, confidence)
	Petty & Jarvis (1996)	95 undergraduates	18-item NCS	$r = -.24, p < .01$
		Personal relevance (high scores indicate a tendency to perceive social issues as personally important or relevant)		
	M. M. Thompson & Zanna (1995), Sample 2	91 Canadian undergraduates (54 male, 37 female)	34-item NCS	$r = .23, p < .05$
		Problem solving (high scores indicate low self-appraised problem-solving effectiveness)		
Problem Solving Inventory (Heppner & Petersen, 1982)	Heppner, Reeder, & Larson (1983)	52 undergraduates (26 male, 26 female) selected from upper and lower 18% of scorers on Problem Solving Inventory	34-item NCS	$r = -.62$,[a] $p < .001$
		Procrastination (high scores indicate a chronic tendency to procrastinate)		
Adult Inventory for Procrastination (McCown & Johnson, 1989)	Ferrari (1992)	215 adult working college students (81 male, 134 female, mean age = 34)	25-item scale (Tanaka, Panter, & Winborne, 1988)	$r = -.31, p < .01$ (subscale *r*s not reported)
General procrastination (Lay, 1986)	Ferrari (1992)	215 adult working college students (81 male, 134 female, mean age = 34)	25-item scale (Tanaka, Panter, & Winborne, 1988)	*ns* (subscale *r*s not reported)
		Receivers' apprehension (high scores indicate a tendency to respond to information reception tasks with anxiety)		
Receivers' Apprehension Test (Wheeless, 1975)	Buhr & Pryor (1988)	71 undergraduates	18-item NCS	$r = -.33, p < .01$
		Repression–sensitization (high scores indicate a tendency to approach threatening or anxiety-provoking information [i.e., sensitization])		
Repression–sensitization (Byrne, 1964)	Unpublished data reported in DeBono & Snyder (1992)			*ns* (*r* not reported)

Table 2 (*continued*)

Source	Study	Sample information	Need for cognition measure	Correlation
		Self-complexity (high scores indicate a complex self-representation)		
Self-complexity (Linville, 1985)	Miller, Omens, & Delvadia (1991)	98 undergraduates (45 male, 53 female)	18-item NCS	$r = -.07$, *ns*
		Self-consciousness		
Private self-consciousness[n] (high scores indicate a high level of attention to inner thoughts and feelings)				
Self-Consciousness Questionnaire (Buss, 1980)	Mueller, Haupt, & Grove (1988)	71 undergraduates (29 male, 42 female)	18-item NCS	$r = .22$, *ns*
	Mueller & Johnson (1990)	20 undergraduates, 20 elderly people from the community	18-item NCS	$r = .16$, *ns*
	Tolentino, Curry, & Leak (1990)	57 undergraduates (19 male, 38 female)	18-item NCS	$r = .17$, *ns*
Self-Consciousness Questionnaire (Fenigstein, Scheier, & Buss, 1975)	Mueller & Grove (1991)	98 undergraduates (53 male, 45 female)	18-item NCS	$r = .04$, *ns*
	Osberg (1987), Sample 1	221 undergraduates (72 male, 149 female)	34-item NCS	$r = .11$, *ns*
	Osberg (1987), Sample 2	66 undergraduates (28 male, 38 female)	34-item NCS	$r = .37$, $p < .01$
	Osberg (1987), Sample 3	43 male inmates	34-item NCS	$r = .34$, $p < .05$
	Petty & Jarvis (1996)	140 undergraduates	18-item NCS	$r = .13$, *ns*
Public self-consciousness[o] (high scores indicate a high level of attention to one's public image)				
Self-Consciousness Questionnaire (Buss, 1980)	Mueller, Haupt, & Grove (1988)	71 undergraduates (29 male, 42 female)	18-item NCS	$r = -.15$, *ns*
	Mueller & Johnson (1990)	20 undergraduates, 20 elderly people from the community	18-item NCS	$r = -.14$, *ns*
Self-Consciousness Questionnaire (Fenigstein, Scheier, & Buss, 1975)	Mueller & Grove (1991)	98 undergraduates (53 male, 45 female)	18-item NCS	$r = -.17$, *ns*
	Osberg (1987), Sample 1	221 undergraduates (72 male, 149 female)	34-item NCS	$r = -.21$, $p < .01$
	Osberg (1987), Sample 2	66 undergraduates (28 male, 38 female)	34-item NCS	$r = .00$, *ns*
	Osberg (1987), Sample 3	46 male inmates	34-item NCS	$r = .02$, *ns*
	Petty & Jarvis (1996)	140 undergraduates	18-item NCS	$r = -.09$, *ns*
		Self-directed religious problem-solving style (high scores indicate a problem-solving approach that emphasizes personal freedom from God, agency, and active coping)		
Self-Directed Religious Problem Solving Style Questionnaire (Pargament et al., 1988)	Tolentino, Curry, & Leak (1990)	57 undergraduates (19 male, 38 female)	18-item NCS	$r = .25$, *ns* ($p < .06$)
		Self-esteem[p] (high scores indicate a positive overall evaluation of oneself)		
Revised Janis-Field Scale (Eagly, 1967)	Osberg (1987), Sample 1	213 undergraduates (69 male, 144 female)	34-item NCS	$r = .44$, $p < .001$
	Osberg (1987), Sample 2	66 undergraduates (28 male, 38 female)	34-item NCS	$r = .37$, $p < .01$
	Osberg (1987), Sample 3	44 male inmates	34-item NCS	$r = .54$, $p < .001$
Self-Esteem Scale (Coopersmith, 1967)	Mueller & Grove (1991)	98 undergraduates (53 male, 45 female)	18-item NCS	$r = .45$, $p < .05$
Self-Esteem Scale (Rosenberg, 1965)	Kernis, Grannemann, & Barclay (1992)	95 undergraduates (62 women, 33 men)	18-item NCS	$r = .15$, *ns*
	Osberg (1987), Sample 1	216 undergraduates (71 male, 145 female)	34-item NCS	$r = .42$, $p < .001$
	Osberg (1987), Sample 2	66 undergraduates (28 male, 38 female)		$r = .21$, *ns*
	Osberg (1987), Sample 3	44 male inmates		$r = .40$, $p < .001$
	Petty & Jarvis (1996)	95 undergraduates	18-item NCS	$r = .28$, $p < .05$

(*table continues*)

Table 2 (*continued*)

Source	Study	Sample information	Need for cognition measure	Correlation
		Self-monitoring (high scores indicate a chronic concern regarding self-presentation)		
Concern for Appropriateness Scale (Lennox & Wolfe, 1984)	Miller, Omens, & Delvadia (1991)	98 undergraduates (45 male, 53 female)	18-item NCS	$r = -.30, p < .01$
Attention to Social Comparison subscale				$r = -.41, p < .001$
Cross-Situational Variability subscale				$r = -.04$, *ns*
Revised Self-Monitoring Scale (Lennox & Wolfe, 1984)				$r = .16$, *ns*
Ability to Modify Self-Presentation subscale				$r = .11$, *ns*
Sensitivity to the Expressive Displays of Others subscale				$r = .16$, *ns*
Self-Monitoring Scale (Snyder, 1974)	Stayman & Kardes (1992)	161 undergraduates	18-item NCS	$r = .10$, *ns*
		Sensation seeking (high scores indicate a tendency to seek out and enjoy activities associated with high levels of sensation)		
Sensation Seeking (Zuckerman, 1979)	Crowley & Hoyer (1989)	96 upper-level undergraduates	18-item NCS	$r = .19, p < .03$
	Olson, Camp, & Fuller (1984)	140 undergraduates	34-item NCS	$r = .25, p < .05$
Boredom Susceptibility subscale				$r = .03$, *ns*
Disinhibition subscale				$r = -.03$, *ns*
Experience Seeking subscale				$r = .41, p < .05$
Thrill and Adventure Seeking subscale				$r = .31, p < .05$
		Sensory innovativeness (high scores indicate a desire for new experiences that stimulate the senses)		
Sensory innovativeness (Venkatraman & Price, 1990)	Venkatraman & Price (1990)	326 undergraduates	34-item NCS	$r = .04$, *ns*
		Shyness (high scores indicate a tendency for shyness in social situations)		
Shyness (Cheek & Buss, 1981)	Osberg (1987), Experiment 2	66 undergraduates (Sample 2)	34-item NCS	$r = .09$, *ns*
		Simplification (high scores indicate a motive to achieve cognitive structure by ignoring, distorting, and otherwise avoiding new information)		
Simplifiers scale (Cox, 1967)	Venkatraman, Marlino, Kardes, & Sklar (1990a)	78 undergraduates	34-item NCS	$r = -.26, p < .05$
		Sociability (high scores are positively related to sociability)		
Sociability (Cheek & Buss, 1981)	Osberg (1987), Experiment 2	66 undergraduates (Sample 2)	34-item NCS	$r = .02$, *ns*
		Social anxiety[a] (high scores indicate high anxiety induced by social situations)		
Self-Consciousness Questionnaire (Buss, 1980)	Mueller, Haupt, & Grove (1988)	71 undergraduates (29 male, 42 female)	18-item NCS	$r = -.16$, *ns*
	Mueller & Johnson (1990)	20 undergraduates, 20 elderly people from the community	18-item NCS	$r = -.40, p < .01$ $r = -.62, p < .01$, (elderly only; r not reported for young only)
Self-Consciousness Questionnaire (Fenigstein, Scheier, & Buss, 1975)	Mueller & Grove (1991)	98 undergraduates (53 male, 45 female)	18-item NCS	$r = -.24, p < .05$
	Osberg (1987), Sample 1	220 undergraduates (71 male, 149 female)	34-item NCS	$r = -.30, p < .01$
	Osberg (1987), Sample 2	66 undergraduates (28 male, 38 female)	34-item NCS	$r = -.28, p < .05$
	Osberg (1987), Sample 3	47 male inmates	34-item NCS	$r = -.38, p < .05$
	Petty & Jarvis (1996)	140 undergraduates	18-item NCS	$r = -.39, p < .01$

Table 2 (*continued*)

Source	Study	Sample information	Need for cognition measure	Correlation
Social desirability[a] (high scores indicate a tendency to respond to self-evaluative questions in a way that makes one appear desirable to oneself or others)				
Social desirability (Crowne & Marlowe, 1964)	Cacioppo & Petty (1982), Study 3	104 undergraduates (35 male, 69 female)	34-item NCS	$r = .08$, *ns*
Social desirability (Crowne & Marlowe, 1964)	Cacioppo & Petty (1982), Study 4	97 undergraduates (29 male, 68 female)	34-item NCS	$r = .21$, $p < .05$
Social desirability (Crowne & Marlowe, 1964)	Fletcher, Danilovics, Fernandez, Peterson, & Reeder (1986)	81 undergraduates (33 male, 48 female)	34-item NCS	$r = .15$, *ns*
Social desirability (Crowne & Marlowe, 1964)	Petty & Jarvis (1996)	25 undergraduates	18-item NCS	$r = -.12$, *ns*
Social desirability (Reynolds, 1982)	Olson, Camp, & Fuller (1984)	140 undergraduates	34-item NCS	$r = .16$, $p < .05$
Social identity orientation (high scores indicate the importance of social values [e.g., attractiveness, popularity] to one's identity)				
Social identity orientation (Cheek, 1983)	Berzonsky & Sullivan (1992)	163 female undergraduates	18-item NCS	$r = -.28$, $p < .01$
Test anxiety (high scores indicate a tendency to become anxious in response to testing situations)				
Test anxiety (Sarason, 1972)	Cacioppo & Petty (1982), Study 2	419 undergraduates	34-item NCS	$r = .02$, *ns*
Uncertainty orientation (high scores indicate a desire to maximize information gain rather than to maintain one's perceived reality)				
Uncertainty orientation (Sorrentino, Short, & Raynor, 1984)	Sorrentino, Bobocel, Gitta, Olson, & Hewitt (1988), Study 1	211 undergraduates	18-item NCS	$r = .20$, $p < .002$
Verbal processing style (high scores indicate a preference for verbal over other types of information)				
Style of Processing Scale (Childers, Houston, & Heckler, 1985)	Venkatraman, Marlino, Kardes, & Sklar (1990a)	78 undergraduates	34-item NCS	$r = .22$ (significance not reported)
Visual processing style (high scores indicate a preference for visual over other types of information)				
Style of Processing Scale (Childers, Houston, & Heckler, 1985)	Venkatraman, Marlino, Kardes, & Sklar (1990a)	78 undergraduates	34-item NCS	$r = -.11$, *ns*
Worry (high scores indicate a chronic tendency to worry)				
Penn State Worry Questionnaire (Meyer, Miller, Metzger, & Borkovec, 1990)	Meyer, Miller, Metzger, & Borkovec (1990)	87 undergraduates (47 female, 40 male)	18-item NCS	*ns* (*r* not reported)

[a] Obtained through a conversion of reported means and standard deviations. [b] $r_{avg} = -.17$, $p < .000001$; $\chi^2(9) = 54.27$, $p < .0000001$. [c] $r_{avg} = .26$, $p < .0000001$; $\chi^2(6) = 8.07$, $p < .00000001$. [d] $r_{avg} = -.05$, $p < .96$; $\chi^2(1) = 1.83$, $p < .90$. [e] $r_{avg} = .25$, $p < .0000001$; $\chi^2(3) = 29.88$, $p < .0000001$. [f] $r_{avg} = .17$, $p < .00001$; $\chi^2(3) = 2.78$, $p < .43$. [g] $r_{avg} = .24$, $p < .00001$; $\chi^2(1) = 2.45$, $p < .90$. [h] $r_{avg} = -.24$, $p < .0001$; $\chi^2(1) = 1.37$, $p < .90$. [i] $r_{avg} = -.22$, $p < .001$; $\chi^2(1) = 1.55$, $p < .90$. [j] $r_{avg} = .18$, $p < .01$; $\chi^2(1) = 0.98$, $p < .90$. [k] $r_{avg} = -.16$, $p < .0001$; $\chi^2(2) = 7.56$, $p < .05$. [l] $r_{avg} = -.08$, $p < .05$; $\chi^2(2) = 2.09$, $p < .35$. [m] $r_{avg} = -.18$, $p < .000001$; $\chi^2(2) = 11.24$, $p < .01$. [n] $r_{avg} = .16$, $p < .0001$; $\chi^2(7) = 7.10$, $p < .42$. [o] $r_{avg} = -.13$, $p < .0001$; $\chi^2(6) = 3.93$, $p < .69$. [p] $r_{avg} = .38$, $p < .0000001$; $\chi^2(8) = 13.05$, $p < .11$. [q] $r_{avg} = -.35$, $p < .0000001$; $\chi^2(7) = 6.74$, $p < .46$. [r] $r_{avg} = .10$, $p < .01$; $\chi^2(4) = 2.43$, $p < .66$.

Test–retest reliability has been examined in two studies. Sadowski and Gulgoz (1992b) reported a test–retest correlation of .88 ($p < .001$) over a 7-week period in their study of 71 undergraduates using the 18-item NCS, and Verplanken (1991) reported a correlation of .66 ($p < .001$) over approximately 8 months in his study of Dutch residents using only 6 items from the Dutch translation of the NCS. These data, although limited, support the temporal stability of people's scores on the NCS.

Gender Effects

Cacioppo and Petty (1982) found the 34-item NCS to be gender neutral in two independent studies, an effect replicated by Olson, Camp, and Fuller (1984); Tanaka et al. (1986, 1988); and Waters and Zakrajsek (1990).[2] Potential gender differences in the 18-item NCS were examined by Tolentino, Curry, and Leak (1990); Sadowski (1993); Lassiter, Briggs, and Bowman (1991); and, in two studies, by Spotts (1994). All found the NCS to be gender neutral. Sadowski (1993), for instance, administered the 18-item NCS to 708 female and 510 male undergraduates and found no gender differences in the means or

[2] Although Tanaka et al. (1988) reported a gender difference on their Cognitive Persistence subscale, they found the total score on the NCS to be gender neutral. Also, although Waters and Zakrajsek (1990) failed to replicate the gender difference reported by Tanaka et al. on the Cognitive Persistence subscale, they did replicate the finding that the total score on the NCS was gender neutral.

distributions of need for cognition scores. Furthermore, factor analysis revealed two factors with latent roots greater than one, and application of the scree test confirmed that one factor was dominant (Factor 1 accounted for 30.9% of the variance, and Factor 2 accounted for 9.0%). No gender differences were found when separate factor analyses were calculated on the responses of male and female participants to the 18-item NCS. Sadowski (1993) also found the reliability of the scale to be similar for men and women and comparable to earlier research (e.g., Cronbach α = .86 for men and women). Finally, two studies by Pieters et al. (1987) and Verplanken (1993) confirmed that the Dutch version of the NCS, which is based on 15 items from the 18-item NCS, was gender neutral.

In sum, individual differences along a single continuum of need for cognition have been scaled reliably with short forms such as that presented in the Appendix. Moreover, there is some evidence that the factor structure and reliability of the NCS are the same in Europe as in North America. Assuring respondents that (a) there are no "correct" answers, (b) their honesty in responding to the questions is important, and (c) their responses are anonymous may contribute to obtaining psychometrically sound data (Cacioppo & Petty, 1982), although these assessment features have not been studied systematically. The response scale (e.g., 5-point vs. 9-point) and anchors (e.g., *very much agree* vs. *extremely characteristic*) have also varied across studies, apparently with little effect until perhaps the response options are reduced to just two (cf. Tanaka et al., 1988). Considerable research exists relating need for cognition to other individual-differences variables. The research reviewed in this section, for instance, indicates that need for cognition is gender neutral. In the following section, we survey the remaining research on need for cognition and other personality and individual-differences variables.

Relation of Need for Cognition to Other Individual Differences

Research on the relationship between need for cognition and other individual-differences variables provides information about the convergent and discriminant validity of the construct of need for cognition, as well as the personology of individuals low versus high in need for cognition. It is relatively simple to administer and intercorrelate multiple individual-differences surveys, so it should not be surprising that need for cognition has been related to a host of variables. As a means of facilitating comprehension of this literature, individual-differences variables are listed alphabetically in Table 2 with subscales (if any) and relevant citations embedded within this listing. Sample sizes and summary statistics are also summarized in Table 2. Meta-analyses were performed for any category of scales (or subscales) in which one or more studies yielded statistically nonsignificant (or inconsistent) results.

Convergent and Discriminant Validity

Inspection of Table 2 indicates good convergent and discriminant validity for need for cognition and, perhaps more important, reveals the attributes associated with need for cognition. Individuals who differ in terms of their need for cognition, for instance, have been posited to differ in terms of their tendency to actively acquire information about a relevant stimulus or event and to engage in effortful cognitive activity when given a task or making sense of the world. As would be expected, therefore, variations in need for cognition are negatively related to scores on scales measuring dogmatism ($rs = -.23$ to $-.24$, $ps < .05$; Cacioppo & Petty, 1982; Fletcher, Danilovics, Fernandez, Peterson, & Reeder, 1986); attention to social comparison cues (self-monitoring subscale; $r = -.41$, $p < .05$; Miller et al., 1991); the tendency to value factors such as attractiveness and popularity in one's identity (social identity orientation; $r = -.28$, $p < .05$; Berzonsky & Sullivan, 1992); the tendency to ignore, avoid, or distort new information (simplification scale; $r = -.26$, $p < .05$; Venkatraman et al., 1990a); diffuse–avoidant-oriented identity styles ($r = -.35$, $p < .05$; Berzonsky & Sullivan, 1992); need for closure (meta-analysis $r_{ave} = -.26$, $p < .01$, where r_{ave} is the average correlation index; Petty & Jarvis, 1996; Webster & Kruglanski, 1994); preference for order (meta-analysis $r_{ave} = -.24$, $p < .01$; Petty & Jarvis, 1996; Webster & Kruglanski, 1994); preference for predictability (meta-analysis $r_{ave} = -.22$, $p < .01$; Petty & Jarvis, 1996; Webster & Kruglanski, 1994), decisiveness (meta-analysis $r_{ave} = -.22$, $p < .01$; Petty & Jarvis, 1996; Webster & Kruglanski, 1994); and closed-mindedness (meta-analysis $r_{ave} = -.34$, $p < .01$; Petty & Jarvis, 1996; Webster & Kruglanski, 1994); causal uncertainty ($r = -.42$, $p < .05$; Weary & Edwards, 1994); and the personal need for structure (meta-analysis $r_{ave} = -.16$, $p < .01$; Neuberg & Newsom, 1993; Petty & Jarvis, 1996), desire for structure (meta-analysis $r_{ave} = -.08$, $p < .05$; Neuberg & Newsom, 1993; Petty & Jarvis, 1996), and response to lack of structure (meta-analysis $r_{ave} = -.18$, $p < .01$; Neuberg & Newsom, 1993; Petty & Jarvis, 1996).

Furthermore, and consistent with the far-reaching influences of interindividual variations in cognitive motivation, need for cognition is positively related to an individual's tendency to formulate complex attributions (attributional complexity; $rs = .36$ to $.51$, $ps < .01$; Fletcher et al., 1986; Petty & Jarvis, 1996); devote attention exclusively to an ongoing cognitive task (absorption; $r = .37$, $p < .01$; Osberg, 1987); base judgments and beliefs on empirical information and rational considerations (objectivism; $r = .47$, $p < .01$; Leary et al., 1986); seek out, scrutinize, and use relevant information when making decisions and solving problems (information-oriented identity style; $r = .50$, $p < .01$; Berzonsky & Sullivan, 1992); be curious (e.g., mean correlation across curiosity scales; $r = .57$, $p < .05$; Olson et al., 1984; see Table 2, intrinsic motivation; desire new experiences that stimulate thinking (cognitive innovativeness; $rs = .26$ to $.40$, $ps < .05$; Venkatraman et al., 1990a; Venkatraman & Price, 1990); perceive social issues to be personally relevant or involving ($r = .23$, $p < .05$; M. M. Thompson & Zanna, 1995); possess information about various aspects of the consumer world ($r = .36$, $p < .05$; Inman, McAlister, & Hoyer, 1990); desire to maximize information gain (uncertainty orientation; $r = .20$, $p < .05$; Sorrentino, Bobocel, Gitta, Olson, & Hewitt, 1988); and be open to ideas ($r = .78$, $p < .01$; Berzonsky & Sullivan, 1992), actions ($r = .39$, $p < .01$; Berzonsky & Sullivan, 1992), feelings ($r = .31$, $p < .01$; Berzonsky & Sullivan, 1992), and values ($r = .29$, $p < .05$; Berzonsky & Sullivan, 1992) but not fantasy ($r = .07$, *ns*; Berzonsky & Sullivan, 1992). Finally, need for cognition has been found to be weakly or nonsignificantly related to potential response biases such as test anxiety ($r = .02$, *ns*; Cacioppo & Petty, 1982) and social desirabil-

ity (at least when responses are made anonymously; meta-analysis $r_{ave} = .14, p < .01$; Cacioppo & Petty, 1982; Fletcher et al., 1986; Olson et al., 1984; Petty & Jarvis, 1996).

Predictive Validity and Personology: Beyond Cognitive Ability

To the extent that individuals are intellectually gifted, they are likely to also receive reinforcement for, receive competence feedback about, and develop feelings of mastery regarding problem solving and intellectual challenges. Because these factors contribute to the development of intrinsic motivation toward an activity (Deci & Ryan, 1980; Harackiewicz & Elliot, 1993; Koestner, Zuckerman, & Koestner, 1987; Pittman & Heller, 1987), intelligence and need for cognition should covary. Need for cognition is thought to reflect a cognitive motivation rather than an intellectual ability, however, and thus it should be related to but nonredundant with intellectual ability.[3] Several studies have examined the relationship between need for cognition and intelligence. Results confirm that need for cognition is modestly related to ability indexes such as verbal intelligence (meta-analysis $r_{ave} = .24, p < .01$; Cacioppo et al., 1983, 1986), ACT scores (meta-analysis $r_{ave} = .26, p < .01$; Cacioppo & Petty, 1982, 1984; Dollinger & McMorrow, 1992; Fletcher et al., 1986; Olson et al., 1984; Petty & Jarvis, 1996; Waters & Zakrajsek, 1990), high school grade point average ($r = .26, p < .01$; Petty & Jarvis, 1996), and college grade point average (meta-analysis $r_{ave} = .17, p < .01$; Cacioppo & Petty, 1984; Petty & Jarvis, 1996; Tolentino et al., 1990; Waters & Zakrajsek, 1990), whereas need for cognition appears to be unrelated to abstract reasoning ability ($r = -.03$, *ns*; Cacioppo et al., 1983). A study by Venkatraman et al. (1990a) provided complementary data to the relationship between need for cognition and verbal versus abstract intelligence; they found that individuals high, in contrast to low, in need for cognition preferred or enjoyed verbal information ($r = .22, p < .05$) but did not differ in preferences for visual information ($r = -.11$, *ns*). Finally, Cacioppo et al. (1986) found that although both need for cognition and verbal intelligence predicted the number of arguments participants could recall after exposure to a persuasive message, need for cognition accounted for significant additional variance in message recall after the effects predicted by the measure of intelligence had been statistically controlled (*ps* < .05). Thus, although related theoretically and empirically, need for cognition and intelligence are distinguishable by both stochastic and functional criteria (Cacioppo & Berntson, 1994; Howe, Rabinowitz, & Grant, 1993).

Intrinsic interest in cognitive challenges. Another key set of distinctions between individuals high and low in need for cognition is that the former enjoy effortful reasoning and problem solving more and are less stressed by cognitively effortful problems, complex life circumstances, or cognitively demanding tasks. Although most of the evidence bearing on these observations is reviewed in the next two sections, several studies of individual differences are relevant. A study by Amabile, Hill, Hennessey, and Tighe (1994), for instance, bears specifically on the postulate that individuals high, relative to low, in need for cognition are intrinsically motivated to engage in effortful cognitive endeavors. Amabile et al. developed individual-differences measures to assess intrinsic and extrinsic motivation. As would be expected, need for cognition was more highly related to intrinsic motivation ($r = .69, p < .01$) than to extrinsic motivation ($r = -.27, p < .01$). The Intrinsic Motivation scale consists of two subscales: Challenge and Enjoyment. The content of the items in the Challenge subscale is weighted toward cognitive challenges. For instance, the three most highly weighted items in the Challenge subscale are "I enjoy tackling problems that are completely new to me," "I enjoy trying to solve complex problems," and "The more difficult the problem, the more I enjoy trying to solve it." Although the correlation between this subscale and need for cognition is high ($r = .71, p < .01$; Amabile et al., 1994), this may reflect the fact that the items in the Challenge subscale are quite similar to those in the NCS and that both are tapping interindividual variations in need for cognition. The Enjoyment subscale of the Amabile et al. (1994) Intrinsic Motivation scale, in contrast, contains items that include but are not limited to cognitive challenges or tasks. For instance, the three most highly weighted items in the Enjoyment subscale are "I want to find out how good I really can be at my work," "I prefer to figure things out for myself," and "What matters most to me is enjoying what I do." Results revealed a sizable positive correlation between need for cognition and this subscale ($r = .49, p < .001$; Amabile et al., 1994), consistent with the supposition that need for cognition is a motivational construct and reflects individual differences in intrinsic motivation to engage in effortful cognitive processes.

Additional evidence that need for cognition reflects individual differences in intrinsic motivation to think comes from a study by Olson et al. (1984), who correlated need for cognition and the subscales of the Ontario Test of Intrinsic Motivation. As summarized in Table 2, subscales that tapped intrinsic motivation in cognitive domains (e.g., academic curiosity, specific curiosity, complexity, novelty, computational, and scientific) were consistently more highly correlated with need for cognition than subscales that tapped intrinsic motivation in noncognitive domains (e.g., outdoor, artistic, and musical).

Effortful thinking also can be a potential source of stress and anxiety, of course, but demands for effortful thinking and cognitive challenges should be more likely to provoke stress and anxiety in individuals low than high in need for cognition. In a study of 140 undergraduates, Olson et al. (1984) reported a modest negative correlation between need for cognition and both state and trait anxiety (*rs* = −.23 and −.27, respectively, *ps* < .05). Subsequent research has shown that need for cognition is negatively related to anxiety about cognitive stressors (Cacioppo & Petty, 1984) and perceived stress in college undergraduates (Petty & Jarvis, 1996). In Cacioppo and Petty (1984), for instance, undergraduates who had scored in the lower or upper tripartite of scores on the NCS were recruited for a study 6 weeks later in which they completed the personal situations inventory (Pratt & Weerts, 1982). This inventory is

[3] The relationship between need for cognition and intelligence might be expected to also be characterized by a curvilinear component if intelligence is a necessary but not a sufficient condition for need for cognition. The level of intelligence necessary for variations in need for cognition to develop may be sufficiently modest, however, that curvilinear trends are negligible in most populations.

composed of subscales that measure students' fears and anxieties about seven broad categories of stressors. Students high, in contrast to low, in need for cognition expressed significantly less stress and anxiety about matters involving academic challenges but comparable levels of stress and anxiety about being harmed physically, observing others being harmed physically, dating, establishing or maintaining friends, and nonacademic aspects of college life. Buhr and Pryor (1988) similarly found need for cognition to be modestly but negatively related to scores on the receiver's apprehension test (indicating a disposition to respond to information reception tasks with anxiety or disaffection; $r = -.33$, $p < .05$), and Meyer, Miller, Metzger, and Borkovec (1990) found it to be unrelated to measures of unproductive worry or pathological rumination (see Table 2).

A study by Heppner, Reeder, and Larson (1983) suggests that individuals low in need for cognition are more anxious about cognitive stressors because they anticipate they will be less effective problem solvers. Heppner et al. pretested 500 participants using the problem-solving inventory, which is a survey that gauges self-appraised problem-solving effectiveness. Heppner et al. (1983) subsequently recruited and administered the NCS to 26 participants who had scored in the top 18% on the problem-solving inventory and to 26 participants who scored in the bottom 18%. They found that participants who viewed themselves as effective problem solvers were also characterized by a higher need for cognition ($r = -.62$; high scores on Heppner et al.'s, 1983, problem-solving inventory indicate low self-appraised problem-solving effectiveness).

Social issues represent dilemmas with which individuals must grapple as members of an organized collective. M. M. Thompson and Zanna (1995) have reported that individuals high in need for cognition hold less conflicted or ambivalent attitudes toward a variety of social issues ($rs = -.41$ and $-.33$ in Studies 1 and 2, respectively, $ps < .01$). The relationship between need for cognition and attitude ambivalence was not attributable to attitude position: Individuals high in need for cognition were just as likely to hold positive or negative attitudes regarding various social issues as individuals low in need for cognition. In a follow-up study, M. M. Thompson and Zanna (1995) found that when the issues were perceived as being personally irrelevant, neither those high nor those low in need for cognition had thought much about the issues or had worked through inconsistencies in their feelings about the issues; when the issues were viewed as being relevant, however, individuals high in need for cognition were more likely to have worked through inconsistencies, thereby lessening their attitude ambivalence. Relatedly, Weary and Edwards (1994) reported that individuals high in need for cognition were less likely to be characterized by causal uncertainty, presumably because they are more likely to have worked through or formulated causal attributions about events in their world.

Emotional and agentic dispositions. The articulation of the empirical relationships between need for cognition and various dimensions of personality makes it possible to investigate whether need for cognition has unique explanatory power or acts in conjunction with other relatively distinct constructs. Individuals high in need for cognition, for instance, are more likely than individuals low in need for cognition to base their judgments and beliefs on empirical information and rational considerations (Leary et al., 1986). Are individuals low in need for cognition also relatively emotional? The research reviewed earlier on the relationship between need for cognition and anxiety, as well as the research showing that individuals high in need for cognition also tend to be more curious (Olson et al., 1984) and to feel more personally involved in social issues (M. M. Thompson & Zanna, 1995), suggests that need for cognition and emotionality are not related, at least in any simple fashion. Additional evidence for the distinction between need for cognition and affective predispositions comes from studies relating need for cognition to affective orientation ($r = .07$, *ns*; Booth-Butterfield & Booth-Butterfield, 1990), affective intensity ($r = -.22$, *ns*; Petty & Jarvis, 1996), sociability ($r = .02$, *ns*; Osberg, 1987), functional flexibility (e.g., "How capable are you of being dominant when the situation requires?" $r = .01$, *ns*; Miller et al., 1991), trait anger ($r = -.11$, *ns*; Olson et al., 1984), normative identity style ($r = .00$, *ns*; Berzonsky & Sullivan, 1992), extraversion ($rs = .03$ to $.11$, *ns*; Crowley & Hoyer, 1989; Dornic et al., 1991), repression–sensitization (DeBono & Snyder, 1992; correlations not reported), fear of invalidity ($rs = -.02$ to $-.08$, *ns*; M. M. Thompson & Zanna, 1995), sensory innovativeness ($r = .04$, *ns*; Venkatraman & Price, 1990), shyness ($r = .09$, *ns*; Osberg, 1987), and loneliness ($r = -.10$, *ns*; Osberg, 1987). Indeed, contrary to the notion that the relative rationality of individuals high in need for cognition leaves them without feelings, research on alexithymia has shown that individuals high in need for cognition have less difficulty identifying and communicating feelings, discriminating feelings from bodily sensations, or enjoying a normal emotional and fantasy life ($rs = -.42$ to $-.52$, $ps < .01$; G. J. Taylor & Bagby, 1988; G. J. Taylor, Bagby, & Parker, 1992).

Individuals high in need for cognition, however, do appear to be relatively agentic. Specifically, they tend to be high in private, and low in public, self-consciousness (meta-analysis r_{ave}s = .16 and = $-.13$, respectively, $ps < .001$; Mueller & Grove, 1991; Mueller, Haupt, & Grove, 1988; Mueller & Johnson, 1990; Osberg, 1987; Petty & Jarvis, 1996; Tolentino et al., 1990), field (in)dependence (high scores reflect field independence; $r = .19$, $p < .01$; Cacioppo & Petty, 1982), introspectiveness ($r = .16$, $p < .05$; Berzonsky & Sullivan, 1992), desire for control ($r = .48$, $p < .001$; E. P. Thompson, Chaiken, & Hazlewood, 1993), need to evaluate ($r = .35$, $p < .05$; Petty & Jarvis, 1996), self-directed religious problem-solving style ($r = .25$, $p < .05$; Tolentino et al., 1990), masculinity (but not femininity or androgeny; $rs = .34$ to $.38$, $ps < .05$; Osberg, 1987; Waters & Zakrajsek, 1990), self-esteem (meta-analysis $r_{ave} = .38$, $p < .001$; Kernis et al., 1992; Mueller & Grove, 1991; Osberg, 1987; Petty & Jarvis, 1996), total sensation seeking ($rs = .19$ to $.25$, $ps < .05$; Crowley & Hoyer, 1989; Olson et al., 1984), communication apprehension (high scores reflect low apprehension; $r = .33$, $p < .05$; Wycoff, 1992), and inner directedness (inner–other social preference, $r = .19$, $p < .05$ [Crowley & Hoyer, 1989]; internal–external correspondence, $r = .12$, $p < .05$ [Ickes & Teng, 1987]). Individuals high in need for cognition also tend to be low in neuroticism ($r = -.24$, $p < .05$; Dornic et al., 1991), external locus of control ($r = -.32$, $p < .05$; Fletcher et al., 1986), and social anxiety (meta-analysis $r_{ave} = -.35$, $p < .01$; Mueller & Grove, 1991; Mueller et al., 1988; Mueller & Johnson, 1990; Osberg, 1987; Petty & Jarvis, 1996), although the

association with social anxiety is possibly heightened in elderly people ($r = -.62, p < .01$; Mueller & Johnson, 1990).

Demographic Variables

The demographics of need for cognition are also becoming clearer. As noted in the previous section, need for cognition is gender neutral. Davis et al. (1993) tested 453 juvenile justice workers to examine the correlation between education level and need for cognition. Results revealed a weak but significant relationship between need for cognition and education level ($r = .13, p < .001$). Tanaka et al. (1988) contrasted the need for cognition scores of 38 students in their 1st or 2nd year of college with the scores of 41 students in their 3rd or 4th year of college. Although the difference in the need for cognition scores between these groups did not differ statistically given their relatively small sample size, the effect size ($r = .10$, *ns*) was similar to that reported by Davis et al. (1993). Spotts (1994) conducted studies of community samples to examine this relationship. In Spotts's (1994) first study, 201 adults from local civic groups and senior citizen centers and university staff personnel (ranging in age from 23 to 87 years) completed a survey in which need for cognition and educational level were measured. In the second study, 165 community residents (ranging in age from 20 to 91 years) completed and returned a mail survey. Need for cognition and educational level were positively correlated in both studies (*r*s = .46 and .43 in Studies 1 and 2, respectively, *p*s < .001). Thus, the relationship between need for cognition and education is reliable (meta-analysis $r_{ave} = .25, p < .001$) and in the expected direction, but its magnitude is elevated predictably as the range of scores increases. What is unclear from these studies is whether the relationship between need for cognition and education reflects a process of self-selection (i.e., individuals high in need for cognition are more likely to pursue an education), an effect of education on individuals' level of need for cognition (e.g., higher education fosters success and intrinsic enjoyment from effortful problem solving), or the operation of a third factor (e.g., more intelligent individuals are more likely to attain higher levels of education and need for cognition).

The relationship between age and need for cognition in adults has been examined in nine studies, with the vast majority of the studies reporting a small association (e.g., meta-analysis $r_{ave} = -.17, p < .001$). In only one study was the association positive (Petty & Jarvis, 1996), and this may reflect the confounding in this study of age and education level. And in all but the two studies by Spotts (1994), the association between age and need for cognition was quite weak even though the range of ages exceeded 50 years in most studies and college students typically served as the "young" participants. Research with children, as well as studies of young, middle-aged, and elderly adult participants matched on education level, would help to complete this picture.

Finally, Tolentino et al. (1990) correlated the family income levels of 57 undergraduates with these students' need for cognition scores. Although Tolentino et al. (1990) reported that the correlation was not significant, it is unclear whether the need for cognition scores of college students and of the income-earning parent(s) are correlated.

In summary, the studies in this section indicate that need for cognition relates in a theoretically meaningful fashion to other personality and individual-differences variables and provide information about the location of need for cognition within the landscape of personality processes and individual differences. These studies, for instance, provide consistent support across various populations for the convergent and discriminant validity of the conceptualization of need for cognition as an index of the tendency to engage in and enjoy effortful cognitive work, demonstrate that need for cognition can be distinguished conceptually from cognitive ability, and reveal that need for cognition is related to agentic but not simple emotional personality processes and individual differences.

Need for Cognition and Engagement in Effortful Cognitive Endeavors

With the exception of the research in which need for cognition was related to intellectual measures (e.g., verbal intelligence and ACT) or scholastic performance (e.g., grade point average), the studies reviewed in the preceding section related scores on one verbal measure (the NCS) to scores on other verbal measures. In this and the following sections, we review studies that examined whether need for cognition predicts performances on cognitive tasks or other criterion behaviors. The studies in these sections are organized to address two key postulates regarding need for cognition: Individuals who differ in terms of their need for cognition also differ in terms of their tendency to engage in effortful cognitive activity when given a task or making sense of the world and in their tendency to enjoy (or are less stressed by) cognitively effortful problems, life circumstances, or tasks.

Evidence of Engagement in Effortful Information-Processing Activity

The hypothesis that individuals high in need for cognition are more likely to engage in effortful information-processing activity than individuals low in need for cognition has been examined in a variety of paradigms with a diverse set of measures and procedures. Relevant studies are summarized in Tables 3 and 4. Our review of these studies is organized around the differing procedures used to examine the link between need for cognition and effortful information processing.

Information recall. One of the most tested hypotheses is that individuals high in need for cognition should recall more of the information to which they are exposed than individuals low in need for cognition. This hypothesis stems from the fact that if people are thinking about and elaborating on information, then they should remember this information better than if they are not devoting much cognitive effort to processing it (Craik & Lockhart, 1972). In the first test of this hypothesis, Cacioppo et al. (1983) told college students who were high or low in their need for cognition that they would be reading an editorial prepared by a journalism student for possible broadcast and publication. The students then read a message contain-

(*text continues on page 229*)

Table 3
Cognitive Effort: Studies With Need for Cognition as a Factor

Dependent measure and study	Independent variable(s) and operationalization(s)	Study N	Statistic	p	Direction of effect	d_{within}	$d_{study\ average}$
			Assimilation and contrast				
NC × Positivity of Prime							
Martin, Seta, & Crelia (1990, Study 3; impressions of a target when given ambiguous information)		52	$F(1, 36) = 5.75$	<.05	HNC show contrast LNC show assimilation		0.799
			Attitudes: message factors				
NC × AQ[b]							
Axsom, Yates, & Chaiken (1987)[a]	Message: favoring probation over prison	108		*ns*			0.000
Baron, Logan, Lilly, Inman, & Brennan (1994)	Message: favoring flouridized water	199	$F(1, 192) = 1.16$	.280	LNC differentiate AQ less than HNC		0.155
Cacioppo, Petty, Kao, & Rodriguez (1986, Study 1)	Message: favoring tuition increase at one's university	185	$F(1, 178) = 6.63$	<.020	LNC differentiate AQ less than HNC		0.386
Cacioppo, Petty, & Morris (1983, Study 2)	Message: favoring tuition increase at one's university	74	$F(1, 70) = 3.54$	<.070	LNC differentiate AQ less than HNC		0.450
Haugtvedt, Petty, & Cacioppo (1992, Study 1)	Message: calculator advertisement	97	$F(1, 93) = 12.50$	<.001	LNC differentiate AQ less than HNC		0.733
Haugtvedt, Petty, & Cacioppo (1992, Study 2)	Message: typewriter advertisement	125	$F(1, 121) = 4.62$	<.030	LNC differentiate AQ less than HNC		0.391
Inman, McAlister, & Hoyer (1990)	Message: household products (e.g., toilet paper, bath soap) advertisements	155	$F(1, 152) = 7.13$	<.01	LNC differentiate AQ less than HNC		0.433
Petty, Schumann, Richman, & Strathman (1993, Study 1)	Message: favoring reform to the foster care system	137		*ns*			0.000
Priester & Petty (1995, Study 2)[a]	Message: favoring comprehensive exams at one's university	163	$F(1, 155) = 4.80$	<.050	LNC differentiate AQ less than HNC		0.352
Priester & Petty (1995, Study 3)[a]	Message: favoring environmental reform	84		*ns*			0.000
Smith & Petty (in press, Study 2)[a]	Message: favoring vitamin K	118	$F(1, 102) = 9.93$	<.010	LNC differentiate AQ less than HNC		0.624
			Attitudes: mood factors				
NC × Mood							
Petty, Schumann, Richman, & Strathman (1993, Study 1)		137		*ns*			0.000
Wegener, Petty, & Klein (1994, Study 1)		74		*ns*			0.000
Wegener, Petty, & Klein (1994, Study 2)[a]		118		*ns*			0.000

Table 3 (*continued*)

Dependent measure and study	Independent variable(s) and operationalization(s)	Study *N*	Statistic	*p*	Direction of effect	d_{within}	$d_{study\ average}$
			Attitudes: source factors				
NC × Source Factors[c]							
Haugtvedt, Petty, & Cacioppo (1992, Study 3)	Source: social attractiveness	100	$F(1, 96) = 5.56$	<.020	LNC differentiate cue more than HNC		0.481
Priester & Petty (1995, Study 1)	Source: perceived source honesty	105		*ns*			0.000
Priester & Petty (1995, Study 2)[a]	Source: perceived source honesty	163		*ns*			0.000
Priester & Petty (1995, Study 3)[a]	Source: perceived source honesty	84		*ns*			0.000
			Attitudes: higher order interactions of multiple factors				
NC × AQ × Message Factors							
Smith & Petty (in press, Study 2)	Message factor: match or mismatch between message framing and expected message framing	118	$F(1, 102) = 8.99$	<.010	HNC differentiate AQ regardless of expectedness of message frame, but LNC differentiate AQ only when message frame unexpected		0.594
NC × AQ × Source Factors[d]							
Priester & Petty (1995, Study 2)	Source: perceived source honesty	163	$F(1, 155) = 6.20$	<.050	HNC differentiate AQ regardless of source honesty, but LNC differentiate AQ for dishonest source only		0.400
Priester & Petty (1995, Study 3)	Source: perceived source honesty	84	$F(1, 76) = 4.79$	<.050	HNC differentiate AQ regardless of source honesty, but LNC differentiate AQ for dishonest source only		0.502
NC × Involvement × Context Factors[e]							
Axsom, Yates, & Chaiken (1987)	Context: consensus information	108	$F(1, 91) = 3.97$	<.050	Uninvolved LNC affected by cue, but HNC and involved LNC not affected		0.418
Meyers-Levy & Peracchio (1992, Study 2)	Context: camera angle	118	$F(2, 106) = 8.95$	<.003	Uninvolved LNC use cue most, involved LNC and uninvolved HNC use cue moderately, and involved HNC do not use cue at all		0.581
			Attitude change over time: moderation				
NC × Time to Think							
Leone & Ensley (1986)		66	$F(1, 62) = 5.24$	<.050	Given ample time to think: HNC > LNC		0.581

(*table continues*)

Table 3 (*continued*)

Dependent measure and study	Independent variable(s) and operationalization(s)	Study *N*	Statistic	*p*	Direction of effect	d_{within}	$d_{study\ average}$
			Attitude change over time: polarization				
NC × Time to Think							
Leone & Ensley (1986)		66	$F(1, 62) = 3.09$	<.090	Given ample time to think: LNC > HNC		−0.447
NC × Time							
Smith, Haugtvedt, & Petty (1994)		189	$F(1, 187) = 2.53$	.110	HNC and LNC attitudes similar at Time 1, but HNC attitudes more extreme than LNC attitudes in second measurement period		0.233
			Cognitive effort: performance on cognitive tasks				
NC main effects[f]							
Baugh & Mason (1986)	Task: anagrams	44	$r = .24$	<.100	HNC > LNC		0.494
Dornic, Ekehammar, & Laaksonen (1991) Math Task Performance	Task: math with noise	59	$r = .281$	<.050	HNC > LNC	0.586	0.726
	Task: math without noise	59	$r = .399$	<.005	HNC > LNC	0.870	
Furlong (1993)	Task: quality of argument generation	61	$r = .09$	*ns*	HNC > LNC		0.181
Leone & Dalton (1988)[a]	Task: course performance	87		*ns*			0.000
Sadowski & Gulgoz (1992a)	Task: course performance	47	$r = .28$	<.050	HNC > LNC		0.583
NC × Task Difficulty							
Leone & Dalton (1988)	Task: effortful and noneffortful course material	87	$F(1, 83) = 5.05$	<.050	HNC > LNC on effortful material, but no difference on noneffortful material		0.493
			Cognitive effort: self-report effort or thought on cognitive tasks				
NC main effects[g]							
Cacioppo & Petty (1982, Study 4)[a]	Task: number circling	97		*ns*			0.000
Cacioppo, Petty, Kao, & Rodriguez (1986, Study 1)	Task: persuasive messages	185	$F(1, 180) = 9.78$	<.010	HNC > LNC		0.466
Cacioppo, Petty, Kao, & Rodriguez (1986, Study 2)[a]	Task: 1984 presidential elections	108	$F(1, 106) = 12.80$	<.010	HNC > LNC		0.695
Cacioppo, Petty, & Morris (1983, Study 1)	Task: persuasive messages	114	$F(1, 110) = 9.61$	<.010	HNC > LNC		0.591
Dornic, Ekehammar, & Laaksonen (1991)	Task: math with noise	59	$r = -.197$	*ns*	LNC > HNC	−0.402	−0.463
	Task: math without noise	59	$r = -.254$	<.100	LNC > HNC	−0.525	
Haugtvedt & Petty (1992, Study 1)	Task: persuasive messages	46		*ns*			0.000
Lassiter, Briggs, & Bowman (1991)	Task: unitization	62		*ns*			0.000
Pieters & Verplanken (in press)	Task: Dutch elections	128	$\beta = .45$	<.001	HNC > LNC		0.568
Ratneshwar, Mick, & Reitinger (1990)	Task: judgments of products	81		*ns*			0.000

Table 3 (*continued*)

Dependent measure and study	Independent variable(s) and operationalization(s)	Study N	Statistic	p	Direction of effect	d_{within}	$d_{study\ average}$
			Cognitive effort: self-report effort or thought on cognitive tasks (cont'd)				
Sorrentino, Bobocel, Gitta, Olson, & Hewitt (1988, Study 1)[a]	Task: persuasive messages	114		*ns*			0.000
Thompson, Chaiken, & Hazlewood (1993)	Task: brainstorming	67		*ns*			0.000
Verplanken (1993)	Task: product evaluation	120	$F(1, 114) = 5.24$	<.030	HNC > LNC		0.429
NC × Personal Relevance							
Sorrentino, Bobocel, Gitta, Olson, & Hewitt (1988, Study 1)	Task: persuasive messages	114	$F(1, 108) = 3.99$	<.050	HNC report more effort under low relevance, but LNC report more effort under high relevance		0.384
NC × Time							
Cacioppo, Petty, Kao, & Rodriguez (1986, Study 2)	Task: 1984 presidential elections	108	$F(1, 95) = 4.62$	<.050	HNC think about election both at 8 weeks before election and just after election, but LNC report thought after the election only		0.423
			Cognitive responses: number of issue-relevant thoughts				
NC main effects[b]							
Bodenhausen (1988)	Task: evaluation of evidence	90		*ns*			0.000
Lassiter, Briggs, & Slaw (1991, Study 1: explanatory thoughts)	Task: impression formation	197	$t(195) = 2.67$	<.010	HNC > LNC		0.382
Lassiter, Briggs, & Slaw (1991, Study 2: explanatory thoughts)	Task: impression formation	148	$t(146) = 1.60$	<.050	HNC > LNC		0.265
Furlong (1993)							
Premises generated	Issue: economics	61	$r = .216$	*ns*	HNC > LNC	0.442	0.467
Lines of reasoning generated	Issue: economics	61	$r = .194$	*ns*	HNC > LNC	0.396	
Claims generated	Issue: economics	61	$r = .271$	<.050	HNC > LNC	0.563	
Manfredo & Bright (1991)	Issue: parks and camping	368		*ns*			0.000
Priester & Petty (1995, Study 1)[a]	Issue: senior comprehensive exams	105		*ns*			0.000
Smith, Haugtvedt, & Petty (1994)	Issue: recycling	189	$t(187) = 1.35$	<.090	HNC > LNC		0.197
Smith & Shaffer (1991)	Neutral mood control condition	27	$r = .07$	*ns*	HNC > LNC	0.140	0.631
	Fixed neutral mood condition	25	$r = .13$	*ns*	HNC > LNC	0.260	
	Positive mood control condition	24	$r = .64$	<.01	HNC > LNC	1.670	
	Fixed positive mood condition	24	$r = .31$	*ns*	HNC > LNC	0.652	
Verplanken (1993; task-irrelevant responses used as a covariate)	Task: product evaluation	120	$F(1, 111) = 5.33$	<.03	HNC > LNC		0.438

(*table continues*)

Table 3 (*continued*)

Dependent measure and study	Independent variable(s) and operationalization(s)	Study N	Statistic	p	Direction of effect	d_{within}	$d_{study\ average}$
			Cognitive responses: number of issue-relevant thoughts (cont'd)				
Verplanken, Hazenberg, & Palenewen (1992; total cognitive responses used as a covariate)	Task: product evaluation	53	$F(1, 50) = 4.43$	<.04	HNC > LNC		0.595
			Cognitive response: proportion of issue-relevant thoughts				
NC main effects							
Axsom, Yates, & Chaiken (1987)[a]	Issue: probation vs. prison	108		*ns*			0.000
NC × Involvement							
Axsom, Yates, & Chaiken (1987)[a]	Issue: probation vs. prison	108	$F(1, 92) = 4.11$	<.05	LNC cognitive responses affected by involvement, but HNC responses not affected by involvement		0.423
NC × AQ							
Axsom, Yates, & Chaiken (1987)[a]	Issue: probation vs. prison	108		*ns*			0.000
NC × Context							
Axsom, Yates, & Chaiken (1987)[a]	Context: consensus information	108		*ns*			0.000
NC × AQ × Involvement							
Axsom, Yates, & Chaiken (1987)	Issue: probation vs. prison	108	$F(1, 92) = 5.12$	<.03	LNC: more thought under high than low involvement regardless of AQ HNC: more thought to strong arguments under low involvement and more thought to weak arguments under high involvement		0.472
			Cognitive response: number of peripherally relevant thoughts				
NC main effects							
Haugtvedt & Petty (1992, Study 1)	Cue: number of arguments presented	46	$\chi^2(1) = 8.31$	<.010	LNC > HNC		−0.939
			Cognitive response: proportion of peripherally relevant thoughts				
NC × Involvement: interaction contrast							
Axsom, Yates, & Chaiken (1987)	Cue: consensus information	108	$t(104) = 1.97$	<.060	LNC low involvement generate a higher proportion of cue-relevant thoughts than LNC high involvement or HNC		0.360
			Cognitive response: total number of thoughts				
NC main effects							
Verplanken, Hazenberg, & Palenewen (1992)	Task: product evaluation	53		*ns*			0.000

Table 3 (*continued*)

Dependent measure and study	Independent variable(s) and operationalization(s)	Study *N*	Statistic	*p*	Direction of effect	d_{within}	$d_{study\ average}$
			Cognitive response: valence of thoughts				
Negative thoughts: NC main effects[i]							
Cacioppo, Petty, Kao, & Rodriguez (1986, Study 1)[a]	Issue: raising tuition	185		*ns*			0.000
Furlong (1993)	Issue: federal budget	61	$r = .255$	<.050	HNC > LNC		0.527
Haugtvedt & Petty (1992, Study 1)	Message: telephone answering machine	46		*ns*			0.000
Haugtvedt & Petty (1992, Study 2)	Message 1: antifood additive	51		*ns*		0.000	0.498
	Message 2: profood additive	51	$F(1, 49) = 12.90$	<.001	HNC > LNC	1.030	
Haugtvedt, Petty, & Cacioppo (1992, Study 1)[a]	Message: calculator	97	$F(1, 93) = 12.73$	<.001	HNC > LNC		0.740
Priester & Petty (1995, Study 1)	Issue: senior comprehensive exams	105		*ns*			0.000
Negative thought–message factors: NC × AQ[j]							
Cacioppo, Petty, Kao, & Rodriguez (1986, Study 1)		185	$F(1, 178) = 6.01$	<.020	LNC less affected by AQ than HNC		0.367
Haugtvedt, Petty, & Cacioppo (1992, Study 1)		97	$F(1, 93) = 3.77$	<.060	LNC less affected by AQ than HNC		0.403
Positive thoughts: NC main effects[k]							
Cacioppo, Petty, Kao, & Rodriguez (1986, Study 1)[a]		185		*ns*			0.000
Haugtvedt, Petty, & Cacioppo (1992, Study 1)[a]		97		*ns*			0.000
Haugtvedt & Petty (1992, Study 1)		46	$F(1, 44) = 15.14$	<.001	HNC > LNC		1.170
Petty, Schumann, Richman, & Strathman (1993, Study 1; percentage of positive thoughts)[a]	Issue: state foster care	137		*ns*			0.000
Priester & Petty (1995, Study 1)		105		*ns*			0.000
Smith & Petty (in press, Study 2)[a]	Issue: vitamin K	118		*ns*			0.000
Positive thoughts–message factors: NC × AQ[l]							
Cacioppo, Petty, Kao, & Rodriguez (1986, Study 1)		185	$F(1, 178) = 2.70$	.100	LNC less affected by AQ than HNC		0.246
Haugtvedt, Petty, & Cacioppo (1992, Study 1)		97		*ns*			0.000
Petty, Schumann, Richman, & Strathman (1993, Study 1; percentage of positive thoughts)		137		*ns*			0.000

(*table continues*)

Table 3 (*continued*)

Dependent measure and study	Independent variable(s) and operationalization(s)	Study N	Statistic	p	Direction of effect	d_{within}	$d_{study\ average}$
			Cognitive response: valence of thoughts (cont'd)				
Smith & Petty (in press, Study 2; positive minus negative thoughts)		118	$F(1, 102) = 11.54$	<.010	LNC less affected by AQ than HNC		0.673
			Correspondence bias: extremity of impressions				
NC main effects[m]							
D'Agostino & Fincher-Kiefer (1992, Study 1)		48	$F(1, 44) = 8.74$	<.050	LNC > HNC		−0.891
D'Agostino & Fincher-Kiefer (1992, Study 2)		79	$F(1, 75) = 4.62$	<.050	LNC > HNC		−0.496
			Difficulty of cognitive tasks: self-report				
NC main effects[n]							
Baugh & Mason (1986)	Task: anagram task	30	$\chi^2 = 5.74$	<.050	LNC > HNC		−0.973
Dornic, Ekehammar, & Laaksonen (1991)	Task: math task with noise	59	$r = -.238$	<.100	LNC > HNC	−0.490	−0.583
	Task: math task without noise	59	$r = -.321$	<.050	LNC > HNC	−0.678	
Verplanken (1993)	Task: product evaluation	120	$F(1, 114) = 3.10$	<.090	HNC > LNC		0.330
			Knowledge tests: belief listing				
NC main effects[o]							
Ahlering (1987)	Test: listing consequences of electing 1984 presidential candidates	45	$t(43) = 2.14$	<.020	HNC > LNC		0.653
Cacioppo, Petty, Kao, & Rodriguez (1986, Study 2)	Test: information about 1984 presidential candidates	61	$F(1, 59) = 4.52$	<.050	HNC > LNC		0.553
Condra (1992)	Test: reasons for supporting 1988 presidential candidates	86	$F(1, 84) = 4.42$	<.010	HNC > LNC		0.459
			Knowledge tests: knowledge				
NC main effects[p]							
Martin, Ward, Achee, & Wyer (1993, Study 2)	Test: generate list of birds	68	$F(1, 57) = 9.55$	<.003	HNC > LNC		0.819
Wolfe & Grosch (1990)	Test: true–false trivia questions	162	$r = .33$	<.050	HNC > LNC		0.699
			Knowledge tests: recall				
NC main effects[q]							
Axsom, Yates, & Chaiken (1987), argument recall		108		*ns*			0.000
Bodenhausen (1988), evidence recall		90		*ns*			0.000

Table 3 (*continued*)

Dependent measure and study	Independent variable(s) and operationalization(s)	Study N	Statistic	p	Direction of effect	d_{within}	$d_{study\ average}$
			Knowledge tests: recall (cont'd)				
Bodenhausen & Lichtenstein (1987), evidence recall		104		*ns*			0.000
Boehm (1994), source recall		57		*ns*			0.000
Cacioppo, Petty, Kao, & Rodriguez (1986, Study 1), argument recall		185	$F(1, 180) = 13.99$	<.001	HNC > LNC		0.557
Cacioppo, Petty, & Morris (1983, Study 1), argument recall		114	$F(1, 110) = 13.62$	<.01	HNC > LNC		0.704
Haugtvedt & Petty (1992, Study 1), argument recall		46		*ns*			0.000
Haugtvedt & Petty (1992, Study 2), argument recall	Message 1: antifood additive	51	$F(1, 49) = 15.60$	<.001	HNC > LNC	1.130	0.853
	Message 2: profood additive	51	$F(1, 49) = 4.28$	<.050	HNC > LNC	0.591	
Haugtvedt, Petty, & Cacioppo (1992, Study 1), argument recall		97		*ns*			0.000
Heslin & Johnson (1992), brand recall		78		*ns*			0.000
Kassin, Reddy, & Tulloch (1990), evidence recall		41	$F(1, 37) = 3.04$	<.100	HNC > LNC		0.573
Lassiter, Briggs, & Bowman (1991), recall of information on video		62	$t(60) = 3.13$	<.010	HNC > LNC		0.808
Lassiter, Briggs, & Slaw (1991, Study 2), memory of target[a]		213	$F(1, 211) = 7.98$	<.010	HNC > LNC		0.389
Martin, Seta, & Crelia (1990, Study 3), memory of target		52		*ns*			0.000
Meuller & Grove (1991), memory of traits		98		*ns*			0.000
Meuller, Haupt, & Grove (1988)							
Memory of adjectives when judged as self-relevant		71	$r = .17$	*ns*	HNC > LNC	0.345	0.234
Memory of adjectives when judged as other relevant		71	$r = .25$	<.050	HNC > LNC	0.516	
Memory of nouns when judged as self-relevant		71	$r = .05$	*ns*	HNC > LNC	0.100	
Memory of nouns when judged as other relevant		71	$r = -.01$	*ns*	LNC > HNC	−0.020	

(*table continues*)

Table 3 (*continued*)

Dependent measure and study	Independent variable(s) and operationalization(s)	Study N	Statistic	p	Direction of effect	d_{within}	$d_{study\ average}$
			Knowledge tests: recall (cont'd)				
Meuller & Johnson (1990)							
Recall of trait words when elderly make self-judgments only		20	$r = .49$	<.050	HNC > LNC	1.124	0.925
Recall of trait words when elderly make both self-judgments and other judgments		20	$r = .45$	<.050	HNC > LNC	1.008	
Recall of trait words when college students make self-judgments only		20	$r = .52$	<.050	HNC > LNC	1.218	
Recall of trait words when college students make both self-judgments and other judgments		20	$r = .19$	*ns*	HNC > LNC	0.387	
Meuller, Keller, & Dandoy (1989), face memory		90		*ns*			0.000
Meyers-Levy & Peracchio (1992), product recall[a]		118	$F(1, 106) = 45.97$	<.001	HNC > LNC		1.310
Peltier & Schibrowsky (1994)							
Argument recall		130	$\beta = .004$, $t(128) = 2.052$	<.050	HNC > LNC	0.362	0.284
Brand recall		130	$\beta = .004$, $t(128) = 1.96$	.050	HNC > LNC	0.346	
Product recall		130	$\beta = .004$, $t(128) = 0.844$	.399	HNC > LNC	0.149	
Source recall		130	$\beta = .006$, $t(128) = 1.594$	.111	HNC > LNC	0.282	
Petty, Schumann, Richman, & Strathman (1993, Study 1), message recall		137		*ns*			0.000
Ratneshwar, Mick, & Reitinger (1990), product recall		81		*ns*			0.000
Srull, Lichtenstein, & Rothbart (1985, Study 2), memory of target's behavior		100	$F(1, 98) = 68.73$	<.001	HNC > LNC		1.670
			Recall: higher order interactions of multiple factors				
NC × Inconsistency of Target Information Lassiter, Briggs, & Slaw (1991, Study 2)		213	$F(1, 211) = 4.00$	<.050	HNC remember more information, especially when it is inconsistent with expectancies about target		0.275

Table 3 (*continued*)

Dependent measure and study	Independent variable(s) and operationalization(s)	Study *N*	Statistic	*p*	Direction of effect	d_{within}	$d_{study\ average}$
Recall: higher order interactions of multiple factors (cont'd)							
NC × Inconsistency of Target Information: within-cell correlations between NC and recall by amount of incongruity							
Srull, Lichtenstein, & Rothbart (1985, Study 2), memory of target's behavior	Incongruous information	100	$r = .73$	<.001	HNC > LNC	2.140	
	Congruous information	100	$r = .48$	<.001	HNC > LNC	1.090	
	Irrelevant information	100	$r = .05$	*ns*	HNC > LNC	0.100	
NC × Involvement							
Meyers-Levy & Peracchio (1992; product recall)		118	$F(1, 106) = 8.43$	<.004	Recall greatest for HNC–high involvement and lowest for LNC–low involvement, HNC–low involvement and LNC–high involvement recall scores fell between these two extremes		0.564
Knowledge tests: self-report knowledge							
NC main effects[f]							
Cacioppo & Petty (1984)	Topic: current events	527	$r_{avg} = .23$	<.050	HNC > LNC		0.473
Cacioppo, Petty, Kao, & Rodriguez (1986, Study 2)	Topic: Mondale–Ferraro	108	$F(1, 106) = 12.27$	<.010	HNC > LNC	0.680	0.729
	Topic: Reagan–Bush	108	$F(1, 106) = 16.07$	<.010	HNC > LNC	0.779	
Manfredo & Bright (1991)	Topic: camping and parks	368		*ns*			0.000
Message evaluation and perceived argument quality: self-report							
NC × AQ[g]							
Baron, Logan, Lilly, Inman, & Brennan (1994)		199	$F(1, 192) = 12.00$	<.001	HNC differentiate AQ more than LNC		0.500
Cacioppo, Petty, Kao, & Rodriguez (1986, Study 1)		185	$F(1, 178) = 4.59$	<.050	HNC differentiate AQ more than LNC		0.321
Cacioppo, Petty, & Morris (1983, Study 1)		114	$F(1, 110) = 22.45$	<.001	HNC differentiate AQ more than LNC		0.904
Cacioppo, Petty, & Morris (1983, Study 2)		74	$F(1, 70) = 8.70$	<.050	HNC differentiate AQ more than LNC		0.705
Smith & Petty (in press, Study 2)		118	$F(1, 102) = 6.49$	<.050	HNC differentiate AQ more than LNC		0.504

(*table continues*)

Table 3 (*continued*)

Dependent measure and study	Independent variable(s) and operationalization(s)	Study *N*	Statistic	*p*	Direction of effect	d_{within}	$d_{study\ average}$
			Order effects: primacy				
NC main effects[t]							
Ahlering & Parker (1989), primacy score of impression		36	$F(1, 34) = 5.58$	<.025	LNC > HNC		−0.810
Kassin, Reddy, & Tulloch (1990), perceptions of defendant's guilt as a function of first or second argument		41	$F(1, 37) = 8.96$	<.005	HNC > LNC		0.984
			Persistence of attitudes				
Linear trend over time							
Verplanken (1991)	HNC: persistence of attitude over 14 months (3 measurement periods)	72	$F(1, 69) = 3.98$	<.050	Increase in attitudes after a persuasive message persisted for HNC but not for LNC	0.480	
	LNC: persistence of attitudes over 14 months (3 measurement periods)	58	$F(1, 55) = 0.02$	>.800		0.036	
NC × Time							
Haugtvedt & Petty (1992, Study 1)		64	$F(1, 44) = 6.34$	<.015	Increase in attitudes after a persuasive message persisted for HNC but not for LNC		0.759
			Resistance of attitudes				
NC × Time							
Haugtvedt & Petty (1992, Study 2)		51	$F(1, 49) = 19.38$	<.001	No NC difference to first message, but a challenge to message persuaded LNC but not HNC		1.260
			Unitization				
NC main effects							
Lassiter, Briggs, & Bowman (1991)	Number of meaningful behaviors in a video	62	$t(60) = 2.75$	.010	HNC > LNC		0.710

Note. Study *N*s reflect the sample size of the study minus any participants reported as deleted from the experimenter's analysis for purposes of experimental validity (e.g., contingency awareness or inability to understand experimental directions). However, cases in which participants were deleted from a particular analysis but were not explicitly reported in the method or results section (e.g., missing data on a particular dependent measure) are not reflected in this value. For cases in which a given sample provided more than one index of a particular dependent variable, the within-study effect sizes were averaged to a single between-studies effect size and were included once in the meta-analysis. In cases in which there were three or more studies in a particular dependent measure, chi-square tests of homogeneity are reported. Effect sizes for nonsignificant results in which statistics were not reported were calculated by using $p = .5$, and effect sizes for significant results in which statistics were not reported were calculated by using the reported probability level or maximum probability level. All meta-analysis *p* levels reflect one-tailed significance tests. AQ = argument quality; NC = need for cognition; HNC = individuals high in need for cognition; LNC = individuals low in need for cognition.

[a] Qualified by a higher order interaction. [b] $d_{avg} = .312, p < .0000001; \chi^2(10) = 16.80, p = .07$. [c] $d_{avg} = .106, p = .161; \chi^2(3) = 4.29, p = .231$. [d] $d_{avg} = -.435, p = .0008$. [e] $d_{avg} = .503, p = .0002$. [f] $d_{avg} = .342, p = .005; \chi^2(4) = 5.56, p = .23$. [g] $d_{avg} = .272, p = .0000002; \chi^2(11) = 27.75, p < .004$. [h] $d_{avg} = .205, p = .002; \chi^2(9) = 12.72, p = .176$. [i] $d_{avg} = .234, p = .015; \chi^2(5) = 12.12, p = .03$. [j] $d_{avg} = .380, p < .02$. [k] $d_{avg} = .070, p = .29; \chi^2(5) = 12.50, p = .03$. [l] $d_{avg} = .230, p = .006; \chi^2(3) = 8.35, p = .04$. [m] $d_{avg} = -.643, p = .0006$. [n] $d_{avg} = -.109, p = .531; \chi^2(2) = 12.38, p = .0003$. [o] $d_{avg} = -.534, p = .0003; \chi^2(2) = .252, p = .88$. [p] $d_{avg} = -.734, p = .0000002$. [q] $d_{avg} = .355, p < .0000001; \chi^2(18) = 100.90, p < .000001$. [r] $d_{avg} = .324, p = .0000005; \chi^2(2) = 16.30, p = .00003$. [s] $d_{avg} = .539, p < .0000001; \chi^2(4) = 5.87, p = .21$. [t] $d_{avg} = .136, p = .27$.

ing either six strong or six weak arguments favoring the recommendation that seniors should be required to pass a comprehensive exam in their major as a requirement for graduation.[4] After message exposure, the students completed a number of measures and were given 5 min to list each of the message arguments presented. Two judges ($r = .74$), unaware of condition, scored the number of arguments recalled correctly, and the average score given by the judges was analyzed. Regardless of the quality of the arguments in the message, students high in need for cognition recalled about two thirds of them, whereas students low in need for cognition recalled about half of them, a difference that was highly significant (see Table 3).

Since Cacioppo et al.'s (1983) study, 22 additional tests of this hypothesis have been reported. As noted in Table 3, individuals high and low need for cognition have been compared in their ability to recall not only written persuasive arguments, as in the Cacioppo et al. (1983) study, but also the source of a communication (e.g., Boehm, 1994), events depicted in a video (Lassiter, Briggs, & Bowman, 1991), evidence from a trial (e.g., Kassin, Reddy, & Tulloch, 1990), faces presented on slides (Mueller, Keller, & Dandoy, 1989), the names of products (e.g., Meyers-Levy & Peracchio, 1992) and brands (e.g., Heslin & Johnson, 1992) featured in advertisements, trait information about themselves (Mueller & Johnson, 1990), and behaviors ascribed to hypothetical target individuals (e.g., Srull, Lichtenstein, & Rothbart, 1985). A meta-analytic comparison of the overall difference in recall between participants high and low in need for cognition across all of these studies demonstrated that, in general, individuals high in need for cognition recall more of the information to which they are exposed than individuals low in need for cognition ($d = .355$, $p < .001$; see Table 3).[5]

Exceptions to the general finding that individuals high in need for cognition recall more information than those low in need for cognition might be anticipated when the information presented is sufficiently simple to remember that even individuals low in need for cognition have little difficulty in recalling it or sufficiently complex that even individuals high in need for cognition do not have the ability to encode or retrieve it. Also, situational factors can moderate cognitive motivation such that the motivation to think is so low that neither individuals low nor individuals high in need for cognition think about the material or is so high that both individuals low and high in need for cognition think extensively about the material. For instance, no differences in recall have been found when the material is irrelevant to the task at hand (Srull et al., 1985). Conversely, two studies demonstrated that the difference in recall between individuals high versus low in need for cognition is especially pronounced when material is task relevant and inconsistent with expectations (Lassiter, Briggs, & Slaw, 1991; Srull et al., 1985). Thus, it appears that individuals high, in contrast to low, in need for cognition are particularly likely to engage in the difficult cognitive work needed to resolve inconsistencies in the information to which they are exposed.

Responsiveness to argument quality. In addition to examining the sheer amount of information that individuals high and low in need for cognition can recall, researchers have investigated the extent to which people high and low in need for cognition are differentially attentive to the quality of the information to which they are exposed. For example, if people are thinking about and elaborating the arguments in a persuasive message, their attitudes after message exposure should be more influenced by the quality of the arguments that the message contains than if thinking about the message content is cursory or diminished (Petty, Wells, & Brock, 1976). In the first test of the hypothesis that individuals high and low in need for cognition would be differentially influenced by the quality of the arguments in a persuasive appeal, Cacioppo et al. (1983, Study 2) told undergraduates high and low in need for cognition that their university office of student and academic affairs had prepared some policy statements for possible broadcast and publication in the local media. The students then read a message containing either four strong or four weak arguments favoring a recommendation that tuition at their university be increased (see Footnote 4). After message exposure, the students completed a number of measures, including scales assessing their own attitudes toward the proposal (e.g., good–bad). A marginal Argument Quality × Need for Cognition interaction ($p < .07$) emerged on the attitude measure and revealed that students high in need for cognition were more influenced by the quality of the arguments in the message than were students low in need for cognition.

To date, 11 tests of the Need for Cognition × Argument Quality interaction have been reported. When the results from all tests are combined by means of meta-analytic procedures, the interaction is highly reliable ($d = .312$, $p < .001$). That is, the attitudes of individuals high in need for cognition are more influenced by the quality of the issue-relevant arguments in a persuasive message than are the attitudes of individuals low in need for cognition. In 5 of these tests (see Table 3), the participants high and low in need for cognition were also asked to directly evaluate the quality of the message. Across these tests, ratings of message quality made by individuals high in need for cognition were more influenced by the manipulated quality of the persuasive message than were ratings of individuals low in need for cognition ($d = .539$, $p < .001$).

In sum, research manipulating the quality of the arguments in a persuasive message strongly indicates that individuals high in need for cognition are more likely to exert the cognitive effort

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[4] The arguments were pretested to ensure that the strong message elicited primarily favorable thoughts and the weak version elicited primarily unfavorable thoughts from both individuals high in need for cognition and individuals low in need for cognition when they were instructed to think about them (see Petty & Cacioppo, 1986, for a discussion of the argument quality manipulation). In addition, an initial session was conducted to assess need for cognition and to match individuals high versus low in need for cognition in terms of their initial attitudes toward the recommendation.

[5] This meta-analysis collapsed across several different kinds of recall. Given the heterogeneity statistic, separate analyses were also conducted within any category of recall that contained at least three independent tests. Results confirmed that individuals high in need for cognition exhibited greater recall than individuals low in need for cognition across most tasks and measures: recall of target's behavior, $d = .676$, $p < .001$ (four studies); message argument recall, $d = .312$, $p < .001$ (eight studies); recall of traits, $d = .255$, $p < .08$ (three studies); recall of product mentioned in an ad, $d = .409$, $p < .001$ (four studies); and recall of evidence, $d = .100$, $p < .31$ (three studies).

necessary to process the substantive merits of the information to which they are exposed than are individuals low in need for cognition. Individuals who are low in need for cognition may need a special incentive to engage in careful message scrutiny. For example, in one study, individuals high and low in need for cognition were exposed to a message from a trustworthy or an untrustworthy source who presented strong or weak arguments in favor of his position (Priester & Petty, 1995). The attitudes of individuals high in need for cognition were influenced by argument quality regardless of source trustworthiness, but individuals low in need for cognition scrutinized the message only when the source was not trustworthy. In another study (Smith & Petty, in press), individuals high and low in need for cognition were presented with strong or weak arguments of either the type they expected (e.g., positively framed arguments when they expected them to be positively framed) or a type that was unexpected (e.g., positively framed arguments when they expected them to be negatively framed). The attitudes of individuals high in need for cognition were influenced by argument quality regardless of the confirmation or disconfirmation of expectations. However, the attitudes of individuals low in need for cognition were influenced by argument quality only when the type of argument they received was unexpected. Consistent with the view that people low in need for cognition act as cognitive misers, these individuals tend to think about persuasive message content spontaneously mostly when there are special incentives to do so (e.g., when the message is surprising or they suspect that the source might not be telling the truth).

Responsiveness to peripheral cues. If the attitudes of individuals low in need for cognition tend not to be influenced by effortful consideration of the arguments in a persuasive message, then what determines their attitudes? According to the elaboration likelihood model of persuasion (Petty & Cacioppo, 1981, 1986) and the heuristic–systematic model (Chaiken, Liberman, & Eagly, 1989; Eagly & Chaiken, 1993), if a person is relatively unmotivated or unable to think carefully about the substantive information in a persuasive message, he or she should be more influenced by simple cues in the persuasion setting, such as how expert or attractive the message source is (Petty, Cacioppo, & Goldman, 1981) or the mere number of arguments the message contains (Petty & Cacioppo, 1984), than if motivation and ability to think are high. Research has supported the view that individuals low in need for cognition are more influenced by such simple cues than are individuals high in need for cognition. For example, Chaiken, Axsom, Hicks, Yates, and Wilson (1985, cited in Chaiken, 1987) exposed participants high and low in need for cognition to a message that actually contained six distinct persuasive arguments, but the speaker began the message by stating that he would present either 10 or 2 reasons. A significant Need for Cognition × Number of Argument Cues interaction revealed that participants low but not high in need for cognition agreed more with the message when the speaker simply claimed to have more reasons in support of his advocacy (see also Haugtvedt, Petty, & Cacioppo, 1992).

It is worth reiterating that although individuals low in need for cognition tend to avoid processing message arguments and rely instead on simple cues in the persuasion environment, even these individuals can be motivated to think and avoid cues under some circumstances. For example, to provide a situational motivator of thought, Axsom, Yates, and Chaiken (1987) varied the personal relevance of the communication (Petty & Cacioppo, 1979) to which participants high and low in need for cognition were exposed. In addition, they manipulated whether the message suggested that the position was popular (many people applauded the speaker) or not (few people applauded the speaker). When the message was low in personal relevance, the attitudes of participants low but not high in need for cognition were influenced by the consensus cue. When the message was high in personal relevance, however, neither participants high in need for cognition nor those low in need for cognition were influenced by this cue (see also Meyers-Levy & Peracchio, 1992).[6]

According to the elaboration likelihood model, a Need for Cognition × Cue interaction is most likely when the variable serving as a cue under low elaboration conditions cannot serve in an alternative role when the elaboration likelihood is moderate or high (Petty & Cacioppo, 1986). For example, an individual's happy or sad mood or the high or low credibility of the message source can serve as a simple cue when the likelihood of thinking is quite low, modifying attitudes by relatively nonthoughtful conditioning or heuristic processes. On the other hand, when the likelihood of thinking is moderate to high, mood and source credibility can influence attitudes by modifying the extent or nature of the information-processing activity that takes place (see Chaiken & Maheswaran, 1994; Petty, Cacioppo, & Kasmer, 1988; Petty, Gleicher, & Baker, 1991). If variables such as mood and source credibility influence the attitudes of both individuals high in need for cognition and individuals low in need for cognition, but for different reasons, no interaction between the variable and need for cognition would be obtained. Instead, as we review in more detail later, a main effect for a variable on attitudes could be observed if the variable produces an effect on attitudes unmediated by thoughts under low elaboration conditions but produces an effect on attitudes that is mediated by thoughts under high elaboration conditions (e.g., Petty, Schumann, Richman, & Strathman, 1993). Because some variables serving as cues under low elaboration conditions can influence attitudes by other means as the elaboration likelihood is increased, it is not surprising that although the interaction of need for cognition with argument quality is robust, the interactions of need for cognition with factors such as source expertise and mood have not been reliable on an overall basis.

Number of thoughts generated. In addition to examining the extent to which individuals low and high in need for cognition are influenced by message arguments versus simple cues, some investigators have examined the hypothesis that individuals high in need for cognition would generate more task-relevant thoughts than those low in need for cognition. In a typical study, participants are exposed to some cognitive task (e.g., forming an impression of a target individual or processing a persuasive message), and, after exposure, they are asked to list the thoughts

[6] Additional support for this hypothesis has been found in research that has measured the cue-relevant (i.e., peripherally relevant) thoughts generated by individuals high and low in need for cognition (Axsom et al., 1987; Haugtvedt & Petty, 1992; see Table 3).

they had during exposure. These thoughts are then coded into various categories (e.g., message relevant vs. source relevant and favorable vs. unfavorable vs. neutral toward the advocacy) and analyzed (see Cacioppo & Petty, 1981, for a discussion of the thought-listing procedure).

Several tests have been reported of the hypothesis that individuals high in need for cognition are more likely to generate issue- or task-relevant thoughts than individuals low in need for cognition. The methods of examining this hypothesis have varied, however. First, some researchers have examined the raw numbers of task-relevant and task-irrelevant thoughts generated. For example, in an impression formation study in which inconsistent information was given about a target person, individuals high in need for cognition were found to generate more thoughts explaining the inconsistencies in the information than individuals low in need for cognition (Lassiter, Briggs, & Slaw, 1991, Studies 1 and 2). There were no differences in nonexplanatory thoughts. In a second procedure, irrelevant thoughts are controlled by using them as a covariate in the analysis of task-relevant thoughts. For example, in one study, individuals high in need for cognition reported significantly more task-relevant thoughts after working on an information-acquisition task than did individuals low in need for cognition when task-irrelevant thoughts were used as covariates (Verplanken, 1993).[7] Across the 10 tests of the task-relevant thoughts hypothesis, the pattern has been that individuals high in need for cognition tend to generate a greater number of task-relevant thoughts than individuals low in need for cognition ($d = .205$, $p < .002$). In some studies, investigators have controlled for task-irrelevant thoughts by analyzing the proportion of task-relevant thoughts generated. For example, Axsom et al. (1987) found that participants high in need for cognition generated a greater proportion of message-relevant thoughts than those low in need for cognition when the topic of the communication was manipulated to be low in personal relevance. When the message was of high relevance, providing a situational motivation to think (Petty & Cacioppo, 1979), participants high and low in need for cognition generated similarly high proportions of message-relevant thoughts.[8] Not all studies have found individuals high and low in need for cognition to differ in the number or proportion of task-relevant thoughts generated, however (e.g., Bodenhausen, 1988; Priester & Petty, 1995). Petty and Cacioppo (1986) argued that the enhanced thinking of individuals high versus low in need for cognition might manifest itself not in differences in the total number of relevant thoughts listed but, rather, in thoughts that better reflect the quality of the information presented. For example, college students low in need for cognition might list three positive and four negative thoughts in response to a message on raising tuition regardless of the quality of the arguments used. These thoughts might reflect their initial unfavorable attitudes on the issue rather than the information presented in the message. On the other hand, individuals high in need for cognition, who are carefully scrutinizing the information presented, might list five positive and two negative thoughts if the arguments in the message are very compelling but two positive and five negative thoughts if the arguments are very specious. Note that all individuals list seven relevant thoughts to the messages, but the profile of thoughts of individuals high in need for cognition is more responsive to the merits and implications of the information presented.

A few studies have examined the profile of thoughts hypothesis and have been supportive. Specifically, two studies (Cacioppo et al., 1986, Study 1; Haugtvedt et al., 1992, Study 1) found that the Need for Cognition × Argument Quality interaction was significant on the number of negative thoughts generated ($d = .38$, $p < .05$). These two studies also provided a test of the Need for Cognition × Argument Quality interaction on the number of positive thoughts generated, and two additional studies (Petty et al., 1993, and Smith & Petty, in press) examined this interaction on the proportion of positive thoughts generated. Across the four studies of thought positivity, the interaction of need for cognition with argument quality proved significant ($d = .23$, $p < .006$). In sum, the profile of thoughts generated by individuals high in need for cognition is more likely to reflect the quality of the arguments in a message than is the profile of thoughts generated by individuals low in need for cognition.

It is interesting to note that, across several studies using different message topics, individuals high in need for cognition tended to generate more negative thoughts than individuals low in need for cognition ($d = .23$, $p < .02$), but there was no such overall difference in the number of positive thoughts generated ($d = .07$, $p = .29$). We do not believe that this indicates that individuals high in need for cognition are dispositionally more negative or pessimistic, however. Inspection of Table 1, for instance, indicates that individuals high in need for cognition are slightly but significantly lower in negativity (neuroticism) than individuals low in need for cognition. Instead, the finding that individuals high in need for cognition tend to generate more negative (but not positive) thoughts overall than individuals low in need for cognition may reflect the more discerning, knowledgeable, and agentic qualities of the former individuals and the fact that the persuasion literature tends to use counterattitudinal appeals. Individuals high in need for cognition may appear skeptical when confronted with a counterattitudinal appeal because they are more likely to be motivated and able to defend their positions. This skepticism is tempered, of course, when strong arguments are presented (cf. Cacioppo et al., 1983). On the other hand, individuals high in need for cognition might adopt a less skeptical stance toward proattitudinal appeals, again by virtue of their superior motivation and ability to defend their views. Thus, if the persuasion literature had used mostly proattitudinal messages, individuals high in need for cognition might have appeared more favorable overall than individuals low in need for cognition.

Correlation of thoughts with judgments. Another procedure that has been used to address the hypothesis that individuals high in need for cognition make more thoughtful judgments

[7] In a very similar procedure, individuals high in need for cognition generated more task-relevant thoughts than individuals low in need for cognition when total thoughts were used as the covariate (Verplanken et al., 1992).

[8] In studies reporting only the proportion of task-relevant thoughts generated, it is not possible to determine if the absolute number of task-relevant thoughts was affected. The same holds for studies analyzing task-relevant thoughts with task-irrelevant thoughts as a covariate.

than individuals low in need for cognition is examination of the extent to which specific beliefs and thoughts are correlated with judgments. Studies using this approach are summarized in Table 4. The more thoughtful a person's judgments, the more these judgments should be predictable from the person's thoughts and beliefs. Thus, if individuals high in need for cognition scrutinize and elaborate material more, their judgments should be more highly correlated with their thoughts and beliefs than those of individuals low in need for cognition. Consistent with this hypothesis, Verplanken (1989) found that attitudes toward the use of coal as a source of electricity were more highly correlated with perceptions of the costs and benefits of using coal for individuals high than low in need for cognition. Pieters, Petty, and Haugtvedt (1985; cited in Petty & Jarvis, 1996) found a similar effect regarding attitudes toward an energy conservation proposal.

If people evaluate a persuasive message by thinking, then their attitudes toward the advocacy should be more highly correlated with their valenced thoughts about the message than if evaluations are relatively unthoughtful (Brock, 1967; Greenwald, 1968). Several studies have examined the hypothesis that the valenced postmessage thoughts of individuals high in need for cognition should be more predictive of their evaluative judgments (attitudes) than the valenced thoughts of individuals low in need for cognition. For example, Haugtvedt et al. (1992, Study 1) exposed participants high and low in need for cognition to advertisements for a new consumer product that contained either strong or weak reasons to purchase the product. After exposure to one of the ads, participants reported their attitudes toward the product and listed their thoughts. Collapsing across the argument quality manipulation, the results revealed that for individuals high in need for cognition, attitudes were correlated with both the number of favorable thoughts listed ($r = .39, p < .01$) and the number of unfavorable thoughts listed ($r = -.58, p < .01$). For individuals low in need for cognition, however, attitudes were predicted by neither favorable ($r = .11$, *ns*) nor unfavorable ($r = -.22$, *ns*) thoughts. The six studies that also tested the correlation between valenced thoughts and attitudes for individuals high and low in need for cognition were examined; the results revealed that, overall, valenced thoughts are better predictors of attitudes for individuals high than low in need for cognition ($Z = 2.35, p < .01$).

In addition, across three studies, explicit ratings of message quality were more predictive of attitudes for individuals high than low in need for cognition ($Z = 3.02, p < .001$, see Table 4). For individuals low in need for cognition, the mere number of arguments they can recall about a message is a better predictor of attitudes than it is for individuals high in need for cognition (Haugtvedt & Petty, 1992). This pattern of results could reflect the fact that individuals high in need for cognition are engaging in on-line thinking about the message (Hastie & Park, 1986), whereas individuals low in need for cognition are engaging in evaluation at the time of the attitude question.

Possession of knowledge. Given that individuals high in need for cognition tend to exert more cognitive effort on a variety of cognitive tasks than individuals low in need for cognition, they would be expected to acquire more knowledge on a variety of issues. This greater knowledge acquisition is presumably facilitated by their greater propensity to seek out information and to subject this information to more effortful or elaborate information processing. Evidence relevant to this hypothesis comes from several studies of the knowledge base of individuals high versus low in need for cognition (see Table 3). First, in three studies of the extent to which individuals high and low in need for cognition possessed relevant knowledge about politics, individuals high versus low in need for cognition listed more pieces of information about the presidential candidates (Cacioppo et al., 1986), more consequences of electing various candidates to office (Ahlering, 1987), and more reasons supporting their candidates (Condra, 1992; $d = .534, p < .001$). In two additional studies, individuals high in need for cognition generated a longer list of types of birds (Martin, Ward, Achee, & Wyer, 1993) and performed better on a knowledge of trivia test than individuals low in need for cognition (Wolfe & Grosch, 1990; $d = .734, p < .0001$).[9]

Not only do individuals high in need for cognition possess more knowledge on various issues than individuals low in need for cognition, but they appear to be aware of their more extensive knowledge base. That is, across three independent tests (see Table 3), individuals high in need for cognition reported possessing more knowledge than did individuals low in need for cognition ($d = .324, p < .0001$).

Performance on other cognitive tasks. If individuals high in need for cognition put greater effort into cognitive tasks than individuals low in need for cognition, then not only should they acquire more knowledge, but they also might perform better on these tasks. The accumulated research is consistent with this view. That is, individuals high in need for cognition have been shown to perform better on a variety of cognitive tasks such as doing arithmetic problems (Dornic et al., 1991), solving anagrams (Baugh & Mason, 1986), and performing college course work (Sadowski & Gulgoz, 1992a; $d = .342, p < .005$; see Table 3). As has been shown in other areas of research, however, there are limits to differences in task performance as a function of need for cognition. Differences in the course performance of individuals high versus low in need for cognition, for instance, are especially apparent when mastery of the course material requires effortful thought (Leone & Dalton, 1988).

Attitudinal consequences of cognitive effort. A number of specific consequences of the greater cognitive effort of individuals high in need for cognition have been explored in the domain of attitude research. We have already noted that individuals high in need for cognition engage in greater thought about the substantive arguments in a persuasive communication and are less influenced by peripheral cues than are individuals low in need for cognition. Even when no persuasive message is presented, however, individuals high in need for cognition appear to engage in greater thought about the issue.

[9] In some studies, it is difficult to separate individual differences in existing knowledge from individual differences in enjoyment of performing a knowledge listing task. The converging operations used and the meta-analysis summarized in Table 3, however, provide clear support for the notion that individuals high in need for cognition extract and use more knowledge from events in their environment than individuals low in need for cognition. Evidence reviewed later (see Table 5) further supports the notion that individuals high in need for cognition are also more likely to enjoy cognitively effortful tasks.

If individuals high in need for cognition engage in greater thinking about an issue, and this thinking is guided by a consistent evaluative schema, then evaluations are likely to polarize with thought, at least to the point at which polarization becomes so strong that reality constraints moderate evaluations (for reviews, see Tesser, 1978; Tesser, Martin, & Mendolia, 1995). In support of this view, Smith, Haugtvedt, and Petty (1994) measured the attitudes of individuals high and low in need for cognition and then had them complete a survey of more specific beliefs on the issue. Individuals high and low in need for cognition initially expressed the same attitudes; after the survey, however, attitudes of individuals high in need for cognition were more extreme than were the attitudes of individuals low in need for cognition. That is, the attitudes of individuals high in need for cognition became more polarized with thought. In apparent conflict with this result, Leone and Ensley (1986) found that individuals high in need for cognition moderated their attitudes after a reflection period. In their study, individuals high and low in need for cognition were instructed to spend either 30 s or 180 s thinking about their thoughts and feelings toward four issues about which they had previously expressed moderate attitudes. After the reflection period, participants expressed their attitudes again. Overall, individuals high in need for cognition, when given 180 s to think, were less likely to show attitude polarization and were more likely to show attitude moderation than were individuals low in need for cognition.

It is interesting to note that, in the Smith et al. (1994) study on attitude polarization effects, the participants were not explicitly instructed to think about their attitudes. Rather, they merely completed a survey of beliefs on the topic in between the two attitude measures. On the other hand, in the Leone and Ensley (1986) study, the participants explicitly were instructed to think about the issue. Lassiter, Apple, and Leach (1994) examined whether providing explicit instructions to think or not could account for the discrepancy between the Smith et al. (1994) and the Leone and Ensley (1986) studies. In their research, individuals high and low in need for cognition were either instructed to think during a waiting period or allowed to sit and do whatever they wanted. When participants were instructed to think, the findings of Leone and Ensley (1986) were replicated: Individuals low in need for cognition showed greater attitude polarization than individuals high in need for cognition. However, when participants were not instructed to think, those high in need for cognition showed greater polarization than those low in need for cognition, replicating the pattern obtained by Smith et al. (1994). This suggests that when individuals high in need for cognition spontaneously engage in thought, their attitudes tend to polarize, consistent with prior work on the attitude polarization effect. However, when individuals are specifically instructed to consider their attitudes, those high in need for cognition may carefully consider all sides of the issue and thus show moderation instead of polarization.

The existing research on attitudes suggests that whether or not a persuasive communication is presented, the attitudes of individuals high in need for cognition tend to be more thoughtfully based than the attitudes of individuals low in need for cognition. The elaboration likelihood model suggests that if attitudes are thoughtfully based, they should be stronger than attitudes based on simple cues (Petty & Cacioppo, 1986). More specifically, attitudes that are thoughtfully based have been found to be more persistent over time, more resistant to change, and more predictive of behavior than attitudes that are less thoughtful (see Petty, Haugtvedt, & Smith, 1995, for a review). If the attitudes of individuals high in need for cognition are more thoughtfully based than the attitudes of individuals low in need for cognition, they should be more likely to possess the attributes of strong attitudes. In fact, research has supported the view that the attitudes of individuals high in need for cognition are more likely to persist over time than are the attitudes of individuals low in need for cognition (Haugtvedt & Petty, 1992, Experiment 1; Verplanken, 1991); also, individuals high in need for cognition are more likely to resist counterattitudinal influence (Haugtvedt & Petty, 1992, Experiment 2), and their attitudes are more likely to be predictive of behavioral intentions and behavior (Cacioppo et al., 1986; Verplanken, 1989).

Awareness of Cognitive Effort

A wide variety of studies using multiple operationalizations to make inferences about the extent of cognitive activity have come to the same conclusion: Individuals high in need for cognition tend to engage in greater information-processing activity than individuals low in need for cognition. Furthermore, the attitudes and judgments formed by individuals high versus low in need for cognition differ in the ways that would be expected if these judgments were based on differing amounts of thought. Although individuals high and low in need for cognition appear to differ in the extent to which they engage in cognitive activity, are they aware of these differences? Consider that the NCS relies on self-reports, but these reports are taken in the absence of any specific cognitive task. Thus, it might be that individuals high and low in need for cognition are aware of their general tendencies to engage in cognitive activity but are unaware of the extent of their cognitive engagement when it comes to any particular task.

In the first examination of this issue, Cacioppo and Petty (1982, Study 4) had individuals who were high and low in need for cognition engage in either a relatively simple or a complex number circling task. Although participants reported that the complex task required more mental effort than the simple task, individuals high and low in need for cognition did not differ in the effort they reported expending on either task. Perhaps because participants realized that it was quite easy for the experimenter to determine how well they performed on the task (i.e., by counting the correct number of circles), both those high in need for cognition and those low in need for cognition worked relatively hard on the tasks. However, on a more ambiguous persuasion task in which participants were simply asked to read a communication (and it was not clear how the experimenter could evaluate the participants' responses), those high in need for cognition reported exerting significantly more effort than those low in need for cognition (Cacioppo et al., 1983, Study 1). Across the 12 tests of the self-reported effort hypothesis, the evidence suggests that individuals high in need for cognition reliably perceive that they exert more cognitive effort than individuals low in need for cognition ($d = .272$, $p < .001$; see Table 3).

Two studies have examined moderators of the perceived effort and thinking expended by individuals high versus low in need

Table 4
Correlational Studies Blocking on Need for Cognition

Dependent measure and study	Condition	HNC					LNC				
		N	Statistic	p	d_{within}	d_{study}	N	Statistic	p	d_{within}	d_{study}
Attitudes predicting behaviors											
Cacioppo, Petty, Kao, & Rodriguez (1986, Study 2)	All	49	r = .870	<.010	3.520	3.460	52	r = .46	<.050	1.040	0.975
	Only those who voted	40	r = .860		3.370		41	r = .41		0.889	
Attitudes predicting behavioral intentions[a]											
Cacioppo, Petty, Kao, & Rodriguez (1986, Study 2)		49	r = .960	<.010		6.860	55	r = .900	<.010		4.120
Verplanken (1989)	Coal: intend to oppose	891	r = .390		0.847	1.360	781	r = .110		0.221	0.746
	Coal: intend to support	891	r = .440		0.980		781	r = .350		0.747	
	Nuclear: intend to oppose	891	r = .730		2.140		781	r = .480		1.090	
	Nuclear: intend to support	891	r = .640		1.670		781	r = .430		0.953	
Attitudes predicting beliefs											
Verplanken (1989)	Coal benefits	891	r = .440	<.010	0.980	1.290	781	r = .440	<.010	0.980	1.150
	Coal risks	891	r = .560	<.010	1.350		781	r = .510	<.010	1.190	
	Nuclear benefits	891	r = .410	<.010	0.889		781	r = .360	<.010	0.772	
	Nuclear risks	891	r = .710	<.010	2.020		781	r = .650	<.010	1.710	
Message evaluation (self-report) predicting attitude[b]											
Axsom, Yates, & Chaiken (1987)	High involvement	24	β = .470	<.060	0.669	1.070	31	β = .410	<.060	0.582	0.325
	Low involvement	28	β = .600	<.001	1.440		24	β = .220	*ns*	0.000	
Cacioppo, Petty, & Morris (1983, Study 2)		37	r = .700	<.010		1.960	37	r = .220	*ns*		0.451
Verplanken (1991)		72	r = .470	<.010		1.060	58	r = .230	*ns*		0.473
Thought indexes (issue relevant) predicting attitudes[c]											
Axsom, Yates, & Chaiken (1987)	High involvement	24	β = .450	<.060	0.669	0.640	30	β = .370	<.06	0.592	0.626
	Low involvement	28	β = .390	<.060	0.615		24	β = .360	<.06	0.669	
Haugtvedt, Petty, & Cacioppo (1992, Study 1)	Positive thoughts	42	r = .390	<.050	0.847	1.130	55	r = .110	*ns*	0.221	0.336
	Negative thoughts	42	r = −.580	<.050	−1.420		55	r = −.220	*ns*	−0.451	
Haugtvedt & Petty (1992, Study 1)	Positive thoughts	22	r = .480	<.050		1.090	24	r = .080	*ns*		0.161
Petty, Schumann, Richman, & Strathman (1993, Study 1)	Manipulated mood	67	β = .370	<.050	0.410	0.456	70	β = .320	<.050	0.401	0.401

Table 4 (*continued*)

Dependent measure and study	Condition	HNC					LNC				
		N	Statistic	p	d_{within}	d_{study}	N	Statistic	p	d_{within}	d_{study}
Thought indexes (issue relevant) predicting attitudes[c] (cont'd)											
Percentage of positive thoughts	Mood manipulation check	67	$\beta = .390$	<.050	0.410		70	$\beta = .270$	<.050	0.401	
	Self-report pleasantness	67	$\beta = .390$	<.050	0.410		70	$\beta = .280$	<.050	0.401	
Percentage of negative thoughts	Mood manipulation check	67	$\beta = -.550$	<.010	−0.593		70	$\beta = -.300$	<.050	−0.401	
Priester & Petty (1995, Study 1)	Positive–negative thoughts: trustworthy source	24	$r = .670$	<.005	1.810	1.480	27	$r = .220$	>.250	0.451	0.906
	Positive–negative thoughts: untrustworthy source	28	$r = .520$	<.005	1.220		26	$r = .580$	<.005	1.420	
Smith & Petty (in press, Study 2)	Positive–negative thoughts	58	$r = .739$	<.001		2.190	60	$r = .545$	<.001		1.300

Note. When only betas are reported, effect sizes were estimated from the maximum probability level. For cases in which a given sample provided more than one index of a particular dependent variable, the within-study effect sizes were averaged to a single between-studies effect size within each level of need for cognition. Absolute value of d was used when averaging between study effect sizes in which the correlation between negative thoughts and attitude was averaged with the correlation between positive thoughts and attitude. Effect sizes were averaged and Z scores compared only when two or more studies were reported on a given dimension. HNC = individuals high in need for cognition; LNC = individuals low in need for cognition. [a] d_{avg}HNC = 1.540, $p < .0000001$; d_{avg}LNC = 0.903, $p < .0000001$; $Z_{comp} = 3.60$, $p < .0002$. [b] d_{avg}HNC = 1.290, $p < .0000001$; $\chi^2(2) = 3.15$, $p = .22$; d_{avg}LNC = 0.430, $p = .01$; $\chi^2(2) = 0.09$, $p = .95$; $Z_{comp} = 3.02$, $p = .001$. [c] d_{avg}HNC = 1.130, $p < .0000001$; $\chi^2(5) = 17.13$, $p = .002$; d_{avg}LNC = 0.663, $p < .0000008$; $\chi^2(5) = 8.56$, $p = .13$; $Z_{comp} = 2.35$, $p = .01$.

for cognition. In one investigation, the perceived amount of thinking done by individuals high versus low in need for cognition about an upcoming presidential election was examined as a function of time (Cacioppo et al., 1986). Eight weeks before the election, individuals high in need for cognition reported more thinking than individuals low in need for cognition. However, once the time for the election arrived, individuals high and low in need for cognition reported similar amounts of thinking. This is consistent with the view that people who do not enjoy thinking will postpone their cognitive activity until situational factors affecting cognitive motivation are amplified. Another study examined perceptions of cognitive effort for individuals high versus low in need for cognition for tasks that differed in their personal relevance (Sorrentino et al., 1988, Study 1). For the low relevance task, the typical result was obtained: Individuals high in need for cognition reported more effort than individuals low in need for cognition. When the task was of high relevance, on the other hand, individuals low in need for cognition reported slightly more effort than individuals high in need for cognition. Because individuals low in need for cognition are not used to engaging in mental effort, when they are motivated to do so by the personal relevance of the task, the amount of effort they expend may seem greater than it actually is.

Even though individuals high in need for cognition tend to report exerting more cognitive effort and thought than individuals low in need for cognition, two reports showed that those high in need for cognition reported that the cognitive tasks of solving anagrams (Baugh & Mason, 1986) and performing mental arithmetic (Dornic et al., 1991) were less difficult than did those low in need for cognition. These cognitive tasks may, in fact, be easier for individuals high rather than low in need for cognition because they exert more effort on the tasks at the time of performance or because they are generally more practiced at these tasks or engaging in cognitive activities generally. On the other hand, individuals high in need for cognition reported that the task of evaluating a product was more difficult than did individuals low in need for cognition (Verplanken, 1993). The latter may seem more difficult because evaluating a new product is a novel task for which individuals high in need for cognition actually engage in greater effort than individuals low in need for cognition. Thus, overall, there was no effect of need for cognition on perceived task difficulty (see Table 3).[10]

In summary, individuals high in need for cognition generally report that they exert more effort on specific cognitive tasks than do individuals low in need for cognition, and they report engaging in more thought on these specific cognitive tasks as well. However, when situational factors induce individuals low in need for cognition to engage in considerable mental effort, they report as much or more effort as individuals high in need for cognition. The reason for the latter effect may be that individuals low in need for cognition are not as practiced in thinking as individuals high in need for cognition, and thus when both engage in high levels of thinking, this thinking may seem more effortful to individuals who are low in need for cognition.

[10] These studies also point to the multiple determinants of self-reports of cognitive effort. It therefore is important to measure or control these various determinants to interpret unequivocally the psychological significance of these measures (Cacioppo & Tassinary, 1990).

Finally, individuals high in need for cognition view well-practiced cognitive tasks as less difficult than do individuals low in need for cognition, but they may view novel cognitive tasks as more difficult because of the greater cognitive work they devote to these tasks.

Relatively Objective Versus Biased Information Processing

On the basis of the evidence reviewed so far, it might appear as if the information-processing activity of individuals high in need for cognition is relatively objective and impartial. For example, individuals high in need for cognition focus on the merits of the information they receive rather than relying on simple (and sometimes unreliable) cues, and they recall more of the information to which they are exposed. Yet, even though focused on the merits of the information presented rather than on simple cues, the processing of this information is not necessarily objective and impartial. Instead, this processing can be biased by a number of factors. In this regard, it is important to note that Cacioppo and Petty's (1982) conceptualization of need for cognition did not assume that individuals high in need for cognition would always be more objective in their thinking than individuals low in need for cognition. Rather, it was assumed that information-processing activity can sometimes be relatively objective and impartial but can also be biased in various ways (see Kunda, 1990; Petty & Cacioppo, 1986; Wilson & Brekke, 1994). Several sources of bias are discussed next.

Mood. Research clearly indicates that a person's momentary affective state can bias cognitive activity. For example, if people are in a positive mood, positive items in memory are more likely to come to mind than negative ones (Blaney, 1986; Bower, 1981), and people are more likely to overestimate the probability of positive events and underestimate the likelihood of negative events (e.g., E. Johnson & Tversky, 1983). Mood-based influences on cognitive activity should be more likely for individuals who are engaged in cognitive activity, and research supports the view that individuals high in need for cognition are more susceptible to the influence of affective states on cognition than are individuals low in need for cognition, even though the effects of mood on attitudes may be similar.

In one study, for example, Petty et al. (1993) placed students who were either high or low in need for cognition in a positive or a neutral mood and then exposed them to a persuasive message advocating a change in the foster care system in their state. After the message, students reported their attitudes toward the proposal and listed their thoughts. The results of this study revealed that although positive mood had a favorable impact on the attitudes of both the students high in need for cognition and those low in need for cognition, this effect was mediated by the favorable impact of mood on thoughts only for those high in need for cognition. That is, for individuals high in need for cognition, the more positive their mood, the more positive their thoughts, and the more positive their thoughts, the more positive their attitudes. For individuals low in need for cognition, however, mood had a direct effect on attitudes that was unmediated by thoughts.[11]

In the Petty et al. (1993) study, the reason why individuals high in need for cognition generated more positive thoughts to the persuasive message when in a positive mood was not examined. Petty and Wegener (1991) speculated that if a message presented desirable consequences of adopting a recommendation, thoughtful people in a positive mood might overestimate the likelihood that these positive consequences would occur and, thus, be more favorably disposed toward them. If the effect of mood on thinking were mediated by the effect of mood on likelihood judgments, then if a message presented the undesirable consequences of not following a recommendation (e.g., "If you don't stop smoking, you'll get cancer") rather than the desirable consequences of following a recommendation (e.g., "If you stop smoking, you'll live a long life"), being in a positive mood should be harmful for persuasion because the undesirable consequences of not agreeing with the message (i.e., getting cancer) would be perceived as less likely. To examine this, Wegener, Petty, and Klein (1994) placed participants high and low in need for cognition in a positive or a negative mood and then presented them with a persuasive message that emphasized the benefits of following a recommendation or the costs of not following a recommendation. After the message, participants reported their attitudes toward the message and indicated the likelihood of the consequences presented in the message arguments. As expected, individuals high in need for cognition who were placed in a positive mood were more influenced by the benefits than the costs message, but individuals high in need for cognition placed in a negative mood were more persuaded by the costs than the benefits message. Furthermore, these attitude effects were mediated by the effect of mood on likelihood judgments. Individuals low in need for cognition, in contrast, showed no effect of mood on either likelihood judgments or attitudes.

Priming. In addition to an individual's mood state, judgments can be biased by cognitive information that is temporarily activated in memory. In a typical evaluative priming study, for example, individuals are asked to unscramble sentences with hostile or nonhostile content, and then they are asked to judge the ambiguous behavior of a target individual (e.g., Srull & Wyer, 1979). When hostility has been primed, the target person is seen as more hostile than when hostility has not been primed.

Petty and Jarvis (1996) argued that individuals high in need for cognition could be more easily influenced by cognitively primed material than individuals low in need for cognition for at least three reasons. First, it might be easier to activate concepts for individuals high than low in need for cognition because the former individuals would be more likely to have highly accessible and interconnected nodes in memory. Second, even if concept activation were held constant, because individuals high in need for cognition engage in more thinking than individuals low in need for cognition, the activated concept would bias more thoughts for the former than the latter group. Finally, even

[11] Batra and Stayman (1990) also found that mood had a direct effect on attitudes, which was unmediated by thoughts for participants low in need for cognition. Unlike Petty et al. (1993), they did not find a mediated effect for individuals high in need for cognition. However, because mood failed to influence the attitudes of individuals high in need for cognition in Batra and Stayman's research, there was no effect to mediate.

if concept activation and amount of thinking were held constant, the judgments of individuals high in need for cognition are based more on the thoughts that they generate than are the judgments of individuals low in need for cognition, so any biased thoughts would have a greater impact on judgments. In a representative study examining the priming hypothesis, participants high and low in need for cognition were primed with the concept of either winning or losing before placing up to a $1 bet on a roulette wheel (Petty, Jarvis, Bozzolo, & Strathman, 1995, cited in Petty & Jarvis, 1996). The bets of individuals high but not low in need for cognition were influenced by the priming manipulation.

The effect of priming should be especially strong when the primes are subtle and participants are unaware of their influence. However, if people are made aware of a biasing effect on their judgments and they are motivated to be accurate, then they might attempt to adjust their judgments to remove the anticipated effect of the biasing factor (Petty & Wegener, 1993). Furthermore, individuals high in need for cognition should be more likely to correct or adjust their judgments for biasing factors than should individuals low in need for cognition because corrections require mental effort (Martin, 1986; Strack, 1992), and individuals high in need for cognition should be more likely to engage in this mental work. For example, Gilbert, Pelham, and Krull (1988) have argued that attributional judgments are best conceptualized as involving a two-step process. Specifically, people first make dispositional inferences for a person's behavior and then correct for situational constraints. The situational correction step requires more cognitive effort than simply going with the initial dispositional default judgment. To the extent that individuals high in need for cognition are more likely to correct their initial dispositional judgments in light of situational information, the attributions of these individuals should be less dispositional than the attributions of individuals low in need for cognition. This hypothesis has been supported in research (D'Agostino & Fincher-Kiefer, 1992).

Thus, individuals high in need for cognition appear to be more likely to correct their initial judgments in light of additional information or factors that might have biased their judgments. This implies that if the biasing factors in a judgment setting are obvious rather than subtle, then the judgments of individuals high in need for cognition should show less impact of the biasing factor (e.g., primed material) than those of individuals low in need for cognition (Petty & Jarvis, 1996). People can be made aware of the biasing effect of some stimulus by explicit prompts or by making the biasing information quite blatant (Petty & Wegener, 1993; Wilson & Brekke, 1994). When participants were likely to be aware of biasing factors in a judgment setting, the existing research indicates that those high in need for cognition were more likely to correct for these biases than were those low in need for cognition (Martin, Seta, & Crelia, 1990).

Primacy–recency effects. If a person receives two messages of equal strength on opposing sides of an issue, impartial processing of both messages should result in neither a primacy nor a recency effect. That is, neither the first nor the second message should have any advantage. Should individuals high or low in need for cognition be more susceptible to primacy effects? Research on resistance to persuasion guided by the elaboration likelihood model (Petty & Cacioppo, 1986) suggests that individuals high in need for cognition can be more susceptible to primacy effects than individuals low in need for cognition. In resistance research, participants' attitudes are first formed or changed to be in favor of some issue, and then these new attitudes are attacked. Earlier, we noted that individuals high in need for cognition have been found to be more resistant to an attacking message than are individuals low in need for cognition (Haugtvedt & Petty, 1992). This is presumably because individuals high in need for cognition form stronger attitudes toward the initial advocacy than individuals low in need for cognition and thus are better able to counterargue any opposing message. This suggests that individuals high in need for cognition would be more susceptible to a primacy effect because they would form stronger attitudes toward whichever of two equally strong messages is presented first. A strong attitude toward the first message would then enable counterarguing of the second communication. This reasoning implies that high processing of both the first and the second messages could result in a primacy effect. On the other hand, low processing of both messages might result in a recency effect. If people are doing little processing of either message and then are asked for their opinion, it is reasonable that they would be more influenced by whatever they heard most recently (Haugtvedt & Wegener, 1994).

Two studies have examined the impact of need for cognition on primacy and recency effects. Consistent with the reasoning just outlined, one study reported primacy on the part of individuals high in need for cognition and recency on the part of individuals low in need for cognition (Kassin et al., 1990). However, another study reported that individuals low in need for cognition showed greater primacy than individuals high in need for cognition (Ahlering & Parker, 1989). Petty and Jarvis (1996) noted a difference between these studies that might account for the different results obtained. Specifically, one clear difference between the study finding greater primacy for individuals high in need for cognition and the study finding greater primacy for individuals low in need for cognition is that, in the former study, the materials presented two clear sides to the issue: the prosecution and defense arguments in a trial. Participants first received information from one source on one side of the issue and then received information from a second source on the other side of the issue (Kassin et al., 1990). Thus, individuals high in need for cognition probably formed an opinion about one side before processing the second side. In contrast, in the Ahlering and Parker (1989) study, participants received 16 trait adjectives (in an 8 positive to 8 negative or 8 negative to 8 positive order) from 16 different sources about one person. In this procedure, individuals high in need for cognition might not form an opinion after each of the 16 sources but would probably wait until all of the information was heard or would at least simply update their opinion with each new piece of information. On the other hand, if individuals low in need for cognition formed their judgments early on the basis of minimal information, a strong primacy effect would be expected (see also Kruglanski & Freund, 1983). Future research might examine these speculations.

Summary

It is apparent from this review that people high in need for cognition engage in greater information-processing activity

than people low in need for cognition. This effortful cognitive activity is sometimes relatively objective and is sometimes influenced by subtle affective and cognitive biases. When perceived biases are detected, however, individuals high in need for cognition are more likely to engage in the cognitive effort necessary to correct their judgments. These corrections need not render the judgments more accurate, however, because people are not necessarily aware of the actual effect of biasing factors on their judgments (Nisbett & Wilson, 1977; Wegener & Petty, 1995). Interestingly, the differences between individuals high and low in need for cognition, including their responsivity to biasing features, may be more evident for verbal than visual information (e.g., see Briggs & Lassiter, 1994).

Need for Cognition and the Enjoyment of Effortful Cognitive Endeavors

Individuals high versus low in need for cognition were conceptualized as differing in their enjoyment as well as their tendency to engage in complex or effortful cognitive activities. Consistent with this conceptualization, the research summarized in Table 2 indicates that individuals who score high rather than low in need for cognition also score higher on measures of dispositions such as intrinsic motivation to cogitate, curiosity, and cognitive innovativeness. In this section, we summarize the research assessing the tendency of individuals high versus low in need for cognition to enjoy cognitively effortful tasks.

Self-Reported Affective and Motivational Reactions to Cognitive Tasks

The most common method of examining this hypothesis has been to measure participants' affective reactions to cognitively demanding tasks or events. As summarized in Table 5 individuals high in need for cognition generally react more positively and less negatively to thought-provoking stimuli ranging from political elections (Condra, 1992) to math stressors (Dornic et al., 1991). Although the meta-analysis confirmed that these differences were reliable (ds = −.447 and .306 for negative [ratings of annoyance, frustration, and tension] and positive [ratings of task enjoyment and pleasantness] affective reactions, respectively, ps < .01), they also reveal significant heterogeneity in studies measuring task enjoyment.

An early study by Cacioppo and Petty (1982, Study 4) forecasted that there would be moderators of this relationship. Participants in this study performed a number-circling task using either simple or complex rules. Participants in the simple number-circling task condition were instructed to circle all 1s, 5s, and 7s, whereas participants in the complex number-circling task condition were instructed to circle all 3s, any 6 that preceded a 7, and every other 4. Participants were given tables containing a total of 3,500 random numbers and were given 10 min to perform the task. Immediately afterward, participants rated their affective reactions to the task. Results revealed that individuals high in need for cognition reacted more positively to a number-circling task that required they use complex rules but that individuals low in need for cognition reacted more positively when the task required they use simple rules. It is interesting to note, therefore, that two of the three other studies contributing to the heterogeneity in studies measuring task enjoyment used relatively unchallenging cognitive tasks (e.g., brief exposures to product information to simulate, for instance, "glancing at an ad when flipping the pages of a magazine" [Ratneshwar, Mick, & Reitinger, 1990, p. 549] or pressing a button to indicate meaningful units of behavior [Lassiter, Briggs, & Bowman, 1991]). In the third study (Baugh & Mason, 1986), participants performed 10 single-solution anagrams and subsequently rated the length of time in which they perceived they had performed the task (stressful situations lengthen time perception), the ease of the task, and their enjoyment performing the task. Although participants did not differ in their rated task enjoyment, those high in need for cognition rated the anagrams as simpler and time perception as shorter than those low in need for cognition.

Studies of individual differences in self-reported motivation to think about experimental tasks have also revealed an effect for need for cognition, with individuals high in need for cognition reporting higher levels of processing motivation (d = .546, p < .01); this literature, too, is characterized by heterogeneity. In this set of studies, however, the heterogeneity stems primarily from a study in which a significant interaction was found instead of a main effect (Cacioppo et al., 1983): Individuals high in need for cognition were more motivated to think about strong (e.g., difficult to counterargue) but not weak (e.g., simple to counterargue) message arguments supporting a counterattitudinal position.

Experimental Tests of Individuals' Intrinsic Motivation to Perform Cognitively Challenging Tasks

Another method of examining the task enjoyment hypothesis has been to determine whether individuals high in need for cognition react to situational contingencies as would be expected if they were more intrinsically motivated to engage in cognitive challenges than individuals low in need for cognition. Participants in E. P. Thompson et al.'s (1993) study, for instance, performed a brainstorming task under extrinsic reward or no-reward conditions. Recall that extrinsic reward has been shown to undermine intrinsic motivation in prior research (e.g., Deci & Ryan, 1980; Harackiewicz & Elliot, 1993). Afterward, participants in the E. P. Thompson et al. (1993) study were given an opportunity to work on a set of extra brainstorming puzzles and completed self-report motivation items. Consistent with the characterization of need for cognition as an intrinsic motivation, individuals high in need for cognition played more with the extra brainstorming puzzles in the no-reward than reward conditions, whereas individuals low in need for cognition showed the reverse. Furthermore, and consistent with the research reviewed earlier, analyses of the self-report measures revealed that individuals high in need for cognition expressed more intrinsic motivation than individuals low in need for cognition when no extrinsic reward was offered but that individuals high and low in need for cognition did not differ in reported intrinsic motivation to perform the brainstorming task when they had performed the task for an extrinsic reward. That is, the extrinsic reward undermined the interest in and enjoyment of the brainstorming puzzles in participants high but not low in need for cognition.

Additional evidence that individuals high in need for cognition are intrinsically motivated to perform cognitive tasks rather than just any experimental task is provided by Petty, Cacioppo, and Kasmer (1985; cited in Cacioppo et al., 1986). Prior research has demonstrated that individuals put less effort into a task when they share responsibility for the outcome as part of a group than when they are individually responsible for the outcome, an effect that has been dubbed "social loafing" (e.g., Latané, Williams, & Harkins, 1979). Petty et al. reasoned that if individuals high in need for cognition are more intrinsically motivated to engage in effortful cognitive endeavors, then they should be less likely to socially loaf on a cognitive task than would individuals low in need for cognition. As a test of this hypothesis, participants performed a brainstorming task (generating uses for objects) after they were led to believe that they were individually responsible or that they were part of a group that was responsible for performing the task. Results revealed a significant interaction showing that participants low in need for cognition generated fewer ideas under group than under individual conditions (i.e., they socially loafed), whereas those high in need for cognition generated equally high numbers of ideas regardless of social condition. For comparison purposes, another group of participants performed a physical task (screwing and unscrewing bolts and nuts) under individual or group instructions. Results revealed only a significant main effect for social condition, showing greater loafing by participants both low and high in need for cognition in the group conditions. Thus, only participants high in need for cognition working on cognitively challenging tasks failed to show the motivational deficit that usually results from shared responsibility.

Information Seeking

Finally, researchers have investigated whether individuals low versus high in need for cognition differ in the type or amount of information they tend to seek. The results of these studies indicate that participants high in need for cognition were more likely to use the media for information gathering (e.g., Ahlering, 1987; Condra, 1992; Pieters, Verplanken, & Modde 1987) and sought more information about a new consumer product (Verplanken et al., 1992) than individuals low in need for cognition. Furthermore, Ferguson, Chung, and Weigold (1985, cited in Cacioppo et al., 1986) found that a random sample of 233 residents of Gainesville, Florida, who were characterized by high levels of need for cognition reported relying more on newspapers and magazines for news and reported watching television less than did residents characterized by low levels of need for cognition. The meta-analysis confirmed that individuals high in need for cognition are more likely to seek information about a wide range of tasks, issues, and current events than are individuals low in need for cognition ($d = .457$, $p < .001$). Related research has shown that individuals high in need for cognition also are more likely to feel involved in complex social issues (Verplanken, 1989; M. M. Thompson & Zanna, 1995) and to anticipate and follow presidential debates (Ahlering, 1987; Condra, 1992).

In sum, the research summarized in Table 5 provides converging evidence that individuals high in need for cognition seek more information about new products and complex issues, exhibit more behaviors characteristic of intrinsic cognitive motivation, and enjoy cognitively challenging (but not unchallenging) tasks more than individuals low in need for cognition. Thus, despite the use of very different tasks and methodologies, the research on interindividual variations in tendencies to engage in and enjoy effortful cognitive enterprises intersects with that summarized in the preceding sections.

Discussion

Cognitive motivation has typically been studied as a situational variable, whereas cognitive ability has been viewed as a dispositional variable. The literature on need for cognition supports the notion that cognitive motivation is subject to dispositional as well as situational influences. Despite need for cognition (as a motivational factor) and intelligence (as an ability factor) both being dispositional variables that determine cognitive outcomes such as learning and recall, these constructs are clearly separable on statistical (see Table 2) and functional grounds (e.g., see Table 3). Need for cognition, for instance, is only modestly correlated with verbal intelligence and is unrelated to analytic thinking. These results indicate a stochastic independence between need for cognition and intelligence. Functional independence has also been demonstrated in several ways. Analyses, in which need for cognition and intelligence are treated as blocking variables in studies of message processing and persuasion, for instance, have revealed different patterns of results for these variables. Furthermore, when individuals high and low in need for cognition are exposed to persuasive communications, those high in need for cognition often recall more message arguments, and the difference in recall remains even after statistically controlling for intelligence (e.g., Cacioppo et al., 1986).

Refinements in the Conceptualization and Scaling of Need for Cognition

Until the emergence of need for cognition, research tended to focus on the situational factors that determine when individuals think effortfully about people and events in their world and when they think more superficially or heuristically (e.g., see the review by Petty & Cacioppo, 1981). The present review reinforces the view that an additional source of variance in this area of research is individual differences. Individuals low in need for cognition are characterized by low intrinsic motivation to engage in effortful cognitive endeavors, whereas individuals high in need for cognition are characterized by high intrinsic motivation to exercise their mental faculties. These individual differences appear to be derived largely from past experience, buttressed by accessible memories and behavioral histories, manifest in current experience, and influential in the acquisition or processing of information relevant to dilemmas or problems. Factor analytic studies further support the notion that much of the interindividual variation in people's tendency to engage in and enjoy effortful cognitive endeavors can be represented in terms of a single factor.

Need for cognition has been conceptualized at a macrolevel to represent interindividual variations in people's general tendency to engage in and enjoy effortful cognitive endeavors rather than chronic tendencies toward processing information in par-

Table 5
Studies Examining Enjoyment of Cognitive Tasks With Need for Cognition as a Factor

Dependent measure and study	Independent variable(s) and operationalization(s)	Study N	Statistic	p	Direction of effect	d_{within}	$d_{study\ average}$
			Annoyance, frustration, and tension with cognitively challenging tasks				
NC main effects[b]							
Cacioppo and Petty (1982, Study 4)		97	$r = -.23$	<.03	LNC > HNC		−0.472
Dornic, Ekehammar, & Laaksonen (1991)							−0.398
Frustration	Task: math with noise	59	$r = -.132$	*ns*	LNC > HNC	−0.266	
	Task: math without noise	59	$r = -.325$	<.01	LNC > HNC	−0.687	
Tension	Task: math with noise	59	$r = -.057$	*ns*	LNC > HNC	−0.114	
	Task: math without noise	59	$r = -.259$	<.05	LNC > HNC	−0.536	
			Enjoyment and pleasantness of cognitive tasks				
NC main effects[c]							
Baugh & Mason (1986)	Task: anagrams	30		*ns*			0.000
Cacioppo & Petty (1982, Study 4)[a]	Task: number search task	97		*ns*			0.000
Condra (1992)	Task: political elections	86	$F(1, 84) = 10.55$	<.01	HNC > LNC		0.709
Dornic, Ekehammar, & Laaksonen (1991)	Task: math with noise	59	$r = .412$	<.005	HNC > LNC	0.904	0.942
	Task: math without noise	59	$r = .440$	<.005	HNC > LNC	0.980	
Lassiter, Briggs, & Bowman (1991)	Task: unitization of target's behavior	62		*ns*			0.000
Ratneshwar, Mick, & Reitinger (1990)	Task: brief ad exposures	81		*ns*			0.000
Tolentino, Curry, & Leak (1990)	Task: cognitively oriented magazine choice	57	$r = .37$	<.01	HNC > LNC	0.797	0.542
	Task: cognitively oriented nonfiction	57	$r = .45$	<.001	HNC > LNC	1.008	
	Task: cognitively oriented fiction	57	$r = .29$	<.05	HNC > LNC	0.606	
	Task: cognitively oriented social activities	57	$r = .41$	<.01	HNC > LNC	0.899	
	Task: cognitively oriented TV shows	57		*ns*		0.000	
	Task: cognitively oriented movies	57		*ns*		0.000	
NC × Task Complexity							
Cacioppo & Petty (1982, Study 4)	Task: simple or complex number search task	97	$F(1, 93) = 6.98$	<.01	LNC enjoy the simple task, whereas HNC enjoy the complex task		0.548
			Information-seeking habits				
NC main effects[d]							
Ahlering (1987)	Task: viewing debate	37	$t(35) = 1.50$	.064	HNC > LNC		0.507
Condra (1992)	Task: seeing candidates in person	86	$F(1, 84) = 8.20$	<.01	HNC > LNC	0.624	0.359

Table 5 (*continued*)

Dependent measure and study	Independent variable(s) and operationalization(s)	Study *N*	Statistic	*p*	Direction of effect	d_{within}	$d_{study\ average}$
		Information-seeking habits (cont'd)					
	Task: use media to see how candidates stand on issues	86	$F(1, 84) = 9.77$	<.01	HNC > LNC	0.682	
	Task: use media to judge the likely winner	86	$F(1, 84) = 0.17$	*ns*		0.090	
	Task: use media for information to have conversations	86	$F(1, 84) = 8.17$	<.01	HNC > LNC	0.624	
	Task: use media to help make up mind	86	$F(1, 84) = 0.00$	*ns*		0.000	
	Task: use media to enjoy the excitement of the race	86	$F(1, 84) = 3.50$	<.05	HNC > LNC	0.408	
	Task: use media to get arguments to support positions	86	$F(1, 84) = 0.22$	*ns*		0.102	
Pieters, Verplanken, & Modde (1987, Study 1)	Task: read information about nuclear power	49	$t(47) = 2.48$	<.01	HNC > LNC		0.723
Pieters, Verplanken, & Modde (1987, Study 2)	Task: read information about nuclear power	164	$t(162) = 3.79$	<.001	HNC > LNC	0.596	0.587
	Task: read information about coal	164	$t(162) = 3.68$	<.001	HNC > LNC	0.578	
Verplanken (1993)	Task: amount of information obtained in an information acquisition task	120	$F(1, 116) = 1.10$	*ns*			0.195
Verplanken, Hazenberg, & Palenewen (1992)	Task: amount of information obtained in an information acquisition task	53	$t(51) = 1.96$	.05	HNC > LNC		0.594
		Intrinsic motivation to engage in cognitively effortful tasks: behavioral indexes					
NC main effects							
E. P. Thompson, Chaiken, & Hazlewood (1993)[a]	Task: brainstorming	67		*ns*			0.000
NC × Extrinsic Reward							
E. P. Thompson, Chaiken, & Hazlewood (1993)	Task: brainstorming	67	$F(1, 62) = 8.36$	<.005	LNC > HNC with incentive, but HNC > LNC without incentive		0.734
		Reported motivation to engage in cognitively effortful tasks					
NC main effects[c]							
Cacioppo, Petty, & Morris (1983, Study 1)[a]	Task: persuasive message	114		*ns*			0.000
Dornic, Ekehammar, & Laaksonen (1991)	Task: math with noise	59	$r = .268$	<.05	HNC > LNC	0.556	0.615
	Task: math without noise	59	$r = .319$	<.05	HNC > LNC	0.673	

(*table continues*)

Table 5 (*continued*)

Dependent measure and study	Independent variable(s) and operationalization(s)	Study *N*	Statistic	*p*	Direction of effect	d_{within}	$d_{study\ average}$
		Reported motivation to engage in cognitively effortful tasks (cont'd)					
Meyers-Levy & Peracchio (1992, Study 2)	Task: persuasive messages	21	$F(1, 19) = 19.33$	<.01	HNC > LNC		2.020
E. P. Thompson, Chaiken, & Hazlewood (1993)[a]	Task: brainstorming	67	$F(1, 57) = 6.87$	<.02	HNC > LNC		0.694
NC × AQ							
Cacioppo, Petty, & Morris (1983, Study 1)	Task: persuasive message	114	$F(1, 110) = 44.04$	<.001	More motivation to think about strong than weak arguments, but this tendency was stronger for HNC than LNC		1.270
NC × Extrinsic Reward							
E. P. Thompson, Chaiken, & Hazlewood (1993)	Task: brainstorming	67	$F(1, 57) = 3.42$	<.07	HNC > LNC when no extrinsic reward, but no difference when there is a reward		0.490

Note. Study *N*s reflect the sample size of the study minus any participants reported as deleted from the experimenter's analysis for purposes of experimental validity (e.g., contingency awareness or inability to understand experimental directions). However, cases in which participants were deleted from a particular analysis but were not explicitly reported in the method or results section (e.g., missing data on a particular dependent measure) are not reflected in this value. For cases in which a given sample provided more than one index of a particular dependent variable, the within-study effect sizes were averaged to a single between-studies effect size and were included once in the meta-analysis. In cases in which there were three or more studies in a particular dependent measure, chi-square tests of homogeneity are reported. Effect sizes for nonsignificant results in which statistics were not reported were calculated by using $p = .5$, and effect sizes for significant results in which statistics were not reported were calculated by using the reported probability level or maximum probability level. AQ = argument quality; NC = need for cognition; LNC = individuals low in need for cognition; HNC = individuals high in need for cognition.

[a] Qualified by a higher order interaction. [b] $d_{avg} = -.477$, $p = .003$. [c] $d_{avg} = .306$, $p = .0009$; $\chi^2(6) = 14.99$, $p = .02$. [d] $d_{avg} = .457$, $p = .0000007$; $\chi^2(5) = 3.66$, $p = .6$. [e] $d_{avg} = .546$, $p = .00004$; $\chi^2(3) = 16.48$, $p = .0008$. All meta-analysis *p* levels reflect one-tailed significance tests.

ticular domains, individual differences in cognitive complexity, or drives for structure (Cacioppo & Petty, 1982). The scaling of interindividual variations in need for cognition was, therefore, achieved by generating a pool of questions concerning a person's reactions to demands for effortful thinking in diverse settings. Specifically included by Cacioppo and Petty (1982) when generating these questions were items describing a variety of broad situations in which people could choose to garner information, analyze available evidence, abstract from past experience, or synthesize ideas; explicitly excluded were items dealing with potentially noneffortful cognitive activity such as inner broodings, reverie, mystical or religious experience, daydreaming, and artistic ruminations. The items were also worded to avoid responses limited to particular domains, problems, or situations, and known groups and cross validations were used to select items for measuring need for cognition. Thus, the NCS was designed to distinguish between individuals varying along a continuum ranging from the extreme cognitive miser to the supreme cognizer.

The research on scaling interindividual variations in need for cognition has consistently demonstrated that both the 34-item NCS and the 18-item NCS are internally consistent and reliable. Because of the face-valid nature of the items, there is suggestive evidence from early studies that more valid data are obtained when respondents believe their responses are anonymous, but additional research on these issues would be worthwhile. A few studies have reported a multifactor solution to the NCS, but no evidence has been provided in any of these studies that these multifactor structures are stable or that the subscales relate uniquely to criterion measures. The vast majority of factor analytic studies of the NCS have found that one factor captures the bulk of the variance in responses; this one-factor solution has been found to be stable in cross validations; and scores on this factor have been as (or more) predictive of interindividual variations and criterion variables as has any subscale. Moreover, the one-factor solution appears to account for an even larger portion of variance when the short form is used (see Table 1). Thus, the conceptualization of need for cognition as a single individual-differences continuum ranging from cognitive misers to cognizers appears the most parsimonious.

The existing research advances understanding of the construct of need for cognition by embedding the construct within a broader nomological net. Both individuals low in need for cognition and those high in need for cognition, for instance, must make sense of their world; accordingly, few differences exist between individuals low and high in need for cognition in terms of their need for structure or need to make sense of their world (e.g., see Neuberg & Newsom, 1993; Webster & Kruglanski, 1994). Instead, the extant literature demonstrates that the difference between individuals low and high in need for cognition is in the way in which they tend to derive meaning, adopt positions, and deal with problems. Research relating need for cognition to other individual-differences variables provides evidence that individuals high in need for cognition naturally tend to seek, acquire, think about, and reflect back on information to make sense of stimuli, relationships, and events in their world; individuals low in need for cognition, in contrast, are more likely to rely on others (e.g., experts), cognitive heuristics, or social comparison processes to provide this structure. Thus, just as assuredly as intelligent individuals naturally learn more quickly and comprehend more complex patterns in data than unintelligent individuals, individuals high in need for cognition are more likely to seek out, attend to, and think about the data that make up their world than individuals low in need for cognition. In contrast to individuals low in need for cognition, individuals high in need for cognition view cognitive effort not as toil but as a way of life.

Additional evidence for this formulation can be found in the research, summarized in Tables 3–5, indicating that individuals who differ in terms of their need for cognition also differ in terms of their tendency to engage in effortful cognitive activity when given a task or making sense of the world, actively acquire information about a relevant stimulus or event, and enjoy (or are less stressed by) cognitively effortful problems, life circumstances, or tasks. For instance, although both individuals high and individuals low in need for cognition want to hold veridical attitudes, individuals high in need for cognition are more likely to base their attitudes on their responses to issue-relevant information (e.g., message arguments), whereas individuals low in need for cognition are more likely to use simple cues to guide their attitudes (e.g., consensus cues). Both individuals high and individuals low in need for cognition can understand the cues and message arguments in these studies, but the two groups respond differently to these features because of chronic differences in how they think about events in their world. In contrast to the case for individuals low in need for cognition, cognitive effort is part of the essential character of individuals high in need for cognition. Thus, individuals high, as compared with low, in need for cognition are more likely to watch presidential debates, read rather than watch television to keep up with the news, and approach and have more positive attitudes toward stimuli or tasks that require reasoning or problem solving (e.g., reading and comprehensive exams), even though they have comparable attitudes toward nonintellective stimuli (e.g., pets and sports; Cacioppo & Petty, 1984).

By virtue of their tendency to think about stimuli in their world, individuals high in need for cognition are also more agentic and conscientious, at least in cognitive domains, but are no more (or less) sociable, emotional, or extraverted than individuals low in need for cognition. Individuals high in need for cognition perceive themselves as contributing to or in control of their own fate, to be effective problem solvers, and to have more knowledge and more integrated (less ambivalent or conflicting) information about a wide range of social issues. Indeed, the extant research shows that individuals high, in contrast to low, in need for cognition tend to have active, exploring minds; through their senses and intellect, they reach and draw out information from their environments. Accordingly, they are more likely to expend effort on information acquisition, reasoning, and problem solving to cope with a wide variety of predicaments in their world. The chronic tendency by individuals high in need for cognition to process information effortfully also appears to result in more, or more accessible, information on a range of topics and more knowledgeable and substantive responding on those topics. Although differences in metacognition as a function of need for cognition have not been examined to date, the research reviewed in this article is consistent with the notion that individuals high in need for cognition are char-

acterized by richer implicit theories and strategies of mentation. The research reviewed earlier on bias corrections, for instance, is consistent with the notion that individuals high in need for cognition make greater use of implicit theories to correct judgmental biases. What is not clear from this research is whether individuals high, as compared with low, in need for cognition are more likely to have relatively accurate implicit theories of judgmental biases, have more accessible implicit theories of judgmental biases, or engage in the effort required to access or apply these implicit theories. Indeed, differences in the metacognition of individuals high versus low in need for cognition appear to be a fertile area of research.

Of course, individuals can differ dispositionally in the extent to which effortful thinking is intrinsically reinforcing, and they can differ in the reasons effortful thinking is intrinsically reinforcing. Variations in the former reflect individual differences in need for cognition, whereas variations in the latter reflect idiosyncratic antecedents of need for cognition. We return to this second distinction later.

Need for Cognition and Person–Situation Interactions

Although individuals high, relative to low, in need for cognition tend to engage in and enjoy more effortful cognitive processing, the extant literature confirms that this relationship can be moderated by factors such as situational influences on cognitive motivation (e.g., personal relevance of an event or external contingencies surrounding a task). The theoretical nature of this relationship is depicted in Figure 1. Individuals are exposed to so many stimuli in the course of their daily lives that it would be maladaptive to think extensively about them all. Conversely, some events or decisions have such high personal relevance and consequences that nearly everyone can be expected to give considerable thought to them. Differences between individuals low and high in need for cognition, therefore, should be more evident when the situational forces underlying cognitive effort are neither very low nor very high.

Several studies, for instance, indicate that the effects of need for cognition emerge when the task is low to moderate but not high in personal relevance (e.g., Axsom et al., 1987). The situational pressure to think about the topic is quite high when personal relevance is high in these studies; thus, both individuals low and individuals high in need for cognition have shown evidence of high levels of topic-relevant thinking when confronted by novel counterattitudinal appeals on personally relevant topics. When there are few or no situational pressures to think about a particular attitude topic, in contrast, personal relevance appears to help eliminate a floor effect for issue-relevant thinking. For instance, M. M. Thompson and Zanna (1995) examined attitude ambivalence as a function of need for cognition and found that individuals high in need for cognition held less conflicted or ambivalent attitudes toward social issues they believed were personally relevant; comparable levels of attitude ambivalence were observed in individuals low in need for cognition (regardless of the personal relevance of the social issue) and individuals high in need for cognition for social issues that were low in personal relevance. These results may indicate that individuals high in need for cognition were more likely than those low in need for cognition to spontaneously think about and resolve attitude ambivalence when the topic was personally relevant but that neither individuals low nor individuals high in need for cognition were motivated to think sufficiently about their attitudes to resolve their ambivalence when the topic was personally irrelevant and there was no additional situational stimulus to think about the topic. Thus, whether the relation between need for cognition and various psychological phenomena is more evident under conditions of low or high personal relevance depends on the existence of ceiling or floor effects for cognitive motivation that are attributable to the situation.

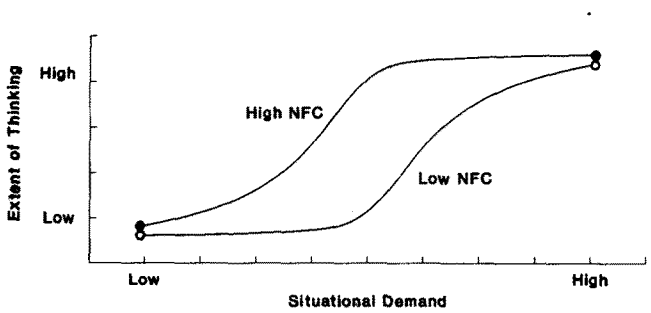

Figure 1. Individuals high, relative to low, in need for cognition (NFC) tend to engage in and enjoy more effortful cognitive processing, but this relationship can be moderated by factors such as the situational influences on cognitive motivation (e.g., personal relevance of an event or external contingencies surrounding a task). Specifically, differences between individuals low and high in need for cognition are more evident when the situational forces underlying cognitive effort are neither very low nor very high.

The evidence reviewed in this article also suggests a set of conditions in which individuals high in need for cognition may exert less rather than more cognitive effort than individuals low in need for cognition. A chronic tendency to process information effortfully should result not only in more information on a range of topics but also in more accessible and less conflicting information, factors that have been shown to lessen the effort and stresses of decision making (Blascovich et al., 1993). For decisions, issues, arguments, or evidence that individuals have not had an opportunity to consider previously, individuals high in need for cognition would still be expected to engage in more effortful processing. However, individuals high in need for cognition may need to exert less rather than more cognitive effort than individuals low in need for cognition when the situation dictates that they determine their attitudes about a complex but familiar issue. Thus, individuals high in need for cognition may express their attitudes more quickly (indicating more accessible attitudes) than individuals low in need for cognition on topics about which participants have high prior knowledge; but on topics about which participants have little prior knowledge, however, individuals high in need for cognition may express their attitudes more slowly (indicating less accessible attitudes or more deliberation before determining their position).

Although this specific hypothesis has not been tested, several existing studies are consistent with this reasoning. First, studies by Dornic et al. (1991) using mental arithmetic as a stressor and by Baugh and Mason (1986) using anagrams as a stressor suggested that individuals high in need for cognition regarded the tasks as simpler and tended to perform better than individ-

uals low in need for cognition. Second, Stayman and Kardes (1992) exposed participants to a message and recorded the response latencies to questions about explicit and implicit message conclusions. They found that individuals high in need for cognition responded more quickly than individuals low in need for cognition, suggesting that the way in which they had previously processed the message rendered its implications more accessible. Finally, Mueller et al. (1988) examined the speed with which participants could determine whether traits were self-relevant or were nouns. Results revealed that individuals high in need for cognition were faster in determining whether traits were self-descriptive than individuals low in need for cognition, but response times were comparable for the two groups when they judged whether the traits were nouns. The latter result suggests that differences in reaction time were not simply the result of individuals high in need for cognition being faster at any (lexical) task. Thus, although dispositional variables such as need for cognition can influence cognitive motivation, the existing cognitive representation of a stimulus or problem and situational influences must also be considered.

Need for Cognition and the Five-Factor Model of Personality Structure

The question of whether individual differences in need for cognition are best scaled as a single dimension or as multiple dimensions bears on the broader question of the structure of personality. Watson, Clark, and Harkness (1994) noted that key aspects of the definition of a personality factor are that it is internal and organized and represents a tendency shown by individuals over time and situations. They further noted that "traditionally, talents and abilities also have been excluded from personality, although the inclination to engage in skill-related behaviors has not" (Watson et al., 1994, pp. 18–19). By these criteria, need for cognition represents a personality variable reflecting individual differences in inclination to engage in and enjoy effortful cognitive activity: It can be reliably measured, is stable over time, can be consensually validated, is not an artifact resulting from response biases or situation-based consistencies, can account for significant variance beyond that explained by intellectual ability, and can be linked to important life outcomes such as academic achievement. As noted earlier, individuals high in need for cognition tend to have active, exploring minds, and, through their senses and intellect, they reach and draw out information from their environment; accordingly, they are more likely to expend effort on information acquisition, reasoning, and problem solving to cope with a wide variety of predicaments in their world. This portrayal of need for cognition is reminiscent of a midlevel construct within the fifth factor in the hierarchically organized five-factor model of personality (e.g., Digman, 1990; Goldberg, 1982; John, Angleitner, & Ostendorf, 1988; McCrae, 1993; Watson et al., 1994).

The five-factor model of personality structure derives from analyses of the language of personality and is based on the assumption that a taxonomy of personality attributes reveals the surface structure of a general and latent psychological structure. Structure in the five-factor model refers to covariation (Watson et al., 1994). Furthermore, the five-factor model of personality depicts trait–behavior covariations at four levels of abstraction: (a) specific behaviors; (b) habits, act frequencies, and predispositions; (c) characteristics, scales, and facets; and (d) general traits (Digman, 1990). Watson et al. (1994) noted that trait dimensional hierarchies are variance–covariance hierarchies in which the covariance of the lower order elements becomes the variance of the higher order elements. The five factors (sometimes termed *superfactors*) that have emerged in studies of personality attributes have carried various labels (e.g., see Costa & McCrae, 1985; Digman, 1990; Goldberg, 1982, 1992) but include *extraversion,* the tendency toward sociability, positive emotions, and high activity; *agreeableness,* a disposition toward nurturance, altruism, trust, and friendly compliance; *conscientiousness,* the will to achieve, self-control, persistence, and dependability; *neuroticism,* the tendency to experience negative emotions; and *openness,* a receptivity to new ideas, a preference for varied sensations, and intellectuality.

Need for cognition appears to fall within the third level of this trait dimensional hierarchy (i.e., characteristics, scales, and facets), but where it falls with respect to the five superfactors has not been examined comprehensively. A general rule regarding the traits that fall under these superfactors is that traits under the same superfactor covary substantially, whereas traits falling under different superfactors do not covary. On the basis of this general rule, the research summarized here suggests that need for cognition does not fall squarely under extraversion (surgency), agreeableness (sociability), or neuroticism (negative emotionality). The openness factor in the big-five model has gone by various names, including intelligence, culture, independence, and intellect (Digman, 1990), and need for cognition can be expected to be a component of this fifth factor. As suggested by the various labels that have been used to describe this factor, however, other characteristics that are only mildly to moderately related to need for cognition also fall under the openness (or intellect) factor, including authoritarianism, cognitive complexity, creativity, hypnotizability, and openness to actions, feelings, and aesthetics (Goldberg, 1990; McCrae, 1993). Thus, whether need for cognition falls only or primarily under the fifth factor has yet to be determined. Given the wide-ranging antecedents and consequences of cognitive motivation, it is also conceivable that need for cognition represents a facet of two different superfactors. Specifically, the agentic qualities (self-control, thinking, introversion, and prudence) associated with the conscientiousness superfactor—as well as the adjective clusters in Goldberg's (1990) conscientiousness scale characterized by descriptors such as logical and disorganized—suggest a possible association between conscientiousness and need for cognition. Interestingly in this context, conscientiousness has been related to academic achievement (Wiggins, Blackburn, & Hackman, 1969).

Specifying the relationship between need for cognition and the superfactors of conscientiousness and openness, as well as the covariation between need for cognition and each of these factors when predicting cognitive outcomes such as text processing and academic performance, may be a particularly fruitful area of research. As others have noted, however, the five-factor model is fundamentally an atheoretical description of the covariation among personality attributes. Although some have proposed (Costa & McCrae, 1995; McCrae & Costa, in press) and critiqued (e.g., Block, 1995a, 1995b) the five-factor model as a description of the causal underpinnings of individual

differences, most have regarded the five factors as a taxonomic framework for phenotypic personality attributes (e.g., see Goldberg & Saucier, 1995). If need for cognition has unique stochastic and functional relationships to conscientiousness and openness, subsequent research would be needed to determine whether this reflects an unmeasured multidimensionality in need for cognition or, more likely, an inherent difference in the psychological structure that emerges when focusing on a general cognitive predisposition for information processing rather than on the personality attributes used in language. Indeed, consistent with this latter possibility, Epstein (1994) recently proposed an alternative framework for organizing personality that was designed to accommodate unconscious and conscious processes. In Epstein's (1994) model, need for cognition represents an important component of one of two fundamental modes of information processing. Thus, whether the influence of need for cognition is best understood within the framework of one of the superfactors or as a distinct process-based dimensional component in an alternative taxonomic framework is an open question at this juncture.

Placement of need for cognition within a unified framework of personality such as the five-factor model or Epstein's (1994) model may provide a useful reference, but it does not explain how or why individuals differ in need for cognition.[12] We turn briefly to this issue in our concluding section.

Antecedents to Need for Cognition

The existing literature is consistent with the characterization of need for cognition as an intrinsic motivation to engage in effortful cognitive endeavors. Thus, need for cognition, at least in theory, should result from a person's values and the competence feedback and feelings of personal satisfaction and mastery derived from cognitive challenges. Children who learn, through observation and experience, that they can cope with their problems through reason and verbal influence rather than through physical force or flight should tend to develop higher levels of need for cognition because of the demonstrated import of good problem-solving skills and habits in charting a course through the hazards of life.

It is not the instrumentality of thinking in these settings that may be important, however. Prior research on the effects of contingent rewards (those based on level of performance) and noncontingent rewards (those based on mere task completion) on intrinsic motivation has yielded mixed results. Rosenfield, Folger, and Adelman (1980) demonstrated that it is not contingency per se that is important but, rather, whether the rewards provide information about an individual's competence. The development of need for cognition, therefore, may benefit from the construction of contingencies (e.g., in educational settings) that foster both cognitive development and feelings of enjoyment, competence, and mastery in thinking. Research on intrinsic motivation also suggests ways in which need for cognition might be diminished. For instance, individuals who initially enjoy thinking and effortful problem solving but who are subjected to high levels of what they perceive to be continuing and controlling surveillance, time pressure, and external reward may pay a price over time in terms of their level of need for cognition. Payment for grades for extended periods of time, for instance, may hinder the development of an individual's intrinsic interest in effortful cognitive endeavors if these rewards create the self-perception that the student is "a pawn" to the source of external rewards (deCharms, 1968).

A person's values also appear important to consider when constructing competence feedback. Harackiewicz and Elliot (1993), for instance, demonstrated that performance goals (demonstrating ability) enhanced intrinsic motivation among participants who were high in achievement orientation, whereas mastery goals (developing skills) enhanced intrinsic motivation among participants who were low in achievement orientation. Earlier in this article, we distinguished between individual differences in the extent to which effortful thinking is intrinsically reinforcing and differences in the reasons effortful thinking is intrinsically reinforcing. The former reflects need for cognition, whereas the latter—which is more similar to the distinction drawn by Harackiewicz and Elliot (1993)—reflects idiosyncratic antecedents of need for cognition. Thus, a chronic tendency to engage in or enjoy effortful cognitive activity may develop as a means of achieving control in individuals who have a high need for control, as a means of achieving a structured world in individuals who have a high need for structure, as a means of obtaining stable and valid evaluations of the world in individuals who have a high need to evaluate, and so forth. Not all individuals who have high need for control (or need for structure or to evaluate) have the cognitive skill, inclination, or ability to achieve control (or structure or stable evaluations) in their lives through reasoning and problem solving. Furthermore, because the intrinsic reinforcement received, at least ini-

[12] Wicklund (1990) has criticized psychological investigations of a number of individual-differences constructs, suggesting that theorizing about "types" of people reduces to a list of behaviors, results in no antecedent psychological variables, depends on circular research for support, results in attempts to claim all of the variation within the behavioral realm being studied, and precludes theoretical integration. We share Wicklund's belief that there is nothing psychologically informative about individual differences per se. To the extent that general theories illuminate intrapersonal psychological processes, however, they should also provide insight into interindividual variations that would otherwise be regarded as error variance in nomothetic research (see Cacioppo et al., 1983). The study of individual differences can also stimulate theory in the field by pointing to limitations and by suggesting alternative organizations of the data. The research reviewed earlier not only articulates better the nomological net within which need for cognition is embedded (e.g., see Table 2) but provides a more detailed depiction of the similarities and differences in the psychological processes and behavioral responses that characterize individuals low and high in need for cognition (e.g., see Tables 3–5). Furthermore, the emphasis by most investigators of need for cognition has been on person–situation interactions rather than on claims that all of the variation within the behavioral realm being studied can be explained by a single individual difference. To the contrary, by specifying the conditions in which individuals high versus low in need for cognition respond differently to events in their world, this research—like research on other individual-differences variables—has helped identify antecedent variables. Thus, we share the view that the goal of research on individual differences is to develop better or more comprehensive psychological theories; we disagree, however, that research on individual differences inherently hinders theoretical progress and indeed believe that comprehensive psychological theories cannot ignore individual differences.

tially, from effortful problem solving may originate from very different sources for different individuals, only modest correlations are to be expected between need for cognition and variables such as need for control or need to evaluate (Petty & Jarvis, 1996; Roman, Moskowitz, Stein, & Eisenberg, 1995).

Summary

A sizable empirical literature on need for cognition has developed over the past 12 years. Even though the prime focus of many of these studies was not personality processes, this literature paints a surprisingly coherent picture of the concept and consequences of need for cognition. The evidence supports the existence of stable individual differences in people's tendency to engage in and enjoy effortful cognitive activity. These individual differences range along a continuum from individuals low in need for cognition (chronic cognitive misers) who possess low intrinsic motivation to engage in effortful cognitive endeavors to individuals high in need for cognition (chronic cognizers) who possess high intrinsic motivation to exercise their mental faculties. Indeed, the endless intellectual curiosity of individuals high in need for cognition appears not as an eccentricity but as a life force. The differences between individuals low and high in need for cognition appear to be derived in large part from past experience, to be buttressed by accessible memories and behavioral histories, to manifest in current experience, and to influence the acquisition or processing of information relevant to dilemmas or problems. The extant research demonstrates that need for cognition can be distinguished conceptually from cognitive ability and reveals need for cognition to be related to agentic but not simple emotional personality processes and individual differences. A number of unanswered questions have also been identified in this review, including the metacognitions of individuals low and high in need for cognition, the location of need for cognition within unified frameworks of personality structure, and the ontogeny of need for cognition. Given the multiple (e.g., educational and familial) influences likely contributing to the development of need for cognition, of course, only modest correlations should be expected between need for cognition and any one of these potential determinants (Cacioppo & Berntson, 1992). The literature on intrinsic motivation may provide a useful starting point for understanding the antecedents of need for cognition, but research on possible genetic influences (beyond those subserving intelligence) would also be informative. Given that need for cognition can be reliably measured, is stable over time and situations, can account for significant variance in information processing beyond that explained by intellectual ability, and can be linked to important life outcomes such as academic achievement, it is our hope that this review will contribute to these questions being answered and to more focused and theoretically motivated research on motivated cognition.

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Appendix

Short Form of the Need for Cognition Scale

Instructions: For each of the statements below, please indicate to what extent the statement is characteristic of you. If the statement is extremely uncharacteristic of you (not at all like you) please write a "1" to the left of the question; if the statement is extremely characteristic of you (very much like you) please write a "5" next to the question. Of course, a statement may be neither extremely uncharacteristic nor extremely characteristic of you; if so, please use the number in the middle of the scale that describes the best fit. Please keep the following scale in mind as you rate each of the statements below: 1 = extremely uncharacteristic; 2 = somewhat uncharacteristic; 3 = uncertain; 4 = somewhat characteristic; 5 = extremely characteristic.

Item number	Item wording
1.	I would prefer complex to simple problems.
2.	I like to have the responsibility of handling a situation that requires a lot of thinking.
3.	Thinking is not my idea of fun.[a]
4.	I would rather do something that requires little thought than something that is sure to challenge my thinking abilities.[a]
5.	I try to anticipate and avoid situations where there is a likely chance I will have to think in depth about something.[a]
6.	I find satisfaction in deliberating hard and for long hours.
7.	I only think as hard as I have to.[a]
8.	I prefer to think about small, daily projects to long-term ones.[a]
9.	I like tasks that require little thought once I've learned them.[a]
10.	The idea of relying on thought to make my way to the top appeals to me.
11.	I really enjoy a task that involves coming up with new solutions to problems.
12.	Learning new ways to think doesn't excite me very much.[a]
13.	I prefer my life to be filled with puzzles that I must solve.
14.	The notion of thinking abstractly is appealing to me.
15.	I would prefer a task that is intellectual, difficult, and important to one that is somewhat important but does not require much thought.
16.	I feel relief rather than satisfaction after completing a task that required a lot of mental effort.[a]
17.	It's enough for me that something gets the job done; I don't care how or why it works.[a]
18.	I usually end up deliberating about issues even when they do not affect me personally.

Note. From "The Efficient Assessment of Need for Cognition," by J. T. Cacioppo, R. E. Petty, and C. F. Kao, 1984, *Journal of Personality Assessment, 48,* pp. 306–307. Copyright 1984 by Lawrence Erlbaum. Adapted by permission. The number of response options on the scales used across studies has typically ranged from five to nine, and the labels for these response options have varied from agreement–disagreement to extremely uncharacteristic–extremely characteristic. Although these variations across studies may influence the total scores obtained, they have not had dramatic effects on the relationships between interindividual variations in need for cognition and other variables in a given study.

[a] Reverse scored.

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