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The effects of individual differences in cognitive styles on decision-making accuracy and latency

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Defence R&D Canada – Toronto
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Abstract

How might individuals' typical decision-making styles affect the quality and latency of their decisions? In a first study, 48 adults completed three measures of cognitive styles, including the Personal Need for Structure and Personal Fear of Invalidity scales (PNS and PFI; Thompson, Naccarato, Parker, & Moskowitz, 2001), and the Need for Cognition scale (NFC; Cacioppo & Petty, 1982). Participants then completed three trials of a medium-fidelity simulation of a naval surveillance and threat assessment task called TITAN (i.e., "Team and Individual Threat Assessment Network") that required participants to evaluate seven pieces of information for potential targets displayed in a radar space (e.g., direction, speed, bearing, etc.). After reviewing the information for each target, participants submitted their threat assessment and were provided feedback about the degree of actual threat for the target. For each session, participants were instructed to clear the radar space of as many targets as possible within a 25-minute period and to perform this operation as accurately as possible. Results showed a significant decrease in processing time across trials. Higher NFC scores predicted a significantly smaller mean decision error across trials, and higher PNS scores predicted a greater mean decision error, although the latter effect failed to reach statistical significance. None of the cognitive styles scores had a significant main effect on the mean time spent processing TITAN targets.

In Study 2, 80 Canadian Forces personnel completed the three cognitive styles measures and worked in four-person teams on TANDEM II, a simulation similar to TITAN. Each team consisted of three subordinates who separately reviewed and integrated five pieces of complex information per target before forwarding their individual threat assessments to a team leader. The team leader then assessed the veridicality of the three assessments and integrated them into a final threat assessment for each of 42 targets in each of three sessions. In this case, both processing time and decision error significantly decreased with practice. Although none of the cognitive styles significantly predicted decision error or time, several interesting trends are of note. For example, higher PNS scores predicted a greater mean decision error, and higher NFC scores predicted a shorter mean decision time. We discuss the results of these two studies in terms of their relevance with past research in the social attitude literature and their implications for future research.

Résumé

Quelle pourrait être l'influence des modes décisionnels typiques sur la qualité et le temps de latence des décisions des personnes? Dans le cadre d'une première étude, 48 adultes ont été soumis à trois mesures de styles cognitifs, dont le besoin personnel de structure et la crainte d'invalidité personnelle (échelles PNS et PFI; Thompson, Naccarato, Parker et Moskowitz, 2001), ainsi que le besoin de cognition (NFC; Cacioppo et Petty, 1982). Les participants ont ensuite pris part à trois essais de simulation à fidélité moyenne d'une tâche de surveillance maritime et d'évaluation des menaces appelée TITAN (réseau d'évaluation collective et individuelle des menaces). Les participants devaient évaluer sept éléments d'information concernant des cibles possibles affichées sur un espace radar (tels la direction, la vitesse, le relèvement, etc.). Après avoir examiné l'information relative à chacune des cibles, les participants soumettaient leur évaluation des menaces et recevaient une rétroaction quant au degré de menace réelle posée par la cible. À chaque session, on a demandé aux participants d'éliminer de l'espace radar le plus de cibles possibles au cours d'une période de 25 minutes et d'effectuer cette tâche avec le plus de précision possible. Les résultats montrent une diminution significative du temps de traitement durant les essais. Les indices NFC supérieurs présageaient un taux moyen d'erreur de décision sensiblement inférieur durant les essais, et les indices PNS supérieurs présageaient un plus fort taux moyen d'erreur de décision, quoique ce dernier effet n'ait aucune signification statistique. Aucun indice des styles cognitifs n'a eu d'effet significatif sur le délai moyen de traitement des cibles TITAN.

Dans le cadre d'une seconde étude, 80 membres des Forces canadiennes ont été soumis aux trois mesures de styles cognitifs et ont travaillé par équipes de quatre à l'exercice TANDEM II, une simulation semblable à la tâche TITAN. Chacune des équipes était formée de trois subordonnés, appelés à examiner et à intégrer séparément cinq éléments d'information complexes par cible avant de transmettre leur évaluation individuelle des menaces à un chef d'équipe. Le chef d'équipe a évalué la véridicité des trois évaluations avant de les intégrer à une évaluation finale des menaces pour chacune des 42 cibles durant chacune des trois sessions. En l'occurrence, le temps de traitement autant que l'erreur de décision ont sensiblement diminué avec la pratique. Même si aucun des styles cognitifs n'a permis de prévoir les erreurs ou le temps de décision de manière significative, plusieurs tendances intéressantes sont à noter. Par exemple, les indices PNS supérieurs laissaient présager une plus forte erreur de décision moyenne, et les indices NFC supérieurs étaient précurseurs d'un plus bref délai moyen de décision. Nous discutons de la pertinence des résultats de ces deux études par rapport à certaines études publiées sur les attitudes sociales et à leurs implications pour les travaux de recherche à venir.

Executive summary

Overview: This research explores how individuals' typical decision-making styles affect the quality and latency of their decisions. We investigated three cognitive styles: the Personal Need for Structure and Personal Fear of Invalidity (PNS and PFI; Thompson, Naccarato, Parker, & Moskowitz, 2001), and the Need for Cognition (NFC; Cacioppo & Petty, 1982). A high PNS occurs when a person is compelled by a need for structure, order, and consistency, and it has long been considered a fundamental human motivation. While some individuals are driven by needs for clarity and structure, other people may be more generally concerned with the cost of committing errors, and they may be considered to have a high PFI. Individuals high in PFI are preoccupied with the consequence or perceived risk of some undertaking. The third cognitive style, NFC, refers to an individual's tendency to engage in and enjoy effortful cognitive endeavors.

We investigated the effects of these cognitive styles in two studies, one devoted to individual decision-making and the second, devoted to team decision-making. A secondary goal of this research was to explore the dimensionality of the PNS scale. In their psychometric work, Neuberg and Newsom (1993) isolated two factors within the items comprising the PNS scale. The first factor, DFS, containing four items, is termed the "*Desire for Structure*," and includes items such as "I enjoy having a clear and structured mode of life." The second factor, RLS, is referred to as "*Response to a Lack of Structure*." It contains seven items such as "It upsets me to go into a situation without knowing what I can expect from it."

Study One: In the first study, 48 adults completed the three measures of cognitive styles, as well as questions assessing demographic variables. Participants then completed three trials of a medium-fidelity simulation of a naval surveillance and threat assessment task called TITAN (i.e., "Team and Individual Threat Assessment Network") that required participants to evaluate seven pieces of information for potential targets displayed in a radar space (e.g., direction, speed, bearing, etc.). After reviewing the information for each target, participants submitted their threat assessment and were provided feedback about the degree of actual threat for the target. For each session, participants were instructed to clear the radar space of as many targets as possible within a 25-minute period and to perform this operation as accurately as possible. Results showed a significant decrease in processing time across trials. *Higher* NFC scores predicted a significantly *smaller* mean decision error across trials, and *higher* PNS and RLS scores predicted a *greater* mean decision error, although the latter two effects failed to reach statistical significance. None of the cognitive styles scores had a significant main effect on the mean time spent processing TITAN targets.

Study Two: In a second study, 80 Canadian Forces personnel completed the three cognitive styles measures and worked in four-person teams on TANDEM II, a simulation similar to TITAN. Each team consisted of three subordinates who separately reviewed and integrated five pieces of complex information per target before forwarding their individual threat assessments to a team leader. The team leader then assessed the veridicality of the three assessments and integrated them into a final threat assessment for each of 42 targets in each of three sessions. In this case, both processing time and decision error significantly decreased with practice. Although none of the cognitive styles significantly predicted time or accuracy,

several interesting trends are of note. For example, *higher* PNS and DFS scores predicted a *greater* mean decision error. *Higher* NFC scores predicted a *shorter* mean decision time, as did higher DFS scores, whereas *higher* RLS scores predicted, as in Study 1, a *longer* mean decision time.

Discussion: In summary, although the present studies lack statistical power, the results are promising enough to warrant further studies. These studies, addressing the limitations of the present designs, may thus provide better tests of these hypotheses. Finally, we have suggested some potential future avenues of investigation in the pursuit of the underlying causes of individual differences in decision- making.

Blais, A.-R., Thompson, M.M., & J.V. Baranski, 2002. The effects of individual differences in cognitive styles on decision-making accuracy and latency. DRDC Toronto TR 2003-023 Defence R&D Canada – Toronto.

Sommaire

Aperçu : Cette recherche explore l'influence des modes décisionnels typiques sur la qualité et le temps de latence des décisions des personnes. Nous avons examiné trois styles cognitifs : le besoin personnel de structure et la crainte d'invalidité personnelle (PNS et PFI; Thompson, Naccarato, Parker et Moskowitz, 2001), ainsi que le besoin de cognition (NFC; Cacioppo et Petty, 1982). Le besoin personnel de structure (PNS) est élevé lorsqu'une personne ressent un grand besoin de structure, d'ordre et de cohérence, et on le considère depuis longtemps comme un facteur fondamental de la motivation humaine. Alors que certaines personnes sont motivées par un besoin de clarté et de structure, d'autres se préoccupent davantage des coûts des erreurs possibles, et l'on peut considérer qu'elles ont un besoin élevé de structure. Les personnes dont le PFI est élevé s'inquiètent des conséquences ou des risques perçus d'une tâche. Le troisième style cognitif, le besoin de cognition (NFC), renvoie à la tendance d'une personne à entreprendre et à apprécier des tâches cognitives qui exigent des efforts.

Nous avons examiné les effets de ces styles cognitifs dans le cadre de deux études, une consacrée au processus décisionnel individuel et la seconde, à la prise de décisions collective. Un objectif secondaire de cette recherche consistait à explorer la dimensionnalité de l'échelle PNS. Durant leurs travaux psychométriques, Neuberg et Newsom (1993) ont isolé deux facteurs parmi les éléments constitutifs de l'échelle PNS. Le premier facteur, DFS, qui réunit quatre éléments, équivaut au *désir de structure*, et intègre des éléments comme « J'aime avoir un mode de vie clair et structuré ». Le second facteur, RLS, équivaut à la *réaction à un manque de structure*. Il comprend sept éléments comme le suivant « Cela me perturbe de me placer dans une situation dont j'ignore les conséquences ».

Première étude : Dans le cadre de la première étude, 48 adultes ont été soumis aux trois mesures de styles cognitifs et ont répondu à des questions visant à évaluer des variables démographiques. Les participants ont ensuite pris part à trois essais de simulation à fidélité moyenne d'une tâche de surveillance maritime et d'évaluation des menaces appelée TITAN (réseau d'évaluation collective et individuelle des menaces). Les participants devaient évaluer sept éléments d'information concernant des cibles possibles affichées sur un espace radar (tels la direction, la vitesse, le relèvement, etc.). Après avoir examiné l'information relative à chacune des cibles, les participants soumettaient leur évaluation des menaces et recevaient une rétroaction quant au degré de menace réelle posée par la cible. À chaque session, on a demandé aux participants d'éliminer de l'espace radar le plus de cibles possibles au cours d'une période de 25 minutes et d'effectuer cette tâche avec le plus de précision possible. Les résultats montrent une diminution significative du temps de traitement durant les essais. Les indices NFC *supérieurs* présageaient un taux moyen d'erreur de décision sensiblement *inférieur* durant les essais, et les indices PNS et RLS *supérieurs* présageaient un *plus fort* taux moyen d'erreur de décision, quoique ces deux derniers effets n'aient aucune signification statistique. Aucun indice des styles cognitifs n'a eu d'effet significatif sur le délai moyen de traitement des cibles TITAN.

Seconde étude : Dans le cadre d'une seconde étude, 80 membres des Forces canadiennes ont été soumis aux trois mesures de styles cognitifs et ont travaillé par équipes de quatre à l'exercice TANDEM II, une simulation semblable à la tâche TITAN. Chacune des équipes

était formée de trois subordonnés, appelés à examiner et à intégrer séparément cinq éléments d'information complexes par cible avant de transmettre leur évaluation individuelle des menaces à un chef d'équipe. Le chef d'équipe a évalué la véridicité des trois évaluations avant de les intégrer à une évaluation finale des menaces pour chacune des 42 cibles durant chacune des trois sessions. En l'occurrence, le temps de traitement autant que l'erreur de décision ont sensiblement diminué avec la pratique. Même si aucun des styles cognitifs n'a permis de prévoir le temps ou l'exactitude des décisions de manière significative, plusieurs tendances intéressantes sont à noter. Par exemple, les indices PNS et DFS *supérieurs* laissaient présager une *plus forte* erreur de décision moyenne. Les indices NFC *supérieurs* étaient précurseurs d'un *plus bref* délai moyen de décision, tout comme les indices DFS supérieurs, tandis que les indices RLS *supérieurs* étaient associés, comme dans le cas de la première étude, à un *plus long* délai moyen de décision.

Discussion : Bref, même si le poids statistique de ces études est faible, leurs résultats sont suffisamment prometteurs pour justifier la réalisation d'autres études. Il est possible que ces études, portant sur les limites que présentent les conceptions actuelles, permettent de mieux vérifier ces hypothèses. Enfin, nous avons proposé des avenues à explorer afin de cerner les causes sous-jacentes des différences individuelles en matière de décision.

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Introduction

Although still sometimes a controversial notion, there is growing agreement within cognitive psychology that individual differences can have profound effects on decision-making performance (Ackerman, 1987; Stanovich & West, 2000). Indeed, Henmon (1911) was among the first to notice that some individuals have faster response times and greater confidence in their decisions than do other individuals. Although the existence of individual differences are common and well documented in cognitive psychology, it is only very recently that there has been any attempt to understand the aspects of personality that may serve as the basis for these differences in performance (e.g., Pallier, Wilkinsion, Danthiir, Kleitman, Knezevic, Stankov, & Roberts, 2002).

Social psychology has explored the precursors of individual differences in judgments. Within this literature seeking to understand the bases of these individual differences, one class of variables, termed *cognitive styles*, considers the role of enduring knowledge-seeking preferences (Hunt, Krzystofiak, Meindl, & Yousry, 1989; Leonard, Scholl & Kowalski, 1999; Ruble & Cosier, 1990). Because they assess stable propensities in modes of information gathering, cognitive styles are considered integral to decision processes and outcomes (Leonard, et al.; Ruble & Cosier). They are hypothesized to affect judgments directly and to interact with situational or specific task constraints encountered (Ackerman, 1987; Thompson, Naccarato, Parker & Moskowitz, 2001); thus their effects are assumed to be readily evident in most decision-making situations. To date, however, the vast majority of research utilizing cognitive styles has largely been limited to social and attitudinal judgments, focusing, for instance, on the role of individual differences in the tendency to use existing stereotypes to guide judgments or on the influence of individual differences in the formation of impressions of people (Mikulincer, Yinon, & Kabili, 1991; Neuberg & Newsom, 1993; Schultz & Searleman, 1998, are exceptions).

The present research integrates cognitive decision-making research with that of social psychological work on individual differences in decision-making, historically quite separate areas of psychological research. Specifically, we investigate the role of cognitive styles in the quality and latency of complex decisions in a decision-making task relevant to the military. Three cognitive styles are investigated here: the Personal Need for Structure (PNS; Thompson, et al., 2001), the Personal Fear of Invalidity (PFI; Thompson, et al.), and the Need for Cognition (NFC; Petty & Cacioppo, 1982).

Thompson et al. (2001) developed the PNS and PFI scales across a series of studies that demonstrated the internal consistency (αs > 0.80), and replicated the factor structures of the measures. They also investigated, with samples of undergraduate students, and the convergent and discriminant validity of the PNS and PFI scores with respect to constructs such as authoritarianism, rigidity, depression, and self-consciousness. They also used the measures in studies demonstrating the construct validity of the measures in terms of tendency to use stereotypes (PNS) and proclivity to conflicted attitudes. The measures have been used in subsequent research by many other researchers. In their scale development paper, Cacioppo and Petty (1982) also demonstrated the reliability and validity of the measure. Since its introduction, the Need for Cognition has become one of the most widely used social psychological individual difference measures (Cacioppo, Petty, Feinstein, & Jarvis, 1996), being used in a great number of research studies.

We begin by reviewing the literature demonstrating how variations in these cognitive styles have been shown to influence social and attitudinal judgments. We then present two experiments that explore the effect of cognitive styles on military decision-making at the individual and team levels.

Personal Need for Structure

One construct falling under the rubric of cognitive styles is the *Personal Need for Structure* (PNS; Thompson et al., 2001). Generally, a need for structure occurs when a person is compelled by a desire for structure, order and consistency. Considered a fundamental motive within social psychology (see Cohen, Stotland & Wolfe, 1955; Heider, 1958), a need for structure is assumed to be adaptive, facilitating individuals' perceptions of control and predictability in a complex world (Cohen et al.; Heider; Neuberg & Newsom, 1993). Accordingly, the judgments of those individuals high in Personal Need for Structure are thought to be characterized by decisiveness, that is, high confidence and quick response times.

In the context of social judgment research, people high in PNS have been shown to base their judgments to a greater degree on the initial information encountered and to be more resistant to incorporating conflicting evidence (Kaplan, Wanshula & Zanna, 1991). They are more influenced by previously primed categories and stereotypes than are individuals low in PNS (Neuberg & Newsom, 1993; Moskowitz, 1993; Schaller, Boyd, Yohannes, & O'Brien, 1995; E. Thompson, Roman, Moskowitz, Chaiken, & Bargh, 1994). Finally, there is some evidence that high PNS is associated with shorter response latencies both inside (Schultz & Searleman, 1998) and outside of a laboratory environment (Neuberg & Newsom; Roman, Moskowitz, Stein & Eisenberg, 1991). Only two studies to date have explored the effects of PNS in more traditional judgment domains. That research has shown that, in comparison to individuals low in PNS, people high in PNS tend to arrange information into fewer, less cognitively complex structures (Neuberg & Newsom) and to develop mental sets more readily, at least under stress inductions (Schultz & Searleman).

PNS Subfactors: Desire for Structure and Response to a Lack of Structure

In their psychometric work, Neuberg and Newsom (1993) isolated two factors within the items comprising the PNS scale. The first factor, DFS, containing four items, is termed the "*Desire for Structure* " and includes items such as "I enjoy having a clear and structured mode of life." The second factor, RLS, is referred to as "*Response to a Lack of Structure*." It contains seven items such as "It upsets me to go into a situation without knowing what I can expect from it."

Neuberg and Newsom (1993) found that individuals high in DFS were more likely to respond to ambiguous behavior based upon pre-existing stereotypes; there were no effects of RLS on this task. In contrast, people high in RLS were more likely to respond to the complexity of a card-sorting task with fewer, more simplistic categories across all knowledge domains. Effects for DFS appeared only for highly familiar, less complex domains.[1] Although these subfactors were demonstrated by Neuberg and Newsom, to date, researchers have typically used total PNS scores in their studies. Thus, the present research is one of the first to continue exploring the potential utility of the one conceptualization of PNS versus the two factor conceptualization of the DFS and RLS subscales.

Personal Fear of Invalidity

While some individuals are driven by needs for clarity and structure, other people are more generally concerned with the cost of committing errors and as such, may be considered to have a high *Personal Fear of Invalidity.* Individuals high in PFI tend to be preoccupied with the consequences or perceived risk of some undertaking. In order to avoid potential mistakes, those high in PFI are more likely to see alternatives, vacillate between options, and show discomfort with feedback that indicated an error had been made. A heightened concern with error might be manifested through behavioral and cognitive hesitancy and a resistance to committing to situations and ideas. This characteristic manner of reevaluating options is logically linked to an agitation around decisions, as well as to vacillation, ambivalence, and procrastination regarding the making of important decisions. In some circumstances, however, this flexibility of thought suggests that these individuals may be more "data-driven" than "theory-driven" and as such, less likely to employ stereotypes or be quick to reach conclusions about people (see Kruglanski & Freund, 1983).

Previous research by Thompson and Zanna (1995) investigated the PFI as an antecedent of ambivalent or conflicted social attitudes (Lewin, 1951; Miller, 1944). Respondents completed a questionnaire in which they were instructed to concentrate upon either the positive (or negative) aspects of each social issue (e.g., legalizing euthanasia) and indicated how positive (or negative) they felt regarding each issue. Participants then spent 15-20 minutes filling out various other scales and completed the opposite valenced form of the social attitudes scale. Results demonstrated that individuals possessing higher levels of PFI tended to express greater ambivalence across a variety of social issues. A second study suggested that having greater information about these social issues did not lessen the ambivalence of high PFI individuals.

In other research, Somers and Lefcourt (1992) found that first year university students classified as high PFI in a mass testing session at the beginning of the term were more likely to procrastinate and fail to complete their course requirements. Interestingly, high PNS has been related to early completion of experimental participation credits in introductory psychology course (Neuberg & Newsom, 1993; Roman, et al. 1991).

[1] Supporting the conjectures of Newberg and Newsom, Thompson et al. (2001) have demonstrated that RLS is more highly correlated to measures of anxiety and concerns with making errors than is DFS. Field studies too have corroborated the RLS-stress relation (Kivimaki, Elovainio & Nord, 1996).

Need for Cognition

A third cognitive style that may affect decision processes is the *Need for Cognition* (Cacioppo & Petty, 1982). A need for cognition refers to an individual's tendency to engage in and enjoy effortful cognitive endeavors (Cacioppo, et al, 1996). Although modestly related to overall intellectual ability, need for cognition is thought to be more about the process of knowledge gathering, rather than the intellectual ability per se.

In their recent summary of the NFC literature, Cacioppo et al. (1996) present experimental results particularly relevant to the formulation of predictions concerning the judgmental accuracy. They summarize a series of studies that indicate that individuals high in NFC are more likely to remember a greater amount of source material, relative to individuals low in NFC. Moreover, these memory differences were most pronounced when the source material was complex or inconsistent. Other research has corroborated this finding, showing that individuals high in NFC are less likely to be ambivalent or conflicted about the social attitudes they hold (Thompson & Zanna, 1995). Individuals high in NFC may also make more accurate judgments as they are more likely to correct their initial judgments in light of new information and are more likely to correct for biasing factors in the judgment setting (see Martin, Seta, & Crelia, 1990; Petty & Jarvis, 1996).

Hypotheses

As noted earlier, this is one of the first attempts to investigate the effects of cognitive styles on a military decision-making task. Thus, this work is exploratory in nature. Nonetheless, based on the proceeding literature review, we expect:

1. PNS scores to be *positively* related to decision error.[2]

2. PFI scores to be *negatively* related to decision error. That is, given their overriding concerns with making errors, individuals with higher PFI scores should make *more accurate* judgments than should individuals with lower PFI scores.

3. NFC scores to be *negatively* related to decision error.

There is less empirical research on which to base hypotheses concerning the relation of these cognitive styles to decision time. However, extrapolating from the prior theoretical work cited, we expect:

1. PNS scores to be *negatively* related to latency or decision time.

2. PFI scores to be *positively* related to latency.

3. NFC scores to be *negatively* related to latency, although the theory associated with need for cognition does not explicitly address decision-making latency.

[2] We do not have specific hypotheses regarding the effects of the DFS and RLS scores on decision error and time. We will however explore these relationships, as a first step in our program of research.

Study 1: Individual TITAN Study

Method

Participants

Forty-eight adults participated in Study 1. All were recruited by advertisement from local universities ($n = 24$) and army reserve units ($n = 24$). The mean age of the participants was 20.98 years ($SD = 2.45$), and there were 17 women and 31 men in this sample.

Materials

Scales

Participants completed various individual differences measures, including the following:

1. The *Personal Need for Structure Scale* (PNS; Thompson, et al., 2001), a 12-item scale. Sample items include "I enjoy having a clear and structured mode of life," and "I hate to change my plans at the last minute".

2. The *Personal Fear of Invalidity Scale* (PFI; Thompson et al., 2001), a fourteen-item scale (e.g., "I tend to struggle with most decisions.").

3. For both the PNS and PFI scales, participants rate the extent to which they agree with each statement on a six-point Likert-type scale ranging from 1, "Strongly Disagree" to 6, "Strongly Agree."

4. The *Need for Cognition Scale* (NFC; Petty & Cacioppo, 1982), an eighteen-item scale (e.g., "I would prefer complex to simple problems."). Participants rate the degree to which each item characterizes them on a nine-point Likert-type scale ranging from 1, "Strongly Disagree" to 9, "Strongly Agree."

TITAN task

TITAN (i.e., Team and Individual Threat Assessment Network) is a medium-fidelity simulation of a naval surveillance and threat assessment operation that requires participants to evaluate seven pieces of information for targets displayed in a radar space (e.g., direction, speed, bearing, etc.) on a PC workstation with a color screen.

Participants were told that each piece of information, implying a threat level, should be weighted equally in their overall threat assessment. The information was not necessarily consistent, that is, some information indicated that the target was not a threat, while other information suggested varying degrees of target threat (e.g., hostile or unknown information).

After reviewing the information for each target, participants submitted their threat assessment using a mouse and a sliding visual analogue probability scale that ranged from 0, "No Threat" to 1.0, "Highest Threat." Immediately after submitting their response, participant received feedback concerning the "true" threat assessment for the target, which was determined by a computer algorithm that reflected a perfect equal weighting function, and a statement of the percent of error between their assessment and the true threat.

Once a target was "cleared", the participant selected the next target to be processed. The objective of the experimental session was to clear the radar space of as many targets as possible within a 25-minute period and to perform this operation as accurately as possible. Participants completed three sessions, in order to determine the effect of practice. Measures of performance included, averaged across targets, for each of three experimental sessions:

1. Mean target processing time (in milliseconds) and

2. Mean absolute assessment error (i.e., the deviation from the true threat assessment).

Procedure

Participants received payment for their participation. Four individuals completed this experiment in the context of a larger study investigating a variety of individual and team-based tasks. However, these participants took part in the TITAN task independently of each other and in separate rooms.

Upon arriving at the laboratory, participants completed a questionnaire including demographic information and individual; differences measures. Following a short break, they received extensive individual training and practice on the experimental platform before completing the three experimental sessions, with ten-minute breaks in-between sessions.

Results

Data screening and descriptive statistics

Decision latency (i.e., "Time") designated mean processing time, and the accuracy measure (i.e., "Error") represented mean absolute percentage error. Processing times greater than three standard deviations above the mean were trimmed as outliers, accounting for 71 of the 7051 total number of tracks (or about 1% of the trials).

We screened the data for missing values, univariate outliers, skewness, and kurtosis. An individual data point was missing for one of the PFI items, so we replaced its value with the sample mean value for that item (Cohen & Cohen, 1983), resulting in a sample size of 48 individuals. We transformed the accuracy measures using a power transformation, as they exhibited significant univariate skewness and kurtosis (Cohen & Cohen). We conducted all our analyses on both the original and transformed scores and obtained similar results, so we report only the results associated with the original scores.

We submitted the PNS Scale to confirmatory factor analyses, in order to investigate whether a two-factor model (i.e., DFS and RLS) provided a better fit to the sample data than a one-factor model (i.e., overall PNS). After a careful analysis of the residuals, parameter estimates, and fit indices, it was not clear which model was best. We decided to report the results associated with both the overall PNS Scale and its two hypothesized subscales, DFS and RLS.[3] We computed the total scores on the cognitive styles measures by summing the items on their respective (sub)scales.

Preliminary analyses revealed no significant differences between military and civilian participants on the dependent variables. Thus we collapsed data across groups. We report descriptive statistics and Pearson correlation coefficients in Table 1. Due to our small sample size, we use $p < .10$ as our significance level for all subsequent analyses (except when otherwise noted), in order to maintain an adequate statistical power, where power refers to the probability of rejecting the null hypothesis *given that it is actually false.*

Practice effects

We found a significant main effect of practice on processing time, $F(1.73, 81.20) = 9.76$, $\eta_p^2 = .17$, but not on Error, as shown by univariate repeated-measures analyses of variance with session as a within-subjects factor.[45] Processing time decreased with

[3] Neither of the solutions yielded a good fit. Details of the confirmatory factor analyses are available from the first author.

[4] Partial Eta squared (η_p^2) measures the strength of an experimental effect (i.e., effect size), indicating the proportion of the variation in the dependent variable accounted for by the effect; small, medium, and large effects are represented by, respectively, $\eta_p^2 = .01, .06$, and $.14$ (Cohen, 1988).

practice, and this decline was significant between the first and last, $t(47) = 3.28$, $d = .47$, and second and last sessions, $t(47) = 3.90$, $d = .56$.[6]

Cognitive styles and performance

Univariate repeated-measures analyses of covariance – with session as a within-subjects factor and the PNS, PFI, and NFC scores as covariates – revealed a significant main effect of the NFC scores, $F(1, 44) = 3.95$, $\eta_p^2 = .08$ on the mean error rate across trials.[7, 8] *Higher* NFC scores predicted a *smaller* mean decision error across trials, $B = -0.000525(0.000264)$, $\beta = -.31$. The following results were also consistent with our hypotheses, although they failed to reach statistical significance: *higher* PNS and RLS scores predicted a *greater* mean decision error (see Table 2 for detail). PFI scores were unrelated to decision error.

None of the cognitive styles scores had a significant main effect on the mean time spent processing TITAN targets.[9] However, as expected, there was a tendency for *higher* PFI scores to predict a *longer* mean decision time (see Table 3). When we included the DFS and RLS scores in the model, their effects on Time revealed opposite trends: *higher* RLS scores predicted a *longer* mean decision time, whereas *higher* DFS scores predicted a *shorter* mean decision time, although neither of these results achieved statistical significance.

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[5] We corrected for departure from sphericity by adjusting the degrees of freedom using a Greenhouse-Geisser correction.

[6] We used a significance level of .10/6 = .0167, based on a familywise alpha level of .10 (Keppel, 1991). Cohen's *d* is a measure of effect size for paired-samples t-tests; small, medium, and large effects are represented by, respectively, $d = .20$, .50, and .80 (Cohen, 1988).

[7] We conducted the repeated-measures analyses of covariance by simultaneously entering the PNS, PFI, and NFC scores in a first model and the DFS, RLS, PFI, and NFC scores in a second model.

[8] None of the interaction effects (i.e., between the within-subjects factor and each covariate) in the analyses of covariance were significant.

[9] We correlated various personality measures (i.e., Mastery, Optimism, and the Big Five) with Time and Error and found significant Pearson correlations between Neuroticism and Time ($r = .29$) and Mastery and Error ($r = -.38$).

Study 2: Team TITAN Study

Method

Participants

Eighty Canadian Forces reservists whose ranks ranged from Private to Major, responded to posters at their units advertising a team decision-making study. There were 11 women and 69 men in this sample.

Materials

Scales

Participants completed, among various measures, the individual differences measures described above, that is, the PNS, PFI, and NFC scales.

TITAN task

The task involved an interactive version of the TITAN threat assessment task used in Experiment 1. The experiment was conducted in the context of a scenario in which participants were part of a United Nations peacekeeping force tasked to monitor and assess the threat potential of all air, surface and subsurface activity of a belligerent force threatening a neighboring country. This scenario emphasized that military, air, and hostile elements of the targets should contribute to higher threat assessments, whereas civilian, surface, and peaceful elements should contribute to lower threat assessments.

Each subordinate team member viewed five pieces of information per target. As in the previous study, each piece of information implied a threat level and each informational cue was to be weighted equally in the overall threat assessment. After reviewing the information for the target, each subordinate individually made a threat assessment on a probability scale similar to that employed in Experiment 1. The leader could also choose to access any piece of threat information available to the subordinates. Each subordinate assessment was instantaneously forwarded by the system to the leader. Only after all three subordinate assessments were finalized could the leader make the final assessment. On the basis of the three subordinate assessments, plus any of the subordinates' sensor information that the leader queried on their own, the leader made a final threat assessment for each target.

Immediately after submitting a response, the leader received feedback concerning the "true" assessment for the target, the percent of error of the assessments of each of the three subordinate members, and an index of cumulative team-level performance. Subordinate members received feedback at the team level only. Once a target was "cleared", the leader selected the next target to be processed. The objective of each experimental session was to clear the radar space of 42 contacts as quickly and as accurately as possible. Measures of team performance included, averaged across targets:

1. *Mean target processing time* (in milliseconds) and

2. *Mean absolute assessment error* (i.e., the deviation from the true threat assessment).

Procedure

Individuals received their daily wage in return for their participation. Each team consisted of one leader and three subordinates. The individual with the most senior rank was assigned the leader position. As was the case in the first experiment, upon arriving at the laboratory, participants completed a questionnaire including demographic information and the cognitive styles measures described above.

Following a short break, participants were given extensive individual training and practice on the experimental platform. Specifically, one experimenter provided the three subordinate team members with the specific instructions required for the Alpha, Bravo, and Charlie roles; a second experimenter provided specific instructions to the leader, highlighting the unique aspects of that role. The participants, as a team, processed five practice targets as accurately as possible with the experimenters present to answer any queries. The participants and their PC workstations were located in separate rooms. However, the workstations were networked together, and the team members could communicate by headsets.

The teams participated in three sessions in order to determine the effect of practice. Each session lasted between 20-60 minutes depending on the team performance. Participants received a ten-minute break period between sessions during which they received feedback on their team performance (i.e., time and accuracy).

Results

Data screening and descriptive statistics

Team decision latency (i.e., "Time") designated the mean team processing time per target, and the team accuracy measure (i.e., "Error") represented the mean team absolute percentage error per target. Trials on which processing times exceeded three standard deviations from the mean were trimmed as outliers, accounting for 85 of the 2449 trials (or about 3.5% of the trials).

We screened the data for missing values, univariate outliers, skewness and kurtosis. The individual differences data for two members of one team was lost due to a computer malfunction. Thus the results are based on the data for 19 teams for which both individual differences and performance data were available (for a total of 78 individuals, with three or four individuals per team).

Confirmatory factor analyses of the PNS items showed that, this time, the two-factor solution resulted in a better model than the one-factor solution. Yet, to be consistent, we decided to report the results associated with the overall PNS Scale and its two hypothesized subscales, DFS and RLS.

We computed the scores on the cognitive styles measures by averaging scores across all team members. We report descriptive statistics and Pearson correlation coefficients in Table 4. Due to our small sample size, we again use $p < .10$ as our significance level for all subsequent analyses (except when otherwise noted), in order to maintain adequate statistical power, that is, in order to maintain an adequate probability of rejecting the null hypothesis.

Practice effects

We found a significant main effect of practice on Time and Error, $F(1.29, 23.25) = 37.36$, $\eta_p^2 = .68$ and $F(2,36) = 6.46$, $\eta_p^2 = .26$, respectively, in univariate repeated-measures analyses of variance with session as a within-subjects factor. Processing time decreased with practice across all three sessions, whereas decision error was most reduced between the first and second, $t(18) = 3.20$, $d = .73$, and first and last trials, $t(18) = 3.17$, $d = .73$.

Cognitive styles and performance

None of the cognitive styles significantly predicted the dependent variables in univariate repeated-measures analysis of covariance – with session as a within-subjects factor and the PNS, PFI, and NFC scores as covariates.[10] However, some trends in the data emerged which were consistent with our expectations. *Higher* PNS and DFS scores were related to a *greater*

[10] We correlated various personality measures (i.e., Self-Esteem, the Big Five) with Time and Error and found a significant Pearson correlation between Extraversion and Error ($r = -.46$).

mean decision error (see Table 5 for details). *Higher* NFC scores predicted a *shorter* mean decision time as did higher scores on the DFS subscale of the PNS scale. *Higher* RLS scores predicted, as in Study 1, a *longer* mean decision time (see Table 6). Results for PFI did not support predictions as *higher* PFI scores predicted *shorter* mean decision time and were unrelated to decision accuracy.

General Discussion

The present research investigated the role of individual differences in judgment and decision-making performance. In both studies, the decision-making task required participants to review several pieces of information in order to make a series of threat assessments in the context of a naval surveillance task. Specifically we explored the effects of three cognitive styles used in the social psychological literature, Personal Need for Structure, Personal Fear of Invalidity (Thompson et al., 2000) and need for Cognition, on processing time and error rates in the TITAN task.

With respect to decision error, we found limited support for our hypotheses. Specifically, PNS tended to be positively related to decision error, although the results did not achieve statistical significance in either study. Similarly, while NFC scores were *negatively* related in both studies to decision error, as expected, these results achieved statistical significance in Study 1 only. Our hypothesis that PFI scores would be *negatively* related to decision error was not supported in either study.

Concerning decision latency or processing time, our prediction that PNS scores would be *negatively* related to decision time was not supported in either study. Interestingly, in both studies, the effects of the DFS and RLS scores on decision time were in opposite directions (negative for the DFS and positive for the RLS scores), yielding a null overall effect of the PNS scores. We had anticipated a positive relation between PFI scores and decision latency, but this relation did not receive support, although results did reveal a trend in the expected direction in Study 1. Finally, our prediction that NFC scores would be *negatively* related to decision latency was not supported, although there was a trend in that direction in Study 2.

The research explored the potential differential effects of Desire for Structure and Response to a Lack of Structure, the two PNS subscales identified by Neuberg and Newsom (1993). Factor analytic results across studies tended to suggest the presence of two factors. Moreover, the results for Study 1 indicated that DFS was related to shorter reaction times, and RLS was associated with longer reaction times. The result for DFS was replicated in Study 2 but was not replicated for RLS. These differential effects of DFS and RLS are consistent with Thompson et al's (2001) prior work, which has demonstrated a consistent small positive correlation between the PFI and PNS scales, this positive relation being accounted for by the items comprising the RLS factor. Overall, these findings do suggest the potential utility of further exploration of the two-factor conceptualization of PNS.

Clearly, our results were not as strong as hoped for. A major limitation of these studies was their small sample sizes, particularly with respect to Study 2 ($N = 19$). The hypothesized relationships may have failed to reach statistical significance because of the small sample size and reduced statistical power, although in an effort to maintain an adequate level of statistical power, we used $p < .10$ as our significance level across studies. Yet, this increased significance level is associated with a corresponding rise in the probability of rejecting the null hypothesis *given that it is true* (i.e., a Type I error). We acknowledge the possibility that some of our significant results may have been due to chance. However, it is important to note that the effect sizes associated with the experimental effects were in the small-to-medium range, and in some cases, for reaction times, in the medium-to-large range. Although some effects failed to reach statistical significance, they still were of moderate magnitude and worth investigating in future research. Thus, these studies should be best viewed as pilot efforts, providing direction, including recommendations for larger sample sizes, for future work.

There was also an inconsistent pattern of results across studies. The results may have been inconsistent across studies due to the nature of the task. Although similar in their focus on naval threat assessment, Study 1 focused on individual decision-making, whereas Study 2 focused on team decision-making. It may be that participants in Study 1 felt more personally involved in their performance outcomes as these outcomes were clearly based on their performance alone. The designs of the studies also provided different types of feedback for participants. In Study 1, individuals received trial-by-trial feedback on the quality of each of their threat assessments. In Study 2, on the other hand, individual team members only received group-level feedback, an amalgamation of their own accuracy, that of their team mates, and that of their leader who was responsible for the final threat assessment. Depending on the relation of participants' own assessment to that of the other members of the team, the accuracy feedback the individual received may have been consistent, unrelated, or even inconsistent with his or her own actual performance.

Importantly, the research design did not control for the consistency of the individual target cues participants reviewed in making their decision assessments. Past theory and research suggests that one critical variable for these cognitive styles is the complexity of the information that knowledge-seekers encounter; specifically, the degree of consistency in the information cues judges use to make their decision. For instance, individuals high in PNS are hypothesized to have greater difficulty with contradictory or disparate information (Thompson et al., 2001). In general, past research has shown that people high in PNS tend to base their judgments to a greater degree on initial information encountered, and that they are more resistant to incorporating conflicting evidence (Kaplan et al., 1991). Thus, in the present studies, to the extent that these individuals are presented with consistent target cues, their judgments may be as accurate as those of individuals low in PNS. Yet, in cases where information cues are disparate, those high in PNS may be particularly vulnerable to judgmental error and therefore, to lessened decision accuracy.

Theory may also suggest a PFI-information complexity relation. High-PFI individuals tend to be more ambivalent, or conflicted, about social issues, and thus, they may be more likely to weigh disparate pieces of information more equally, leading to confusion and hesitation (Thompson et al., 2001; Thompson & Zanna, 1995). Although not yet directly assessed empirically, prior research suggests that the effects of high PFI might also be particularly apparent under conditions where informational cues are not consistent. Similarly, past research has demonstrated that individuals high in NFC are better able to synthesize disparate informational cues (Cacioppo et al., 1996). Again in the present context and task, this may mean that the judgmental benefits of being high in NFC, relative to being low in NFC, would be particularly evident under conditions where informational cues are disparate. Thus, a potentially important next step in this research program would be to modify the nature of the task. Specifically the amount of conflicting information presented to participants might be controlled, on a trial-by-trial or session-by-session basis (i.e., a within-subjects design) or in different information consistency conditions (i.e., a between-subjects design). It may be that the effects of cognitive styles would become more apparent under these conditions.

It may also be the case that certain cognitive styles will be more related to accuracy of judgments and others will relate to decision latency. Indeed, there may be no reason to expect that all cognitive styles will be equally predictive of accuracy *and* latency. As noted in the introduction, existing social psychological research on these does not always address both accuracy and latency dimensions, thus our present predictions in one of those domains were made with less certainty. PNS, with its characterization of the quick and confident decision-maker, speaks to latency and confidence. In the present research, PNS and its subfactors were indeed related to decision latency. Prior PNS research also shows a link to accuracy, only when inconsistent information is presented to the judge (Kaplan et al., 1991). PFI is related to hesitation and doubt (Thompson et al., 2001), speaking more directly to the latency and confidence of judgments made, but not necessarily to judgmental accuracy.

Future research concerning the effects of individual differences on decision-making may also benefit from an exploration of other personality traits and cognitive styles that may be implicated in decision accuracy and latency. For example, the work of Pallier et al. (2002) has documented effects of Proactivism and Activity on subjective confidence, a measure related to judgmental accuracy and latency. Subscales of the Big Five may also be implicated in decision processes. That is, the Openness to Experience and Conscientiousness subscales of the Big Five Measure of Personality may also be related to judgment accuracy latency and confidence. The Judgmental Self-Doubt scale (JSDS; Mirel, Greblo & Dean, 2002) may also prove to be a useful measure to pursue. Although related to the PFI construct, Mirels argues that that the JSDS was developed to measure individuals' generalized evaluation of their judgmental abilities, while PFI focuses more specifically on the fear of making a mistake, that is, the feeling or affective component (Mirels et al.). Another measure that may bear fruit in this regard is the Objectivism Scale that is designed to assess the tendency to base judgments on empirical evidence versus subjective assessments and intuition (Leary, Shepperd, McNeil, Jenkins, & Barnes, 1986).

In summary, the results of the present studies are inconclusive for a variety of reasons, most particularly a lack of statistical power. However, the results are promising enough to warrant further studies that address the limitations of the present designs and may thus provide better tests of these hypotheses. Finally, we have suggested some potential future avenues of investigation in the pursuit of the underlying causes of individual differences in decision-making.

Table 1: *Descriptive Statistics and Pearson Correlation Coefficients Among the Measures*

(STUDY 1; N = 48)

Measure	No. Items	*M*	*SD*	PNS	DFS	RLS	PFI	NFC	Time1	Time2	Time3	Time	Error1	Error2	Error3	Error
PNS	12	39.94	7.43	**.73**	.75	.89	.39	-.18	.21	.15	.06	.15	.29	.24	.25	.27
DFS	4	14.09	3.38	.75	**.56**	.38	.25	-.08	-.02	-.06	-.19	-.10	.16	.16	.17	.17
RLS	7	23.89	5.08	.89	.38	**.68**	.37	-.22	.28	.21	.16	.23	.30	.25	.24	.28
PFI	14	48.70	9.25	.39	.25	.37	**.78**	-.47	.30	.20	.11	.22	.20	.25	.21	.23
NFC	18	103.58	18.34	-.18	-.08	-.22	-.47	**.89**	-.13	-.07	-.14	-.12	-.40	-.30	-.31	-.35
Time1	1	25.55	4.85	.21	-.02	.28	.30	-.13	–	.85	.64	.90	.34	.38	.28	.35
Time2	1	25.55	5.69	.15	-.06	.21	.20	-.07	.85	–	.78	.96	.22	.18	.16	.19
Time3	1	23.50	5.27	.06	-.19	.16	.11	-.14	.64	.78	–	.88	.06	-.08	-.03	-.02
Time	3	24.87	4.83	.15	-.10	.23	.22	-.12	.90	.96	.88	**.90**	.22	.17	.14	.19
Error1	1	.057	.029	.29	.16	.30	.20	-.40	.34	.22	.06	.22	–	.84	.88	.94
Error2	1	.057	.037	.24	.16	.25	.25	-.30	.38	.18	-.08	.17	.84	–	.88	.96
Error3	1	.054	.032	.25	.17	.24	.21	-.31	.28	.16	-.03	.14	.88	.88	–	.96
Error	3	.056	.031	.27	.17	.28	.24	-.35	.35	.19	-.02	.18	.94	.96	.96	**.94**

Note. PNS = Personal Need for Structure, DFS = Desire for Structure, RLS = Response to Lack of Structure, PFI = Personal Fear of Invalidity, NFC = Need for Cognition; Time1-3 = decision time for Trials 1 to 3, Time = mean decision time across trials; Error1-3 = decision error for Trials 1 to 3, Error = mean decision error across trials. Internal consistency reliability estimates (Cronbach's alphas) are shown on the main diagonal of the correlation matrix. Correlations above 0.24 are significant at $p < .10$ (two-tailed).

Table 2: *Summary of Multiple Regression Analyses for Variables Predicting Error*

(STUDY 1; N = 48)

Variable	*B*	*SE B*	β	*t*	η_p^2
Model 1					
PNS	0.000895	0.000625	.21	1.43	.044495
PFI	0.000030	0.000559	.01	0.05	.000063
NFC	-0.000525	0.000264	-.31	1.98	.082394
Model 2					
DFS	0.002819	0.005602	.08	0.50	.005853
RLS	0.007663	0.006790	.18	1.12	.028766
PFI	0.000030	0.000563	.01	0.05	.000065
NFC	-0.000513	0.000268	-.30	1.92	.078607

Note. $R^2 = .17$ for Model 1; $R^2 = .17$ for Model 2 (*ps* < .10).

Table 3: *Summary of Multiple Regression Analyses for Variables Predicting Time*

(STUDY 1; N = 48)

Variable	*B*	*SE B*	β	*t*	η_p^2
Model 1					
PNS	0.049419	0.103371	.08	0.48	.005168
PFI	0.092433	0.092412	.18	1.00	.022232
NFC	-0.006996	0.043646	-.03	-0.16	.000584
Model 2					
DFS	-1.381700	0.892204	-.24	-1.55	.052827
RLS	1.689156	1.081425	.25	1.56	.053692
PFI	0.096639	0.089727	.19	1.08	.026268
NFC	-0.000269	0.042634	-.00	-0.01	.000001

Note. $R^2 = .05$ for Model 1; $R^2 = .12$ for Model 2 (*ns*).

Table 4: *Descriptive Statistics and Pearson Correlation Coefficients Among the Measures*

(STUDY 2; N = 19)

Measure	No. Items	*M*	*SD*	PNS	DFS	RLS	PFI	NFC	Time1	Time2	Time3	Time	Error1	Error2	Error3	Error
PNS	12	45.07	4.51	**.77**	.81	.90	.06	.13	-.01	.11	.04	.05	.31	.27	.14	.30
DFS	4	16.17	1.60	.81	**.63**	.56	.11	.05	-.18	-.14	-.00	-.14	.25	.49	.24	.40
RLS	7	26.36	3.11	.90	.56	**.68**	.11	.15	.16	.27	.05	.19	.36	.17	.15	.27
PFI	14	48.09	3.48	.06	.11	.11	**.79**	.16	-.37	-.19	-.16	-.30	.23	.12	.12	.19
NFC	18	103.57	9.15	.13	.05	.15	.16	**.84**	-.20	-.31	-.33	-.29	.03	-.10	.04	-.02
Time1	1	40.15	13.22	-.01	-.18	.16	-.37	-.20	–	.77	.47	.91	.06	-.10	.08	.01
Time2	1	27.07	9.50	.11	-.14	.27	-.19	-.31	.77	–	.80	.96	.23	.08	.30	.24
Time3	1	23.12	6.00	.04	-.00	.05	-.16	-.33	.47	.80	–	.77	.12	.21	.28	.24
Time	3	30.11	8.56	.05	-.14	.19	-.30	-.29	.91	.96	.77	**.82**	.14	.03	.22	.15
Error1	1	.157	.032	.31	.25	.36	.23	.03	.06	.23	.12	.14	–	.59	.45	.84
Error2	1	.135	.035	.27	.49	.17	.12	-.10	-.10	.08	.21	.03	.59	–	.47	.86
Error3	1	.134	.030	.14	.24	.15	.12	.04	.08	.30	.28	.22	.45	.47	–	.77
Error	3	.142	.026	.30	.40	.27	.19	-.02	.01	.24	.24	.15	.84	.86	.77	**.77**

Note. Internal consistency reliability estimates (Cronbach's alphas) are shown on the main diagonal of the correlation matrix.
Correlations above 0.39 are significant at $p < .10$ (two-tailed).

Table 5: *Summary of Multiple Regression Analyses for Variables Predicting Error*

(STUDY 2; N = 19)

Variable	*B*	*SE B*	β	*t*	η_p^2
Model 1					
PNS	0.001743	0.001423	.30	1.22	.090912
PFI	0.001394	0.001852	.18	0.75	.036396
NFC	-0.000286	0.000724	-.10	-0.39	.010288
Model 2					
DFS	0.005807	0.004796	.35	1.21	.094787
RLS	0.000594	0.002483	.07	0.24	.004074
PFI	0.001168	0.001852	.15	0.63	.027634
NFC	-0.000249	0.000722	-.10	-0.35	.008436

Note. R^2 = .13 for Model 1; R^2 = .19 for Model 2 (*ns*).

Table 6: *Summary of Multiple Regression Analyses for Variables Predicting Time*

(STUDY 2; N = 19)

Variable	*B*	*SE B*	β	*t*	η_p^2
Model 1					
PNS	0.192884	0.448764	.10	0.43	.012166
PFI	-0.632536	0.584104	-.26	-1.08	.072511
NFC	-0.287960	0.228380	-.30	-1.26	.095831
Model 2					
DFS	-1.913643	1.426176	-.36	-1.34	.11395
RLS	1.293082	0.738433	.47	1.75	.17968
PFI	-0.628061	0.550613	-.26	-1.14	.08503
NFC	-0.321069	0.214614	-.34	-1.50	.13783

Note. R^2 = .18 for Model 1; R^2 = .33 for Model 2 (*ns*).

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14. ABSTRACT

(U) How might individuals' typical decision-making styles affect the quality and latency of their decisions? In a first study, 48 adults completed three measures of cognitive styles, including the Personal Need for Structure and Personal Fear of Invalidity scales (PNS and PFI; Thompson, Naccarato, Parker, & Moskowitz, 2001), and the Need for Cognition scale (NFC; Cacioppo & Petty, 1982). Participants then completed three trials of a medium-fidelity simulation of a naval surveillance and threat assessment task called TITAN (i.e., "Team and Individual Threat Assessment Network") that required participants to evaluate seven pieces of information for potential targets displayed in a radar space (e.g., direction, speed, bearing, etc.). After reviewing the information for each target, participants submitted their threat assessment and were provided feedback about the degree of actual threat for the target. For each session, participants were instructed to clear the radar space of as many targets as possible within a 25-minute period and to perform this operation as accurately as possible. Results showed a significant decrease in processing time across trials. Higher NFC scores predicted a significantly smaller mean decision error across trials, and higher PNS scores predicted a greater mean decision error, although the latter effect failed to reach statistical significance. None of the cognitive styles scores had a significant main effect on the mean time spent processing TITAN targets.
In Study 2, 80 Canadian Forces personnel completed the three cognitive styles measures and worked in four-person teams on TANDEM II, a simulation similar to TITAN. Each team consisted of three subordinates who separately reviewed and integrated five pieces of complex information per target before forwarding their individual threat assessments to a team leader. The team leader then assessed the veridicality of the three assessments and integrated them into a final threat assessment for each of 42 targets in each of three sessions. In this case, both processing time and decision error significantly decreased with practice. Although none of the cognitive styles significantly predicted decision error or time, several interesting trends are of note. For example, higher PNS scores predicted a greater mean decision error, and higher NFC scores predicted a shorter mean decision time. We discuss the results of these two studies in terms of their relevance with past research in the social attitude literature and their implications for future research.

(U) Quelle pourrait être l'influence des modes décisionnels typiques sur la qualité et le temps de latence des décisions des personnes? Dans le cadre d'une première étude, 48 adultes ont été soumis à trois mesures de styles cognitifs, dont le besoin personnel de structure et la crainte d'invalidité personnelle (échelles PNS et PFI; Thompson, Naccarato, Parker et Moskowitz, 2001), ainsi que le besoin de cognition (NFC; Cacioppo et Petty, 1982). Les participants ont ensuite pris part à trois essais de simulation à fidélité moyenne d'une tâche de surveillance maritime et d'évaluation des menaces appelée TITAN (réseau d'évaluation collective et individuelle des menaces). Les participants devaient évaluer sept éléments d'information concernant des cibles possibles affichées sur un espace radar (tels la direction, la vitesse, le relèvement, etc.). Après avoir examiné l'information relative à chacune des cibles, les participants soumettaient leur évaluation des menaces et recevaient une rétroaction quant au degré de menace réelle posée par la cible. À chaque session, on a demandé aux participants d'éliminer de l'espace radar le plus de cibles possibles au cours d'une période de 25 minutes et d'effectuer cette tâche avec le plus de précision possible. Les résultats montrent une diminution significative du temps de traitement durant les essais. Les indices NFC supérieurs présageaient un taux moyen d'erreur de décision sensiblement inférieur durant les essais, et les indices PNS supérieurs présageaient un plus fort taux moyen d'erreur de décision, quoique ce dernier effet n'ait aucune signification statistique. Aucun indice des styles cognitifs n'a eu d'effet significatif sur le délai moyen de traitement des cibles TITAN.
Dans le cadre d'une seconde étude, 80 membres des Forces canadiennes ont été soumis aux trois mesures de styles cognitifs et ont travaillé par équipes de quatre à l'exercice TANDEM II, une simulation semblable à la tâche TITAN. Chacune des équipes était formée de trois subordonnés, appelés à examiner et à intégrer séparément cinq éléments d'information complexes par cible avant de transmettre leur évaluation individuelle des menaces à un chef d'équipe. Le chef d'équipe a évalué la véridicité des trois évaluations avant de les intégrer à une évaluation finale des menaces pour chacune des 42 cibles durant chacune des trois sessions. En l'occurrence, le temps de traitement autant que l'erreur de décision ont sensiblement diminué avec la pratique. Même si aucun des styles cognitifs n'a permis de prévoir les erreurs ou le temps de décision de manière significative, plusieurs tendances intéressantes sont à noter. Par exemple, les indices PNS supérieurs laissaient présager une plus forte erreur de décision moyenne, et les indices NFC supérieurs étaient précurseurs d'un plus bref délai moyen de décision. Nous discutons de

la pertinence des résultats de ces deux études par rapport à certaines études publiées sur les attitudes sociales et à leurs implications pour les travaux de recherche à venir.

15. KEYWORDS, DESCRIPTORS or IDENTIFIERS

(U) cognitive style, decision-making, accuracy, latency

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