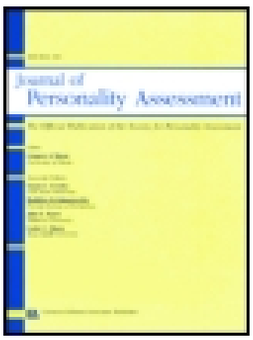

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The Development and Validation of the Rational and Intuitive Decision Styles Scale

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ABSTRACT

Decision styles reflect the typical manner by which individuals make decisions. The purpose of this research was to develop and validate a decision style scale that addresses conceptual and psychometric problems with current measures. The resulting 10-item scale captures a broad range of the rational and intuitive styles construct domain. Results from 5 independent samples provide initial support for the dimensionality and reliability of the new scale, as demonstrated by a clear factor structure and high internal consistency. In addition, our results show evidence of convergent and discriminant validity through expected patterns of correlations across decision-making individual differences and the International Personality Item Pool (IPIP) Big Five traits. Research domains that would benefit from incorporating the concept of decision styles are discussed.

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Anecdotally, it is well understood that people vary in the way that they make decisions. Some individuals engage in lengthy deliberation, whereas others depend on a quick "gut" feel. Some individuals approach decision making cognitively and systematically, whereas others adopt more of an affective and unsystematic approach. Conceptually, researchers agree that decision making depends on characteristics of the decision maker, as well as task and environmental factors (Einhorn, 1970; Hunt, Krzystofiak, Meindl, & Yousry, 1989), but the former has received the least emphasis in the literature (Appelt, Milch, Handgraaf, & Weber, 2011; Highhouse, 2001; Mohammed & Schwall, 2009; Verplanken, 1993). Addressing this discrepancy, we examine an individual difference of special relevance to decision making, namely decision style, referring to the typical manner by which individuals make decisions (Driver, Brousseau, & Hunsaker, 1990; Harren, 1979).

In the end, individuals are the ones who make decisions; therefore, "decision styles form the backbone of effective decision making" (Rowe & Boulgarides, 1992, p. 23). Decision styles are independent of cognitive abilities (Thunholm, 2004) and have shown incremental prediction in self-ratings of decision quality above and beyond Big Five personality traits ($\Delta R^2 = .11$; Wood & Highhouse, 2014). Their importance is further demonstrated in their influence on a variety of career-related and health outcomes. To illustrate, decision styles have been associated with person–job fit (Singh & Greenhaus, 2004; $\Delta R^2 = .06$ for career decision-making styles), job satisfaction (Crossley & Highhouse, 2005; $\Delta R^2 = .06$ for rational and intuitive choice), job search process satisfaction (Crossley & Highhouse, 2005; $\Delta R^2 = .03$ when adding rational and intuitive choice), sales manager performance (Russ, McNeilly, & Comer, 1996; overall performance rating: $r = .226$ for rational, $r = -.315$ for avoidant; behavioral performance rating: $r = -.197$ for avoidant), decision quality (Wood & Highhouse, 2014; $R^2 = .32$ for self-ratings; $R^2 = .10$, for peer ratings), depressive symptomatology (Leykin & DeRubeis, 2010; e.g., $r = .27$ for dependent, $r = .62$ for avoidant, $r = -.41$ for intuitive), and cortisol and stress levels (Thunholm, 2008; $r = .62$ for avoidant style).

Based on a growing body of research, decision styles show promise as a meaningful and significant construct that warrants further attention (e.g., Thunholm, 2008; Wood & Highhouse, 2014). However, for this potential to be fully realized, systematic attention must be devoted to measurement, an area where the literature has been criticized for falling short (e.g., Mohammed & Schwall, 2009; Spicer & Sadler-Smith, 2005). Although several typologies of decision styles have been offered (e.g., Driver et al., 1990; Harren, 1979; Rowe & Boulgarides, 1992; Scott & Bruce, 1995), researchers vary substantially with regard to terminology, the number and type of decision styles proposed, and measurement. Existing measures have several shortcomings, including a lack of construct validity evidence (e.g., Driver et al., 1990; Leykin & DeRubeis, 2010; Shiloh, Koren, & Zakay, 2001) and psychometric weaknesses (e.g., Hodgkinson, Langan-Fox, & Sadler-Smith, 2008; Scott & Bruce, 1995; Spicer & Sadler-Smith, 2005). Furthermore, the decision style construct has not been fully situated within a nomological network of relevant constructs, so not enough is known about how they relate to other individual differences.

Responding to calls for a more systematic and theory-driven approach to research on decision styles, we critically evaluate existing measures and introduce a new scale that improves on previous measures. We offer evidence regarding the dimensionality, stability, and validity (convergent and discriminant) of a new decision style scale over three studies with five samples.

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The conceptualization of decision-making styles

Cognitive styles are trait-based individual differences that represent how someone perceives and processes information across a broad range of contexts (Kozhevnikov, 2007). This construct has its roots in psychology and has been applied in a variety of contexts, including how to improve learning, creativity, accuracy of perceptions, memory processes, and motivation (Rayner, 2000). Examples of cognitive styles include rational ability and rational engagement, which reflect an individual's ability and preference to think in logical ways (Pacini & Epstein, 1999). Cognitive styles have also been discussed in terms of experiential ability and experiential engagement, which represent the ability and preference to rely on impressions and feelings (Pacini & Epstein, 1999). These cognitive styles bear some conceptual similarities to rational and intuitive decision styles. However, the constructs are different in scope. Whereas decision styles more narrowly focus on capturing decision-making processes, cognitive styles more broadly capture general information processing and problem solving.

Some authors treat cognitive and decision styles interchangeably (e.g., Andersen, 2000), and others consider cognitive styles a subset of decision styles (e.g., Thunholm, 2004). The more recent perspective is to view decision styles as a subset of cognitive styles (e.g., Dalal & Brooks, 2013; Kozhevnikov, 2007). We adopt the latter perspective, narrowly defining decision styles as "the individual's characteristic mode of perceiving and responding to decision making tasks" (Harren, 1979, p. 125), and more broadly defining cognitive styles as general propensities toward organizing and processing information (Kozhevnikov, 2007). Nevertheless, we reference work labeled as cognitive or thinking styles, but measure dimensions similar to those in the decision style literature (e.g., Armstrong & Priola, 2001; Pacini & Epstein, 1999; Witteman, van den Bercken, Claes, & Godoy, 2009).

The conceptual framework of decision-making styles is also not well established. Whereas some authors view decision styles as a learned habit to make decisions in a certain way (Driver et al., 1990; Scott & Bruce, 1995), others view them as value- and personality-based (e.g., Rowe & Boulgarides, 1992). According to Driver and colleagues (1990), differences in decision styles are based on contextual variables such as the amount of information considered and the number of alternatives identified when reaching decisions. In contrast, Rowe and Boulgarides (1992) based decision styles on trait-based variables such as cognitive complexity and value orientation. We adopt the view that decision styles is a "habit-based propensity" to respond in a particular manner to decision making (Scott & Bruce, 1995, p. 820). We view decision styles as likelihoods of behavior (Leykin & DeRubeis, 2010) that allow for some change or development in response to factors such as environmental load and pressure (Driver, Svensson, Amato, & Pate, 1996), decision time, and task familiarity (Spicer & Sadler-Smith, 2005). Decision styles are therefore viewed as having both trait-based and contextual antecedents.

Although independent, decision-making styles are not viewed as reciprocally exclusive (Scott & Bruce, 1995; Spicer & Sadler-Smith, 2005). However, individuals are considered to have a dominant style even if they use multiple styles (Driver et al., 1990). As depicted in Table 1, several typologies of decision styles have been proposed, differing in number as well as type. Indeed, the one consistency seems to be inconsistency, with the number of dimensions of decision styles ranging from one to seven across articles. Comparisons between studies are difficult because different terminology is used, but it is not immediately clear whether the actual constructs are distinct or similar (e.g., Is decisional procrastination [Mann, 1982] the same as an avoidant decision style [Scott & Bruce, 1995]?). On close inspection of the articles, however, it appears that there is considerable overlap in that intuitive/experiential/conceptual, logical/rational/analytical/vigilance/compensatory, and avoidant/hesitant/decisional procrastination/indecisiveness/regret-avoidant are defined similarly. Consistent with previous research, we define the rational style as being characterized by a thorough search for information and a systematic evaluation of all choices and potential alternatives, whereas an intuitive style is characterized by the use of a quick decision-making process that is primarily based on hunches and feelings (Phillips, Pazienza, & Ferrin, 1984; Scott & Bruce, 1995). Individuals with an avoidant style attempt to escape decision making at all costs (e.g., Mann, 1982). In our measure of decision styles, we focus on the rational and intuitive styles as described in greater detail in the next section.

The measurement of decision styles

Table 1 highlights a variety of measurement options available for assessing decision styles. However, the list quickly dwindles when applying the criteria of a readily accessible, widely generalizable, easy-to-use, self-report measure of decision style with strong psychometric and construct validity evidence. For example, several scales are not publicly available, either because they are copyrighted (e.g., AIM Survey, Agor, 1989; Decision Style Inventory III, Rowe & Boulgarides, 1992; Cognitive Style Index, Allison & Hayes, 1996) or unpublished (e.g., Harren, 1978; Mann, 1982; Nygren, 2000). Lowering research feasibility, Arroba's (1978) qualitative measure requires coding, and the Driver Decision Style Exercise needs to be sent to the authors for scoring (Driver et al., 1990). Some of the unique dimensions of Leykin and DeRubeis's (2010) scale (e.g., brooding, anxiety) are designed to assess depressive symptoms, limiting generalizability.

Calling into question the alignment between measurement and conceptualization, some measures in Table 1, such as the Myers–Briggs Personality Inventory (e.g., Andersen, 2000; Henderson & Nutt, 1980; Hunt et al., 1989) and need for cognition (e.g., Shiloh, Salton, & Sharabi, 2002; Witteman et al., 2009) are not specifically designed to assess decision styles. Despite its popularity, the Myers–Briggs measure has been criticized on numerous conceptual and methodological grounds, raising questions concerning its suitability for measuring decision styles (Hodgkinson & Clarke, 2007). Furthermore, the face validity of some scales is suspect when items do not specifically reference decision making (e.g., faith in intuition: "I have a good sense of rhythm," "I trust my initial feelings about people"; Epstein, Pacini, Denes-Raj, & Heier, 1996). In addition to content validity concerns, construct validity evidence is

Table 1. Dimensions and measures of decision style.

Author(s)	Dimensions of decision style	Measure of decision style
Agor (1989)	Intuitive ability	AIM Survey, measures potential intuitive ability and whether individuals use intuitive ability to make decisions
Andersen (2000)	Extrovert–introvert Sensing–intuition Thinking–feeling	Myers–Briggs Type Indicator (MBTI), Keegan Type Indicator (KTI), measures extraversion, sensation, intuition, thinking, and feeling
Armstrong & Priola (2001)	Analytic-intuitive dimension	Cognitive Style Index (Allison & Hayes, 1996)
Arroba (1978); Hesketh (1982)	No thought Compliant Logical Emotional Intuitive Hesitant	Qualitative (interviews coded) or six self-report items assess the six decision-making styles
Baiocco, Laghi, & D'Alessio (2009); Galotti et al. (2006); Gambetti, Fabbri, Bensi, & Tonetti (2008); Loo (2000); Russ, McNeilly, & Comer (1996); Sager & Gastil (1999); Scott & Bruce (1995); Spicer & Sadler-Smith (2005); Thunholm (2004, 2008, 2009)	Rational Intuitive Dependent Avoidant Spontaneous	General Decision Making Style (GDMS) instrument (Scott & Bruce, 1995)
Dewberry, Juanchich, & Narendran (2013); Leykin & DeRubeis (2010)	Spontaneous Dependent Vigilant Avoidant Brooding Intuitive Anxious	Decision Styles Questionnaire: Items assessing decision-making styles related to depressive symptomatology
Driver, Brousseau, & Hunsaker (1990)	Decisive Flexible Hierarchic Integrative Systemic	Driver Decision Style Exercise (short case and questions about the case that must be sent to authors for scoring)
Effert & Ferrari (1989); Ferrari & Dovidio (2000, 2001); Frost & Shows (1993)	Decisional Procrastination Indecisiveness	Decisional Procrastination Scale (Mann, 1982) Indecisiveness scale
Harren (1979); Phillips, Pazienza, & Ferrin (1984); Phillips & Strohmer (1982); Singh & Greenhaus (2004)	Rational Intuitive Dependent	Assessment of Career Decision Making (ACDM): Agree–disagree items asking how individuals make important decisions such as choosing a job or college major (Harren, 1978)
Henderson & Nutt (1980)	Sensation-Intuition (ST) Sensation-Feeling (SF) Intuition-Thinking (NT) Intuition-Feeling (NF)	MBTI
Hunt, Krzystofiak, Meindl, & Yousry (1989)	Intuitives (intuition and feeling) Analytics (sensing and thinking) Mixed (sensing and feeling or intuition and feeling)	MBTI
Mann (1998)	Defensive avoidance Hypervigilance Vigilance	Decision Making Questionnaires I and II (Mann, 1982)
Nygren (2000)	Analytical Intuitive Regret-avoidant	Decision Making Style Inventory
Rowe & Boulgarides (1992); Rowe & Mason (1987)	Directive Analytical Conceptual Behavioral	Decision Style Inventory III (1985): Measures an individual's relative scores compared with the population as a whole (not absolute values)
Shiloh, Koren, & Zaykay (2001)	Compensatory Noncompensatory	Compensatory Style Questionnaire (statements representing beliefs favoring compensatory and noncompensatory processes)
Shiloh, Salton, & Sharabi (2002); Shiloh & Shenhave-Sheffer (2004); Witteman, van den Bercken, Claes, & Godoy (2009)	Intuitive/experiential Analytical/rational	Rational-Experiential Inventory (REI; Epstein, Pacini, Denes-Raj, & Heier, 1996) Faith in intuition Need for cognition Revised REI (Pacini & Epstein, 1999) Rational ability and engagement Experiential ability and engagement
Sjöberg (2003)	Intuitive Analytical	Decision situations rated on whether they should be made in an intuitive or analytic mode

conspicuously absent for most decision style measures (e.g., Driver et al., 1990; Leykin & DeRubeis, 2010; Rowe & Boulgarides, 1992; Sjöberg, 2003). Especially rare are confirmatory factor analyses and convergent, discriminant, and predictive validity. When the factor structure has been tested, results have cast doubt on the construct validity of measures such as the Cognitive Style Index and Rational-Experiential Inventory (Hodgkinson et al., 2008; Hodgkinson & Sadler-Smith, 2003).

Closest to meeting the accessibility, generalizability, feasibility, and validity criteria listed earlier, Scott and Bruce's (1995) General Decision Making Style (GDMS) instrument is the most popular decision styles measure (e.g., Loo, 1999; Russ et al., 1996; Thunholm, 2004). In a study comprised of four samples (military officers, MBA students, undergraduates, and engineers or technicians), Scott and Bruce (1995) concluded that there were five decision-making styles (rational, intuitive, dependent, avoidant, spontaneous). However, raising questions about dimensionality, multiple studies have reported goodness-of-fit indexes for confirmatory factor analyses that fall well below recommended criteria. Although the start of acceptable fit for the comparative fit index (CFI) is .95 and root mean square errors of approximation (RMSEAs) of .06 or below indicate close fit (Hu & Bentler, 1999), several authors reported CFIs ranging from .78 to .91 and RMSEAs ranging from .07 to .18 (Curseu & Schruijer, 2012; Loo, 2000; Spicer & Sadler-Smith, 2005; Thunholm, 2004). The intuitive style was especially problematic for model fit (Curseu & Schruijer, 2012; Loo, 2000).

Moreover, studies using the GDMS have found different patterns of intercorrelations between dimensions. For example, whereas some empirical work reported that a higher rational style was associated with a lower avoidant style (Scott & Bruce, 1995, $r = -.17$ to $-.44$; Spicer & Sadler-Smith, 2005, $r = -.23$ and $r = -.24$), others failed to find a significant negative correlation between rational and avoidant styles (Gambetti, Fabbri, Bensi, & Tonetti, 2008, $r = -.09$; Thunholm, 2004, $r = -.01$). Furthermore, although Scott and Bruce (1995) reported alphas of .77 to .85 for GDMS subscales, several subsequent studies found lower internal consistency, resulting in some authors adding additional items to improve internal reliabilities (e.g., Galotti et al., 2006). The alphas for the rational dimension have been particularly problematic (.66 in Pranckun, 2007; .67 in Russ et al., 1996; .67 in Spicer & Sadler-Smith, 2005; .65 in Thunholm, 2004; .60 in Thunholm, 2009; .68 in Baiocco, Laghi, & D'Alessio, 2009). Indeed, one rational item was omitted from the Scott and Bruce (1995) published article (Galotti et al., 2006), but alphas remain low for the complete five-item subscale (e.g., Baiocco et al., 2009; Russ et al., 1996; Spicer & Sadler-Smith, 2005; Thunholm, 2004, 2009). As a result of these weaknesses, "there is a need for further refinement of the GDMS and especially the rational scale" (Thunholm, 2009, p. 323). In response to the multiple calls for additional scale development (Mohammed & Schwall, 2009; Spicer & Sadler-Smith, 2005), we develop and validate the Decision Styles Scale (DSS).

Our choice to limit our focus to rational and intuitive styles was based on theoretical and empirical reasons. First, the broader individual difference of cognitive style has long been conceptualized to encompass two systems of information processing referred to as the dual-process framework (Kahneman, 2011). These components include a rational/reasoning and intuitive/experiential component (Epstein et al., 1996; Hodgkinson, Sadler-Smith, Sinclair, & Ashkanasy, 2009). The rational mode is intentional, analytic, relatively slow, rule-governed, and logically defensible, whereas the intuitive mode tends to be automatic, preconscious, relatively fast, affect-laden, heuristic, and experience-based (e.g., Hammond, Hamm, Grassia, & Pearson, 1997; Hodgkinson & Sadler-Smith, 2003; Kahneman, 2011). These two fundamental types of information processing provide a strong theoretical foundation for proposing parallel decision styles capturing individual differences in the way that people respond to decision-making situations.

Second, content validity is especially deficient for extant rational and intuitive scales, as most do not fully capture the richness of conceptualizations of rationality and intuition. For example, even though thorough information gathering is a key aspect of their definition of rational decision processing, it is not reflected in Scott and Bruce's (1995) GDMS items. Likewise, relying on first impressions and making quick decisions is part of their theoretical underpinnings of intuition, but is excluded from intuitive style GDMS items (Scott & Bruce, 1995). Third, across the various typologies depicted in Table 1, rational and intuitive are the most commonly represented decision styles. Even when studies measure a variety of decision styles as with the GDMS, means tend to be highest for rational and intuitive dimensions (Bruine de Bruin, Parker, & Fischhoff, 2007; Curseu & Schruijer, 2012; Spicer & Sadler-Smith, 2005). Fourth, an analysis of existing measures revealed that the rational and intuitive scales were especially problematic in terms of unsatisfactory internal consistency reliabilities, model fit, and limited validation evidence (e.g., Curseu & Schruijer, 2012; Scott & Bruce, 1995). In contrast, the avoidant/decisional procrastination scales evidenced strong psychometric properties (e.g., Mann, 1982).

Over a series of three studies, we used five samples to introduce and assess the construct validity of the DSS representing rational and intuitive dimensions. Study 1 presents the item generation and reduction process that resulted in a 10-item scale and examines test–retest reliability. Study 2 verifies the factor structure via confirmatory factor analysis across multiple samples and Study 3 establishes a nomological network through examining convergent and discriminant validity.

Study 1: Item generation, reduction, and test–retest reliability

Method

Item generation and reduction

Before generating an initial pool of 33 items, the key definitional components of rational and intuitive decision styles were identified and agreed on within our research group by thoroughly reviewing the decision-making literature. Conceptually, a rational decision style involves information gathering, alternative generation, and thorough evaluation (e.g., Dean & Sharfman, 1993; Shafir & LeBoeuf, 2002). An intuitive style involves relying on feelings and making decisions quickly (e.g., Dane & Pratt, 2007; Harren, 1979; Russ et al., 1996). To establish evidence of content validity, we generated scale items representing

Table 2. Summary of sample characteristics and analyses.

Sample	Source	*N*	Gender	Ethnicity	Average age	Analyses
1	Undergraduate students (48.2% juniors and seniors)	83	62.7% female	87.8% White	20.51	• Initial pool of 25 items • Item reduction to 17 items using EFA
2	Undergraduate students (98.0% juniors and seniors)	148	69.6% female	86.5% White	23.48	• Initial pool of 17 items • Item reduction to 10 items using EFA
3	Undergraduate students (97.7% juniors and seniors)	88	69.4% female	82.4% White	23.05	• EFA • Test–retest reliability (Time 1 and 2 separated by 2–3 weeks)
4	Undergraduate students (12.4% juniors and seniors)	535	61.2% female	91.2% White	19.18	• CFA • Discriminant/convergent validity
5	Undergraduate students (32.2% juniors and seniors)	306	70.5% female	89.7% White	19.42	• CFA • Discriminant/convergent validity

Note. Data were collected from a large Northeastern research university in the United States. Participants were recruited by the researchers through the use of institutional review board (IRB)-approved recruitment scripts that were delivered in person or through e-mail. Participation in the study was voluntary. Each participant was given extra credit for his or her participation. All surveys were delivered online. Participants engaged in implied consent through their completion of the online survey. IRB approval was obtained for data collection across all five samples. EFA = exploratory factor analysis; CFA = confirmatory factor analysis.

each dimension, ensuring that the items contained in the scales comprehensively captured the essence of the construct. This process was repeated after each item reduction and carried out by a group of more than three researchers. Group consensus was achieved regarding the key components represented by each item. Whereas extant decision style scales have measured only a subset of the construct dimensions represented in the DSS (e.g., Pacini & Epstein, 1999; Scott & Bruce, 1995), we worked to capture the broad range of the construct domain for rational and intuitive styles. After several iterations of comparing, revising, and combining items, we selected 25 for empirical testing (13 rational and 12 intuitive).

Item reduction occurred in two steps involving two samples (see Table 2 for sample descriptions). First, the initial pool of 25 items was administered in paper-and-pencil format to 83 undergraduate students. The response format was a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). We conducted an exploratory factor analysis (EFA, principal axis factoring) with oblique rotation (Promax), allowing for interrelatedness among factors (Fabrigar, Wegener, MacCallum, & Strahan, 1999). The scree plot and eigenvalues suggested a two-factor solution, accounting for 37.26% of the total item variance. Items with factor loadings over .40 on the appropriate factor with no major cross-loadings were judged as representative of the construct (Hinkin, 1998). Seventeen items remained after culling items with weak loadings, strong cross-loadings, and similar content (to avoid oversampling from a specific portion of the construct domain). Again, content validity was established through group consensus by ensuring that retained item content sampled the breadth of each dimension's definition. As a result, one intuitive item with a .389 factor loading was retained for further investigation (see Table 3).

The 17-item scale was then administered in a second independent sample (i.e., Sample 2; see Table 2 for sample description). Similar to the analyses conducted for Sample 1, EFAs again unambiguously identified two factors in Sample 2,

Table 3. Factor loadings and reliabilities across all samples.

Decision style item	Sample 1 (EFA)	Sample 2 (EFA)	Sample 3a (EFA)	Sample 3b (EFA)	Sample 4 (CFA)	Sample 5 (CFA)
Rational decision style (α)	(.83)	(.87)	(.89)	(.84)	(.82)	(.78)
I prefer to gather all the necessary information before committing to a decision.	.66	.78	.81	.73	.65	.62
I thoroughly evaluate decision alternatives before making a final choice.	.69	.78	.80	.72	.76	.60
In decision making, I take time to contemplate the pros/cons or risks/benefits of a situation.	.71	.75	.68	.78	.71	.66
Investigating the facts is an important part of my decision-making process.	.74	.74	.84	.71	.60	.65
I weigh a number of different factors when making decisions.	.68	.79	.82	.61	.71	.70
Intuitive decision style (α)	(.72)	(.83)	(.83)	(.89)	(.75)	(.73)
When making decisions, I rely mainly on my gut feelings.	.58	.81	.73	.90	.63	.64
My initial hunch about decisions is generally what I follow.	.66	.82	.78	.81	.66	.63
I make decisions based on intuition.	.69	.68	.72	.66	.68	.55
I rely on my first impressions when making decisions.	.39	.59	.70	.84	.56	.57
I weigh feelings more than analysis in making decisions.	.50	.52	.56	.69	.54	.56
Interfactor correlations	(–.16)	(–.42**)	(–.47**)	(–.43**)	(–.25**)	(–.24**)
$\chi^2(34)$					60.95**	75.81**
RMSEA					.04	.06
SRMR					.03	.05
NNFI					.97	.91
CFI					.98	.93

Note: EFA = exploratory factor analysis; CFA = confirmatory factor analysis; RMSEA = root mean square error of approximation; SRMR = standardized root mean square residual; NNFI = Non-Normed Fit Index; CFI = comparative fit index.
**$p < .01$.

accounting for 47.62% of the total item variance. Further item reductions were made based on lack of simple structure (high cross-loadings) in pattern matrices and item redundancy. Again, the final items were discussed in our research group and group consensus was reached with regard to the coverage of all definition components. After this culling process, 10 items remained (5 each for rational and intuitive styles; see Table 3). Across samples, items were normally distributed and generally not subject to range restriction and the strength of the relationship between the decision styles ranged from small ($r = -.16$) to moderate ($r = -.47$).

The factor structure of the 10-item scale was also evaluated using parallel analysis (PA). This process involved four key steps (Hayton, Allen, & Scarpello, 2004). First, a random data set with the same number of observations as Sample 2 ($N = 148$) was generated for all 10 items. Second, a principal components analysis (PCA) was conducted on the random data. Both Steps 1 and 2 were repeated 50 times, during which the eigenvalues for all 10 items from each PCA were recorded. Third, both the average and the 95th percentile eigenvalues from all 50 runs were calculated. Fourth, the eigenvalues from the actual data collected in Sample 2 were compared to both the average and the 95th percentile eigenvalues from the random data. Factors were retained if the eigenvalues from the actual data were higher than those generated in the random data.

As shown in Figure 1, the PA suggested that there were two factors in the data. The first and second eigenvalues in the actual data (4.47 and 1.83) were larger than both the first and second mean eigenvalues in the random data (1.44 and 1.29) and the first and second 95th percentile eigenvalues in the random data (1.56 and 1.37). Conversely, the third eigenvalue in the actual data (0.73) was smaller than both the third mean eigenvalue (1.18) and the 95th percentile eigenvalue (1.24) in the randomly generated data.

Test–retest reliability

Although decision styles are commonly conceptualized as patterns of habitual response to decision-making situations (e.g., Driver et al., 1990; Scott & Bruce, 1995), little empirical evidence exists regarding their stability. Therefore, it was important to assess the test–retest reliability of the newly developed scale. Using a limited sample of 88 students (Sample 3 in Table 2), the DSS was administered with either a 2- or 3-week time lag ($M = 2.49$ weeks) in between assessments. The use of a less than 2-month time lag helps to capture the dependability of the measure over time as opposed to stability (Watson, 2004). Test–retest reliability was high for both the rational ($r = .79$, $p < .01$) and intuitive ($r = .79$, $p < .01$) dimensions

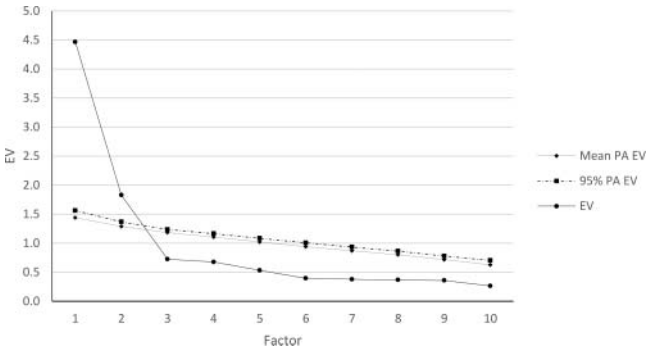

Figure 1. Parallel analysis (PA) results from Study 1. *Note:* EV = eigenvalues; Mean PA = average eigenvalues from randomly generated data; 95% PA = 95th percentile of eigenvalues from randomly generated data.

Study 2: Confirmatory factor analysis

The purpose of Study 2 was to verify the two-factor structure of the 10-item scale developed in Study 1 with confirmatory factor analyses (CFAs). These analyses were conducted using Samples 4 and 5 (see Table 2 for sample descriptions).

Method

CFAs performed with LISREL 8.80 (Jöreskog & Sörbom, 2007) and internal consistency reliability analyses were examined in two independent samples (4 and 5 in Table 3). Multiple indexes were used to examine goodness of fit (Bagozzi & Yi, 1988), including the χ^2 and relative chi-square statistics, the Non-Normed Fit Index (NNFI; Bentler & Bonett, 1980), the CFI (Bentler, 1990), the standardized root mean square residual (SRMR; Hu & Bentler, 1999), and the RMSEA (Browne & Cudeck, 1993). Values of .95 or higher for the NNFI and CFI and .06 or lower for the RMSEA and SRMR are recommended criteria for close model fit (Hu & Bentler, 1999).

Results

As shown in Table 3, fit indexes were generally at or above recommended standards across both samples. Exceptions to this were the NNFI and CFI in Sample 5, which were below the recommended cutoff of .95 (Hu & Bentler, 1999) but above a .90 cutoff (Bentler & Bonett, 1980). Our model evaluation was based on a set of various indexes as opposed to any one index (Gerbing & Anderson, 1992). Given the trends across these indexes, the DSS best conforms to a two-factor structure. The rational and intuitive dimensions of decision styles therefore seem to be both theoretically and empirically distinguishable.

Study 3: Convergent and discriminant validity

Data on discriminant and convergent validity for Study 3 were obtained from Samples 4 and 5 (see Table 2 for sample descriptions). As construct validation requires tests of both convergent and discriminant validity (Campbell & Fiske, 1959), we identified constructs theorized to be positively, negatively, or unrelated to rational and intuitive decision styles. To position decision styles in the broader domain of decision making and psychological research, we examined the relationship between decision styles and decision making individual differences and the International Personality Item Pool (IPIP) Big Five personality traits.

Based on previous research (e.g., Cursau & Schruijer, 2012; Loo, 2000; Thunholm, 2004), we did not expect decision style to be significantly related to personal characteristics such as age, gender, or index of cognitive ability (grade-point average [GPA]). Although women are anecdotally assumed to have greater intuition, decision style research has not found support

for this claim (e.g., Baiocco et al., 2009, $\eta^2 = .01$; Curseu & Schruijer, 2012, $r = -.03$; Sadler-Smith, 2011, $r = .11$).

Decision-making individual differences

An important aspect of the validation was to demonstrate that decision styles are convergent, but nonredundant, with other decision-making individual differences. In terms of convergent validity, we expected that a DSS rational style would be positively correlated with rational ability (capacity to think analytically) and rational engagement (reliance on and enjoyment of thinking logically; Pacini & Epstein, 1999). Similarly, we predicted that an intuitive style on the DSS would be positively correlated with experiential ability (capacity to rely on impressions and feelings) and experiential engagement (reliance on and enjoyment of feelings and intuitions; Pacini & Epstein, 1999). However, the two sets of constructs are nonredundant in that rational and intuitive styles on the DSS encompass a narrower focus on decision making, whereas rational and experiential ability and engagement broaden to include general modes of thinking and problem solving (e.g., "I'm not that good at figuring out complicated problems"; "I tend to use my heart as a guide for my actions"; Pacini & Epstein, 1999).

Likewise, decision styles are a subset of linear and nonlinear thinking styles, which capture a multidimensional set of dynamics, including creativity, life changes, and information processing (Vance, Groves, Paik, & Kindler, 2007). The main difference between these individual differences is the breadth of the constructs, with linear and nonlinear thinking styles representing a broader domain that relates to various elements of information processing than decision styles, which are narrowly focused on decision-making behaviors. We expected that linear thinking (preference for selecting external data and facts and processing this information through analysis and reason) would correlate positively with a rational style on the DSS (but not so highly as to suggest redundancy). Nonlinear thinking (preference for attending to internal feelings and processing through hunches and intuition) was predicted to correlate positively with an intuitive style on the DSS.

It was also expected that individuals with a rational style on the DSS would report more decision-making self-efficacy (belief in one's capability to make good decisions; Creed, Patton, & Bartrum, 2004) than individuals who report an intuitive style on the DSS. Reasons for this relationship are twofold. First, because a systematic approach to decision making involving information gathering, considering various alternatives, and thorough evaluation are commonly prescribed as normative (e.g., Milkman, Chugh, & Bazerman, 2009; Nutt, 2002), it is likely that rational style individuals will convey confidence in their decision-making abilities. Second, research has shown that exerting higher effort on a task can result in higher levels of satisfaction and perceptions of competence (Waterman, 2005).

Maximizing and satisficing were expected to exhibit discriminant validity with decision styles. Whereas maximizers optimize or use "the best" as a criterion by which to make decisions and employ an "exhaustive search and decision procedure," satisficers use "good enough" as a criterion when making decisions and choose a lower threshold of acceptability (Schwartz et al., 2002, p. 1193). Although a rational style is characterized by a thorough search for information and systematic evaluation of potential alternatives, maximizers continue to search to the point of paralysis (Purvis, Howell, & Iyer, 2011). Because maximizing has been identified as maladaptive across studies (e.g., Bruine de Bruin et al., 2007; Parker, Bruine de Bruin, & Fischhoff, 2007; Purvis et al., 2011; Schwartz et al., 2002), whereas rational and intuitive styles are viewed more neutrally, it was predicted that these individual differences would not be significantly related.

IPIP Big Five personality traits

We expected that the new DSS would be nonredundant with the IPIP Big Five personality inventory. As such, extraversion, neuroticism, and agreeableness were not predicted to correlate significantly with rational or intuitive styles on the DSS (Goldberg, 1990). Described as planful, thorough, self-disciplined, goal-driven, organized, and achievement-oriented (Barrick & Mount, 1991; Goldberg, 1990), conscientious individuals overlap with some of the characteristics of rational decision makers; therefore, we hypothesized a positive relationship. Because intuitive styles rely on decision-making processes that are distinctly different from normative decision-making practices (Milkman et al., 2009; Nutt, 2002), it was expected that individuals high on openness to experience (creative, curious, imaginative, original, and cultured with wide interests; Goldberg, 1990; Hough, 1992) would score higher on an intuitive style. In addition, openness to experience individuals' tendency to engage in divergent thinking (i.e., idea generation) might go against the convergent thinking (i.e., narrow down to one choice) in which rational decision makers tend to engage (McCrae, 1987).

Measures

The measures used to establish discriminant and convergent validity are described next. Unless otherwise noted, participants responded to items on a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). All alpha levels reported are derived from data collected in this study.

Rational/experiential ability and engagement

Participants completed the revised 40-item Rational-Experiential Inventory (REI; Pacini & Epstein, 1999), which is made up of four subscales containing 10 items each: rational ability ($\alpha = .87$), rational engagement ($\alpha = .85$), experiential ability ($\alpha = .80$), and experiential engagement ($\alpha = .82$). Sample items for the rationality scales included, "I have no problem thinking things through carefully" (ability) and "I enjoy intellectual challenges" (engagement). Examples from the experiential scales are, "I can usually feel when a person is right or wrong, even if I can't explain how I know" (ability) and "I tend to use my heart as a guide for my actions" (engagement).

Linear and nonlinear decision making

Participants completed the 10-item Linear–Nonlinear Thinking Style scale developed by Vance and colleagues (2007).

Respondents were asked to rate themselves on items such as "When making important decisions, I pay close attention to when a number of people with well-justified expertise give me the same advice" (linear) and "When making important decisions, I pay close attention when I experience a 'knowing in my bones,' chills, tingling or other physical sensations" (nonlinear). Cronbach's alpha was .60 for linear (5 items) and .67 for nonlinear (5 items) decision-making scales.

Decision-making self-efficacy

Participants completed the 5-item Decision Making Self-Efficacy Scale adapted from Jones (1986). Items had an internal consistency reliability of .85. A sample item is "I am confident in my ability to make effective decisions."

Maximizing

Participants completed the 12-item Maximization scale developed by Schwartz and colleagues (2002). A sample item is, "When I watch TV, I channel surf, often scanning through the options even while attempting to watch one program." Cronbach's alpha was .64.

IPIP Big Five personality traits

Participants completed the 50-item International Personality Item Pool Big Five personality scale assessing extraversion (α = .89), conscientiousness (α = .81), openness to experience (α = .77), agreeableness (α = .83), and neuroticism (α = .88; Goldberg, 1999; International Personality Item Pool, 2001). Scale anchors ranged from 1 (*very inaccurate)* to 5 (*very accurate).*

Results

As shown in Table 4, the pattern of correlations helps to support both discriminant and convergent validity across the DSS rational and intuitive styles. As expected, age, gender, and cognitive ability were not significantly related to either DSS subscale. GPA had a small to moderate positive correlation with the DSS rational style.

Our results provide initial evidence that suggests that the DSS is convergent with, but distinct from, other decision-making individual differences. As predicted, REI rational ability and engagement were positively associated with a DSS rational style and negatively associated with a DSS intuitive style. Likewise, REI experiential ability and engagement were positively related to a DSS intuitive style, but not significantly related to a DSS rational style. Also consistent with expectations, linear thinking correlated positively with DSS rational style and negatively with DSS intuitive style. Similarly, nonlinear thinking correlated positively with DSS intuitive style but did not correlate significantly with DSS rational style. DSS rational styles reported higher decision-making self-efficacy and higher maximizing orientation.

Results also indicated that the DSS is nonredundant with the popular IPIP Big Five personality inventory. As hypothesized, conscientiousness exhibited a positive relationship with a DSS rational style. Neuroticism and extraversion were also not significantly correlated with rational or intuitive styles on the DSS.

Table 4. Convergent and discriminant validity predictions and results.

	Rational decision style		Intuitive decision style		
Correlate	Prediction	Finding	Prediction	Finding	*N*
Demographics /personal characteristics					
Gender (1 = male, 2 = female)	0	.02	0	.07	535
Age	0	.03	0	−.01	535
GPA	0	.15**	0	−.05	535
Decision-making individual differences					
Rational ability	+	.34**	−	−.27**	306
Rational engagement	+	.37**	−	−.20**	306
Experiential ability	−	.10	+	.38**	306
Experiential engagement	−	−.04	+	.45**	306
Linear decision making	+	.42**	−	−.35**	306
Nonlinear decision making	−	.03	+	.46**	306
Decision making self-efficacy	+	.23**	0	−.05	535
Maximizing orientation	0	.12**	0	.03	535
Big Five traits					
Conscientiousness	+	.37**	0	−.07	535
Openness to experience	−	.24**	+	.02	535
Extraversion	0	.05	0	.08	535
Agreeableness	0	.24**	0	.05	535
Neuroticism	0	−.01	0	.09	535

Note. GPA = grade-point average; + = positive relationship hypothesized; − = negative relationship hypothesized; 0 = no relationship hypothesized.
**$p < .01$.

Contrary to predictions, a DSS rational style was positively correlated with openness to experience and agreeableness.

Discussion

Despite intuitive appeal, decision styles have received little systematic scholarly attention in the decision-making literature (e.g., Dalal & Brooks, 2013; Mohammed & Schwall, 2009). Based on a limited number of studies (e.g., Crossley & Highhouse, 2005; Russ et al., 1996; Thunholm, 2008), decision-making style appears to be a meaningful and potentially important construct that warrants further attention. However, for its promise to be fully realized, attention must be devoted to measurement. In response to the weaknesses of extant measures, the purpose of this research was to develop and validate an improved decision style measure. As such, our first goal was to develop a concise measure that would capture a broad conceptual range of rational and intuitive styles. Our second goal was to assess the construct validity of decision styles, using a more expansive range of decision-making correlates within a nomological network than have been reported in other studies (e.g., Loo, 2000; Scott & Bruce, 1995; Thunholm, 2004).

We developed a 10-item DSS representing rational and intuitive dimensions. Across five independent samples, the dimensionality and reliability of the DSS was evaluated. These results show that the scale has a clear factor structure and high internal consistency. In addition, results from the expected patterns of correlations across decision-making individual differences and IPIP Big Five traits lend support to the convergent and discriminant validity of the DSS. The overall pattern of results across five samples provides preliminary support for the construct validity of the DSS.

Explanation of unexpected findings

Even though many of our hypotheses in Study 3 were supported, a few were not. Among the unexpected findings, an interesting pattern of relationships was seen between the DSS and the decision-making individual differences. We originally hypothesized and found that the decision-making individual differences experiential ability, experiential engagement, and nonlinear decision making were positively related to intuitive decision styles. However, instead of these individual differences being negatively related to rational decision styles, our findings show that these relationships were weak and nonsignificant. The asymmetry of these findings provides additional confirmation that rational and intuitive decision styles are two orthogonal constructs, instead of two ends of the same continuum.

It is also noteworthy that all rational related constructs (rational ability, rational engagement, linear decision making) are associated with both rational and intuitive decision styles but all intuitive related constructs (experiential ability, experiential engagement, and nonlinear decision making) are associated with only intuitive (not rational) decision styles. That is, individuals with a greater ability or tendency to process information rationally or linearly are less likely to be intuitive decision makers, but individuals with a greater ability or tendency to process information intuitively (or experientially) or nonlinearly can be either rational or irrational decision makers.

The literature on intuition provides some explanations for this finding by its distinction between two types of intuition: *heuristic-based* (Tversky & Kahneman, 1974) and *expertise-based* (Kahneman, 2011; Salas, Rosen, & DiazGranados, 2010). On the one hand, heuristic-based intuition relies on using a simplifying heuristic to make a difficult judgment. This type of intuition is not based on processes related to rational decision making, such as systematic information gathering, considering various alternatives, or thorough evaluation. On the other hand, expertise-based intuition relies on the application of one's knowledge and experience in a particular domain. This type of intuition is based on processes related to rational decision making. The quick judgments that characterize this decision-making style are born out of repeated engagement in rational decision-making processes (i.e., systematic information gathering, considering various alternatives, or thorough evaluation) in a specific area or topic. Whereas decision makers relying on heuristic-based intuition would not be able to provide a clear rationale behind their decisions (i.e., *irrational intuitive decision makers*), decision makers relying on expertise-based intuition would be able to retrieve the rationale behind their decisions (i.e., *rational intuitive decision makers*). This duality in the nature of intuition helps to explain the associations found between intuitive correlates and only intuitive decision styles and between rational correlates and both rational and intuitive decision styles.

Finally, the observed relationships between openness to experience and rational decision style and agreeableness and rational decision style were unexpected. It is possible that rational decision makers' tendency to systematically gather and evaluate all relevant information makes them more receptive to new information, ideas, and opinions that would otherwise be screened out by irrational decision makers (McCrae,1994). Supporting this rationale, in McCrae's (1994) theorization about openness to experience, he noted that, "As Rokeach (1960) argued, closed individuals have beliefs that are tightly compartmentalized, not easily affected by contradictory beliefs or by corrective information (Davies, 1993). Open individuals by contrast, have more flexible attitudes" (McCrae, 1994, p. 258). High openness individuals' flexible attitudes toward new information are reflected in rational decision makers' through evaluation of choices.

With regard to agreeableness, Costa, McCrae, and Dye (1991) identified six facets of agreeableness: trust, straightforwardness, altruism, compliance, modesty, and tender-mindedness. These are considered positive traits related to interpersonal relationships. We suspect that although agreeableness would not influence a person's levels of rational decision style, a rational decision maker might decide to behave in ways that are consistent with high agreeableness because he or she sees the benefits of these behaviors on interpersonal relationships.

Research and practical implications

Extant research on decision styles has been criticized as being unsystematic (Appelt et al., 2011) and scattered (Mohammed & Schwall, 2009), with a "regrettable lack of theory and validation" (Dalal & Brooks, 2013, p. 85). Toward improving the state of science in this area, the creation of a psychometrically sound scale is a first step toward encouraging empirical work in research domains where decision styles can be expected to have important implications. Decision styles research complements work on intuitive and analysis modes of cognitive processing (e.g., Hammond et al., 1997; Kahneman, 2011) by introducing individual differences into this important domain. The decision-making literature has been faulted for underemphasizing individual differences (Appelt et al., 2011; Mohammed & Schwall, 2009), so developing a reliable and valid DSS provides a valuable tool to help remedy this regrettable research gap.

Decision styles can also contribute to research on team processes and outcomes.

Because many group tasks require that members make decisions and come to agreement on plans and ideas, decision-making style is likely to emerge as a salient characteristic in a group's life span. However, as both decision styles have strengths and weaknesses, the combination of intuitive and rational decision styles might lead to better decisions than either method alone (Crossley & Highhouse, 2005). Therefore, researchers should examine how decision styles interact with one another to affect behaviors and outcomes (e.g., Singh & Greenhaus, 2004). As a measurement tool, the new DSS can contribute to increased insight into the effects of decision style composition on team outcomes.

In terms of practice, the DSS can be used to better understand how individuals manage difficult situations. Namely, decision styles have been associated with how individuals cope with regret (Ueichi & Kusumi, 2004), resilience (Ahmed, 2015), and stress (Thunholm, 2008). Decision styles have also been associated with psychological conditions, such as depression (Di Schiena, Luminet, Chang, & Philippot, 2013; Leykin &

DeRubeis, 2010) and clinical paranoia (Freeman, Lister, & Evans, 2014). Understanding the decision styles of patients could therefore prove beneficial in being able to develop better individualized treatment plans for patients.

The DSS could also be used in training programs to educate individuals about the strengths and weaknesses of their personal style and how to manage challenges effectively (e.g., Driver et al., 1996). Furthermore, the DSS could be used to select employees whose styles fit the requirements of a job, once better insight is established on the match between decision style and job requirements. Decision support systems are extensively used to guide decision making and avoid biases in industries such as health care (e.g., to make diagnoses) and finance (e.g., to identify candidates for loans). Although research is needed, it is plausible that managers with intuitive decision styles might have more difficulty adjusting to the use of decision support systems because they are deliberately structured after a rational decision-making model.

Limitations and future research

Despite the promising potential of the DSS, several limitations need to be acknowledged. The exclusive use of student samples in a university setting might have contributed to an overrepresentation of the rational decision style and an underrepresentation of the intuitive decision style. A college-level education might help to train and encourage the use of a systematic approach to evaluating information and making decisions that is characteristic of rational decision making. Individuals who do not receive such training might tend to rely on their gut or hunches more when making decisions. Previous research has also shown that older individuals (M age = 75.00) tend to rely on their intuition more than younger individuals (M age = 20.00) because of their decreasing deliberative faculties (Mikels, Cheung, Cone, & Gilovich, 2013). The pattern of means across five samples evidenced similar means and standard deviations for both styles, suggesting that the intuitive style was not subject to greater range restriction than the rational style. However, there were clearly restrictions in age and level of education in the overall sample. Additional research should expand data collection to include organizational samples representing a diversity of professions that encompass older age groups and more varied levels of education.

When evaluating convergent and discriminant validity, GPA was used as a proxy for cognitive ability. Even though GPA has been used to represent cognitive ability in previous research (e.g., Brown & Campion, 1994; Lahmers & Zulauf, 2000; Valacich, Jung, & Looney, 2006) there are some limitations to this approach. Unlike cognitive ability, GPA can be affected by a host of extraneous variables, such as instructor grading variations, student motivation, and student time management skills. Future research evaluating the discriminant validity of the DSS should use more precise metrics to assess cognitive ability.

Test–retest reliability across 2- and 3-week time spans suggested that decision style is stable over short periods of time. However, a longer period is needed for a more complete assessment of temporal stability, especially because there is conceptual disagreement regarding the stability of decision styles. Whereas some authors view decision styles as personality-based (e.g., Rowe & Boulgarides, 1992), others view them as a learned, habit-based propensity to make decisions in a certain way (Driver et al., 1990). Clearly, the extent to which decision styles are flexible and capable of modification is in need of further research.

In addition to temporal malleability, future empirical work should investigate the situational specificity of decision styles. According to Payne (1982), the expression as well as the effectiveness of rational or intuitive styles is likely to be dependent on situational characteristics. For example, even if an individual possessed more of a rational style, extreme time pressure would tend to inhibit trait expression and make the utilization of this decision style dysfunctional. Therefore, high time pressure could constitute a strong situation, minimizing the differences between decision styles, whereas low time pressure could allow more room for decision styles to manifest.

In keeping with recommendations made by Hinkin (1998), future research should also evaluate the predictive validity of the scale. This process would involve showing the incremental validity of the scale over existing scales on decision styles. It is likely that the efficacy of rational and intuitive decision styles could vary based on the type of outcome evaluated. Promising outcomes that might help to highlight the unique strengths of each style include speed (Russ et al., 1996), creativity (Dane & Pratt, 2007), and the avoidance of fallacies in the decision-making process (e.g., resistance to sunk costs; Arkes & Blumer, 1985).

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Appendix:

Rational and intuitive decision style scale items

The following questions relate to how you make decisions.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral (Neither agree nor disagree)	Agree	Strongly Agree

There are no "right" or "wrong" answers, so please state your opinion as honestly as possible. Using the scale below, please indicate the extent to which you agree or disagree with the statements. **Describe how you are now, not as you wish to be in the future.**

Rational items

1. I prefer to gather all the necessary information before committing to a decision.
2. I thoroughly evaluate decision alternatives before making a final choice.
3. In decision making, I take time to contemplate the pros/cons or risks/benefits of a situation.
4. Investigating the facts is an important part of my decision-making process.
5. I weigh a number of different factors when making decisions.

Intuitive items

1. When making decisions, I rely mainly on my gut feelings.
2. My initial hunch about decisions is generally what I follow.
3. I make decisions based on intuition.
4. I rely on my first impressions when making decisions.
5. I weigh feelings more than analysis in making decisions.