

Not All Great Minds Think Alike: Systematic and Intuitive Cognitive Styles

Journal of Personality 82:5, October 2014
© 2013 Wiley Periodicals, Inc.
DOI: 10.1111/jopy.12071

Lilach Sagiv,¹ Adi Amit,² Danit Ein-Gar,³ and Sharon Arieli¹

¹The Hebrew University of Jerusalem

²The Open University of Israel

³Tel Aviv University

Abstract

Individuals process information and make decisions in different ways. Some plan carefully and analyze information systematically, whereas others follow their instincts and do what “feels right.” We aimed to deepen our understanding of the meaning of the intuitive versus systematic cognitive styles. Study 1 ($N = 130$, 39% female, $M_{\text{age}} = 24$) compared cognitive styles of arts, accounting, and mathematics students. Cognitive styles were associated with values (Study 2: $N = 154$, 123, 78; female = 59%, 49%, 85.9%; $M_{\text{age}} = 22, 23, 27$) and traits (Study 3: $N = 77, 140, 151$; female = 59%, 66%, 46%; $M_{\text{age}} = 22, 25, 23$), and they interacted with experience in predicting performance (Study 4: $N = 63$, 48% female, $M_{\text{age}} = 23$; Study 5: $N = 44$, 39% female, $M_{\text{age}} = 23$). All participants were Caucasian Israeli students. The systematic style was most frequent among accountants, and the intuitive style was most frequent among artists, validating the meaning of the styles. Systematic style was positively correlated with Conscientiousness and with security values and negatively correlated with stimulation values. The intuitive style had the opposite pattern and was also positively correlated with Extraversion. Experience improved rule-based performance among systematic individuals but had no effect on intuitive ones. Cognitive style is consistent with other personal attributes (traits and values), with implications for decision making and task performance.

“Cutting through complexity to find a solution runs through four predictable stages: determine a goal, find the highest-leverage approach, discover the ideal technology . . . measure the impact of your work.” (Bill Gates, 2007)

“So you have to trust that the dots will somehow connect in your future. You have to trust in something—your gut, destiny, life, karma, whatever.” (Steve Jobs, 2005)

Thinking processes in general, and information processing in particular, are central, frequent daily-life routines. But not all people think alike. As the two quotes above indicate, individuals' thinking dispositions can be very different. Some think systematically, gathering information, planning their steps, and carefully comparing and evaluating various alternatives. Others follow their instincts and “gut feelings,” making holistic judgments and choosing alternatives that “feel right.” In this research, we investigated the conceptual validity of the *systematic* and *intuitive* cognitive styles. Taking an individual-differences perspective, we investigated the commonalities and differences of conceptualizations and measures proposed in past literature, their relationships with other personal attributes

(values and traits), and their implications for performance and choice.

Past research has considered the systematic and intuitive cognitive styles and investigated some of their consequences (e.g., Allinson & Hayes, 1996; Epstein, Pacini, Denes-Raj, & Heier, 1996; Perkins, 1981; Scott & Bruce, 1995). We advance past studies in several important ways. First, we distinguish the systematic and intuitive styles from other thought-related constructs both theoretically and empirically. Second, we point out the motivations and habits compatible with the two cognitive styles, adding to past studies and facilitating reinterpretation of

This project was supported by the Recanati Fund of the School of Business Administration at the Hebrew University to the first author and by the Edward Hechtkopf and Solomon Family Fellowships to the second author. We thank Tammy Rubel-Lifschitz, Avihay Berlin, Andrey Elster, Keren More, and Naomi Goldblum for their useful comments on earlier drafts of this article. We also wish to thank Niva Porzycki, Nir Halevi, and Tamar Bornstein for their help in collecting the data.

Correspondence concerning this article should be addressed to Lilach Sagiv, School of Business Administration, The Hebrew University of Jerusalem, Jerusalem 91905, Israel. Email: mslilach@mscc.huji.ac.il

some past findings. Third, we contribute to the ongoing debate about whether the systematic and intuitive styles are two separate constructs or two poles of one dimension. Fourth, we use a novel approach to investigate how the two styles are reflected in cognitive performance and choice.

The Systematic and Intuitive Cognitive Styles

A cognitive style is a stable personal attribute reflecting the consistent way in which individuals organize and process information, and ultimately make decisions and act (Hunt, Krzystofiak, Meindl, & Yousry, 1989; Kozhevnikov, 2007; Messick, 1984; Sagiv, Arieli, Goldenberg, & Goldschmidt, 2010). We focus on cognitive styles of thought-based information processing (Kozhevnikov, 2007). A large variety of labels and instruments have been proposed (Riding, 1997), most of which can be conceptually summarized into two major cognitive styles (Graff, 2000), often named the intuitive (or experiential) and the systematic (or rational) styles (e.g., Allinson & Hayes, 1996; Epstein et al., 1996; Norris & Epstein, 2011; Pacini & Epstein, 1999; Sagiv et al., 2010; for earlier studies, see Phillips & Paziienza, 1988).

Individuals with a systematic (rational) style tend to apply rule-based thinking (see Smith & DeCoster, 2000). They analyze the situation and logically evaluate various alternatives in an attempt to discover underlying rules. These rules help them organize the world into systematic patterns on which they can rely when choosing how to act (Perkins, 1981; Scott & Bruce, 1995). An accountant, for example, is likely to have a systematic style. At work and in other contexts, accountants tend to be organized and efficient and are likely to classify and analyze situations, discovering and applying rules and regularities.

Individuals with an intuitive style tend to apply associative thinking (see Smith & DeCoster, 2000), also termed *experiential thinking* (Epstein et al., 1996; Norris & Epstein, 2011). They have a holistic and global perception (Scott & Bruce, 1995) and are often unaware of their thinking patterns. They integrate associations and rely on intuition, taking into account not only facts, but feelings and context as well (Perkins, 1981; Sternberg, 1998). An artist, for example, is likely to have an intuitive style. At work and in other contexts, artists are likely to analyze situations in a complex, holistic manner, linking pieces of information associatively.

To date, there is no agreement in the literature as to whether systematic and intuitive styles are two poles of the same dimension (e.g., Allinson & Hayes, 1996; Sagiv et al., 2010) or two distinct dimensions (e.g., Norris & Epstein, 2011; Pacini & Epstein, 1999; Scott & Bruce, 1995). In this research, we investigated the systematic and intuitive styles separately. Finding that the two are negatively correlated and have opposite patterns of relations with other variables would support the notion that they are two opposite poles of the same dimension.

The Current Research

Past research has focused mainly on exploring the practical implications of the systematic and intuitive cognitive styles, revealing their associations with creativity (Norris & Epstein, 2011; Sagiv et al., 2010; Scott & Bruce, 1995), management practices (Allinson, Armstrong, & Hayes, 2001; Hayes & Allinson, 1994; Sadler-Smith, 2004), decision making (e.g., Amit & Gati, 2013; Blaylock & Rees, 1984; Bruine de Bruin, Parker, & Fischhoff, 2007; Hunt et al., 1989), relationships (Sabatelli, Dreyer, & Buck, 1983), and beliefs (Hicks, Cicero, Trent, Burton, & King, 2010; King, Burton, Hicks, & Drigotas, 2007). This research aimed to deepen our understanding of what dispositional cognitive style is (and what it is not) by studying how it is related to other personality attributes and how it is reflected in occupational choice and cognitive performance.

In Study 1, we investigated how professional fields differ in their dominant cognitive styles, thus validating the meaning of the construct of cognitive style, while comparing various measures for investigating convergent and discriminant validity. To further understand the motivations and habits compatible with the systematic and intuitive styles, we tested their associations with two other central aspects of the self, personal values and personality traits (Studies 2–3). Finally, we explored how cognitive style is reflected in cognitive problem solving. To that end, we investigated how the systematic and intuitive styles differentially interact with experience in predicting performance in a cognitive task (Studies 4–5).

STUDY 1: SYSTEMATIC VERSUS INTUITIVE COGNITIVE STYLE AND CAREER CHOICE

As a first step toward validating the meaning of the systematic and intuitive cognitive styles, we sought to compare individuals in social settings that encourage different types of information processing. We focused on professional environments, comparing students in three academic departments. Professions vary in the skills they require, the activities they employ, and the goals they enable people to attain. Accordingly, people in various professions differ in skills, vocational interests (Holland, 1997), and values (Knafo & Sagiv, 2004). Past studies have documented patterns of cognitive styles in various university departments such as accounting (Gul, Huang, & Subramaniam, 1992), business (Tanova, 2003), computer systems (Moore, O'Maidin, & McElligott, 2003), and tourism-hospitality programs (MacGillivray, 1999). Some departments revealed distinct patterns of cognitive style (Tanova, 2003), whereas others appeared to accommodate different styles (MacGillivray, 1999).

Some professional environments require mainly systematic thinking and rule-based processing and are thus consistent with the systematic style. Others call for associative, holistic processing of information and are thus consistent with the

intuitive style. To conceptually validate the construct of cognitive style, we focused on three academic departments: (a) accounting, which we expected to have a strong systematic orientation; (b) arts, which we expected to have a strong intuitive orientation; and (c) mathematics, which we expected to involve both orientations. We briefly describe the three professions, emphasizing the cognitive styles each requires and facilitates (the descriptions are based on information drawn from the O*NET database, <http://www.onetonline.org>).

Accounting

The accounting profession requires processing of numerical information according to a set of clear, predefined rules and regulations. Accountants follow explicit rules and standards (e.g., “double-entry” bookkeeping), aiming to discover deviations from normative patterns. A systematic style is hence more compatible with this profession than an intuitive one.

Arts

Art is expressive, emotional, and associative, and requires unexpected, imaginative thinking (Holland, 1997). An artist communicates inner ideas and sensations subjectively, so that these are interpretable in numerous ways, and does not follow a “manual” systematically. This profession is therefore more congruent with an intuitive cognitive style than a systematic one.

Mathematics

Mathematicians often need to discover rules and patterns explicitly, following formulas and systematic analyses. Advancement in mathematics, however, often involves unexpected, pioneering thinking, and even implicit learning without the awareness of underlying rules. This profession therefore requires some degree of both cognitive styles. We hypothesized the following:

H1: Students in the three academic departments have different cognitive styles, such that accounting students are the most systematic and least intuitive, arts students are the most intuitive and least systematic, and mathematics students are in between.

Method

Participants and Procedure. The participants were 130 undergraduate students (39% female, $M_{\text{age}} = 24$) of accounting ($n = 46$, 35% female), mathematics ($n = 46$, 58% female), and arts ($n = 38$, 24% female). Only students who stated that they intended to remain in their current department until they

graduated were approached. Participation was anonymous and voluntary. The participants completed a series of cognitive style scales and reported their satisfaction with their department.

Measures

To increase the generalizability of our findings and explore convergent and discriminant validity of the systematic and intuitive styles, we measured cognitive style with several instruments. If cognitive style is a stable personal attribute, individuals should report their style consistently, regardless of a particular measure. We employed several criteria in choosing the instruments studied. First, we considered the conceptualization of the measure. We included measures that are congruent with the theoretical definition of the systematic and intuitive styles (see “The Systematic and Intuitive Cognitive Styles” above). We hence excluded measures that contained aspects other than cognitive style, such as traits (e.g., Myers-Briggs Type Indicator; Briggs & Myers, 1987), and measures that had other theoretical definitions (e.g., the Adaptation-Innovation Inventory [Kirton, 1977], which focuses on conservatism vs. innovation in decision making, rather than on differences in information processing). Second, we chose instruments diverse in terms of context, including instruments that focus on a specific context (e.g., decision making) as well as context-free measures. Third, we included both analytic and holistic measures (see below). Finally, to ensure that the participants were able to devote their full attention and resources to all measures studied, we excluded long measures (e.g., the Cognitive Style Index; Allinson & Hayes, 1996).

General Decision-Making Style. The General Decision-Making Style instrument (GDMS; Scott & Bruce, 1995) consists of five scales measuring cognitive style in the specific context of decision making. Two scales were included in this study. Four items measure the *rational* style (e.g., “Make decisions in a logical and systematic way,” “My decision making requires careful thought”), and five items measure the *intuitive* style (e.g., “When making decisions, I rely upon my instincts,” “I generally make decisions that feel right to me”). The respondents rated the extent to which each statement described them on a 5-point scale ranging from 1 (*highly incorrect*) to 5 (*highly correct*). Internal reliabilities (Cronbach’s alpha) were .66 and .85 for the rational and intuitive scales, respectively.

Thinking and Working Style. The definitions and items of the Thinking and Working Style measure (TWS; Sagiv et al., 2010) are similar to those of the GDMS. However, whereas the GDMS focuses on decision making, the TWS is more general and context-free. Five items measure the *systematic* style (e.g., “When I have to choose between alternatives, I analyze each of them and choose the best one,” “Before I do anything important, I carefully plan my actions”), and five items measure the

intuitive style (e.g., “When I decide how to act, I follow my inner feelings and emotions,” “I know a way of conduct suits me, if I feel it is right”). The respondents rated each statement on a 5-point scale ranging from 1 (*highly incorrect*) to 5 (*highly correct*). The internal reliabilities (Cronbach’s alpha) were .67 (systematic scale) and .77 (intuitive scale).

The Rational-Experiential Inventory. The Rational-Experiential Inventory (REI; Epstein et al., 1996) was designed to elicit the rational versus experiential systems of informational processing. The rational system reflects a focus on identifying and following logical principles and is therefore conceptually compatible with the systematic style. The experiential system is associative and context-dependent and is hence conceptually compatible with the intuitive style. The REI measures individual differences in the experiential system with the Faith in Intuition scale (FI; five items, e.g., “I believe in trusting my hunches,” “I trust my initial feelings about people”) and in the rational system with a short version of the Need for Cognition scale (NFC; Cacioppo & Petty, 1982), consisting of five items (e.g., “I prefer complex to simple problems,” “I try to avoid situations that require thinking in depth about something” [reversed]). The respondents rated each statement on a 5-point scale ranging from 1 (*highly incorrect*) to 5 (*highly correct*). The internal reliabilities (Cronbach’s alpha) were .70 and .81 for the NFC and FI scales, respectively. Interestingly, whereas the conceptual definition of the rational system is congruent with the definition of the systematic style, the NFC in fact measures the broad inclination to pursue knowledge (i.e., epistemic motivation; Amit & Sagiv, 2013).

The Portrait Cognitive Style. Like most self-report measures of cognitive style, the GDMS, TWS, and REI are systematically structured. They require people to deconstruct their thinking style and analyze their information processing in specific details. Thus, these measures are by their very

nature more compatible with the systematic style. We developed the Portrait Cognitive Style (PCS) for the purpose of the current research, as a measure compatible with the intuitive style. The respondents read descriptions of two prototypical characters, one with a systematic style (e.g., “Mr. X acts systematically and logically. When faced with a task, he analyzes the situation and acts in an organized, ordered way . . .”) and one with an intuitive style (e.g., “Mr. Y acts intuitively and impulsively. When faced with a task, he acts according to what feels right . . .”). The participants stated how much they resemble each description in general, and under different circumstances (e.g., preparing a school project, planning a trip), on a 7-point scale ranging from 1 (*not similar at all*) to 7 (*very similar*). The internal reliabilities (Cronbach’s alpha) were .77 and .86 for the systematic and intuitive scales, respectively.

Results and Discussion

Relationships Among the Four Measures of Cognitive Style. Table 1 presents the multi-trait multimethod matrix of correlations among the four measures of cognitive style. The zero-order correlations presented above the diagonal reveal that all four measures of the intuitive style were positively correlated ($r_s = .48$ to $.76$, all $p_s < .01$). The intercorrelations among the systematic style measured by the GDMS, TWS, and PCS were also positive ($r_s = .56$ to $.67$, all $p_s < .01$). These three measures displayed negative correlations with all four measures of the intuitive styles (r_s ranged from $-.22$ to $-.30$, all $p_s < .05$). The measure of the systematic (rational) cognitive style of the REI scale was not significantly correlated with any of the other measures of the systematic style ($r = -.04$, $-.09$, $-.19$ for the GDMS, TWS, and PCS, respectively), nor was it negatively correlated with the measures of the intuitive style ($r = .05$, $.05$, $.02$, $.02$ for the GDMS, TWS, PCS, and FI, respectively). Controlling for gender did not affect the results (see intercorrelations below the diagonal, Table 1).

Table 1 Study 1: Correlations Among the Four Measures of Cognitive Style

	GDMS Rational	GDMS Intuitive	TWS Systematic	TWS Intuitive	PCS Systematic	PCS Intuitive	REI NFC	REI FI
GDMS Rational	(.66)	-.23*	.67**	-.19*	.56**	-.15	-.04	-.02
GDMS Intuitive	-.21*	(.85)	-.23*	.76**	-.22*	.67**	.05	.68**
TWS Systematic	.67**	-.21*	(.67)	-.27**	.67**	-.21*	-.09	-.02
TWS Intuitive	-.16	.76**	-.25**	(.76)	-.17	.64**	.05	.55**
PCS Systematic	.56**	-.20*	.67**	-.15	(.75)	-.30**	-.19*	-.02
PCS Intuitive	-.14	.66**	-.20*	.63**	-.29**	(.86)	.02	.48**
REI NFC	-.07	.05	-.10	.05	-.19*	0	(.70)	.02
REI FI	0	.67**	0	.55**	0	.48**	0	(.83)

Note. GDMS = General Decision-Making Style; TWS = Thinking and Working Style; PCS = Portrait Cognitive Scale; REI = Rational-Experiential Inventory; NFC = Need for Cognition scale; FI = Faith in Intuition scale. Figures above the diagonal are zero-order correlations; figures below the diagonal are partial correlations controlling for gender.

* $p < .05$. ** $p < .01$ (two-tailed).

Cognitive Style and Academic Departments. Table 2 presents the means and standard deviations of the students' cognitive styles in the three departments. We used a MANOVA to test our hypotheses: The department (accounting, mathematics, arts) was the independent variable, and the eight measures of the systematic and intuitive styles were the dependent variables. All eight main effects yielded significant differences in cognitive style across the academic departments, $F(2, 127) = 3.85$ to 14.58 , all $ps < .05$, indicating that at least one department was different for each of the eight scales. Planned contrasts confirmed our hypothesis (H1) for six of the eight measures (systematic and intuitive in TWS, rational and intuitive in GDMS, and X and Y in PCS): Accounting students were the most systematic and least intuitive of the three departments; arts students exhibited the opposite pattern; and mathematics students were in between, $t(127) = 2.17$ to 5.69 , all $ps < .01$, $ds = .38$ – 1.01 (Table 2, columns 1–3 and 5–7). Adding gender to the MANOVA did not affect the results.

The findings were quite different for the REI measure of cognitive style. The systematic (rational) measure was greatest for mathematics students and lowest for accounting students. The experiential measure was greater among arts students than among accounting students, as hypothesized, but it was lowest among mathematics students (see columns 4 and 8 of Table 2).

Student-Department Congruency in Cognitive Style.

Despite the mean differences found among professional environments, there are likely to be some variations in cognitive style within each of them. In choosing their professions, individuals are influenced by various factors other than their cognitive styles (e.g., vocational interests, values, social expectations). Consequently, students in each department are likely to vary in how compatible their cognitive style is with their professional environment. Accordingly, supplementary analysis revealed that for each of the three measures of cognitive style, having a systematic style positively predicted satisfaction among accounting students ($rs = .31$ to $.44$, all $ps < .05$), whereas having an intuitive style positively predicted satisfaction among arts students ($rs = .32$ to $.43$, all $ps < .05$).

These findings are consistent with the rich literature on person-environment fit, which indicates the favorable effects of congruency between individuals and their environments (see a review in Kristof-Brown, Zimmerman, & Johnson, 2005).

In sum, the pattern of correlations among the GDMS, TWS, and PCS; the consistent differences in cognitive style found among the students in the three departments; and the correlations of student-department congruency in cognitive style with satisfaction all combine to validate the meaning of the cognitive style construct. The similarity in the patterns of the GDMS and TWS scales reflects the commonalities in both conceptualization and measurement of the two. The conceptualizations of the PCS are similar, but it is a holistic scale, with a markedly different layout and format. That the pattern of the findings for this scale is so similar to the other two reflects a strong convergent validity.

The findings consistently distinguish the REI from the other three measures of cognitive style. The intuitive (experiential) scale, Faith in Intuition, was consistently correlated with the other three measures, but its pattern differed among the three academic departments. Recently, Norris and Epstein (2011) offered an extended measure for the experiential scale, identifying three facets: intuition, emotionality, and imagination. Future research could further investigate the relationships of the three facets to other measures of cognitive style. The systematic (rational) scale, Need for Cognition, was not significantly correlated with any of the other instruments, nor was it distinguished among academic departments in the hypothesized pattern. Possibly, this scale measures a different construct (e.g., epistemic motivation; Amit & Sagiv, 2013). This may be a worthy line for future research.

Cognitive Style, Traits, and Values

Taken together, the findings of Study 1 point to the divergent and convergent validity of the cognitive style constructs. We conceptualize cognitive styles as a stable individual attribute. To further understand them, one needs to consider the patterns of their relationships to other personality attributes. In the current research, we investigated two other central constructs,

Table 2 Study 1: Intuitive and Systematic Styles in Accounting, Mathematics, and Arts (Four Measures)

	Intuitive				Systematic (Rational)			
	GDMS	TWS	PCS	REI (FI)	GDMS	TWS	PCS	REI (NFC)
Accounting	3.22 (.62)	2.99 (.55)	3.53 (1.20)	3.52 (.57)	3.70 (.54)	3.87 (.51)	5.31 (.81)	3.43 (.65)
Mathematics	3.29 (.72)	3.23 (.69)	3.90 (1.37)	3.28 (.89)	3.42 (.64)	3.62 (.52)	4.96 (1.03)	3.98 (.55)
Arts	3.75 (.69)	3.60 (.59)	4.93 (1.26)	3.78 (.60)	3.43 (.60)	3.53 (.59)	4.61 (1.07)	3.79 (.65)

Note. GDMS = General Decision-Making Style; TWS = Thinking and Working Style; PCS = Portrait Cognitive Scale; REI = Rational-Experiential Inventory; FI = Faith in Intuition scale; NFC = Need for Cognition scale. GDMS, TWS, and REI scales range from 1 (*highly incorrect*) to 5 (*highly correct*); the PCS ranges from 1 (*not similar at all*) to 7 (*very similar*).

traits and values, which have both been the focus of extensive research, indicating their stability across time and contexts, and their ability to predict cognition, affect, and behavior. Traits and values were found consistently correlated, yet they are theoretically and empirically distinct (Roccas, Sagiv, Schwartz, & Knafo, 2002). Understanding how cognitive styles are similar to and different from traits and values will deepen our understanding of the nature of cognitive styles.

Cognitive Styles and Traits. Traits are consistent tendencies of action (McCrae & Costa, 1990). They refer to what people are like, and they vary in the frequency of their occurrence. Being highly conscientious, for example, is reflected in a person's tendency to *act* in an organized, thorough, and reliable manner. Cognitive styles, in contrast, reflect the ways individuals *think*—how they process information, decide, and conclude. Having a systematic style, for example, is reflected in organized and ordered information processing. Thus, whereas traits reflect the *content* of individuals' decisions and action, cognitive styles reflect their *construction*. Traits are the “what,” whereas cognitive styles are the “how.”

Cognitive Styles and Values. Values are cognitive representations of basic motivational goals (Schwartz, 1992). They refer to what people consider important and vary in their significance as guiding principles that serve to affect decisions and actions as well as to evaluate and judge them (see review in Maio, 2010). Emphasizing security values, for example, expresses the motivation for safety, certainty, and stability for oneself and close others. Thus, values are the “why” that account for the “what” (traits) and “how” (cognitive style).

We reason that traits, values, and cognitive style are interdependent. All three personality constructs develop at an early age, and while they vary somewhat in their occurrence, depending on the immediate context, all three constructs reflect stable individual differences across situations and over time. Both traits and values are affected by indigenous (i.e., genetic) factors (e.g., Knafo & Spinath, 2011) and external (i.e., socialization) factors, albeit to a different extent: Values, more than traits, are a product of life experience and socialization (e.g., McCrae & Costa, 1990; Roccas et al., 2002). We reason that cognitive styles, too, are affected by inborn temperament as well as socialization processes and life experiences—both explicit and implicit.

Furthermore, traits, values, and cognitive styles are likely to affect each other. Due to their motivational basis, values are likely to lead individuals to develop and maintain a cognitive style that allows for, facilitates, and promotes the expression of important values and the attainment of the goals underlying them. At the same time, cognitive styles may attune the importance of values. To gain consistency and justify their action, individuals may come to emphasize those values that are compatible with the way they think and process information (cf.

Roccas et al., 2002). Traits and cognitive styles, in turn, are likely to complement each other because adjusting to the environment is likely to be easier when the what (traits) and how (cognitive styles) are consistent with each other.

Studying the relationships between cognitive styles and values (Study 2), we aim to uncover the motivational aspect of the systematic versus intuitive styles. Investigating their relationships with traits (Study 3) would reveal the habitual aspect of the cognitive styles.

STUDY 2: SYSTEMATIC AND INTUITIVE COGNITIVE STYLES AND PERSONAL VALUES

To conceptualize and measure values, we rely on Schwartz's (1992) theory of personal values. Schwartz identified 10 basic value types, each reflecting a different motivation: power, achievement, hedonism, stimulation, self-direction, universalism, benevolence, tradition, conformity, and security. The theory has been verified in an extensive study in over 70 countries, providing evidence for the distinctiveness of the 10 values and their similar meaning across cultures (Davidov, Schmidt, & Schwartz, 2008; Schwartz & Rubel, 2005). To the best of our knowledge, the present research is the first to investigate the associations between values and the systematic versus intuitive cognitive styles. Of the 10 value types, we suggest that stimulation and security are most compatible with the intuitive and systematic styles, respectively.

Stimulation values express the motivation for excitement, change, and novelty (Schwartz, 1992). Processing information intuitively is compatible with emphasizing stimulation values because it entails irregularity, surprise, and change. Intuitive processing of information means thinking in new, unpredictable ways each time, which promotes the goal of experiencing novelty and excitement. In contrast, a systematic style, which entails a routine, orderly search for patterns and rules, is incompatible with stimulation values and threatens the attainment of the goals they reflect. We therefore hypothesized the following:

H1: Stimulation values will be correlated positively with an intuitive cognitive style and negatively with a systematic cognitive style.

Security values reflect the motivation to maintain a stable, predictable, secure environment for the self and close others (Schwartz, 1992). Planned, organized, systematic thought processes that search for regularities and patterns and help predict events may promote security values and the attainment of the goals they represent. In contrast, processing information intuitively, and relying on instinct, gut feelings, and associations, threatens the stability and certainty of one's environment, and hence blocks the attainment of security goals. We therefore hypothesized the following:

H2: Security values will be correlated positively with a systematic cognitive style and negatively with an intuitive cognitive style.

Method

Participants and Procedure. This study was composed of three samples, each collected as part of a larger project. The participants in Sample 1 were 77 senior high school students and 77 undergraduate students (59% female, $M_{\text{age}} = 22$, range: 14–47). Sample 2 consisted of 123 undergraduate business students (49% female, $M_{\text{age}} = 23$, range: 19–33). Sample 3 consisted of 78 undergraduate psychology students (85.9% female, $M_{\text{age}} = 27.53$, range: 21–58). The participants completed the Schwartz Value Survey (SVS; Schwartz, 1992) and the TWS measure of cognitive style. Participation was anonymous and voluntary. The participants received course credit.

Measures

Cognitive Style. We used the TWS scale as in Study 1 (internal reliabilities in Samples 1–3 were .75, .77, and .83 for the systematic style and .70, .74, and .61 for the intuitive style, respectively). The two styles were negatively correlated ($r = -.42, -.56, \text{ and } -.26$ for Samples 1–3).

Values. All participants completed a 44-item version of the Schwartz Value Survey (SVS), which includes all the items

from the original version that have been validated for cross-cultural use (Schwartz, 1992). The value items were sampled to cover all 10 value types in the Schwartz theory. Each item was followed by a short explanatory phrase in parentheses (e.g., WEALTH [material possessions, money]). Participants rated the importance of each item on a 9-point scale ranging from -1 (*opposed to my values*), through 0 (*not important*), to 7 (*of supreme importance*). The asymmetry of the scale reflects the discriminations people naturally make when thinking about value importance, established in pretests during scale construction (Schwartz, 1992). The internal reliabilities of the value type indices in each sample (a total of 30) were within the range usually found for value types (.50 to .80; see Schmitt, Schwartz, Steyer, & Schmitt, 1993), with a few exceptions: tradition and self-direction in Sample 2 ($\alpha_s = .40$ and $.46$, respectively) and power in Sample 3 ($\alpha = .47$).

Results and Discussion

Table 3 presents the correlations between values and cognitive style for the three samples. As hypothesized (H1), stimulation values were positively correlated with the intuitive style ($r_s = .35, .20, .23$ in Samples 1–3, respectively, all $p_s < .05$) and negatively correlated with the systematic style ($r_s = -.33, -.21, -.19$, all $p_s < .05$). Security values (H2) were positively correlated with the systematic style ($r_s = .28, .09, .45$, all but one $p < .05$) and negatively correlated with the intuitive style ($r_s = -.27, -.09, -.21$, all but one $p < .05$).¹ Controlling for

Table 3 Study 2: Correlations Between Cognitive Styles and Personal Values

	Systematic			Intuitive		
	Sample 1	Sample 2	Sample 3	Sample 1	Sample 2	Sample 3
Security	.28** (.27**)	.09 (.06)	.45** (.46**)	-.27** (-.24**)	-.09 (-.08)	-.21* (-.21)
Conformity	.27** (.26**)	.08 (.04)	.19* (.18)	-.24** (-.22**)	-.18* (-.19*)	-.23** (-.25*)
Tradition	.02 (-.01)	-.16 (-.23*)	-.13 (-.10)	-.01 (.05)	.03 (.05)	-.20 (-.17)
Benevolence	-.02 (-.06)	.17 (.18)	-.14 (-.12)	-.09 (-.03)	-.13 (-.17)	-.09 (-.06)
Universalism	-.19* (-.18*)	-.07 (-.05)	-.11 (-.12)	.19* (.18*)	.06 (.06)	.17 (.17)
Self-direction	-.03 (-.02)	-.06 (-.03)	-.13 (-.11)	.03 (.01)	.10 (.11)	.21 (.23*)
Stimulation	-.33** (-.31**)	-.21* (-.18)	-.19* (-.23*)	.35** (.28**)	.20* (.23**)	.23** (.20)
Hedonism	-.17* (-.13)	-.20* (-.18)	-.05 (-.06)	.10 (.02)	.21* (.22*)	.05 (.04)
Achievement	.28** (.30**)	.29** (.29**)	.10 (.09)	-.22** (-.24**)	-.08 (-.07)	-.01 (-.02)
Power	.09 (.08)	.09 (.10)	.11 (.12)	-.04 (-.01)	-.08 (-.10)	-.01 (-.01)

Notes. Partial correlations controlling for gender are presented in parentheses. Mean importance of values are partialled out to control for differences in scale use (see Schwartz, 1992). Boldfaced correlations are hypothesized.

* $p \leq .05$. ** $p < .01$.

gender did not affect the findings (see Table 3, in parentheses). Thus, the systematic and intuitive styles are associated with the opposite motivations of security and stimulation. The motivation for a secure, stable, and predictable environment is correlated with the systematic style, whereas the opposite motivation for novelty, excitement, and change is correlated with the intuitive style. The opposite pattern of correlations of the systematic and intuitive style with values is consistent with the notion that the two are not orthogonal, but rather two ends of the same pole, at least in motivational terms.

Some non-hypothesized correlations emerged as well. The most consistent ones are with conformity and achievement values, which were both positively correlated with the systematic style and negatively correlated with the intuitive style (5/6 correlations significant for conformity, 3/6 significant for achievement values; see Table 3). Due to the post hoc nature of the findings, caution should be used in interpreting them. However, we reason that these patterns of correlations may reflect the preference for the systematic style that dominates Western cultures.

Reviewing research on cultural differences between Western and East Asian societies, Nisbett, Peng, Choi, and Norenzayan (2001) argue that Western societies are characterized by an analytic system of thought. Western cultures have a long tradition of reasoning on the basis of underlying abstract propositions, independent of content. Individuals from Western societies tend to rely on rules and regularities when they interpret events and organize knowledge. The use of a systematic, structured, rule-based system of thought is encouraged and maintained through social practices such as language, schools, and production processes (Nisbett et al., 2001).

Depending on their values, individuals are likely to vary in their deliberate efforts to develop the “right” cognitive style. We suggest that individuals who emphasize conformity and achievement values are especially likely to do so. Conformity values express the motivation to obey social norms and expectations (Schwartz, 1992), which may increase susceptibility to implicit and explicit messages from authority figures and socialization agents regarding normative, appropriate behavior. Achievement values express the motivation for attaining success and expressing competence according to social standards (Schwartz, 1992), which may increase susceptibility to environmental cues regarding behaviors that promote success. In Western cultures, where socialization encourages individuals to think and act systematically, individuals who emphasize conformity and achievement values are therefore likely to develop a systematic cognitive style, as reflected in the pattern of correlations presented in Table 3.

In sum, our findings suggest that the cognitive styles are associated with values both directly and indirectly. They are directly associated with values expressing motivations that are congruent with the systematic versus intuitive styles. In addition, they are indirectly associated with values that express

motivations that lead to susceptibility to socialization processes and are hence related to the cognitive style that is dominant in Western societies (i.e., the systematic style). If our reasoning is correct, the correlations with security and stimulation will replicate across cultures, whereas the correlations with conformity and achievement will replicate in other Western cultures, but not in societies that encourage an associative or holistic thought system.

To further deepen our understanding of the systematic and intuitive styles, we next investigated their associations with the other major aspect of the self-concept: personality traits.

STUDY 3: SYSTEMATIC VERSUS INTUITIVE COGNITIVE STYLES AND PERSONALITY TRAITS

Several past studies investigated the relations of cognitive styles to personality traits, yielding inconsistent findings (e.g., Cools & Van den Broeck, 2007; Isaksen, Lauer, & Wilson, 2003; King & Hicks, 2009; Marks, Hine, Blore, & Phillips, 2008; Pacini & Epstein, 1999; Witteman, van der Bercken, Claes, & Godoy, 2009). These studies have used a variety of instruments to measure both traits and cognitive styles, which may account for some of the variability of the findings. In this research, we focus on the relationships of cognitive styles and traits, as conceptualized and measured by the Five-Factor Model (FFM). The FFM is considered the dominant approach for representing the human trait structure. The model asserts that five basic factors describe most personality traits: Neuroticism, Openness to Experience, Extraversion, Agreeableness, and Conscientiousness.

Past research investigated the associations of the FFM with the systematic and intuitive styles, using the REI scales (King & Hicks, 2009; Marks et al., 2008; Pacini & Epstein, 1999; Witteman et al., 2009). The findings of these studies are not always consistent (see summary in Panel A of Table 4). Moreover, the rational style and the experiential style have surprisingly similar patterns of relations with traits: Both were found positively correlated with Openness to Experience, Extraversion, and sometimes Agreeableness. The main difference found was in their association with Conscientiousness, which was positively correlated with the rational but not with the experiential style.

In the current study, we present theory-driven hypotheses regarding the associations between traits and cognitive styles, using conceptualizations other than the REI. This is especially important due to the findings of Study 1, which show that the need for cognition (the REI measure for the rational style) is a different construct than the systematic, rule-based cognitive style. Based on the theoretical definitions of the intuitive and systematic cognitive styles, we expected Conscientiousness and Extraversion to distinguish between the two styles.

Table 4 Correlations Between Cognitive Style and the Five Personality Traits

		C	E	N	O	A
<i>Panel A: Summary of Past Findings</i>						
Pacini & Epstein (1999)	Rationality (NFC)	+	+	-	+	
	Experiential (FI)		+		+	+
Marks et al. (2008)	Rationality (NFC)	+	+	-	+	+
	Experiential (FI)		+			+
Witteman et al. (2009) (Spanish sample)	Rationality (NFC)				+	
	Experiential (FI)				+	
Witteman et al. (2009) (Dutch sample)	Rationality (NFC)	+	+	-	+	+
	Experiential (FI)	-	+	+	+	+
King & Hicks (2009)	Experiential (FI)		+			
<i>Panel B: Systematic and Intuitive Styles and the Five Personality Traits in Study 3</i>						
Sample 1 (TWS)	Systematic	.43** (.31**)	.11 (-.04)	-.06 (-.08)	.10 (.11)	-.04 (-.03)
	Intuitive	-.34** (-.24**)	.25** (.21**)	.07 (.07)	.00 (.03)	.05 (.13)
Sample 2 (TWS)	Systematic	.48** (.50**)	-.05 (-.06)	-.03 (-.04)	.17* (.14)	-.04 (-.05)
	Intuitive	-.30** (-.33**)	.11 (.13)	.06 (.07)	-.05 (-.04)	.06 (.04)
Sample 3 (TWS)	Systematic	.68** (.66*)	-.10 (-.12)	-.14 (-.13)	.04 (.08)	.17* (.19*)
	Intuitive	-.41** (-.41**)	.33** (.25**)	.22** (.21**)	.13 (.09)	.08 (-.00)

Note. C = Conscientiousness; E = Extraversion; N = Neuroticism; O = Openness to Experience; A = Agreeableness; NFC = Need for Cognition scale; FI = Faith in Intuition scale; TWS = Thinking and Working Style. Partial correlations controlling for gender are in parentheses. The +/- signs indicate a significant positive/negative correlation reported.

* $p < .05$. ** $p < .01$.

Conscientiousness

Highly conscientious individuals tend to be organized, careful, thorough, and reliable. Those low on this dimension tend to be irresponsible, disorganized, and unscrupulous (Costa & McCrae, 1992). Conscientiousness is compatible with the tendency to search systematically for regularities and patterns. People who are prudent, well organized, and thorough are more likely to act in this manner. Conscientiousness is less compatible with the associative, unexpected, and seemingly disorganized nature of the intuitive style.

H1: Conscientiousness will be positively correlated with a systematic cognitive style and negatively correlated with an intuitive style.

Extraversion

Extroverts tend to be sociable, talkative, expressive, and assertive. Introverts, in contrast, tend to be shy, withdrawn, inhibited, and reserved (Costa & McCrae, 1992). Extraversion is more compatible with the associative, emotional, and impulsive nature of the intuitive cognitive style, whereas introversion

is more compatible with the strict, procedural nature of the analytical process used in the systematic style.

H2: Extraversion will be negatively correlated with a systematic cognitive style and positively correlated with an intuitive style.

We suggest that the other trait factors are unrelated to a specific cognitive style. Consider the Openness to Experience trait. Individuals who score high on this trait tend to be intellectual, imaginative, sensitive, and open-minded (Costa & McCrae, 1992). Thus, open individuals are likely to engage in thinking, creating, and/or debating. We reason, however, that such thought and action could be carried out either in an associative, intuitive way, or in a structured, systematic way. For example, dogmatic, closed-minded individuals, as well as open-minded ones, could develop and endorse their beliefs in an impulsive, associative manner. Thus, Openness should not be correlated with any of the two styles. We similarly expect no relationships between cognitive style and the Agreeableness and Neuroticism traits. Accordingly, past research (see Panel A in Table 4) found inconsistent relationships with these traits, failing to distinguish between the systematic and intuitive styles.

Joint Effect of Traits and Values

In generating our hypotheses for Studies 2–3, we treated traits and values separately. However, the two constructs are consistently associated (e.g., De Raad & Van Oudenhoven, 2008; Roccas et al., 2002). We therefore tested their joint effect on cognitive style, as well as the unique contribution of each in explaining the variance in cognitive style. Consistent with our theorizing above, we suggest that each construct is independently associated with cognitive style—whereas traits reflect the aspects of tendency and habit, values reflect motivational aspects.

H3: Traits and values will each contribute independently to the variance explained in the systematic and intuitive cognitive styles.

Method

Participants and Procedure. This study was composed of three samples, each collected as part of a larger project. The first is Sample 1 from Study 2 above. The participants in Sample 2 were 140 undergraduate students (66% female, $M_{\text{age}} = 25$, range: 18–34). The participants in Sample 3 were 151 undergraduate students (46% female, $M_{\text{age}} = 23$, range: 18–48). Participation was anonymous and voluntary. University students received course credit.

Measures

Cognitive Style. The participants completed the TWS scale used in Study 1 (internal reliabilities in Samples 1–3: .75, .81, and .77 for the systematic style and .70, .73, and .71 for the intuitive style, respectively). The correlation between the systematic and intuitive scales was $-.42$, $-.46$, and $-.51$ for Samples 1, 2, and 3, respectively.

Traits. To measure personality traits, we used Saucier's (1994) Mini-Marker questionnaire. The measure consists of eight adjectives measuring each of the five factors (for a total of 40 adjectives) on a 5-point scale ranging from 1 (*very uncharacteristic of me*) to 5 (*very characteristic of me*). The internal reliabilities (Cronbach's alphas) ranged from .64 to .85.

Values. See Study 2 (Sample 1).

Results and Discussion

Panel B of Table 4 presents the correlations between the five trait factors and the two cognitive styles in each sample. As hypothesized (H1), Conscientiousness was positively correlated with the systematic style and negatively correlated with the intuitive style in all samples ($r_s = .43$ to $.68$ for the systematic style and $-.30$ to $-.41$ for the intuitive scales, all $p_s < .01$). As hypothesized (H2), Extraversion was positively

correlated with the intuitive style ($r_s = .11$ to $.33$, all but one $p < .05$). However, its correlations with the systematic style were near zero ($r_s = -.10$ to $.11$, all *ns*).² Again, controlling for gender did not affect the results. We did not expect associations between the cognitive styles and the other traits. Indeed, most correlations with these traits were insignificant, and none was consistent across samples (see Table 4).

In sum, the consistent pattern of results across three samples supports our hypotheses. The findings indicate that being conscientious is strongly associated with having a systematic versus an intuitive style. Stable, enduring tendencies to think and act in a cautious, organized, and responsible way are thus strongly associated with the stable tendency to process information in an ordered, rule-based manner. Extraversion was positively correlated with the intuitive style, whereas correlations with the systematic style were near zero. Thus, whereas Extraversion is compatible with intuitive thinking, it does not conflict with the systematic style. Future research could further investigate this complex pattern of associations.

Our findings interlink with the recent literature on meta-traits (Hirsh, DeYoung, & Peterson, 2009). Two higher-order traits were identified, distinguishing Plasticity (Extraversion and Openness) from Stability (Conscientiousness, Neuroticism, and Agreeableness). Plasticity relates to the tendency to seek novel information, whereas Stability relates to the tendency to seek a stable behavioral and psychological function. Our findings indicate that the systematic style is compatible with the preference for stable rules (Stability), whereas the intuitive style is somewhat compatible with the tendency to seek diversity (Plasticity). Note, however, that the linkage between the two systems is not full. The systematic style is related to Conscientiousness (and is not related to Neuroticism or Agreeableness), and the intuitive style is related to Extraversion (and is not related to Openness).

Joint Effects of Traits and Values on Cognitive Style. To test whether values and traits each contribute independently to the prediction of cognitive style, we ran two hierarchical regression analyses for each style. In the first, values were entered as predictors of cognitive style at the first stage, and traits were added at the second stage. In the second set of regressions, the order was reversed. To minimize the problem of multicollinearity, we included as predictors only the values and traits for which we had a priori hypotheses.

Systematic Style. When entered at the first step, stimulation and security values explained 10% of the variance in the systematic style, $F(2, 149) = 9.02$, $p < .001$. When entered at the second stage, Conscientiousness and Extraversion added 6% to the explained variance ($F_{\text{change}} = 5.03$, $p < .05$). When the order was reversed, traits explained 10% of the variance, $F(2, 149) = 8.48$, $p < .05$, and values added 6% to the explained variance ($F_{\text{change}} = 5.54$, $p < .05$).

Intuitive Style. When entered at the first stage, stimulation and security values explained 14% of the variance in the intuitive style, $F(2, 149) = 12.17, p < .05$. When entered at the second stage, traits added 5% of explained variance ($F_{\text{change}} = 4.95, p < .05$). When the order was reversed, traits explained 10% of the variance, $F(2, 149) = 9.03, p < .05$, and values added 9% to the explained variance ($F_{\text{change}} = 7.91, p < .05$).

The results confirm that values and traits each had a unique contribution to predicting cognitive style. This finding is consistent with our reasoning that cognitive styles reflect both motivation (expressed in their associations with values) and habit (expressed in their association with traits). A personal style of information processing and decision making depends on the importance attributed to novelty and excitement versus stability and safety, as well as by consistent tendencies toward organized, ordered behavior versus impulsive, expressive action.

In Studies 4 and 5, we went on to investigate how the systematic and intuitive styles are reflected in cognitive performance.

STUDY 4: COGNITIVE STYLE, EXPERIENCE, AND PERFORMANCE

As a stable tendency to process information and make decisions, cognitive style should be reflected in performance on cognitive tasks. Only a few studies have taken an individual-differences approach in testing the effect of style on performance. These studies typically used tasks that call for either rule-based or associative processing, aiming to show that systematic individuals perform better than intuitive ones in the former whereas intuitive individuals perform better than systematic ones in the latter (e.g., Epstein et al., 1996; Hicks et al., 2010; Kaufman, 2009; King et al., 2007; Pacini & Epstein, 1999).

This study aims to explore another way in which systematic and intuitive individuals differ in their cognitive performance. We investigated the role of experience in moderating the style-performance association. Because systematic individuals are motivated to discover and use rules, the more experience they have in solving a particular task, the more likely they are to apply the rules they discovered in their past attempts to their current task. Consequently, experienced systematic individuals are likely to perform better than those with minimal experience. In contrast, intuitive individuals are motivated to experience novelty and excitement. They do not explicitly seek rules, nor do they replicate the same method in later tasks. Instead, they treat each task as a new experience, integrating their rich pool of associations.

To tease apart the role of experience from baseline differences between systematic and intuitive individuals, we focused on a task that could be performed either systematically or intuitively. In Studies 4 and 5, we investigated performance in

solving Sudoku puzzles. A Sudoku puzzle can be solved either systematically, by discovering a rule and applying it in subsequent steps, or intuitively, by using holistic analysis and following one's intuitions. Thus, systematic and intuitive individuals are equally likely to perform well in solving a Sudoku puzzle. However, because these puzzles can be solved by applying rule-based thinking, experience is likely to improve performance of systematic (but not intuitive) individuals. We therefore hypothesize the following:

H1: Cognitive style interacts with experience in predicting performance, so that systematic participants with much experience perform better than those with little experience, whereas intuitive participants with much and little experience do not perform differently.

This hypothesis is in line with a recent study (Pretz, 2008) in which inducing intuitive thinking promoted successful everyday problem solving among novices, whereas inducing systematic thinking promoted successful problem-solving among experts.

Method

Participants and Procedure. The participants were 63 undergraduate students (48% female, $M_{\text{age}} = 23$) who participated anonymously for course credit. They reported their cognitive style as well as other personal attributes and then solved an easy Sudoku puzzle (see below).

Instruments

Cognitive Style. We used the TWS (reliability in this study: $\alpha = .74$ for both the intuitive and systematic styles). The two scales were negatively correlated ($r = -.50, p < .01$). This correlation is consistent with our findings above (Studies 1–3) and with our theoretical reasoning that people can be either highly systematic or highly intuitive, but not both. Since this study compared systematic and intuitive participants, we created one index of systematic versus intuitive style by reversing the intuitive items and combining all 10 items ($\alpha = .81$).

Sudoku Task. Sudoku (<http://en.wikipedia.org/wiki/Sudoku>) is a combinatorial number-placing puzzle. The goal is to fill a 9×9 grid with numbers so that each column, each row, and each 3×3 subgrid contains all the digits from 1 to 9. The difficulty of the puzzle is determined partly by the number of digits already filled in. The participants were presented with written instructions followed by an easy Sudoku puzzle. They had 5 min to solve the puzzle. They were told the time would probably not be enough and were asked to fill in as many digits as possible. The number of correctly placed digits ranged from 0 to 46, with a mean of 23.56.

Past Experience. The participants reported the extent of their past experience in solving Sudoku puzzles on a five-

category scale (*never; less than once a month but have done so before; more than once a month but less than once a week; once a week; several times a week*). Solving a Sudoku puzzle for the first time is qualitatively different from solving it after having done it in the past. We therefore included only participants who had some past experience in this study. We classified participants who reported solving Sudoku puzzles less than once a month as having “little experience” and all the others as having “much experience.”

Results and Discussion

We conducted a regression analysis with the number of correct digits in the puzzle as the predicted variable. The predicting variables were experience (little, much), cognitive style (centered), and the interaction between the two. Overall, 16.3% of the variance was explained, $F(3, 59) = 3.82, p < .01$. As could be expected, experience had a strong main effect ($\beta = .30, t = 2.53, p < .05$). No significant main effect emerged for cognitive style ($\beta = -.12, t = -0.99, ns$). As hypothesized, the Style \times Experience interaction was significant ($\beta = .23, t = 1.93, p < .05$). Simple slope analyses confirmed that experience had a significant effect for systematic ($b = 7.58, t = 3.16, p < .05$) but not for intuitive participants ($b = 0.85, t = 0.35, ns$; see Figure 1). Adding gender as a control variable did not change the findings.

Our findings are consistent with the findings of Pretz (2008). In his research, Pretz experimentally induced systematic versus intuitive strategies and showed that the former was more beneficial for experts, whereas the latter was more beneficial for novices. Our findings indicate that stable differences in cognitive style produce a similar pattern: Among novices, intuitive participants performed better in the cognitive task, whereas among experienced participants the pattern was reversed.³ We suggest that systematic individuals are more motivated than intuitive ones to discover rules and apply them in later tasks, and that consequently, when the task allows

for rule-based thinking, systematic individuals improve with experience more than intuitive ones. To test this reasoning more directly, Study 5 focused on participants with no prior experience and tested their improvement in a subsequent Sudoku task.

STUDY 5: PERFORMANCE IN CONSECUTIVE TASKS

To further investigate the moderating role of experience in the performance of systematic versus intuitive individuals, Study 5 employed a within-subject design. This design allows for testing the direct effect of experience on performance in a subsequent task, thus providing additional means to test our reasoning that systematic individuals are more likely than intuitive ones to carry over the rule-based knowledge they have gained. To that aim we focused on participants who had no prior experience in solving Sudoku puzzles. We hypothesized the following:

H1: Cognitive style interacts with experience in predicting performance, so that performance in a subsequent task improves for participants with a systematic style more than for those with an intuitive style.

Method

Participants and Procedure. The participants were 44 undergraduate students (39% female, $M_{age} = 23$) who participated anonymously for course credit. No participant had experience in solving a Sudoku puzzle, allowing the testing of improvement from the first to the second task. They completed the questionnaire described in Study 4 and had 5 min to solve each of two puzzles.

Instruments

Cognitive Style. We used the TWS (in this study: $\alpha = .78$ and $.69$ for the intuitive and systematic scales, respectively). The two scales were negatively correlated ($r = -.36, p = .015$). We reversed the intuitive items and combined all 10 items into an index of systematic versus intuitive style ($\alpha = .78$).

Sudoku Task. The participants were presented with the same written instructions and easy-level Sudoku puzzle as in Study 4. They were then presented with a second, medium-level puzzle. They had 5 min to solve each. Again, they were told that the time would probably not be enough and were asked to fill in as many digits as possible.

Results and Discussion

We conducted a repeated-measure analysis to assess improvement in task performance for systematic and intuitive participants. The performance in the two tasks did not significantly

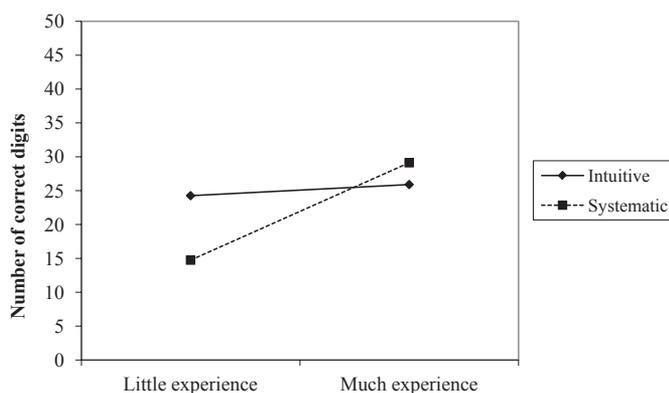


Figure 1 Study 4: Systematic versus intuitive style interacts with experience in predicting task performance.

differ. The number of correct digits ranged from 0 to 17 ($M = 8.15$, $SD = 4.12$) for the first puzzle and from 0 to 19 ($M = 9.56$, $SD = 4.73$) for the second one, $F(1, 39) = 2.86$, *ns*. No significant main effect emerged for cognitive style, $F(1, 39) = .07$, *ns*). As hypothesized, the findings revealed a significant interaction, indicating that improvement in performance was greater for systematic participants than intuitive ones, $F(1, 39) = 5.41$, $p < .05$, partial $\eta^2 = .12$. Adding gender as a control variable did not change the findings.

Taken together, the results of Studies 4 and 5 are consistent with our theorizing regarding the role of experience. We reasoned that systematic individuals extract rules from their past experiences, which they then apply and follow in similar circumstances. The Sudoku puzzle, which can be solved by applying rule-based thinking, allows them to go through this process; experienced systematic individuals hence performed better than novice ones. Intuitive people, in contrast, treat each task as a new one, integrating the full spectrum of associations rather than applying the same rule repetitively. Experience had no effect on their performance.

Importantly, Studies 4–5 are limited in focusing on a task in which rule-based thinking is possible. To fully understand the role of experience, future research could investigate whether experience will improve performance of intuitive individuals in tasks that could not be solved by applying the same rule repetitively but rather call for associative thinking (e.g., art criticism). In such tasks, experience may benefit intuitive individuals who may rely on their expertise in integrating associations and take the context into account.

GENERAL DISCUSSION

Taking an individual-differences perspective to studying cognitive style, we first validated the meaning of the systematic and intuitive cognitive styles, providing evidence for convergent and divergent validity (Study 1). We then investigated theoretical and empirical associations between the two cognitive styles and other personality constructs, pointing to the motivations and habits compatible with each style (Studies 2 and 3). Finally, we investigated implications for cognitive performance, considering the moderating effect of experience (Studies 4 and 5).

An Individual-Differences Perspective: Cognitive Styles, Values, and Traits

Like traits and values, cognitive style is a stable personality construct. Whereas traits refer to “what” and values refer to “why,” cognitive styles refer to “how” people think, decide, and act. The systematic style was found positively correlated with security and negatively correlated with stimulation values (Study 2), indicating that systematic individuals are motivated to find consistent, predictable patterns in their lives. This style was also positively correlated with Conscientiousness (Study

3), indicating that it entails an enduring tendency to be cautious, organized, and reliable. The intuitive style had the opposite pattern of associations, indicating that intuitive individuals are motivated to experience novelty, change, and excitement. Reflecting its impulsive nature, this style was also positively correlated with Extraversion.

Our findings further indicate that values and traits independently predict the systematic and intuitive styles. Thus, individuals’ dominant cognitive style reflects both their consistent behavioral tendencies and habits (traits) and their motivational goals (values). Understanding the motivations associated with cognitive style provides us with useful insights regarding the preferences of intuitive (vs. systematic) individuals in education and work settings, and the goals that they are likely to pursue.

In addition to providing insights into the nature of the systematic and intuitive styles, our findings are consistent with the notion that cognitive styles are partly inherent and partly socialized. This notion is also consistent with our post hoc explanation for the unexpected correlations found between the systematic style and conformity and achievement values. We reasoned that these correlations reflect the susceptibility of individuals who emphasize conformity and achievement values to societal messages regarding the preferred cognitive style—the systematic style in the case of Western cultures.

Behavioral Implications of Cognitive Styles

The findings of Study 1 revealed that the systematic style is more frequent among accounting students, whereas the intuitive style is more frequent among arts students. Thus, the systematic style is dominant in a profession that requires following explicit regulations and procedures. Understanding the professional principles and underlying rules allows accountants to effectively apply these rules in their various tasks. In contrast, artists seek to express themselves by producing unique and creative pieces of art. They therefore benefit more from relying on their instincts, associations, and emotions than from adopting rules or “manuals.” Accordingly, the intuitive style is dominant in this profession. Consistent with the literature on person-environment fit, the findings of Study 1 further reveal that students’ satisfaction was positively predicted by the systematic style in the accounting department, but by the intuitive style in the arts department. These findings have practical implications for organizations: Managers may wish to assign individuals to tasks that are congruent with their dominant cognitive style.

In Studies 4 and 5, we moved from studying a major life decision (choosing a profession) to studying overt performance in a cognitive task. The findings showed that in a task that allows for rule-based processing (a Sudoku puzzle), systematic individuals used past experience to discover rules, which they then applied to enhance their performance in subsequent tasks. This is in line with our finding that systematic individuals are motivated to discover and follow consistent

patterns and rules that allow for certainty, whereas intuitive individuals are motivated to experience novelty and excitement (Study 2) and therefore treat each task as new and unique. Systematic individuals may therefore have an advantage over intuitive ones in jobs that consist of subsequent tasks and allow for acquiring expertise through generalization. Conversely, they may be less effective than intuitive individuals in performing tasks in which no underlying rule applies, where there is no “manual” one can follow. Our findings thus have practical implications for organizational selection and assignment.

Studies 4 and 5 were limited in focusing on a task in which a rule could be identified and subsequently applied. We reason that under these circumstances, experience promotes the process of identifying an efficient method and applying it. These results are consistent with previous research on creativity in which systematic—but not intuitive—individuals benefited from a structured, systematic process designed to generate novel ideas (Sagiv et al., 2010). More research is needed to investigate situations in which rule-based thinking may be ineffective: situations that call for integration of associations and relying on “gut feeling.” Does the essence of experience vary, depending on the type of task? What does it mean to be experienced in tasks that do not allow for applying a systematic approach? Will intuitive individuals improve with experience in such tasks, or will they still approach each task as a novel experience?

LIMITATIONS AND FUTURE DIRECTIONS

Another limitation of this study is the use of self-reports to measure cognitive styles. Like any self-report measure, these instruments are subject to biases due to social desirability or lack of self-awareness. However, in Studies 1, 4, and 5, the reported cognitive styles predicted expected patterns of overt behavior, indicating that these measures are valid. Research on cognitive style would benefit from the development of behavioral indicators of the systematic versus intuitive styles. Another future direction could be studying longitudinally the development of individual dominant cognitive style.

To date, there is no agreement in the literature as to whether systematic and intuitive styles are two poles of one dimension (e.g., Allinson & Hayes, 1996; Sagiv et al., 2010) or two distinct dimensions (e.g., Norris & Epstein, 2011; Pacini & Epstein, 1999; Scott & Bruce, 1995). We reason that an individual is unlikely to be both highly systematic and highly intuitive because when processing information or making a decision, a person cannot apply both intuitive and systematic thinking at the same moment—one can either apply a rule or follow intuition. In the current research, the systematic scales were consistently negatively correlated with the intuitive ones. Moreover, the pattern of correlations between the systematic style and both values (Study 2) and traits (Study 3) were consistently opposite to the pattern found for the intuitive

style. These patterns were, however, not completely opposite (e.g., Extraversion was positively correlated with the intuitive style, but did not correlate with the systematic style). Thus, our findings clearly show that the two styles are not orthogonal. More research is needed, however, to investigate whether the distinction between the two styles is beneficial.

CONCLUSIONS

In the present research, we took an individual-differences perspective in studying the way people think. Our findings indicate that individuals' cognitive style is consistent with their other personal attributes, such as traits and values, and hence contributes to our understanding of personality. We further discussed implications for professional choice and for improvement in performance due to experience. In work and other life domains, differences in cognitive style could be a key factor in understanding how people think, and consequently how they act and decide, and the implications of those actions and decisions.

Notes

1. The participants in Sample 3 also completed the GDMS, yielding highly similar results.
2. The participants in Sample 3 also completed the GDMS, yielding highly similar results.
3. Pretz (2008) also examined the impact of chronic cognitive style (measured with the REI) but did not find significant relationships.

References

- Allinson, C. W., Armstrong, S. J., & Hayes, J. (2001). The effects of cognitive style on leader-member exchange: A study of manager-subordinate dyads. *Journal of Occupational and Organizational Psychology*, *74*, 201–220.
- Allinson, W., & Hayes, J. (1996). The Cognitive Style Index: A measure of intuition-analysis for organizational research, *Journal of Management Studies*, *33*, 119–135.
- Amit, A., & Gati, I. (2013). Table or circles? Comparing two methods for choosing among career alternatives. *Career Development Quarterly*, *61*, 50–63.
- Amit, A., & Sagiv, L. (2013). Tough decisions: Motivated processing of attributes and alternatives in complex choices. *Organizational Behavior and Human Decision Processes*, *121*, 104–117.
- Blaylock, B. K., & Rees, L. P. (1984). Cognitive style and the usefulness of information. *Decision Sciences*, *15*, 74–91.
- Briggs, K., & Myers, I. (1987). *The Myers-Briggs Type Indicator Form G*. Palo Alto, CA: Consulting Psychological Press.
- Bruine de Bruin, W. B., Parker, A. M., & Fischhoff, B. (2007). Individual differences in adult decision-making competence. *Journal of Personality and Social Psychology*, *92*, 938–956.
- Cacioppo, J. T., & Petty, R. E. (1982). The need for cognition. *Journal of Personality and Social Psychology*, *42*, 116–131.

- Cools, E., & Van den Broeck, H. (2007). Development and validation of the Cognitive Style Indicator. *Journal of Psychology: Interdisciplinary and Applied*, **141**, 359–387.
- Costa, P. T., Jr., & McCrae, R. R. (1992). Normal personality assessment in clinical practice: The NEO Personality Inventory. *Psychological Assessment*, **4**, 5–13.
- Davidov, E., Schmidt, P., & Schwartz, S. H. (2008). Bringing values back in: The adequacy of the European Social Survey to measure values in 20 countries. *Public Opinion Quarterly*, **72**, 420–445.
- De Raad, B., & Van Oudenhoven, J. P. (2008). Factors of values in the Dutch language and their relationship to factors of personality. *European Journal of Personality*, **22**, 81–108.
- Epstein, S., Pacini, R., Denes-Raj, V., & Heier, H. (1996). Individual differences in intuitive-experiential and analytical-rational thinking styles. *Journal of Personality and Social Psychology*, **71**, 390–405.
- Gates, B. (2007). Remarks of Bill Gates, Harvard Commencement 2007. <http://news.harvard.edu/gazette/story/2007/06/remarks-of-bill-gates-harvard-commencement-2007/> (last accessed October 11, 2013).
- Graff, M. (2000). The intermediate style position. In R. J. Riding & S. G. Rayner (Eds.), *International perspectives on individual differences* (Vol. 1, pp. 65–78). Stamford, CT: Ablex.
- Gul, F., Huang, A., & Subramaniam, N. (1992). Cognitive style as a factor in accounting students' perceptions of career choice factors. *Psychological Reports*, **71**, 1275–1281.
- Hayes, J., & Allinson, C. W. (1994). Cognitive style and its relevance for management practice. *British Journal of Management*, **5**, 53–71.
- Hicks, J. A., Cicero, D. C., Trent, J., Burton, C. M., & King, L. A. (2010). Positive affect, intuition, and the feeling of meaning. *Journal of Personality and Social Psychology*, **98**, 967–979.
- Hirsh, J. B., DeYoung, C. G., & Peterson, J. B. (2009). Meta-traits of the Big Five differentially predict engagement and restraint of behavior. *Journal of Personality*, **77**, 1085–1102.
- Holland, J. L. (1997). *Making vocational choice: A theory of vocational personalities and work environments* (3rd ed.). Boston: Psychological Assessment Resources.
- Hunt, R. G., Krzystofiak, F. J., Meindl, J. R., & Yoursy, A. M. (1989). Cognitive style and decision making. *Organizational Behavior and Human Decision Processes*, **4**, 436–453.
- Isaksen, S. G., Lauer, K. J., & Wilson, G. V. (2003). An examination of the relationship between personality type and cognitive style. *Creativity Research Journal*, **15**, 343–354.
- Jobs, S. (2005). "You've got to find what you love," Jobs says. <http://news.stanford.edu/news/2005/june15/jobs-061505.html> (last accessed October 11, 2013).
- Kaufman, S. B. (2009). Faith in intuition is associated with decreased latent inhibition in a sample of high-achieving adolescents. *Journal of Aesthetics, Creativity, and the Arts*, **3**, 28–31.
- King, L. A., Burton, C. M., Hicks, J. A., & Drigotas, S. M. (2007). Ghosts, UFOs, and magic: Positive affect and the experiential system. *Journal of Personality and Social Psychology*, **92**, 905–919.
- King, L. A., & Hicks, J. A. (2009). Positive affect, intuition, and referential thinking. *Personality and Individual Differences*, **46**, 719–724.
- Kirton, M. J. (1977). *Manual of the Kirton Adaption-Innovation Inventory*. London: National Foundation for Educational Research.
- Knafo, A., & Sagiv, L. (2004). Values and work environment: Mapping 32 occupations. *European Journal of Psychology of Education*, **19**, 255–273.
- Knafo, A., & Spinath, F. M. (2011). Genetic and environmental influences on girls' and boys' gender-typed and gender-neutral values. *Developmental Psychology*, **47**, 726–731.
- Kozhevnikov, M. (2007). Cognitive styles in the context of modern psychology: Toward an integrated framework of cognitive style. *Psychological Bulletin*, **133**, 464–481.
- Kristof-Brown, A. L., Zimmerman, R. D., & Johnson, E. C. (2005). Consequences of individuals' fit at work: A meta-analysis of person-job, person-organization, person-group, and person-supervisor fit. *Personnel Psychology*, **58**, 281–342.
- MacGillivray, A. C. (1999). Cognitive style of undergraduates in tourism and hospitality management. *Psychological Reports*, **85**, 481–487.
- Maio, G. R. (2010). Mental representations of social values. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 42, pp. 1–43). Burlington, MA: Academic Press.
- Marks, A. D. G., Hine, D. W., Blore, R. L., & Phillips, W. J. (2008). Assessing individual differences in adolescents' preference for rational and experiential cognition. *Personality and Individual Differences*, **44**, 42–52.
- McCrae, R. R., & Costa, P. T., Jr. (1990). *Personality in adulthood*. New York: Guilford Press.
- Messick, S. (1984). The nature of cognitive styles: Problems and promise in educational practice. *Educational Psychology*, **4**, 59–74.
- Moore, S., O'Maidin, D., & McElligott, A. (2003). Cognitive styles among computer systems students: Preliminary findings. *Journal of Computing in Higher Education*, **14**, 45–67.
- Nisbett, R. E., Peng, K., Choi, I., & Norenzayan, A. (2001). Culture and systems of thought: Holistic vs. analytic cognition. *Psychological Review*, **108**, 291–310.
- Norris, P., & Epstein, S. (2011). An experiential thinking style: Its facets and relations with objective and subjective criterion measures. *Journal of Personality*, **79**, 1043–1080.
- Pacini, R., & Epstein, S. (1999). The relation of rational and experiential information processing styles to personality, basic beliefs, and the ratio-bias phenomenon. *Journal of Personality and Social Psychology*, **76**, 972–987.
- Perkins, D. N. (1981). *The mind's best work*. Cambridge, MA: Harvard University Press.
- Phillips, S. D., & Paziienza, N. J. (1988). History and theory of assessment of career development and decision-making. In W. B. Walsh & S. H. Osipow (Eds.), *Career decision making* (pp. 1–31). Hillsdale, NJ: Erlbaum.
- Pretz, J. E. (2008). Intuition versus analysis: Strategy use and experience in complex everyday problem solving. *Memory and Cognition*, **36**, 554–566.

- Riding, R. J. (1997). On the nature of cognitive style. *Educational Psychology, 17*, 29–49.
- Roccas, S., Sagiv, L., Schwartz, S. H., & Knafo, A. (2002). Basic values and the five factor model of personality traits. *Personality and Social Psychology Bulletin, 28*, 789–801.
- Sabatelli, M. R., Dreyer, A., & Buck, R. (1983). Cognitive style and relationship quality in married dyads. *Journal of Personality, 51*, 192–201.
- Sadler-Smith, E. (2004). Cognitive style and the management of small and medium-sized enterprises. *Organization Studies, 25*, 155–181.
- Sagiv, L., Arieli, S., Goldenberg, J., & Goldschmidt, A. (2010). Structure and freedom in creativity: The interplay between externally imposed structure and personal cognitive style. *Journal of Organizational Behavior, 31*, 1086–1110.
- Saucier, G. (1994). Mini-Markers: A brief version of Goldberg's unipolar Big-Five markers. *Journal of Personality Assessment, 63*, 506–516.
- Schmitt, M. J., Schwartz, S. H., Steyer, R., & Schmitt, T. (1993). Measurement models for the Schwartz Values Inventory. *European Journal of Psychological Assessment, 9*, 107–121.
- Schwartz, S. H. (1992). Universals in the content and structure of values: Theoretical advances and empirical tests in 20 countries. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 25, pp. 1–65). New York: Academic Press.
- Schwartz, S. H., & Rubel, T. (2005). Sex differences in value priorities: Cross-cultural and multi-method studies. *Journal of Personality and Social Psychology, 89*, 1010–1028.
- Scott, S. G., & Bruce, R. A. (1995). Decision-making style: The development and assessment of a new measure. *Educational and Psychological Measurement, 55*, 818–831.
- Smith, E. R., & DeCoster, J. (2000). Dual process models in social psychology: Conceptual integration and links to underlying memory systems. *Personality and Social Psychology Review, 4*, 108–131.
- Sternberg, R. J. (1998). *Handbook of creativity*. Cambridge: Cambridge University Press.
- Tanova, C. (2003). Cognitive styles and learning preferences of undergraduate business students in North Cyprus. *Psychological Reports, 93*, 1149–1155.
- Witteman, C., van den Bercken, J., Claes, L., & Godoy, A. (2009). Assessing rational and intuitive thinking styles. *European Journal of Psychological Assessment, 25*, 39–47.