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Distinguishing Deliberate From Systematic Thinking

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Deliberate thinking and systematic thinking are often conflated when contrasted with intuitive thinking. We argue that, in fact, nonintuitive thinking is multidimensional, and that deliberate and systematic thinking are distinct nonintuitive processes. We establish their distinct meanings in 6 studies using 3 research paradigms. Our first paradigm (Studies 1 and 2) takes an individual differences approach. Adopting a meta-analytic design with the addition of new data, we find that deliberate thinking and systematic thinking are differentially associated with personality traits (openness to experience with deliberate thinking; conscientiousness with systematic thinking) and with personal values (self-direction vs. conformity with deliberate thinking; security vs. stimulation with systematic thinking). Our second paradigm (Studies 3 and 4) employs a decision-making task (choosing between different problem types and levels of difficulty) to test for deliberate and systematic thinking in isolation from each other. We show that systematic thinking (in oneself and others) predicts a selection of rule-based over context-based problems, while deliberate thinking predicts a selection of difficult over simple problems. Our third paradigm (Studies 5 and 6) takes a cultural perspective. We show that although deliberate thinking is universally perceived as signifying competence, the contribution of systematic thinking to perceptions of competence is culturally dependent, differing for participants under a collectivistic versus individualistic mindset. Together our findings highlight the need to distinguish between deliberate and systematic thinking and underscore the need for studies of intuitive versus nonintuitive thinking to take a multidimensional perspective.

Keywords: deliberation, individual differences, individualism/collectivism, intuition, systematic

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The prominent perspective in research on thinking styles presumes that deliberate thinking (in the sense of comparatively deep and effortful) and systematic thinking (in the sense of piecemeal, structured processing of details) are both opposites of intuitive thinking, and therefore can be considered two facets of a single concept (Amit, Rusou, & Arieli, 2016; Hoffrage & Marewski, 2015; Kahneman, 2011). This presumption is based on the idea that whereas intuitive thinking is automatic and unconscious, nonintuitive thinking is conscious and hence requires working memory. The activation of working memory, in turn, imposes limitations on the amount of information that can be processed, with the result (by this reasoning) that nonintuitive thinking is both deliberate and systematic (Evans & Curtis-Holmes, 2005). This assumption that deliberate and systematic thinking are interchangeable is manifested in reviews, in which the two are treated as reflecting a single theoretical construct (e.g., Kahneman, 2011); in experimental manipulations, where task designs fail to discriminate between them (e.g., Horstmann, Ahlgrimm, & Glöckner, 2009); and in measures of individual differences, where items designed to capture both are included in a single scale (e.g., Allinson & Hayes, 1996; see discussion in Hodgkinson & Sadler-Smith, 2003).

To challenge the assumption of interchangeability between deliberate and systematic thinking, consider the following. Let us assume Sally and Margaret both deliberate about an important decision, putting thought, time, and mental energy into considering all possibilities. Yet whereas Sally reaches her conclusion by systematically following a decision rule based on a list of pros and

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The research materials and data are available at https://osf.io/g2zds/. A preliminary, abridged (one-paragraph) summary of the main analysis of this investigation was presented in the *Proceedings of the Seventy-Sixth Annual Meeting of the Academy of Management* (Amit, Arieli, & Porzycki, 2017).

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cons she compiled for each option, Margaret does so via intense rumination on what the different alternatives will look and feel like. Although both engage in deliberate (deep) thinking, Margaret reaches her final decision through an integrative, holistic, intuitive evaluation, and Sally through a systematic one. Or consider a different case, where what's needed is a quick decision—for example, where to go for dinner in an unfamiliar town, given a few obvious options (e.g., restaurants within walking distance of a hotel) and no time or inclination to investigate all possible alternatives. Robert makes a snap judgment based on his impressions and feelings about the available choices. Peter also makes a quick decision, but he relies on a rule: He has read that restaurants situated on side streets offer better value for money, because their rents are lower. Both Robert and Peter make their decisions without deliberation, but Robert does so via an intuitive process, and Peter via a systematic one.

In this research, we aim to clarify the distinct meanings of deliberate and systematic thinking and establish theoretical and empirical differences between the two. To do so, we employ three research paradigms and apply heterogeneous methods. Our overall investigation is based on the notion that if two constructs are distinct, they should show different patterns of association with other individual differences, exhibit differential influences on problem choice decisions, and reflect different cultural influences.

In the first part of this paper, we focus on individual differences. We argue that if deliberate and systematic thinking are indeed distinct, as we claim, then dispositions toward deliberate thinking and toward a systematic thinking style should exhibit different patterns of association with other individual differences, such as personality traits and personal values. To test this hypothesis we employ a meta-analytic design, integrating past and new data to create a nomological network capturing different measures of thinking styles and different individual difference associations.

In the second part of the paper we extend the investigation of deliberate and systematic thinking using a behavioral decision-making task (choosing problems and their level of difficulty). In a two-stage task, we show that systematic thinking (in oneself and others) predicts a selection of rule-based over context-based problems, whereas deliberate thinking predicts a selection of difficult over simple problems. In the third and final part of the paper we apply a cultural lens to examine how deliberate and systematic thinking differentially contribute to perceptions of competence. We suggest that deliberate and systematic reasoning are conflated in the literature because both are culturally valued within individualistic cultures. To challenge the assumption that deliberate and systematic thinking are interchangeable in meaning, we show that whereas deliberate thinking is generally perceived as an indicator of competence, the contribution of systematic thinking to perceptions of competence is culturally dependent.

Part 1—Individual Differences in Dispositions Toward Deliberate Versus Systematic Thinking: A Nomological Network

Theories of individual differences in thinking styles (also referred to as cognitive or decision-making styles) conceptualize how individuals organize and process information and draw conclusions as a prelude to action (e.g., Hunt, Krzystofiak, Meindl, & Yousry, 1989; Kozhevnikov, 2007; Messick, 1984; Sagiv, Arieli, Goldenberg, & Goldschmidt, 2010). This stream of research has produced a number of different theories with a large variety of labels and instruments (Riding, 1997). In line with dual process theories, most, if not all, propose two main thinking styles. Table 1 presents the definitions and labels used for the two styles by prominent theories, along with sample items from the measures employed to capture them. We gave the right-hand column the heading *Intuitive thinking style*, because this style is labeled *intuition* or *intuitive* by six of the eight theories. We gave the left-hand column the heading *Nonintuitive thinking style*, because the theories distinguish this style from the intuitive style but do not offer a dominant single label.

The definitions presented in the table for both the intuitive and nonintuitive styles are often complex, encompassing characteristics in different domains (e.g., rapid and holistic or deliberate and reason-based, respectively). As such, it has been argued for adopting a multidimensional approach to the definition and measurement of both intuitive and nonintuitive thinking (see summary in Amit, Arieli, & Porzycki, 2017). Notably, the definitions offered for the intuitive style overlap heavily, with most including some combination of or variation on the following: rapid, automatic, holistic, primarily nonverbal, affect-based, and reliant on hunches and simple heuristic cues. In contrast, the table shows a wide variety of labels for the nonintuitive styles, and profound differences in the items designed to capture them. Similarly, focusing on different measures, Wang, Highhouse, Lake, Petersen, and Rada (2017, Study 2) showed that unlike measures of intuitive thinking, measures of nonintuitive thinking style do not converge. These observations, along with a tendency to collapse definitions and measures (Wang et al., 2017; see also the meta-analysis by Phillips, Fletcher, Marks, & Hine, 2016), point to an especially urgent need to clarify what we mean when we describe a person as a rational, analytic, or systematic (i.e., nonintuitive) thinker, and what qualities should be expected to generalize from one dimension to another.

Overviewing five popular measures of thinking styles, Betsch and Iannello (2010) conclude that the styles these inventories measure can be classed into four factors. Of special interest to the current investigation is the distinction Betsch and Iannello draw between their *cognition-based* and *planned, structured* factors, both of which characterize nonintuitive thinking. The *cognition-based* factor is described as detailed, careful, effortful analysis of information. The *planned, structured* factor is described as following plans and agendas. Based on these findings, we conclude that not only is it possible to differentiate deliberate (cognition-based) from systematic (planned, structured) thinking, but that such differences may be identified through associations published using different measures.[1] To establish the differences between deliberate and systematic thinking, we provide empirical evidence differentially linking measures that best capture each of these constructs with personality traits (Study 1) and personal values (Study 2).

[1] Of the various labels used for nonintuitive thinking listed in Table 1, we adopted the label *deliberate* to describe deep, effortful thinking and *systematic* to describe piecemeal, structured thinking. We adopted the label *systematic* from the Thinking and Working Style questionnaire used in Studies 1 and 2. We refrained from using the fairly popular label *rational*, because it is defined differently by different researchers and as it is often linked with the Rational Experiential Inventory, which, as will be discussed later, better captures deliberate thinking.

Table 1
Measures of Individual Differences in Intuitive and Nonintuitive Thinking Styles

	Nonintuitive thinking style			Intuitive thinking style		
Measure	Label	Definition	Sample items	Label	Definition	Sample items
Rational-Experiential Inventory (REI; Epstein, Pacini, Denes-Raj, & Heier, 1996)	Rational (measured with the Need for Cognition scale)	The rational system is an inferential system that operates by a person's understanding of culturally transmitted rules of reasoning; it is conscious, relatively slow, analytical, primarily verbal, and relatively affect-free; and it has a very brief evolutionary history.	I would prefer complex to simple problems. The notion of thinking abstractly is not appealing to me.	Experiential (measured with the Faith in Intuition scale)	The experiential system is a learning system that is preconscious, rapid, automatic, holistic, primarily nonverbal, intimately associated with affect, and it has a very long evolutionary history.	I trust my initial feelings about people. I believe in trusting my hunches.
Preference for Intuition and Deliberation Scale (PID; Betsch, 2004)	Deliberation	A decision mode that follows cognitions (beliefs, evaluations, reasons; cognition-based decision-making).	Before making decisions, I first think them through.	Intuition	A basic decision mode that uses direct affective reactions towards the decision option as the decision criterion (affect-based decision-making).	I listen carefully to my deepest feelings.
Decision-Making Style Inventory (DMI; Nygren, 2000)[a]	Analytical	A propensity to engage in effortful deliberation in choice situations.	A good rule of thumb is that the more information I have in making a decision, the better that decision will be.	Intuitive	A tendency to follow feelings and simple heuristics.	I can get a good feeling for most decision situations very quickly.
Cognitive Style Index[b] (CSI; Allinson & Hayes, 1996)	Analytical	Emphasizes reasoning, detail, and structure.	I am most effective when my work involves a clear sequence of tasks to be performed.	Intuitive	Emphasizes feelings, open-endedness and a global perspective.	I am inclined to scan through reports rather than read them in detail.
Thinking and Working Style Questionnaire (TWS, Sagiv, Arieli, Goldenberg, & Goldschmidt, 2010)	Systematic	A tendency to logically and intentionally analyze a situation in an attempt to identify systematic rules.	I usually make decisions in a systematic and orderly way.	Intuitive	A tendency to capture a pattern without being able to account for the source of the knowledge or information. Intuitive individuals may not be aware of the pattern, but it may nonetheless guide their way of thinking.	I often follow my instincts. I often make a good decision without really knowing why I made this choice.
General Decision-Making Style[c] (GDMS; Scott & Bruce, 1995)	Rational	Thorough search for and logical evaluations of alternatives.	I make decisions in a logical and systematic way.	Intuitive	Reliance on hunches and feelings.	When making decisions, I rely upon my instincts.

(*table continues*)

Table 1 (*continued*)

	Nonintuitive thinking style			Intuitive thinking style		
Measure	Label	Definition	Sample items	Label	Definition	Sample items
Cognitive Style Indicator[d] (CoSI; Cools & Van den Broeck, 2007)	Knowing	Facts, details, logical reflective, objective, impersonal, rational, precision, methodical.	I want to have a full understanding of all problems.			
	Planning	Sequential, structured, conventional, conformity, planned, organized, systematic, routine.	I like detailed action plans.			
Situation-Specific Thinking Style (SSTS; Novak & Hoffman, 2009)	Rational	Logical, cause-and-effect, rule-based, hierarchical, sequential, process-oriented, slower to implement but quicker to change, high effort, oriented toward delayed action, conscious, and experienced actively with the individual aware of and in control of the process.	I was very aware of my thinking process. I used clear rules.	Experiential	Associative, emotional, low effort, rapid to implement but slow to change, parallel, immediate, outcome-oriented, holistic, preconscious and experienced passively with the process opaque to the individual.	I used my gut feelings. I had flashes of insight.
Assessment of Career Decision-Making[e] (ACDM; Harren, 1979)	Rational	Objective deliberation and self-appraisal.	I am very systematic when I go about making an important decision.	Intuitive	Emotional self-awareness and fantasy.	Even on important decisions I make up my mind pretty quickly. When I make a decision, I just trust my inner feelings and reactions.

[a] The measure offers an additional, third style: Regret-Avoidant. [b] Unidimensional scale with two poles. [c] The measure includes three additional styles: Dependent, Avoidant, Spontaneous. [d] The measure offers an additional, third style: Creative. [e] The measure offers an additional, third style: Dependent.

Study 1

Personality traits are consistent tendencies of action (Costa & McCrae, 1992). These tendencies encompass both motivational (e.g., Major, Turner, & Fletcher, 2006; Sung & Choi, 2009) and stylistic (e.g., Antonioni, 1999; Greven, Chamorro-Premuzic, Arteche, & Furnham, 2008) components, and are expected to relate to both deliberate and systematic thinking, albeit in different ways. Of the five notable personality traits (the Big Five), conscientiousness is the most compatible with systematic thinking (Sagiv, Amit, Ein-Gar, & Arieli, 2014). Highly conscientious individuals are characterized as being organized, careful, thorough and reliable. As such, they are most likely to search for regularities and patterns, thus developing a preference for systematic thinking. In contrast, deliberate, epistemic thinking has been theorized (De Dreu, Nijstad, & van Knippenberg, 2008) and empirically found (Amit & Sagiv, 2013) to be linked with the trait of openness to experience. Individuals with high openness to experience are characterized as being intellectual, imaginative, sensitive, and open-minded. As such, they are likely to be motivated to engage in effortful cognitive tasks, and employ deliberate thinking in the process of developing well-informed conclusions about the world.

We therefore hypothesize that:

H1: Measures that best capture systematic thinking will be most positively correlated with conscientiousness.

H2: Measures that best capture deliberate thinking will be most positively correlated with openness to experience.

Method

We employ a meta-analytic design and integrate past and new data to examine the relationship between personality traits, on the one hand, and measures of deliberate thinking versus systematic thinking on the other. In their meta-analysis, Wang and colleagues (2017) investigated how various measures of intuitive and nonintuitive thinking are associated with the Big Five personality traits. However, in their analysis they collapsed different measures, precluding the drawing of distinctions between them. Seeking to uncover the hypothesized differences between deliberate and systematic thinking, we reanalyze and extend their data. (Reanalysis of published findings was exempt from IRB review. See Study 2 for IRB disclosure of newly introduced data).

According to supplementary data provided by L. Y. Wang (personal communication, September, 3, 2016), among all the measures listed in Table 1, associations with the five factors were reported for only two: the Rational-Experiential Inventory (REI) and the General Decision Making Style scale (GDMS). Notably, the first of these better captures deliberate thinking, whereas the second better captures systematic thinking (Betsch & Iannello, 2010). Hence, a comparison between these two measures may advance our quest to disentangle deliberate from systematic thinking. However, the small number of effects included in the investigation by Wang and colleagues ($k = 10$) is not sufficient to draw conclusions on this question.

To increase the number of available effects for the two thinking styles, we augmented the data from Wang et al. (2017) with data from other studies using different scales. First, for systematic thinking, we added data based on a newer measure, the Thinking and Working Style scale (TWS; Sagiv et al., 2010). The intuitive and systematic subscales of the TWS were found to show similar qualities as the parallel intuitive and rational scales of the GDMS (Sagiv et al., 2014). To increase the number of effects for deliberate thinking, we relied first on the fact that the Rational Experiential Inventory (REI) uses the Need for Cognition (NFC) scale as its measure of the nonintuitive style, and added studies which use the latter scale independent of the REI. In addition, we added studies reporting associations for (lack of) Need for Cognitive Closure (NFCC; Kruglanski & Webster, 1996). Although need for cognition is distinct from (lack of) need for cognitive closure (Roets, Kruglanski, Kossowska, Pierro, & Hong, 2015; Webster & Kruglanski, 1994), their shared meaning as predispositional tendencies to invest effort in information processing (i.e., deliberate thinking) has been noted theoretically (De Dreu et al., 2008) and received some empirical support (e.g., Amit & Sagiv, 2013).[2]

A cited reference search dated to January 5, 2019, was conducted using Google Scholar to retrieve English-language published articles that report associations with personality traits for the NFC, (lack of) NFCC, TWS and GDMS. These data were then added to the data on the REI (or more accurately, its NFC subscale) and the GDMS from Wang et al. (2017). The TWS was introduced recently, and so correlations with the five factors were reported in only three samples. We therefore added original data using the TWS (see Table 2 and the Method section for Study 2, below). Our search retrieved no additional studies using the GDMS besides the one included in Wang et al. (2017). We therefore did not include that study in the meta-analysis, but refer to its findings in the results and discussion sections below. To ensure our search was complete, we also conducted a search for published studies linking personality traits with the other measures of nonintuitive thinking styles listed in Table 1. None was found. The material for this study may be found in https://osf.io/g2zds/.

Results and Discussion

We performed a separate meta-analysis for each of the five factors, using Borenstein, Hedges, Higgins, and Rothstein's (2009) random effect model with correlations corrected for unreliability (Schmidt & Hunter, 2014). To calculate the distribution artifact we relied on reliabilities reported in a meta-analysis of the five personality factors (Viswesvaran & Ones, 2000), and on mean internal consistency reliability for NFC, lack of NFCC, and TWS calculated across samples included in our Studies 1 and 2. The results of the five meta-analyses for each measure are reported in Table 3 using the notation ρ^u to indicate that we report unattenuated correlations.

As hypothesized, the TWS was positively correlated with conscientiousness ($\rho^u_{TWS} = .67$, $p < .001$), whereas NFC and lack of NFCC were positively correlated with openness to experience

[2] Discussion of the commonalities and distinctions between need for cognition and need for cognitive closure is beyond the scope of the current research. However, the distinction we draw between deliberate and systematic thinking may extend the theoretical discussion by Kruglanski and Gigerenzer (2011) on the shared epistemology of intuitive and nonintuitive thinking.

Table 2
Descriptive Information for the Samples Included in the Meta-Analysis Investigating Associations With the Five Personality Traits in Study 1

Manuscript	*N*	% female	*M* age (*SD*)	Scale
Bosnjak, Galesic, & Tuten, 2007	808	37%	33.40 (0.50)	NFC
Buratti, Allwood, & Kleitman, 2013	150	70%	22.40 (4.20)	NFC
Chopik, Rikard, & Cotten, 2017	595	56%	67.09 (10.98)	NFC
Dewberry, Juanchich, & Narendran, 2013	347	61%	Median = 49	NFC
Fleischhauer et al., 2010	300	71%	22.30 (3.50)	NFC
Fleisher, Woehr, Edwards, & Cullen, 2011	123	60%	20.30 (5.20)	NFC
Freeman, Evans, & Lister, 2012	500	58%	45.7 (20.20)	NFC
Furnham & Thorne, 2013	93	87%	19.76 (3.49)	NFC
Grass, Strobel, & Strobel, 2017	396	66%	24.08 (4.72)	NFC
Hughes, Rowe, Batey, & Lee, 2012	300	69%	29.00 (8.98)	NFC
Levin, Gaeth, Schreiber, & Lauriola, 2002	102			NFC
Madrid & Patterson, 2016	220	59%	35.00 (9.30)	NFC
Marks, Hine, Blore, & Phillips, 2008	306	60%	15.70 (0.90)	NFC
Pacini & Epstein, 1999	388	79%	20.52 (1.98)	NFC
Powell, Nettelbeck, & Burns, 2017	201	70%	23.00 (6.20)	NFC
Sadowski & Cogburn, 1997	85	60%	19.71 (1.31)	NFC
Tuten & Bosnjak, 2001	400	51%		NFC
Witteman, van den Bercken, Claes, & Godoy, 2009, (Spanish)	141	83%	21.40 (2.60)	NFC
Witteman et al., 2009, (Dutch)	774	96%		NFC
Woo, Harms, & Kuncel, 2007	81	54%	18.87 (1.54)	NFC
Corr, Hargreaves-Heap, Tsutsui, Russell, & Seger, 2013	110	63%	22.98 (6.56)	NFC & lack of NFCC
Washburn, Smith, & Taglialatela, 2005	124	50%	21	NFC & lack of NFCC
Appelt, Milch, Handgraaf, & Weber, 2011	102			Lack of NFCC
Cornelis, Van Hiel, Roets, & Kossowska, 2009 (Belgian)	145			Lack of NFCC
Cornelis et al., 2009 (Polish)	205			Lack of NFCC
Neuberg, Judice, & West, 1997	273			Lack of NFCC
Roets & Van Hiel, 2011	219			Lack of NFCC
Sagiv, Amit, Ein-Gar, & Arieli, 2014	154	59%	22	TWS
Sagiv et al., 2014	140	66%	25	TWS
Sagiv et al., 2014	151	46%	23	TWS
Unpublished samples 5–12 (see online supplementary materials)				TWS, NFC & lack of NFCC

Note. NFC = need for cognition; NFCC = need for cognitive closure; TWS = thinking and working style.

($\rho^{u}_{NFC} = .46$ & $\rho^{u}_{NFCC} = .36$, both $p < .001$). These hypothesized associations were the strongest positive associations for all three measures. Moderation analyses confirmed the distinction between systematic thinking (as measured using the TWS) and deliberate thinking (as measured by either the NFC or lack of NFCC) on both hypothesized traits (see Table 3).

The single paper reporting correlations of the GDMS with the five factors (Wood & Highhouse, 2014) was not included in the meta-analysis. However, the associations reported show a similar pattern. Systematic thinking measured by the GDMS is most positively associated with conscientious, $r = .35$, $p < .001$, as hypothesized. It was also associated with openness to experience and with agreeableness, but to a lesser extent ($r = .24$ and .22, respectively, both $p < .01$).

Beyond the hypothesized associations between deliberate thinking and openness to experience, two interesting strong associations emerged: a positive correlation between conscientiousness and need for cognition ($\rho^{u}_{NFC} = .23$, $p < .001$), and a negative correlation between conscientiousness and lack of need for cognitive closure ($\rho^{u}_{NFCC} = -.38$, $p < .001$). The pattern of associations shown by the two measures of deliberate thinking thus supports both the shared epistemic meaning of the need for cognition and the (lack of) need for cognitive closure, and their distinct meanings (Roets et al., 2015).

Taken together, our findings allow for a finer interpretation of past findings. Wang and colleagues' (2017) findings point to the relevance of both conscientiousness and openness to experience for nonintuitive thinking, as a unidimensional construct. Based on our findings, a multidimensional approach may be more informative, suggesting that the association with conscientiousness reflects the inclusion of a measure capturing systematic thinking (e.g., TWS or GDMS), whereas the associations with openness to experience reflect the inclusion of a measure capturing deliberate thinking (e.g., NFC as part of the REI). In terms of thinking styles, our findings suggest that the deliberate and systematic aspects of nonintuitive thinking are rooted in different tendencies of action, with systematic thinking being organized, careful, and thorough, and deliberate thinking being effortful and epistemic.

Study 2

Study 1 showed how deliberate and systematic thinking (or more accurately, measures capturing these constructs) are differentially associated with the Big Five personality traits. To further tease apart these two nonintuitive thinking styles, we next considered their associations with personal values. Personal values are cognitive representations of fundamental, abstract, desirable mo-

Table 3
Observed Meta-Correlations of Deliberate Thinking and Systematic Thinking With the Five Personality Factors Corrected for Measure Reliabilities (Uncorrected Correlations in Parentheses)

Construct	Scale	Samples	Stats	Openness	Conscientiousness	Extraversion	Agreeableness	Neuroticism
Systematic thinking	TWS	$K = 11$, $N = 1943$ (8 unpublished)	ρ^{u}_{TWS} (ρ_{TWS})	.10* (.08)	**.67** (.53)**	.08* (.06)	.07 (.06)	−.11* (−.09)
			CI	[.04, .16]	[.58, .76]	[.01, .15]	[−.002, .15]	[−.17, −.05]
Deliberate thinking	NFC	$K = 22$, $N = [5928–6544]$	ρ^{u}_{NFC} (ρ_{NFC})	**.46** (.37)**	.23** (.19)	.14** (.11)	.09* (.07)	−.15* (−.12)
			CI	[.35, .56]	[.15, .31]	[.08, .19]	[.03, .15]	[−.26, −.03]
			Z_{TWS}	5.80**	7.16**	1.28	0.29	0.62
	(lack of) NFCC	$K = 7$, $N = [1076–1178]$	ρ^{u}_{NFCC} (ρ_{NFCC})	**.36** (.27)**	−.38** (−.30)	.11** (.08)	−.05 (−.04)	−.26** (−.20)
			CI	[.19, .53]	[−.52, −.25]	[.02, .20]	[−.17, .06]	[−.39, −.12]
			Z_{TWS}	2.82*	12.39**	0.51	1.79	1.96

Note. Boldfaced effects are hypothesized. K = number of samples. N = total number of participants. Z = moderation (subgroup) analysis comparing the association between the measures best reflecting deliberate thinking (need for cognition [NFC] or lack of need for cognitive closure [NFCC]) and the measure better reflecting systematic thinking (thinking and working style [TWS]).
* $p \leq .05$. ** $p \leq .001$.

tivational goals that transcend specific situations and serve as guiding principles in people's lives (Schwartz, 1992). They vary in their importance as principles guiding people's decisions and actions, and as evaluative bases for judgments (see review in Maio, 2010) and behavior (see a recent review in Roccas & Sagiv, 2017). Thus, any findings that deliberate and systematic thinking have distinct motivational bases can stand as further proof that these two constructs are distinct.

To conceptualize and measure personal values we rely on Schwartz's (1992) theory. Schwartz identified 10 basic value types, each reflecting a different motivation. The theory suggests that 10 value types are organized in a circular structure which illustrates the complementary relationships between neighboring values and conflicting relationships between opposing values (see Appendix A for definitions of all the value types and a figure depicting the circular structure). The theory has been verified by studies covering 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).

Of the 10 value types, those that best reflect deliberate thinking are self-direction and (lack of) conformity (Amit & Sagiv, 2013; Calogero, Bardi, & Sutton, 2009). *Self-direction* values reflect a motivation to engage in independent thought and action, along with openness to new ideas and experiences. Individuals who emphasize self-direction values are motivated to independently explore new things and to chart new, original paths. *Conformity* values express self-restriction and resistance to change. Individuals who emphasize conformity are motivated to comply with norms and expectations undermining the need to invest in information exploration. The motivation to engage in deliberate thinking and to independently develop and hold well-informed conclusions about the world is compatible with self-direction values and incompatible with conformity values.

Concomitantly, of the 10 value types, those most compatible with systematic thinking are security and lack of stimulation (Sagiv et al., 2014). *Security* values reflect the motivation to maintain a stable, predictable, and secure environment for the self and close others. *Stimulation* values, for their part, express a desire for excitement, change, and novelty. A systematic cognitive style, characterized by orderly, rule-based thinking and a propensity to seek regularities and patterns, accords with a desire for a stable and predictable reality. As such, it promotes the goals represented by security and represses those represented by stimulation. In keeping with their predictions, Sagiv et al. (2014) reported consistent negative correlations between systematic thinking and stimulation values, and positive correlations between systematic thinking and security values in two of their three samples.

Based on the discussion above, we hypothesize that among Schwartz's (1992) value types:

> *H1:* Measures that best capture deliberate thinking will be most strongly associated with self-direction (positively) and conformity (negatively).

> *H2:* Measures that best capture systematic thinking will be most strongly associated with security (positively) and stimulation (negatively).

Schwartz's values theory proposes a motivational continuum among the 10 value types (Schwartz, 1992). That is, value types are more closely related the closer they are to each other in the circle, and more opposed the farther they are from each other. This, in turn, implies that if a construct (e.g., deliberate thinking) is most positively associated with one value (e.g., self-direction) and most negatively associated with another (e.g., conformity), that construct's associations with all other values should decrease monotonically around the circle from the most positively to the most negatively associated value, resulting in a sinusoid pattern. We hence hypothesize that:

H3: Correlations between deliberate thinking and the 10 value types will follow a sinusoid pattern, with conformity being most negatively and self-direction most positively associated with deliberate thinking. The expected pattern of correlations, from most negative to most positive, is as follows: (a) conformity; (b) tradition and security; (c) power; (d) achievement and benevolence; (e) hedonism; (f) stimulation and universalism; (g) self-direction.

H4: Correlations between systematic thinking and the 10 value types will follow a sinusoid pattern, with stimulation being most negatively and security most positively associated with systematic thinking. The expected pattern of correlations, from most negative to most positive, is as follows: (a) stimulation; (b) hedonism and self-direction; (c) universalism; (d) achievement and benevolence; (e) tradition; (f) conformity and power; (g) security.

Method

We present data from 1,881 Israeli students collected over the course of five years in 11 separate samples. In all samples, a version of the Schwartz Value Survey (SVS; Schwartz, 1992) was administered as the first measure, followed by measures of deliberate thinking and/or measures of systematic thinking. Descriptive data on all samples is presented in the online supplemental materials. Sample 2 was previously used in Amit and Sagiv (2013), Study 1, sample 1. We are unaware of prior use of any of the other samples. Participants received course credit for their participation. All samples were collected as part of large testing days, in which psychology and business students participate for course credit. As in Study 1, we used the NFC and lack of NFCC scales to capture deliberate thinking. We captured systematic thinking via the systematic subscale of the TWS and the rational subscale of the GDMS. The studies which took place during the testing days were approved by the ethics committee of the Jerusalem School of Business Administration, the Hebrew University of Jerusalem. The material for this study may be found in https://osf.io/g2zds/.

Results and Discussion

The correlations of the 10 value types with deliberate thinking (measured by the NFC and lack of NFCC) and with systematic thinking (measured by the TWS and GDMS) in each of the unpublished samples are reported in the online supplemental materials. To present generalized, stable associations we performed 10 meta-analyses, one for each of the 10 value types, integrating the 11 unpublished samples and the three published ones (Sagiv et al., 2014). We used Borenstein et al.'s (2009) random effect model with correlations corrected for unreliability (Schmidt & Hunter, 2014), defining the reliabilities reported in a meta-analysis by Parks-Leduc, Feldman, and Bardi (2015) as the distribution artifact of the 10 value types, and computing the mean internal consistency reliability across studies using the same scale as the distribution artifact for NFC, lack of NFCC, TWS, and GDMS. We took a conservative approach to adapting the variance for cases with two measures (e.g., correlations with both the NFC and TWS), calculating it based on half the sample size for each entry. Table 4 presents the metacorrelations of the 10 value types with deliberate thinking (measured by the NFC and lack of NFCC) and systematic thinking (measured by the TWS and GDMS).

As hypothesized (H1), across all samples and measures, deliberate thinking was positively correlated with self-direction ($\rho^{u}_{NFC} = .56$, $p < .001$; $\rho^{u}_{NFCC} = .31$, $p < .05$) and negatively correlated with conformity ($\rho^{u}_{NFC} = -.42$, $p < .001$; $\rho^{u}_{NFCC} = -.24$, $p < .05$). For both measures these were the strongest correlations with any of the 10 values.

Also as hypothesized (H2), systematic thinking was positively correlated with security ($\rho^{u}_{TWS} = .23$, $p < .001$; $\rho^{u}_{GDMS} = .38$, $p < .05$). This was the strongest positive correlation between systematic thinking and any of the 10 values for the GDMS, and the third strongest correlation for the TWS. In line with the circular structure of values, systematic thinking was positively correlated with the adjacent values of conformity ($\rho^{u}_{TWS} = .26$, $p < .001$; $\rho^{u}_{GDMS} = .36$, $p < .05$). In addition, both measures were negatively correlated with stimulation ($\rho^{u}_{TWS} = -.28$, $p < .001$; $\rho^{u}_{GDMS} = -.35$, $p < .001$), and for both this was the strongest negative correlation between the systematic style and any of the 10 values.

To the best of our knowledge, the current study is the first investigation of how all 10 value types are correlated with the GDMS, NFC, and NFCC (Amit & Sagiv [2013] report associations of the NFC and NFCC with conformity and self-direction values only). As noted, the pattern of correlations between the GDMS and the 10 value types conforms to the expected pattern for systematic thinking, with positive correlations for security values (and the adjacent conformity values) and negative correlations for stimulation values. Unlike the case with the TWS, correlations for the other values did not reach statistical significance. It may be that the GDMS, which focuses particularly on decision-making (rather than the more general thinking and working [TWS] scale), is not as closely linked to general abstract goals captured by other values. A similar pattern can be seen comparing the (lack of) NFCC and NFC, with the former presenting significant associations only with the hypothesized values and the latter presenting a few other (nonhypothesized) associations. Notably, the nonhypothesized significant correlations of NFC with conformity and with universalism values are consistent with the circular structure of values.

We used moderated subgroup analysis to further differentiate deliberate thinking from systematic thinking, by comparing their patterns of associations with the 10 values. Specifically, we conducted four subgroup analyses for each of the 10 values, comparing (a) the NFC and TWS; (b) the NFC and GDMS; (c; lack of) NFCC and TWS; and (d; lack of) NFCC and GDMS. The results for the NFC differ significantly from those of the TWS and the GDMS for all four hypothesized values (conformity, security, stimulation, and self-direction). The results for (lack of) NFCC differ significantly from those of the TWS for all four hypothe-

Table 4
Observed Meta-Correlations of Deliberate and Systematic Thinking With the 10 Value Types Corrected for Measure Reliabilities (Uncorrected Correlations in Parentheses)

Variable	Scale	*K*	Stats	UN	BE	TR	CO	SE	PO	AC	HE	ST	SD
Systematic thinking	TWS	14	ρ^{u}_{TWS} (ρ_{TWS})	−.18** (−.15)	.06 (.04)	−.09* (−.07)	.26** (.19)	**.23** (.17)**	.13** (.10)	.29** (.23)	−.19** (−.15)	**−.28** (−.22)**	.01 (.01)
	α = .79		CI	[−.24, −.12]	[−.01, .12]	[−.16, −.03]	[.19, .33]	[.15, .32]	[.07, .19]	[.22, .36]	[−.25, −.13]	[−.35, −.21]	[−.06, .08]
	GDMS	4	ρ^{u}_{GDMS} (ρ_{GDMS})	−.09 (−.07)	−.03 (−.02)	−.09 (−.07)	.36* (.26)	**.38* (.26)**	.15 (.11)	.16 (.12)	−.17 (−.12)	**−.35** (−.26)**	.06 (.06)
	α = .73		CI	[−.28, .10]	[−.23, .17]	[−.30, .12]	[.11, .63]	[.12, .64]	[−.05, .35]	[−.04, .35]	[−.37, .03]	[−.55, −.16]	[−.19, .31]
Deliberate thinking	NFC	4	ρ^{u}_{NFC} (ρ_{NFC})	.24* (.20)	.04 (.03)	−.26* (−.19)	**−.42** (−.32)**	−.12 (−.09)	−.05 (−.04)	.16 (.13)	−.13 (−.10)	.07 (.05)	**.56** (.43)**
	α = .87		CI	[.04, .45]	[−.17, .25]	[−.48, −.03]	[−.63, −.20]	[−.34, .10]	[−.26, .17]	[−.05, .36]	[−.35, .08]	[−.14, .28]	[.34, .78]
			$Z_{TWS\text{-}NFC}$	3.94**	0.13	1.35	**5.75****	**2.93***	1.56	1.17	0.51	**3.09***	**4.71****
			$Z_{GDMS\text{-}NFC}$	2.61*	0.47	1.21	**4.55****	**3.01***	1.54	0.13	0.42	**3.40****	**2.74***
	(lack of) NFCC	4	ρ^{u}_{NFCC} (ρ_{NFCC})	.17 (.13)	.00 (.00)	−.19 (−.13)	**−.24* (−.17)**	−.12 (−.08)	−.08 (−.06)	.08 (.06)	.03 (.02)	.07 (.07)	**.31* (.22)**
	α = .80		CI	[−.05, .39]	[−.22, .23]	[−.43, .06]	[−.48, −.01]	[−.35, .12]	[−.31, .14]	[−.14, .30]	[−.20, .25]	[−.15, .30]	[.07, .54]
			$Z_{TWS\text{-}NFCC}$	3.09*	0.48	0.73	**4.03****	**2.72***	1.79	1.74	1.81	**2.96***	**2.38***
			$Z_{GDMS\text{-}NFCC}$	2.10*	0.06	0.20	**3.81***	**3.14***	1.77	0.68	0.95	**3.15***	**1.54**

Note. Boldfaced effects are hypothesized. *K* = number of samples. UN = universalism; BE = benevolence; TR = tradition; CO = conformity; SE = security; PO = power; AC = achievement; HE = hedonism; ST = stimulation; SD = self-direction; NFC = need for cognition; NFCC = need for cognitive closure. α = mean scale reliability across samples. Z_{TWS}/ Z_{GDMS} = Moderation (subgroup) analysis comparing the association between deliberate and systematic thinking measured by the thinking and working style (TWS) or general decision-making style (GDMS), respectively.
$^{*}p \leq .05$. $^{**}p \leq .001$.

sized values, and from those of the GDMS for three of the four hypothesized values (conformity, security, and stimulation). In sum, our findings point to a strong distinction between the deliberate and systematic thinking styles, as reflected in different measures.

To test for the sinusoid pattern of associations across the 10 value types, we computed a Spearman's correlation between the unattenuated metacorrelations reported in Table 4 and the hypothesized ranking of correlations from the lowest (most negative) to the highest (most positive). The NFC and (lack of) NFCC were positively correlated with the expected pattern for deliberate thinking ($r_s = .83$, $p < .01$; $r_s = .94$, $p < .001$, respectively), fully supporting H3. The systematic subscale of the TWS and the rational subscale of the GDMS were positively correlated with the expected pattern for systematic thinking ($r_s = .73$, $p < .05$ and $r_s = .79$, $p < .01$, respectively), fully supporting H4.

Figure 1 provides a graphical presentation of the sinusoid pattern of correlations presented and tested above. The 10 value types are listed on the horizontal axis in an order compatible with Schwartz's (1992) circular structure, and the magnitude of correlations with the construct of interest (deliberate thinking in Figure 1a or systematic thinking in Figure 1b) are represented on the vertical axis. This form of presentation has been usefully utilized in several meta-analytic studies providing comprehensive evaluations of associations across the 10 value types (e.g., values and moral attitudes: Boer & Fischer, 2013; values and traits: Parks-Leduc et al., 2015; values and religiosity: Saroglou, Delpierre, & Dernelle, 2004).

Taken together, our findings indicate that personal values are associated with deliberate thinking and systematic thinking in substantially different ways. These findings join the results of Study 1 in supporting the notion that as individual differences, deliberate and systematic thinking are distinct, rooted in different action tendencies (i.e., traits) and different motivations (i.e., values).

Part 2—Distinguishing the Effect of Systematic and Deliberate Thinking on Problem Choice Decisions

In Part 1 of this paper, we used measures of individual differences in thinking styles to establish the distinction between deliberate and systematic thinking by showing that these two oft-conflated modes have distinct correlates with action tendencies (i.e., traits) and motivations (i.e., values). To further establish the distinction between the two, and to go beyond self-report measures (as used in Studies 1 and 2), we next sought to present differential influences on actual behavior—specifically, on decisions when participants are given a choice between different types of problems.

Past attempts to link thinking styles and performance in decision-making employed a variety of tasks, and focused mainly on measures of more deliberate thinking (see review in Phillips et al., 2016). We argue that performance in those tasks (e.g., the Cognitive Reflection Task by Frederick, 2005) requires both deliberate (i.e., effortful) and systematic (i.e., piecemeal) thinking, and is thus less informative in distinguishing the two thinking styles. In addition, performance is highly susceptible to other factors such as intelligence, past experience and more, as reflected in the low associations found (see Phillips et al., 2016).

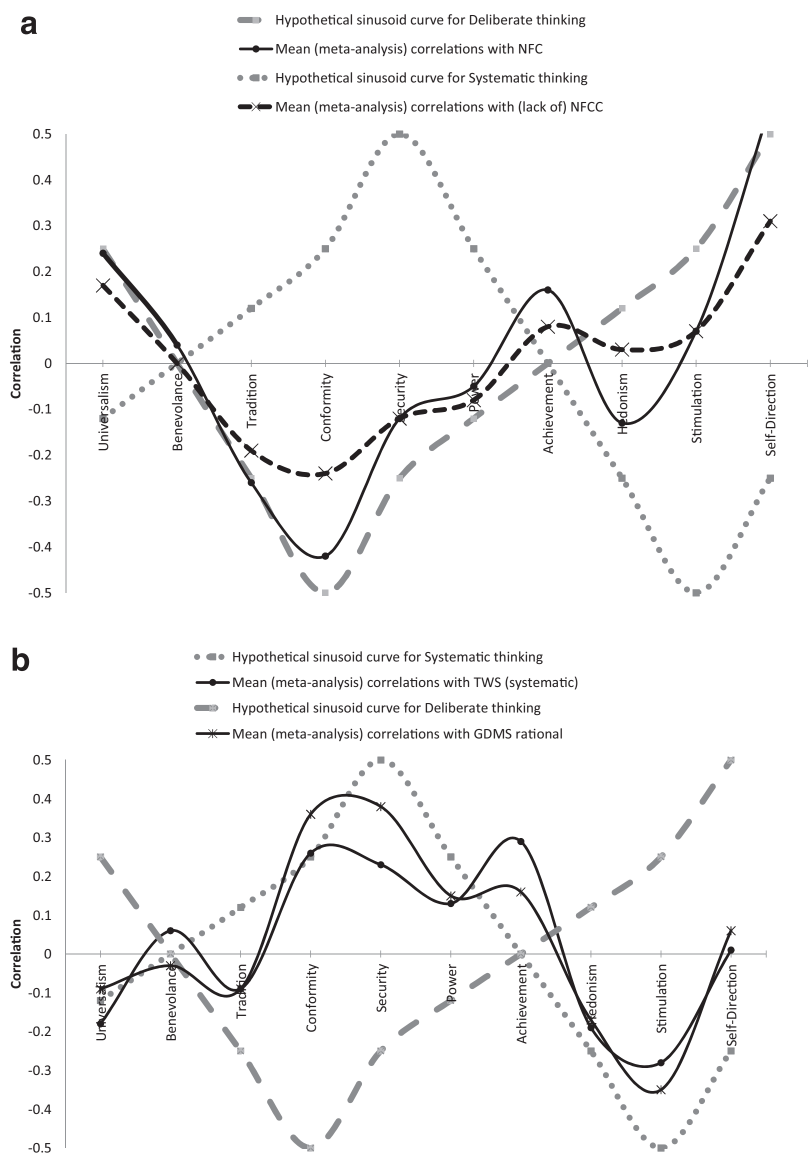


Figure 1. (a) The pattern of observed correlations between deliberate thinking (need for cognition [NFC] and lack of need for cognitive closure [NFCC]) and the 10 value types vis-à-vis the hypothetical sinusoid curves for deliberate thinking and for systematic thinking. (b) The pattern of observed associations between systematic thinking (thinking and working style [TWS] and general decision-making style [GDMS]) and the 10 value types vis-à-vis the hypothetical sinusoid curves for deliberate thinking and for systematic thinking.

To develop a decision task that taps directly into the essence of systematic thinking, we rely on the distinction made by Arieli and Sagiv (2018) between rule-based and context-based problems. Solutions to rule-based problems are more likely to emerge through focusing attention on decomposing the problem and manipulating information by applying analytical rules. In contrast, solutions to context-based problems are more likely to emerge through focusing attention on links between elements and applying holistic integration to capture the entire picture. Systematic thinking is reflected in a preference for piecemeal, organized actions and is compatible with a decision to choose rule-based rather than context-based problems.

Both rule-based and context-based problems may be easy or difficult. Deliberate thinking is reflected in a preference for difficult, challenging problems over simple problems that require little thought (Cacioppo, Petty, & Kao, 1984). We therefore expect that a decision to choose rule-based over context-based problems will be positively associated with systematic thinking but unrelated to deliberate thinking, and that a decision to choose difficult over easy problems will be positively associated with deliberate thinking but unrelated to systematic thinking. We test these differentiating predictions in two studies, the first focusing on individuals' own thinking styles (Study 3), and the second focusing on lay perceptions of congruence with another's thinking styles (Study 4).

Study 3

To investigate the distinct influence of deliberate and systematic thinking on problem choice decisions, we first rely on the different focus of self-report measures confirmed in our Studies 1 and 2: the TWS as a measure tapping more into systematic thinking, and the NFC as a measure tapping more into deliberate thinking. We hypothesize that:

> *H1:* The decision to choose rule-based over context-based problems will be positively associated with a disposition toward systematic thinking (as measured by the TWS) but unrelated to a disposition toward deliberate thinking (as measured by NFC).

> *H2:* The decision to choose difficult over easy problems will be positively associated with a disposition toward deliberate thinking (as measured by NFC) but unrelated to a disposition toward systematic thinking (as measured by the TWS).

Following the results of Study 1, we further expect problem choice decisions to be related to personality traits in a pattern consistent with the hypothesized associations between traits and thinking styles:

> *H3:* The decision to choose difficult over easy problems will be positively associated with openness to experience while the decision to choose rule-based over context-based problems will be associated with conscientiousness.

Method

Participants and procedure. A power analysis conducted using G*Power (Faul, Erdfelder, Lang, & Buchner, 2007) indicated that to gain 80% power in detecting a small-to-medium effect ($f^2 = .04$), a total of 199 participants were required. We used Amazon MTURK to recruit 213 American adults (average age = 35.67, *SD* = 9.83, 35.8% female). Because decision choice tasks require careful reading of texts in English, participants reporting that they were nonnative English speakers and/or that they were not born in the United States were removed from the analysis. Further analysis was conducted on 193 valid participants.

The participants first completed several personality tests, including measures of personality traits, systematic thinking, and deliberate thinking. They then made decisions regarding problem-solving. The first set of decisions required them to choose between rule-based and context-based problems. The second decision required them to choose between more difficult and easier problems. Participants took on average 12 min to complete the survey and were compensated with $2. The study was approved by the ethics committee of the psychology department of the Open University of Israel, protocol number 3230. The material for this study may be found in https://osf.io/g2zds/.

Measures.

Personality traits. We used Saucier's (1994) 40-item measure to capture the five factors, with internal reliabilities ranging from α = .81 to α = .88.

Systematic thinking. We used the TWS to measure systematic and intuitive thinking. Following past research linking thinking styles as measured via the TWS with performance (Sagiv et al., 2010, 2014), we created one index of systematic versus intuitive thinking by reversing the intuitive items and combining all 10 items (α = .81).

Deliberate thinking. We used the 18-item Need for Cognition scale developed by Cacioppo et al. (1984), which yielded satisfactory internal reliability (α = .95).

Choosing rule-based over context-based problems. Participants were presented with three pairs of riddles adopted from Arieli and Sagiv (2018; riddles #2 and #15, #3 and #13, and #7 and #9 in their Appendix A). Each pair included one rule-based and one context-based riddle. The participants were asked not to solve the riddles but simply to indicate which riddle in each pair most took their fancy. The three choices were summed to form an index of preference for rule-based (over context-based) problem-solving tasks, with values ranging from 0 (*choosing only context-based riddles*) to 3 (*choosing all three rule-based riddles*).

To exemplify the task, we present here the first of the three pairs of riddles. The following was the first rule-based riddle (#2 in Arieli & Sagiv, 2018):

> *Every Saturday Dan and Danna invite their friends to dinner (four married couples total, plus the hosts). At the beginning of the evening everyone shakes everyone else's hand (except for one's spouse). After a few moments, Dan asks everyone to stop the handshaking and tell him how many hands they had already shaken. He got nine answers (from everyone but himself) different from each other (0, 1, 2, 3, 4, 5, 6, 7, 8). How many hands did Danna (Dan's wife) shake? ___*

The first context-based riddle read as follows (#15 in Arieli & Sagiv, 2018):

> *Who am I?*
>
> *Oh, what is it that lies out of sight*
>
> *Ruling over its ivory castle,*
>
> *Rescuing many from pitfalls,*
>
> *And tripping others into traps.*
>
> *It can open doors or plan ploys*
>
> *Deliberately or accidentally.*

Choosing difficult over easy problems. After reading all of the riddles, the participants were informed that the researchers were aware that the riddles were difficult. Participants were asked whether they wanted to solve one of their chosen riddles in its difficult (original) form, or to get an easier version (including hints). The following 4-point scale was used for this purpose: "I'd like to make the effort and solve the difficult riddle with no hint" (coded as 0); "I'd like just one hint to get me started with the difficult riddle" (coded as 1); "I'd like a few hints, resulting in an easier version of the riddle" (coded as 2); and "I'd like many hints, resulting in the easiest version of the riddle" (coded as 3). A lower value indicates a decision to choose difficult over easy problems.

Results and Discussion

Regression analysis predicting a choice of rule-based over context-based problems from predispositions toward systematic and deliberate thinking was conducted. A predisposition toward systematic thinking positively predicted choosing rule-based over context-based riddles ($\beta = .128$, $t = 1.759$, $p_{\text{one-tailed}} = .04$), whereas no effect on problem choices was found for a predisposition toward deliberate thinking ($\beta = .005$, $t = 0.069$, $p = .945$), confirming H1.

Next, a regression analysis predicting a choice of difficult over easier problems from predispositions toward systematic and deliberate thinking was conducted. A predisposition toward deliberate thinking negatively predicted requesting more hints ($\beta = -.475$, $t = -7.306$, $p < .001$). No effect on preferred difficulty level was found for a predisposition toward systematic thinking ($\beta = .075$, $t = 1.147$, $p = .253$), confirming H2.

Last, we tested for associations between the choice decisions and traits. A regression analysis predicting a choice of difficult over easy problems from openness to experience and conscientiousness confirmed, as expected, that openness to experience negatively predicted requesting more hints ($\beta = -.179$, $t = -2.451$, $p = .015$). There was no evidence for an effect of conscientiousness on requesting hints ($\beta = .028$, $t = 0.387$, $p = .699$). However, a regression analysis predicting a preference for rule-based over context-based problems did not yield the expected effect, with insignificant effects for both focal traits. Together, the results partially confirm H3.

Interestingly, most of the participants preferred riddles of the same type in all three choices, and there was no substantial favoring of one type over the other: 63 participants chose only context-based riddles, 40 participants chose one rule-based and two context-based riddles, 32 participants chose two rule-based and one context-based riddle, and 58 participants chose only rule-based riddles. This distribution significantly differs from a hypothetical random distribution ($\chi^2(3) = 13.363$, $p = .004$). This distribution is consistent with the idea that generally, a tendency toward systematic (rule-based) behavior is opposed to a tendency toward intuitive-holistic (context-based) behavior.

The results presented above are imperfect (especially with regard to choosing rule-based over context-based problems). Yet they are encouraging, especially when compared with the fairly small documented effects of thinking styles on performance ($r = .11$ in Phillips et al., 2016), and they provide further behavioral support for the distinction between systematic and deliberate thinking.

Study 4

In Study 3 we tested our contention that systematic thinking is distinct from deliberate thinking by linking individuals' own thinking styles (as reflected in self-report measures) with their own choices. We next investigate lay perceptions regarding the appropriateness of different problems (rule-based or context-based and difficult or easy) for *other* people, and specifically for people who are described as systematic or deliberate thinkers. We hypothesize that:

> *H1:* Assignment of rule-based over context-based problems will be positively associated with descriptions of the problem-solver as disposed toward systematic thinking, but unrelated to descriptions of the problem-solver as disposed toward deliberate thinking. Systematic thinkers will be assigned more rule-based problems compared with intuitive thinkers, whereas assignment of rule-based over context-based problems will not differ for deliberate and shallow thinkers.

> *H2:* Assignment of difficult over easy problems will be positively associated with descriptions of the problem-solver as disposed toward deliberate thinking, but unrelated to descriptions of the problem-solver as disposed toward systematic thinking. Deliberate thinkers will be assigned more difficult problems compared with shallow thinkers, whereas assignment of difficult over easier problems will not differ for systematic and intuitive thinkers.

Method

Participants and procedure. A power analysis conducted using G*Power (Faul et al., 2007) indicated that to gain 80% power in detecting a small-to-medium effect ($f^2 = .20$), a total of 199 participants were required. Two hundred twenty-two participants (average age = 33.493, *SD* = 12.721, 53.6% female) were recruited online via Prolific Academic and compensated with £0.35. Using a between-subjects design, participants were randomly assigned to read one of four descriptions of a person named Alex. Alex was characterized as being a deliberate or shallow or systematic or intuitive thinker. To produce the first two descriptions we used sentences derived from measures that better capture high and low deliberate thinking (the NFC and NFCC). To produce the last two descriptions we relied on the Portrait Cognitive Style measure (Sagiv et al., 2014), using sentences derived from the items of the systematic and intuitive subscales of the TWS and GDMS respectively. See Appendix B for the full descriptions.

Participants were required to make decisions about what problem-solving tasks best suit Alex's personality. The participants first decided whether to assign Alex a more rule-based or a more context-based problem. They then decided how difficult to make the task assigned to Alex. The study was exempt from review by the ethics committee of the psychology department of the Open University of Israel based on protocols 3230 and 2928. The material for this study may be found in https://osf.io/g2zds/.

Measures.

Assigning rule-based over context-based problems. Participants were asked to indicate which of a pair of riddles would be a better match for Alex, in terms of the likelihood that he would successfully solve it. Participants' responses were provided on a 0–100 slider scale, from *Riddle A* through *I'm not sure* to *Riddle B*. Responses were coded numerically, with higher numbers reflecting assignment of the rule-based riddle. We used the first pair of riddles presented in Study 3.

Problem difficulty. The participants were informed that they could provide Alex with hints, making the original riddle easier. They were asked to conjecture how many hints (if any) Alex would like to receive. Their responses were provided on a 0–100 slider scale from *Solve the riddle unaided* through *Several hints* to *As many hints as possible*. Responses were coded numerically, with higher numbers reflecting more hints.

Results and Discussion

We conducted a one-way ANOVA with the four thinking styles (systematic, intuitive, deliberate, or shallow) as predictors. To test the differential effect of systematic or intuitive thinking compared with deliberate or shallow thinking, a planned contrast depicting an interaction was used, followed by two more planned contrasts comparing (a) systematic with intuitive thinking, depicted by the plain black and white bars in Figure 2; and (b) deliberate with shallow thinking, depicted by the dotted black and white bars in Figure 2.

As expected (H1), there was a significant interactive effect across the four thinking styles predicting assignment of rule-based over context-based problems, $t(218) = 4.750$, $p < .001$, such that the systematic thinker was assigned more rule-based riddles (M = 84.54, SD = 26.26) than the intuitive thinker (M = 35.36, SD = 34.97), $t(218) = 7.737$, $p < .001$. There was no significant difference between riddles assigned to the deliberate (M = 67.05, SD = 35.30) and shallow thinkers (M = 60.19, SD = 35.06), $t(218) = 1.099$, $p = .273$ (see Figure 2, left panel).

Also as expected (H2), there was a significant interactive effect across the four thinking styles predicting assignment of problem difficulty, $t(218) = 11.750$, $p < .001$, such that the deliberate thinker (M = 10.04, SD = 16.75) was assigned fewer hints than the shallow thinker (M = 91.40, SD = 16.13), $t(218) = 16.868$, $p < .001$. There was no significant difference between hints assigned to the systematic (M = 35.89, SD = 33.72) and intuitive (M = 36.36, SD = 31.34) thinkers, $t(218) = .097$, $p = .923$ (see Figure 2, right panel).

The results fully support our distinction between systematic and deliberate thinking by demonstrating their different implications on assignment decisions. Although not the focus of our investigation, it is interesting to note that assignments for the intuitive thinker differed from assignments for the shallow thinker both in the type of riddle selected (rule-based over context-based), $t(218) = 3.959$, $p < .001$, and in the number of hints, $t(218) = 11.358$, $p < .001$. Moreover, the pattern presented in Figure 2 suggests that intuitive and systematic thinkers are perceived as opposing in nature (indifferent with regard to hints, but mirroring effects with regard to assigning rule-based problems).

Part 3—Perceived Competence of Deliberate Versus Systematic Thinkers: A Cultural Perspective

In Parts 1 and 2 of this article, we established the distinction between deliberate and systematic thinking as reflected in distinct action tendencies (i.e., traits) and motivations (i.e., values), as well as decisions regarding problems selected for oneself and for others.

Yet if the two constructs are distinct, why are they used interchangeably in so much of the literature on intuitive and nonintuitive thinking? One possible answer is that the commonalities between the two, and primarily their mutual divergence from intuitive thinking, has shaped the discourse, removing attention from the differences between them. However, this too raises a question—namely, whether the failure to distinguish between deliberate and systematic thinking is universal, or whether social scientists have perhaps been misled by cultural biases. In this section we take an emic approach, examining whether perceptions of deliberate and systematic thinkers—specifically, their perceived competence—differ between more individualistic and more collectivistic cultures.

Culture consists of shared values, norms, and procedures, reflecting the way the physical and social environments are captured and understood by a specific group, transmitted across time and generations (Triandis, 1994, 2001). As such, culture is considered

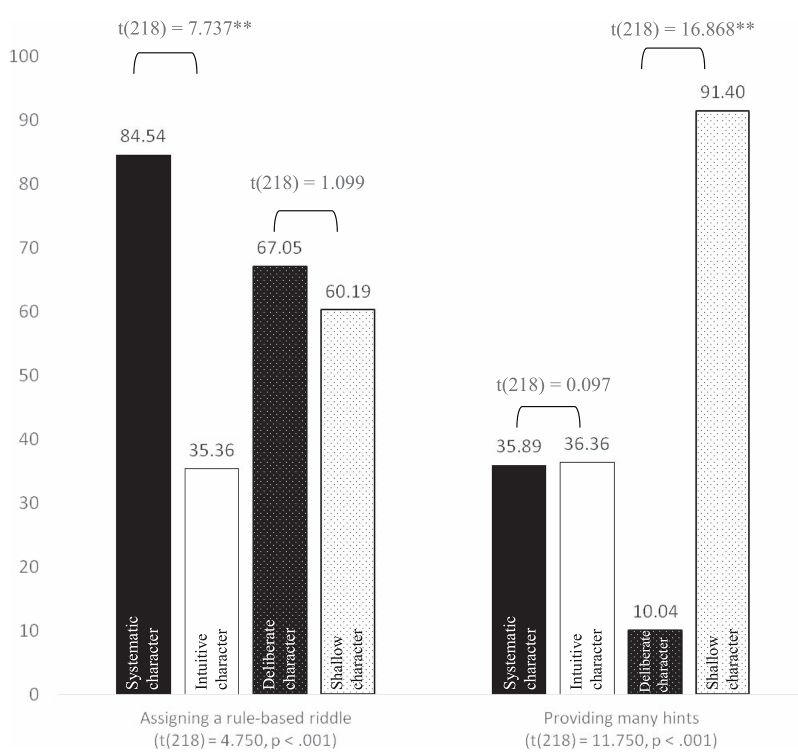


Figure 2. Assignment of rule-based over context-based problems and difficult over simple problems (operationalized as assigning hints) for the four thinking styles (systematic, intuitive, deliberate, or shallow). ** $p < .001$.

to be the collective programing of the mind (Hofstede, Hofstede, & Minkov, 1991) providing a shared meaning system (Shweder & LeVine, 1984). Investigations into the influences of cultural mindset have documented both chronic differences between cultural groups and dynamic influences primed by contextual cues (Oyserman, 2011).

Researchers have proposed various cultural dimensions (Hofstede, 1980; Schwartz, 1999; Triandis, 1994). The most prominent of these distinguishes between cultures where individuals are prioritized over the group (individualistic cultures) and cultures where individuals are seen as interdependent and integrated in a collective (collectivistic cultures). Culture shapes how people think and process information. Considering only the distinction between intuitive thinking, on the one hand, and systematic thinking on the other, it has been found that people from more individualistic cultures are socialized to employ a more systematic way of thinking, whereas people from more collectivistic cultures are socialized to employ more intuitive thinking (see reviews in Nisbett, Peng, Choi, & Norenzayan, 2001; Oyserman, Coon, & Kemmelmeier, 2002). These differences have been found to influence participants' performance in different types of complex problem-solving tasks (Arieli & Sagiv, 2018).[3] We suggest that this cultural socialization will influence not only people's own preferred thinking style, but also their evaluations of others' thinking style, and in consequence, their perceptions of others' competence, intelligence, and likely success. We therefore hypothesize that:

> *H1:* Cultural mindset interacts with systematic thinking to affect perceived competence, such that individuals who display systematic thinking will be perceived as more competent than those who display intuitive thinking under an individualistic mindset but not under a collectivistic mindset.

As we have seen, cross-cultural research provides a basis for positing an association between cultural mindset and a preference for systematic versus intuitive thinking. No such cross-cultural evidence exists with respect to deliberate versus shallow thinking. Rather, there seems to be an assumption that all cultures encourage people to make decisions based on deep thought, a broad consideration of relevant factors, and incorporation of complex information. Indeed, studies have found that deliberate thinkers (operationalized through low need for closure) are less susceptible to biased attributions (Chiu, Morris, Hong, & Menon, 2000) and biased choices (Fu et al., 2007) derived from excessive reliance on cultural norms. We hence have no reason to assume differential cultural socialization for deliberate thinking. We therefore propose that deliberate thinkers will be evaluated more favorably regardless of the perceiver's cultural mindset:

> *H2:* Individuals who display deliberate thinking will be perceived as more competent than those who display shallow thinking regardless of the perceiver's cultural mindset.

We examined cultural influence on perceptions of competence based on thinking style in two studies. In Study 5 we compare perceptions across two cultural subgroups that differ in individualism versus collectivism. In Study 6 we manipulate participants' cultural mindset along the individualism—collectivism dimension. In both, we expect cultural mindset to influence how participants evaluate displays of systematic thinking but not how they evaluate displays of deliberate thinking.

Study 5

To test for cultural influence on perceptions of competence, we focused on two cultural groups that exhibit differing levels of individualism versus collectivism: Jews and Arabs in Israel. Jews are the dominant cultural group in Israel, where consistent Western influence on Israeli society has engendered an individualistic culture that prizes autonomy and personality.[4] Arab culture in Israel is more collectivistic, retaining traditional and communal social norms, highlighting group solidarity and shared goals, and encouraging members to view themselves as an integral part of the group and to find meaning in life through identification with the group (Haj-Yahia, 1995; Pines & Zaidman, 2003). Arabs in Israel are also exposed to the more individualistic Jewish Israeli culture, which dominates social institutions and organizations in the larger Israeli society (Smooha, 1990, 1992). However, empirical comparisons of Arabs and Jews in Israel on the individualism—collectivism continuum (or equivalent cultural dimensions) confirm that Arabs represent a more collectivistic culture than Jews (Arieli & Sagiv, 2018; Cohen, 2007; Schwartz, 2009).

Method

Participants and procedure. The participants were 365 students in an Israeli public university, of whom 203 were Jewish (average age = 24.028, *SD* = 2.529, 45.8% female) and 162 Arab (mean age = 26.753, *SD* = 6.795, 8.1% female). Based on a priori sample size calculations using G*Power (Faul et al., 2007), anticipating a small-to-medium effect size ($f = .15$) with power ($1 - \beta$) of .80, we aimed for a sample size of 350, with 150–200 participants of each culture. The participants were randomly presented with one of four descriptions of a person, and were asked to evaluate the person's competence. The descriptions were manipulated to reflect deliberate or shallow thinking and systematic or intuitive thinking. The survey ended with demographic measures. The language of the survey was Hebrew for Jewish participants and Arabic for Arab participants. The study was approved by the ethics committee of the psychology department of the Open University of Israel, protocol number 2928. The material for this study may be found in https://osf.io/g2zds/.

Manipulation. Participants were asked to read a short description of a person. The descriptions were created by combining the deliberate or shallow with the systematic or intuitive descriptions used in Study 4. The first part of the description reflected either deliberate or shallow thinking. The second part of the description reflected either systematic or intuitive thinking (see Appendix B).

[3] It should be stressed that the cultural perspective does not contradict the individual-differences perspective. People can be socialized to regard one cognitive style as better than another, at least for some problem-solving tasks, while still being subject to individual differences in their traits and values, and, consequently, their own preferred thinking style.

[4] We focus on secular Jews, who are the dominant group in Israel. This population excludes ultra-Orthodox Jews, who form a distinct cultural group emphasizing different cultural values (Arieli & Sagiv, 2018).

Outcome variable. Participants were asked to rate the extent to which they perceived the described person as (a) successful, (b) competent, and (c) intelligent. Answers were given on a 7-point scale, with higher values reflecting more positive evaluations. The three items were averaged to create the perceived competence measure ($\alpha = .85$).

Results and Discussion

Table 5 presents the means and standard deviations for perceived competence across the four experimental conditions (deliberate or shallow by systematic or intuitive) in each culture (Jewish/Arab). A main effect in a three-way analysis of variance confirmed that deliberate thinking was positively linked to high levels of perceived competence, as hypothesized, $F(1, 357) = 152.39$, $p < .001$, $\eta_p^2 = .299$. Although the analysis yielded an unexpected interaction between culture and deliberate thinking, $F(1, 357) = 6.58$, $p = .001$, $\eta_p^2 = .018$, planned contrasts confirmed that the expected positive effect of deliberate over shallow thinking on perceived competence exists in each culture separately (Arabs: $M = 6.00$ vs. 4.34, $t(357) = 9.99$, $p < .001$, $d = 1.06$; Jewish: $M = 5.61$ vs. 4.53, $t(357) = 7.34$, $p < .001$, $d = 0.78$). Note that we did not include a neutral condition describing a person as neither deep nor shallow. Hence, we cannot assess whether our findings imply that deep thinking increases perceived competence or that shallow thinking reduces it.

A significant interaction confirmed our hypothesis that the effect of systematic thinking is culturally dependent, $F(1, 357) = 5.46$, $p = .020$, $\eta_p^2 = .015$. Planned contrasts confirmed that displays of systematic (vs. intuitive) thinking significantly contributed to high levels of perceived competence in the more individualistic (Jewish) culture ($M = 5.38$ vs. 4.77, $t(357) = 4.19$, $p < .001$, $d = 0.44$), but not in the more collectivistic (Arab) culture ($M = 5.28$ vs. 5.15, $t(357) = 0.60$, *ns*). A model controlling for demographic differences (age and gender) between the participants in the two cultural groups yielded the same effects.

Overall, the findings support the notion that deliberate thinking is considered an important contributor to perceptions of competence across cultures. The findings also confirm that systematic thinking is valued more in individualistic cultures. However, while we compared two cultural groups that differ in their emphasis on individualism versus collectivism, these groups also differ in additional factors (e.g., communal life, language, etc.). Thus, our comparison does not allow us to exclude alternative explanations, and to attribute the differences found to individualism versus collectivism alone, which is the purpose of our next study.

Study 6

To further test our hypotheses regarding cultural influence on perceptions of competence, and to establish the causal effect of culture, in our final study we rely on the Culture-as-Situated-Cognition theory (Oyserman, 2011) to experimentally shift individuals into specific cultural mindsets using situational cultural cues.

Method

Participants and procedure. The participants were 302 American adults approached via MTURK (mean age = 36.77, *SD* = 11.39, 181 males, 119 females; two participants did not report their gender). Anticipating a slightly bigger effect size than that found in Study 5 owing to a more homogeneous sample ($f = .16$), we aimed at a sample of 300 based on a priori sample size calculations using G*Power (Faul et al., 2007) with power ($1 - \beta$) of .80. The participants were randomly assigned to one of three cultural prime conditions: individualism, collectivism, or control (i.e., no prime). Following the priming task, participants were presented with one of the four descriptions of a person used in Study 5 (deliberate or shallow thinking crossed with systematic or intuitive thinking), and were asked to rate the extent to which they perceived the described person as competent using the same three items developed in Study 3 ($\alpha = .91$). The survey ended with demographic measures. The study was approved by the ethics committee of the psychology department of the Open University of Israel, protocol number 3021. The material for this study may be found in https://osf.io/g2zds/.

Cultural prime. To activate an individualistic or collectivistic mindset, we used the scrambled sentence task developed by Kühnen and Hannover (2000), consisting of 18 scrambled sentences of five words depicting independent or interdependent relations. The original items were provided by those authors (personal communication, September 19, 2017). The participants were asked to make grammatically correct four-word sentences (e.g., "my he autonomous individuality appreciates" becomes "He appreciates my individuality" for the independent condition, and "in I feel others sync" becomes "I feel in sync" for the interdependent condition). We included a no-prime condition as a control.

Table 5
Means and Standard Deviations of Perceived Decision-Making Competence Across the Four Experimental Conditions (Deliberate vs. Shallow Thinking × Systematic vs. Intuitive Thinking) for Participants From Both Cultural Groups (Study 5)

Culture	Systematic	Intuitive	Systematic vs. Intuitive
Jewish Israelis–individualistic culture			
Shallow	4.83 (0.81)	4.21 (1.04)	$t(357) = 4.19$, $p < .001$
Deliberate	5.91 (0.73)	5.30 (1.05)	
Deliberate vs. Shallow	$t(357) = 7.34$, $p < .001$		
Arab Israelis–collectivistic culture			
Shallow	4.51 (1.23)	4.18 (1.18)	$t(357) = .60$, *n.s*
Deliberate	5.94 (1.34)	6.06 (1.04)	
Deliberate vs. Shallow	$t(357) = 9.99$, $p < .001$		

Results and Discussion

Table 6 presents the means and standard deviations of perceived competence in the 12 experimental conditions. The findings in the no prime (control condition) replicate those found in the more individualistic culture in Study 5 (Jews in Israel): Deliberate thinkers were judged as more competent than shallow thinkers $F(1, 105) = 63.955$, $p < .001$, and systematic thinkers were judged as more competent than intuitive thinkers $F(1, 105) = 27.587$, $p < .001$. These findings can likely be attributed to the individualistic nature of American culture.

Focusing on the two experimental conditions while calculating the error term across all conditions, planned comparisons fully confirmed our hypothesis. Deliberate thinkers were perceived as more competent regardless of cultural prime, $F(1, 290) = 113.754$, $p < .001$, $\eta_p^2 = .282$. Specifically, deliberate thinking contributed to perceptions of competence under both the individualistic and collectivistic cultural mindsets; $F(1, 290) = 55.154$, $p < .001$, $\eta_p^2 = .160$ for the individualistic mindset and $F(1, 290) = 58.616$, $p < .001$, $\eta_p^2 = .168$ for the collectivistic mindset. Overall, systematic thinkers were also perceived as more competent than intuitive thinkers, $F(1, 290) = 9.810$, $p = .002$, $\eta_p^2 = .033$. However, when the two priming groups were examined separately, systematic thinking contributed to perceptions of competence only under the individualistic mindset, $F(1, 290) = 11.474$, $p = .001$, $\eta_p^2 = .038$, but not under the collectivistic mindset, $F(1, 290) = 1.103$, $p = .294$, $\eta_p^2 = .004$, as hypothesized.[5]

Together, the findings of Studies 5 and 6 emphasize the similar effects of systematic and deliberate thinking on perceptions of competence in individualistic cultures (Jews in Israel in Study 5 and Americans in Study 6) and when priming an individualistic mindset (Study 6), and their distinct influence in more collectivistic cultures (Arabs in Israel in Study 5) and when priming a collectivistic mindset (Study 6). These findings emphasize the distinction between deliberate and systematic thinking, as reflected in cultural perceptions. They may also help explain why the two are so often conflated in the literature, much of which originates in Western (i.e., individualistic) settings.

General Discussion

The starting point for the present research was the fact that deliberate thinking and systematic thinking are often conflated, both in popular thinking and in research, reflecting a uni-dimensional perspective on nonintuitive thinking. We join an emerging line of research which challenges this uni-dimensional perspective, and we amplify the call for greater clarification in the language used to define and label the different aspects of nonintuition. To establish our proposition, we employed several research paradigms.

In Part 1 we provided a nomological network comparing associations between different measures of nonintuitive thinking and other personality constructs. The distinct associations of the two thinking styles with action tendencies, as reflected in personality traits (Study 1), and with motivational goals, as reflected in personal values (Study 2), support our call to distinguish deliberate from systematic thinking. In Part 2 we extended the investigation into the distinction between deliberate and systematic thinking by examining decisions regarding choices between different problem types and difficulty levels. We showed that systematic thinking predicts choices (Study 3) and assignment (Study 4) of a congruent problem type (rule-based over context-based problems), whereas deliberate thinking predicts choices and assignment of congruent problem difficulty. In Part 3 we took a different approach, exploiting cultural differences to expose differences between systematic and deliberate thinking. Specifically, we show that deliberate and systematic thinking are not equivalent in signifying competence among participants with a more collectivistic (though not individualistic) mindset, both when comparing subcultures (Study 5) and when priming a cultural mindset (Study 6).

Together, employing heterogeneous methodologies, the six studies raise the need to disentangle deliberate from systematic thinking and support the multidimensional approach to nonintuitive thinking. The nomological network presented in the first part points to the distinct patterns of associations with other personality constructs. Measures that reflect deliberate thinking are positively associated with the trait of openness to experience and with values of self-direction and negatively associated with the opposing values of conformity. In contrast, measures that reflect systematic thinking are positively associated with the trait of conscientiousness and with values of security and negatively associated with the opposing values of stimulation. That is, the two dimensions are associated with different traits and with values on opposing sides of the circle. These distinct associations underscore the fact that the measures tested differ in the aspects of thinking style they capture best. Moreover, five samples in the online supplemental materials included both a measure that best captures deliberate thinking (NFC) and a measure that best captures systematic thinking (TWS). Correlations did not differ significantly from zero in four of the five samples ($r = .09, .18, -.04, .12$, all *ns*); and in the fifth, large, sample, the correlation was significant, but small, $r(316) = .22$, $p < .001$. Although imperfect, these correlations also provide direct support for the distinction between the two nonintuitive styles—deliberate and systematic thinking.

The consistent distinction between the measures presented in Studies 1 and 2 is noteworthy, considering that a recent meta-analysis focusing on performance in decision-making tasks failed to differentiate the effects of different measures of thinking style (Phillips et al., 2016). One could argue that the lack of differentiation in performance between measures that best capture systematic thinking and measures that best capture deliberate thinking documented by Phillips and colleagues (2016) undermines the need to differentiate between deliberate and systematic thinking, since different measures capture different aspects of thinking style, and they all converge in their impact on performance. However, our findings challenge this conclusion in several ways. First, we present differential behavioral outcomes in Studies 3 and 4. Second, we suggest that the heterogeneity of the criteria used in the work by Phillips and colleagues (diverse performance tasks) confounds the criterion and predictor, as the underlying theory is used to derive both the predictor (measure of thinking style) and the criterion (performance task). This confound may obscure existing differences. By comparing associations of different measures with

[5] Comparing the collectivistic condition with the control condition yielded similar results to those found in the main analysis comparing the collectivistic and individualistic conditions. Together, the findings suggest that the individualistic condition resembles the control condition, reflecting the more individualistic nature of American society.

Table 6
Means and Standard Deviations of Perceived Decision-Making Competence Across the Twelve Experimental Conditions (Deliberate or Shallow × Systematic or Intuitive × Individualistic or Collectivistic or no Culture Priming) in Study 6

Prime	Systematic	Intuitive	Systematic vs. Intuitive
Individualistic prime			
Shallow	5.04 (0.85)	3.99 (1.30)	$F(1, 290) = 11.474$, $p = .001$
Deliberate	6.07 (0.63)	5.82 (0.86)	
Deliberate vs. Shallow	$F(1, 290) = 55.154$, $p < .001$		
Collectivistic prime			
Shallow	4.62 (0.73)	4.57 (1.28)	$F(1, 290) = 1.103$, $p = .294$
Deliberate	6.25 (0.53)	5.90 (1.05)	
Deliberate vs. Shallow	$F(1, 290) = 58.616$, $p < .001$		
No Prime (control condition)			
Shallow	4.96 (0.98)	3.84 (0.81)	$F(1, 105) = 27.587$, $p < .001$
Deliberate	6.08 (0.82)	5.43 (0.91)	
Deliberate vs. Shallow	$F(1, 105) = 63.955$, $p < .001$		

the same criteria (personality traits in Study 1 and personal values in Study 2), our studies overcome these caveats, and further point to the need for testing performance in tasks designed to tap into systematic thinking without requiring deliberate thinking (and vice versa).

Of the list of studies reviewed by Phillips and colleagues (2016), only two studies report links between a measure better capturing systematic thinking (the GDMS) and performance in decision-making tasks. The relatively small number of performance studies may indicate a difficulty in finding performance tasks that tap into systematic thinking. Studies 3 and 4 present a new measure focusing on decisions regarding problem choices. The novel task decomposes choices in problem-solving and separates two aspects: the choice of problem type (rule-based or context-based) and problem difficulty. The choice of problem type, we suggest, captures systematic (but not deliberate) thinking, and may hence prove useful in further exploring this topic. Importantly, it is the dissociation between systematic and deliberate thinking with regard to the two aspects of problem-solving that supports our main contention.

Adopting a cultural lens to investigate perceptions of deliberate and systematic thinkers in Part 3, we confirmed that deliberate thinking contributes to competence perceptions regardless of the perceiver's cultural mindset: Israeli Jews and Arabs in Israel (Study 5) and American adults in all cultural prime conditions (Study 6) all perceived deliberate thinkers as more competent than shallow thinkers. More importantly, although systematic thinkers were perceived as more competent under a more individualistic mindset (Israeli Jews in Study 5 and participants in the individualistic priming condition in Study 6), this was not true under a more collectivistic mindset. This is an interesting finding, given that most research on the topic—much of which, like our own, takes perceived competence as the outcome variable—is conducted in Western (i.e., more individualistic) cultures. Deliberate and systematic thinking both positively contribute to perceptions of competence in individualistic cultures, possibly blinding researchers to the distinction between the two.

It should be mentioned that our findings replicate past research that found a preference for systematic over intuitive thinking in individualistic cultures, but do not replicate the opposite preference previously found in more collectivistic cultures (Buchtel & Norenzayan, 2008; Norenzayan, Smith, Kim, & Nisbett, 2002). The lack of a preference for intuitive over systematic thinking among Arabs in Israel (Study 5) and among Americans in the collectivistic prime condition (Study 6) might be explained by the generally more individualistic nature of the Israeli and American cultures.

Is Nonintuitive Thinking Opposed or Orthogonal to Intuitive Thinking?

The present study focused on nonintuitive thinking. However, the findings also offer important insights relevant to intuitive thinking, and especially to the ongoing debate on whether intuition and nonintuition are opposite poles of a single dimension (e.g., Allinson & Hayes, 1996; Sagiv et al., 2010), or whether they are two distinct and orthogonal dimensions (e.g., Norris & Epstein, 2011; Pacini & Epstein, 1999; Scott & Bruce, 1995). It is important to mention here that arguments for the orthogonality of the intuitive and nonintuitive thinking styles often rely on empirical findings using the Rational Experiential Inventory, which uses the need for cognition to capture nonintuition (Epstein, Pacini, Denes-Raj, & Heier, 1996). Notably, these empirical findings have puzzled researchers who theoretically contrast nonintuitive with intuitive thinking. Indeed, Petty and colleagues expressed their surprise that "because the need for cognition scale is used to tap the rational system, one might expect that those high in need for cognition would *not* rely on intuition, images, or affect. However, empirically, the need for cognition and faith in intuition scales are uncorrelated" (Petty et al., 2009, p. 320).

Having clarified the distinction between systematic and deliberate thinking, as well as choices made for intuitive thinkers (see Study 4), it is possible to clarify the gap between past expectations and findings: whereas systematic thinking is opposed to intuitive thinking, deliberate thinking is unrelated to it. Indeed, Wang and colleagues (2017) report no association between the intuitive and nonintuitive styles in studies using measures that best capture deliberate thinking (i.e., the Rational Experiential Inventory), but a consistent negative association between the intuitive and nonintuitive styles in studies using measures that better capture systematic thinking (e.g., the General Decision Making Scale [GDMS] and Assessment of Career Decision-Making [ACDM]). Similarly, using another measure of systematic thinking (the Thinking and Working Style scale [TWS]) we too find a consistent negative association between the nonintuitive systematic scale and the intuitive scale ($\rho^u = -.59$, 95% CI [−.67, −.52], $Z = -15.20$, $p < .001$) across 10 published and 10 unpublished samples collected in diverse cultures (e.g., Hong Kong, Canada, Arabs and Jews in Israel).

Indirectly, our findings extend an emerging discussion about whether the nonintuitive mode of processing is indeed superior to the intuitive mode, as some researchers argue (e.g., Stanovich & West, 2000), or whether each mode has advantages and disadvantages. Those in the latter camp take the view that the nonintuitive system is more suited to complex tasks, whereas the intuitive system, being more primitive, crude, and quick, is more suited to directing everyday behavior (e.g., Epstein et al., 1996). Based on our findings, one might wonder whether the presumed superiority of the systematic system in complex tasks actually reflects a superiority of deliberate thinking. This reinterpretation is in line with findings pointing to the effectiveness of intuitive thinking. For instance, a large body of work highlights the high creativity of intuitive individuals (Rounds, Smith, Hubert, Lewis, & Rivkin, 1999; Scott & Bruce, 1995; Simonton, 2003), and some studies suggest that intuitive managers perform better than those with a systematic style under ambiguous conditions (Sadler-Smith, 2004). The findings of our Studies 5 and 6 add a cultural perspective to this debate, pointing to the role of the individualism—collectivism cultural dimension in shaping perceptions of systematic and intuitive thinkers.

Measuring Deliberate Thinking

The question of what motivates people to engage in effortful cognitive tasks and employ deliberate thinking has given rise to a number of theories; and various conceptualizations of individual differences in deliberate thinking have been presented and developed over the years. Recently, it has been suggested that conceptualizations which address the desire to satisfy curiosity and the depth and breadth of information processing may reflect the same core motivation, which can be called the epistemic motivation (De Dreu et al., 2008).

Specifically, some researchers suggest that need for cognition and (lack of) need for cognitive closure should both be considered conceptualizations of epistemic motivation (for reviews see: Amit & Sagiv, 2013; De Dreu et al., 2008). Others emphasize the distinction between need for cognition and need for cognitive closure, and even refer to the need for cognitive closure (and not the lack of it) as an epistemic motivation (Roets et al., 2015). Although this is not the primary goal of the current research, our findings (Studies 1 and 2) present extensive data on the need for cognition and (lack of) need for cognitive closure. The similarity in the pattern of associations with both personality traits and personal values supports the notion that, as a stable individual difference, need for cognition and (lack of) need for cognitive closure share a core (epistemic) nature.

Measuring Thinking Styles

The literature offers several tools for measuring individual differences in thinking styles (see Table 1). Our findings suggest that whether conclusions based on one measure are generalizable to other measures depends on the dimension(s) the measures capture best. The similarity in the pattern of findings between the nonintuitive scale of the Thinking and Working Style scale (TWS) and the General Decision Making Scale (GDMS) suggest that they both capture the systematic dimension of nonintuitive thinking, distinct from the deliberate thinking dimension best captured by the Rational Experiential Inventory (REI). The TWS and the GDMS rely on self-reports to capture tendencies reflective of thinking styles in different settings—thinking and working in the TWS (Sagiv et al., 2010) and decision-making in the GDMS (Scott & Bruce, 1995). The similar findings found in our studies for both measures offer a first step toward providing a consolidated conceptualization and measurement of systematic thinking as a general personality characteristic, beyond specific settings.

In Studies 1–3 we used the Thinking and Working Style scale (Sagiv et al., 2010) to measure the systematic thinking style. Across studies, samples, and cultures, our theoretical hypotheses regarding systematic thinking were consistently supported. Thus, beyond their theoretical contributions, our findings provide further validation for use of the Thinking and Working Style as a measure of a systematic thinking style.

We point to the need for caution in choosing appropriate measures for both deliberate and systematic thinking. Although we can point to measures best capturing each, now that the distinction between the dimensions is clear, future research should refine existing measures, or suggest new ones, to improve psychometric properties and tighten the link to the new theoretical clarifications. In addition, researchers should adopt adequate terminology to reflect the content of measurements more accurately, rather than using the original, but ambiguous, labels summarized in Table 1.

Limitations and Future Directions

Although all six studies converge in supporting our contention that deliberate thinking is distinct from systematic thinking, the research is not flawless. First, the findings reported in Studies 1–3 rely predominantly (though not solely) on two main self-report measures: the Need for Cognition (for deliberate thinking) and the Thinking and Working Styles (for systematic thinking). Future studies could expand the investigation using other existing measures, or better still, propose a new measure for nonintuitive thinking that takes a multidimensional approach. Another risk regarding correlations among self-reported measures is that of spurious correlations. For example, right-wing authoritarianism is linked to personal values (see Roccas, Schwartz, & Amit, 2010) and to intuitive (but not deliberate) thinking (Kemmelmeier, 2010). Future studies could identify and present related constructs, testing for spurious links or mediated processes.

Studies 3 and 4 present a new measure focusing on decisions regarding problem choices. Although the results confirmed our expectations (in Study 4 more strongly than in Study 3), we call for developing more tasks, potentially ones that also measure actual performance. In addition, more research, including replications, is necessary to fully validate the new measures. Similarly Studies 4–6 present a new measure based on the descriptions in Appendix

B. The studies provide a cultural lens, relying on three cultures (Americans, Israeli Jews and Israeli Arabs). Past research and our findings support the distinctions made on the individualism—collectivism cultural dimension. However, future studies could explore more representative samples and more cultures, especially from cultures other than those which are Western, educated, industrialized, rich and democratic (WEIRD), in which intuitive thinking seems more strongly related to social and cultural structures (Yılmaz & Alper, 2019).

On a more theoretical note, we focused our investigation on nonintuitive thinking, discussing intuitive thinking only in comparison to systematic thinking. Past research has also linked intuitive thinking with personal values (using the TWS; Sagiv et al., 2014) and personality traits (using diverse measures, e.g., Langan-Fox & Shirley, 2003; McCrae & Costa, 1989; Pretz et al., 2014). Future studies could join the emerging line of research on the multidimensionality of intuitive thinking (e.g., Amit, Rusou, & Arieli, 2016; Gore & Sadler-Smith, 2011; Pretz & Totz, 2007; Pretz et al., 2014; Sinclair, 2010), seeking to identify convergences across similar terms and distinguish others. One may wonder whether the multidimensionality of intuitive thinking mirrors that of nonintuitive thinking.

Conclusion

This paper presents an empirical investigation of deliberate and systematic thinking, which have often been used interchangeably in describing nonintuitive thinking. Our research emphasizes their distinct associations with other personality constructs, their distinct influence on problem choice; and their distinct cultural influence as determinants of valuations of competence. Our findings thus suggest that the conflation of deliberate and systematic thinking in the literature may reflect the fact that both are valued within the individualistic cultures from which most researchers come. Together, our findings stress the importance of conceptually and empirically distinguishing between deliberate and systematic thinking, and more broadly, the need for a multidimensional approach to the conceptualization and measurement of intuitive and especially nonintuitive thinking.

References

References marked with an asterisk indicate studies included in the meta-analysis.

Allinson, C. W., & Hayes, J. (1996). The cognitive style index: A measure of intuition-analysis for organizational research. *Journal of Management Studies, 33,* 119–135. http://dx.doi.org/10.1111/j.1467-6486.1996.tb00801.x

Amit, A., Arieli, S., & Porzycki, N. (2017). Distinguishing epistemically motivated thinkers from systematic thinkers. In John Humphreys (Ed.), *Proceedings of the Seventy-sixth Annual Meeting of the Academy of Management*. Advance online publication. http://dx.doi.org/10.5465/ambpp.2016.76

Amit, A., Rusou, Z., & Arieli, S. (2016). Uni-dimensional or multi-dimensional? Empirical evidence for distinguishing between different aspects of intuition. *Journal of Applied Research in Memory & Cognition, 5,* 322–324. http://dx.doi.org/10.1016/j.jarmac.2016.06.002

Amit, A., & Sagiv, L. (2013). The role of epistemic motivation in individuals' response to decision complexity. *Organizational Behavior and Human Decision Processes, 121,* 104–117. http://dx.doi.org/10.1016/j.obhdp.2013.01.003

Antonioni, D. (1999). Relationship between the big five personality factors and conflict management styles. *International Journal of Conflict Management, 9,* 336–355. http://dx.doi.org/10.1108/eb022814

*Appelt, K. C., Milch, K. F., Handgraaf, M. J., & Weber, E. U. (2011). The Decision Making Individual Differences Inventory and guidelines for the study of individual differences in judgment and decision-making research. *Judgment and Decision Making, 6,* 252–262.

Arieli, S., & Sagiv, L. (2018). Culture and problem-solving: Congruency between the cultural mindset of individualism versus collectivism and problem type. *Journal of Experimental Psychology: General, 147,* 789–814. http://dx.doi.org/10.1037/xge0000444

Betsch, C. (2004). Präferenz für intuition und deliberation (PID) [Preference for intuition and deliberation (PID): An inventory for assessing affect- and cognition-based decision-making]. *Zeitschrift für Differentielle und Diagnostische Psychologie, 25,* 179–197. http://dx.doi.org/10.1024/0170-1789.25.4.179

Betsch, C., & Iannello, P. (2010). Measuring individual differences in intuitive and deliberative decision making styles: A comparison of different measures. In A. Glöckner & C. Witteman (Eds.), *Foundations for tracing intuition: Challenges and methods* (pp. 251–271). New York, NY: Psychology Press.

Boer, D., & Fischer, R. (2013). How and when do personal values guide our attitudes and sociality? Explaining cross-cultural variability in attitude -value linkages. *Psychological bulletin, 139,* 1113–1147. http://dx.doi.org/10.1037/a0031347

Borenstein, M., Hedges, L. V., Higgins, J. P. T., & Rothstein, H. R. (2009). *Introduction to meta-analysis*. Hoboken, NJ: Wiley. http://dx.doi.org/10.1002/9780470743386

*Bosnjak, M., Galesic, M., & Tuten, T. (2007). Personality determinants of online shopping: Explaining online purchase intentions using a hierarchical approach. *Journal of Business Research, 60,* 597–605. http://dx.doi.org/10.1016/j.jbusres.2006.06.008

Buchtel, E. E., & Norenzayan, A. (2008). Which should you use, intuition or logic? Cultural differences in injunctive norms about reasoning. *Asian Journal of Social Psychology, 11,* 264–273. http://dx.doi.org/10.1111/j.1467-839X.2008.00266.x

*Buratti, S., Allwood, C. M., & Kleitman, S. (2013). First-and second-order metacognitive judgments of semantic memory reports: The influence of personality traits and cognitive styles. *Metacognition and Learning, 8,* 79–102. http://dx.doi.org/10.1007/s11409-013-9096-5

Cacioppo, J. T., Petty, R. E., & Kao, C. F. (1984). The efficient assessment of need for cognition. *Journal of Personality Assessment, 48,* 306–307. http://dx.doi.org/10.1207/s15327752jpa4803_13

Calogero, R. M., Bardi, A., & Sutton, R. M. (2009). A need basis for values: Associations between the need for cognitive closure and value priorities. *Personality and Individual Differences, 46,* 154–159. http://dx.doi.org/10.1016/j.paid.2008.09.019

Chiu, C. Y., Morris, M. W., Hong, Y. Y., & Menon, T. (2000). Motivated cultural cognition: The impact of implicit cultural theories on dispositional attribution varies as a function of need for closure. *Journal of Personality and Social Psychology, 78,* 247–259. http://dx.doi.org/10.1037/0022-3514.78.2.247

*Chopik, W. J., Rikard, R. V., & Cotten, S. R. (2017). Individual difference predictors of ICT use in older adulthood: A study of 17 candidate characteristics. *Computers in Human Behavior, 76,* 526–533. http://dx.doi.org/10.1016/j.chb.2017.08.014

Cohen, A. (2007). An examination of the relationship between commitments and culture among five cultural groups of Israeli teachers. *Journal of Cross-Cultural Psychology, 38,* 34–49. http://dx.doi.org/10.1177/0022022106295440

Cools, E., & Van den Broeck, H. (2007). Development and validation of the cognitive style indicator. *Journal of Psychology, 141,* 359–387. http://dx.doi.org/10.3200/JRLP.141.4.359-388

*Cornelis, I., Van Hiel, A., Roets, A., & Kossowska, M. (2009). Age differences in conservatism: Evidence on the mediating effects of personality and cognitive style. *Journal of Personality, 77,* 51–88. http://dx.doi.org/10.1111/j.1467-6494.2008.00538.x

*Corr, P. J., Hargreaves-Heap, S., Tsutsui, K., Russell, A., & Seger, C. (2013). Personality and social attitudes: Evidence for positive-approach motivation. *Personality and Individual Differences, 55,* 846–851. http://dx.doi.org/10.1016/j.paid.2013.07.012

Costa, P. T., Jr., & McCrae, R. R. (1992). Four ways five factors are basic. *Personality and Individual Differences, 13,* 653–665. http://dx.doi.org/10.1016/0191-8869(92)90236-I

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. http://dx.doi.org/10.1093/poq/nfn035

De Dreu, C. K., Nijstad, B. A., & van Knippenberg, D. (2008). Motivated information processing in group judgment and decision making. *Personality and Social Psychology Review, 12,* 22–49. http://dx.doi.org/10.1177/1088868307304092

Dewberry, C., Juanchich, M., & Narendran, S. (2013). Decision-making competence in everyday life: The roles of general cognitive styles, decision-making styles and personality. *Personality and Individual Differences, 55,* 783–788. http://dx.doi.org/10.1016/j.paid.2013.06.012

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. http://dx.doi.org/10.1037/0022-3514.71.2.390

Evans, J. S. B., & Curtis-Holmes, J. (2005). Rapid responding increases belief bias: Evidence for the dual-process theory of reasoning. *Thinking & Reasoning, 11,* 382–389. http://dx.doi.org/10.1080/13546780542000005

Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods, 39,* 175–191. http://dx.doi.org/10.3758/BF03193146

*Fleischhauer, M., Enge, S., Brocke, B., Ullrich, J., Strobel, A., & Strobel, A. (2010). Same or different? Clarifying the relationship of need for cognition to personality and intelligence. *Personality and Social Psychology Bulletin, 36,* 82–96. http://dx.doi.org/10.1177/0146167209351886

*Fleisher, M. S., Woehr, D. J., Edwards, B. D., & Cullen, K. L. (2011). Assessing within-person personality variability via frequency estimation: More evidence for a new measurement approach. *Journal of Research in Personality, 45,* 535–548. http://dx.doi.org/10.1016/j.jrp.2011.06.009

Frederick, S. (2005). Cognitive reflection and decision making. *Journal of Economic Perspectives, 19,* 25–42. http://dx.doi.org/10.1257/089533005775196732

Freeman, D., Evans, N., & Lister, R. (2012). Gut feelings, deliberative thought, and paranoid ideation: a study of experiential and rational reasoning. *Psychiatry Research, 197,* 119–122. http://dx.doi.org/10.1016/j.psychres.2011.12.031

Fu, J. H. Y., Morris, M. W., Lee, S. L., Chao, M., Chiu, C. Y., & Hong, Y. Y. (2007). Epistemic motives and cultural conformity: Need for closure, culture, and context as determinants of conflict judgments. *Journal of Personality and Social Psychology, 92,* 191–207. http://dx.doi.org/10.1037/0022-3514.92.2.191

*Furnham, A., & Thorne, J. D. (2013). Need for cognition. *Journal of Individual Differences, 34,* 230–240. http://dx.doi.org/10.1027/1614-0001/a000119

Gore, J., & Sadler-Smith, E. (2011). Unpacking intuition: A process and outcome framework. *Review of General Psychology, 15,* 304–316. http://dx.doi.org/10.1037/a0025069

*Grass, J., Strobel, A., & Strobel, A. (2017). Cognitive investments in academic success: The role of need for cognition at university. *Frontiers in Psychology, 8,* 790. http://dx.doi.org/10.3389/fpsyg.2017.00790

Greven, C., Chamorro-Premuzic, T., Arteche, A., & Furnham, A. (2008). A hierarchical integration of dispositional determinants of general health in students: The Big Five, trait emotional intelligence and humour styles. *Personality and Individual Differences, 44,* 1562–1573. http://dx.doi.org/10.1016/j.paid.2008.01.012

Haj-Yahia, M. M. (1995). Toward culturally sensitive intervention with Arab families in Israel. *Contemporary Family Therapy, 17,* 429–447. http://dx.doi.org/10.1007/BF02249355

Harren, V. A. (1979). A model of career decision making for college students. *Journal of Vocational Behavior, 14,* 119–133. http://dx.doi.org/10.1016/0001-8791(79)90065-4

Hodgkinson, G. P., & Sadler-Smith, E. (2003). Complex or unitary? A critique and empirical re-assessment of the Allinson-Hayes Cognitive Style Index. *Journal of Occupational and Organizational Psychology, 76,* 243–268. http://dx.doi.org/10.1348/096317903765913722

Hoffrage, U., & Marewski, J. N. (2015). Unveiling the lady in black: Modeling and aiding intuition. *Journal of Applied Research in Memory & Cognition, 4,* 145–163. http://dx.doi.org/10.1016/j.jarmac.2015.08.001

Hofstede, G. (1980). Culture and organizations. *International Studies of Management & Organization, 10,* 15–41. http://dx.doi.org/10.1080/00208825.1980.11656300

Hofstede, G., Hofstede, G. J., & Minkov, M. (1991). *Cultures and organizations: Intercultural cooperation and its importance for survival*. New York, NY: McGrawHill.

Horstmann, N., Ahlgrimm, A., & Glöckner, A. (2009). How distinct are intuition and deliberation? An eye-tracking analysis of instruction-induced decision modes. *Judgment and Decision Making, 4,* 335–354. http://dx.doi.org/10.2139/ssrn.1393729

*Hughes, D. J., Rowe, M., Batey, M., & Lee, A. (2012). A tale of two sites: Twitter vs. Facebook and the personality predictors of social media usage. *Computers in Human Behavior, 28,* 561–569. http://dx.doi.org/10.1016/j.chb.2011.11.001

Hunt, R. G., Krzystofiak, F. J., Meindl, J. R., & Yousry, A. M. (1989). Cognitive style and decision making. *Organizational Behavior and Human Decision Processes, 44,* 436–453. http://dx.doi.org/10.1016/0749-5978(89)90018-6

Kahneman, D. (2011). *Thinking, fast and slow*. New York, NY: Farrar, Straus & Giroux.

Kemmelmeier, M. (2010). Authoritarianism and its relationship with intuitive-experiential cognitive style and heuristic processing. *Personality and Individual Differences, 48,* 44–48. http://dx.doi.org/10.1016/j.paid.2009.08.012

Kozhevnikov, M. (2007). Cognitive styles in the context of modern psychology: Toward an integrated framework of cognitive style. *Psychological Bulletin, 133,* 464–481. http://dx.doi.org/10.1037/0033-2909.133.3.464

Kruglanski, A. W., & Gigerenzer, G. (2011). Intuitive and deliberate judgments are based on common principles. *Psychological Review, 118,* 97–109. http://dx.doi.org/10.1037/a0020762

Kruglanski, A. W., & Webster, D. M. (1996). Motivated closing of the mind: "seizing" and "freezing". *Psychological Review, 103,* 263–283. http://dx.doi.org/10.1037/0033-295X.103.2.263

Kühnen, U., & Hannover, B. (2000). Assimilation and contrast in social comparisons as a consequence of self-construal activation. *European Journal of Social Psychology, 30,* 799–811. http://dx.doi.org/10.1002/1099-0992(200011/12)30:6<799::AID-EJSP16>3.0.CO;2-2

Langan-Fox, J., & Shirley, D. A. (2003). The nature and measurement of intuition: Cognitive and behavioral interests, personality, and experiences. *Creativity Research Journal, 15,* 207–222. http://dx.doi.org/10.1080/10400419.2003.9651413

*Levin, I. P., Gaeth, G. J., Schreiber, J., & Lauriola, M. (2002). A new look at framing effects: Distribution of effect sizes, individual differences, and independence of types of effects. *Organizational Behavior and Human Decision Processes, 88,* 411–429. http://dx.doi.org/10.1006/obhd.2001.2983

*Madrid, H. P., & Patterson, M. G. (2016). Creativity at work as a joint function between openness to experience, need for cognition and organizational fairness. *Learning and Individual Differences, 51,* 409–416. http://dx.doi.org/10.1016/j.lindif.2015.07.010

Maio, G. R. (2010). Mental representations of social values. *Advances in Experimental Social Psychology, 42,* 1–43. http://dx.doi.org/10.1016/S0065-2601(10)42001-8

Major, D. A., Turner, J. E., & Fletcher, T. D. (2006). Linking proactive personality and the Big Five to motivation to learn and development activity. *Journal of Applied Psychology, 91,* 927–935. http://dx.doi.org/10.1037/0021-9010.91.4.927

*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. http://dx.doi.org/10.1016/j.paid.2007.07.006

McCrae, R. R., & Costa, P. T., Jr. (1989). Reinterpreting the Myers-Briggs Type Indicator from the perspective of the five-factor model of personality. *Journal of Personality, 57,* 17–40. http://dx.doi.org/10.1111/j.1467-6494.1989.tb00759.x

Messick, S. (1984). The psychology of educational measurement. *Journal of Educational Measurement, 21,* 215–237. http://dx.doi.org/10.1111/j.1745-3984.1984.tb01030.x

*Neuberg, S. L., Judice, T. N., & West, S. G. (1997). What the need for closure scale measures and what it does not: Toward differentiating among related epistemic motives. *Journal of Personality and Social Psychology, 72,* 1396–1412. http://dx.doi.org/10.1037/0022-3514.72.6.1396

Nisbett, R. E., Peng, K., Choi, I., & Norenzayan, A. (2001). Culture and systems of thought: Holistic versus analytic cognition. *Psychological Review, 108,* 291–310. http://dx.doi.org/10.1037/0033-295X.108.2.291

Norenzayan, A., Smith, E. E., Kim, B. J., & Nisbett, R. E. (2002). Cultural preferences for formal versus intuitive reasoning. *Cognitive Science, 26,* 653–684. http://dx.doi.org/10.1207/s15516709cog2605_4

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. http://dx.doi.org/10.1111/j.1467-6494.2011.00718.x

Novak, T. P., & Hoffman, D. L. (2009). The fit of thinking style and situation: New measures of situation-specific experiential and rational cognition. *Journal of Consumer Research, 36,* 56–72. http://dx.doi.org/10.1086/596026

Nygren, T. E. (2000, November). *Development of a measure of decision making styles to predict performance in a dynamic J/DM task*. Paper presented at the 41st Psychonomic Society Meeting, New Orleans, LA.

Oyserman, D. (2011). Culture as situated cognition: Cultural mindsets, cultural fluency, and meaning making. *European Review of Social Psychology, 22,* 164–214. http://dx.doi.org/10.1080/10463283.2011.627187

Oyserman, D., Coon, H. M., & Kemmelmeier, M. (2002). Rethinking individualism and collectivism: Evaluation of theoretical assumptions and meta-analyses. *Psychological Bulletin, 128,* 3–72. http://dx.doi.org/10.1037/0033-2909.128.1.3

*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. http://dx.doi.org/10.1037/0022-3514.76.6.972

Parks-Leduc, L., Feldman, G., & Bardi, A. (2015). Personality traits and personal values: A meta-analysis. *Personality and Social Psychology Review, 19,* 3–29. http://dx.doi.org/10.1177/1088868314538548

Petty, R. E., Briñol, P., Loersch, C., McCaslin, M. J., Leary, M., & Hoyle, R. (2009). The need for cognition. In M. R. Leary & R. H. Hoyle (Eds.), *Handbook of individual differences in social behavior* (pp. 318–329). New York, NY: Guilford Press.

Phillips, W. J., Fletcher, J. M., Marks, A. D., & Hine, D. W. (2016). Thinking styles and decision making: A meta-analysis. *Psychological Bulletin, 142,* 260–290. http://dx.doi.org/10.1037/bul0000027

Pines, A. M., & Zaidman, N. (2003). Israeli Jews and Arabs: Similarities and differences in the utilization of social support. *Journal of Cross-Cultural Psychology, 34,* 465–480. http://dx.doi.org/10.1177/0022022103034004006

*Powell, C., Nettelbeck, T., & Burns, N. R. (2017). The incremental validity of intellectual curiosity and confidence for predicting academic performance in advanced tertiary students. *Personality and Individual Differences, 116,* 51–56. http://dx.doi.org/10.1016/j.paid.2017.04.011

Pretz, J. E., Brookings, J. B., Carlson, L. A., Humbert, T. K., Roy, M., Jones, M., & Memmert, D. (2014). Development and validation of a new measure of intuition: The types of intuition scale. *Journal of Behavioral Decision Making, 27,* 454–467. http://dx.doi.org/10.1002/bdm.1820

Pretz, J. E., & Totz, K. S. (2007). Measuring individual differences in affective, heuristic, and holistic intuition. *Personality and Individual Differences, 43,* 1247–1257. http://dx.doi.org/10.1016/j.paid.2007.03.015

Riding, R. J. (1997). On the nature of cognitive style. *Educational Psychology, 17,* 29–49. http://dx.doi.org/10.1080/0144341970170102

Roccas, S., & Sagiv, L. (Eds.). (2017). *Values and behavior: Taking a cross cultural perspective*. Amsterdam, the Netherlands: Springer. http://dx.doi.org/10.1007/978-3-319-56352-7

Roccas, S., Schwartz, S. H., & Amit, A. (2010). Personal value priorities and national identification. *Political Psychology, 31,* 393–419. http://dx.doi.org/10.1111/j.1467-9221.2010.00763.x

Roets, A., Kruglanski, A. W., Kossowska, M., Pierro, A., & Hong, Y.-Y. (2015). The motivated gatekeeper of our minds. In J. M. Olson & M. P. Zanna (Eds.), *Advances in experimental social psychology* (Vol. 5, pp. 221–283). London, UK: Elsevier. http://dx.doi.org/10.1016/bs.aesp.2015.01.001

*Roets, A., & Van Hiel, A. (2011). Item selection and validation of a brief, 15-item version of the Need for Closure Scale. *Personality and Individual Differences, 50,* 90–94. http://dx.doi.org/10.1016/j.paid.2010.09.004

Rounds, J., Smith, T., Hubert, L., Lewis, P., & Rivkin, D. (1999). *Development of occupational interest profiles for O* NET*. Raleigh, NC: National Center for O* NET Development.

Sadler-Smith, E. (2004). Cognitive style and the management of small and medium-sized enterprises. *Organization Studies, 25,* 155–181. http://dx.doi.org/10.1177/0170840604036914

*Sadowski, C. J., & Cogburn, H. E. (1997). Need for cognition in the big-five factor structure. *The Journal of Psychology: Interdisciplinary and Applied, 131,* 307–312. http://dx.doi.org/10.1080/00223989709603517

*Sagiv, L., Amit, A., Ein-Gar, D., & Arieli, S. (2014). Not all great minds think alike: Systematic and intuitive cognitive styles. *Journal of Personality, 82,* 402–417. http://dx.doi.org/10.1111/jopy.12071

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. http://dx.doi.org/10.1002/job.664

Saroglou, V., Delpierre, V., & Dernelle, R. (2004). Values and religiosity: A meta-analysis of studies using Schwartz's model. *Personality and Individual Differences, 37,* 721–734. http://dx.doi.org/10.1016/j.paid.2003.10.005

Saucier, G. (1994). Mini-markers: A brief version of Goldberg's unipolar big-five markers. *Journal of Personality Assessment, 63,* 506–516. http://dx.doi.org/10.1207/s15327752jpa6303_8

Schmidt, F. L., & Hunter, J. E. (2014). *Methods of meta-analysis: Correcting error and bias in research findings* (3rd ed.). Thousand Oaks, CA: Sage.

Schwartz, S. H. (1992). Universals in the content and structure of values: Theoretical advances and empirical tests in 20 countries. *Advances in Experimental Social Psychology, 25,* 1–65. http://dx.doi.org/10.1016/S0065-2601(08)60281-6

Schwartz, S. H. (1999). A theory of cultural values and some implications for work. *Applied Psychology, 48,* 23–47. http://dx.doi.org/10.1111/j.1464-0597.1999.tb00047.x

Schwartz, S. H. (2009). Culture matters: National value cultures, sources and consequences. In R. S. Wyer, C.-Y. Chiu, & Y.-Y. Hong (Eds.), *Understanding culture: Theory, research, and application* (pp. 127–150). New York, NY: Psychology Press.

Schwartz, S. H., & Rubel, T. (2005). Sex differences in value priorities: Cross-cultural and multimethod studies. *Journal of Personality and Social Psychology, 89,* 1010–1028. http://dx.doi.org/10.1037/0022-3514.89.6.1010

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. http://dx.doi.org/10.1177/0013164495055005017

Shweder, R. A., & LeVine, R. A. (Eds.). (1984). *Culture theory: Essays on mind, self and emotion*. New York, NY: Cambridge University Press.

Simonton, D. K. (2003). Scientific creativity as constrained stochastic behavior: The integration of product, person, and process perspectives. *Psychological Bulletin, 129,* 475–494. http://dx.doi.org/10.1037/0033-2909.129.4.475

Sinclair, M. (2010). Misconceptions about intuition. *Psychological Inquiry, 21,* 378–386. http://dx.doi.org/10.1080/1047840X.2010.523874

Smooha, S. (1990). Minority status in an ethnic democracy: The status of the Arab minority in Israel. *Ethnic and Racial Studies, 13,* 389–413. http://dx.doi.org/10.1080/01419870.1990.9993679

Smooha, S. (1992). *Arabs and Jews in Israel* (Vol. 2). Boulder, CO: Westview.

Stanovich, K. E., & West, R. F. (2000). Individual differences in reasoning: Implications for the rationality debate? *Behavioral and Brain Sciences, 23,* 645–665. http://dx.doi.org/10.1017/S0140525X00003435

Sung, S. Y., & Choi, J. N. (2009). Do big five personality factors affect individual creativity? The moderating role of extrinsic motivation. *Social Behavior and Personality, 37,* 941–956. http://dx.doi.org/10.2224/sbp.2009.37.7.941

Triandis, H. C. (1994). *Culture and social behavior*. New York: McGraw-Hill.

Triandis, H. C. (2001). Individualism-collectivism and personality. *Journal of Personality, 69,* 907–924. http://dx.doi.org/10.1111/1467-6494.696169

*Tuten, T. L., & Bosnjak, M. (2001). Understanding differences in web usage: The role of need for cognition and the five factor model of personality. *Social Behavior and Personality, 29,* 391–398. http://dx.doi.org/10.2224/sbp.2001.29.4.391

Viswesvaran, C., & Ones, D. S. (2000). Measurement error in "Big Five Factors" personality assessment: Reliability generalization across studies and measures. *Educational and Psychological Measurement, 60,* 224–235. http://dx.doi.org/10.1177/00131640021970475

Wang, Y., Highhouse, S., Lake, C. J., Petersen, N. L., & Rada, T. B. (2017). Meta-analytic investigations of the relation between intuition and analysis. *Journal of Behavioral Decision Making, 30,* 15–25.

*Washburn, D. A., Smith, J. D., & Taglialatela, L. A. (2005). Individual differences in metacognitive responsiveness: Cognitive and personality correlates. *Journal of General Psychology, 132,* 446–461. http://dx.doi.org/10.3200/GENP.132.4.446-461

Webster, D. M., & Kruglanski, A. W. (1994). Individual differences in need for cognitive closure. *Journal of Personality and Social Psychology, 67,* 1049–1062. http://dx.doi.org/10.1037/0022-3514.67.6.1049

*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. http://dx.doi.org/10.1027/1015-5759.25.1.39

*Woo, S. E., Harms, P. D., & Kuncel, N. R. (2007). Integrating personality and intelligence: Typical intellectual engagement and need for cognition. *Personality and Individual Differences, 43,* 1635–1639. http://dx.doi.org/10.1016/j.paid.2007.04.022

*Wood, N. L., & Highhouse, S. (2014). Do self-reported decision styles relate with others' impressions of decision quality? *Personality and Individual Differences, 70,* 224–228. http://dx.doi.org/10.1016/j.paid.2014.06.036

Yılmaz, O., & Alper, S. (2019). The link between intuitive thinking and social conservatism is stronger in WEIRD societies. *Judgment and Decision Making, 14,* 156–169.

Appendix A

Definitions of the 10 Value Types in Schwartz's Theory of Personal Values and the Structure of Value Relations

Power

Social status and prestige, control, or dominance over people and resources.

Achievement

Personal success through demonstrating competence according to social standards.

Hedonism

Pleasure and sensuous gratification for oneself.

Stimulation

Excitement, novelty, and challenge in life.

Self-Direction

Independent thought and action-choosing, creating, exploring.

Universalism

Understanding, appreciation, tolerance, and protection of the welfare of all people and of nature.

Benevolence

Preservation and enhancement of the welfare of people with whom one is in frequent personal contact.

Tradition

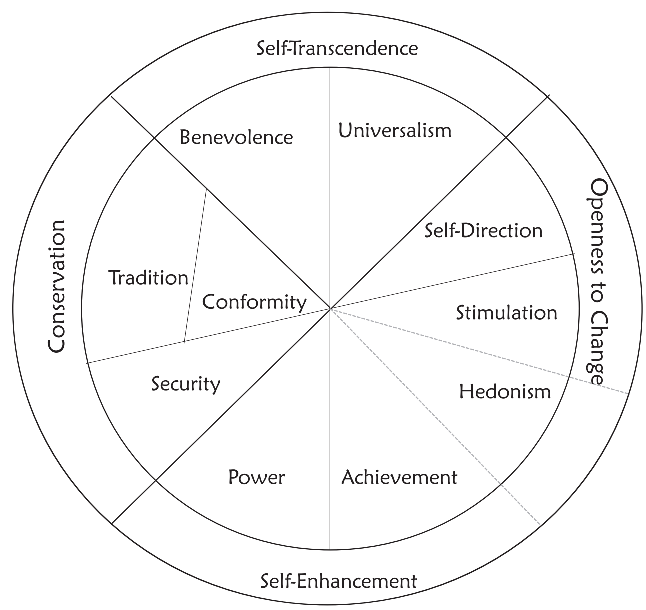
Respect, commitment, and acceptance of the customs and ideas that traditional culture or religion provide the self.

Conformity

Restraint of actions, inclinations, and impulses likely to upset or harm others and violate social expectations or norms.

Security

Safety, harmony, and stability of society, of relationships, and of self.



(*Appendices continue*)

Appendix B

The Descriptions of a Person Characterized With Deliberate or Shallow or Systematic or Intuitive Thinking Used in Studies 4–6

Deliberate Thinking

Alex likes intellectual and difficult problems. He likes to have the responsibility of handling a situation that requires a lot of thinking. He prefers complex to simple problems, and he enjoys tasks that involve coming up with new solutions to problems. He usually ends up deliberating about issues even when they do not affect him personally.

Shallow Thinking

Alex likes simple problems. He prefers tasks that require little thought than tasks that challenge his thinking abilities. He likes to solve problems in a familiar way and avoids from learning new ways. When there is a problem, he doesn't care how or why it works, and it's enough for him to know that something gets the job done. In general, he feels relief rather than satisfaction after completing a task that required a lot of mental effort.

Systematic Thinking

When Alex faces a task, he analyzes the situation and acts in an organized, ordered way. He gathers the information he needs, plans his steps, and acts exactly according to them. There is a reason for everything he does, and he can always explain why he acted the way he did. Evaluating options, he compares them systematically and chooses the option which has more advantages and fewer disadvantages.

Intuitive Thinking

When Alex faces a task, he acts according to what feels right. He trusts his instincts and acts according to them. Usually he follows his gut feelings and cannot always explain his decisions. When he tries to decide between options, he chooses the one that appeals to him most. He often tries to imagine how he would feel in each situation, and chooses the situation that most appeals to him.

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