

Development and Validation of a New Measure of Intuition: The Types of Intuition Scale[†]

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ABSTRACT

The Types of Intuition Scale (TIntS) measures three types of intuition identified in a literature review by Pretz and Totz (2007): holistic, inferential, and affective. Holistic intuitions integrate diverse sources of information in a Gestalt-like, non-analytical manner; inferential intuitions are based on previously analytical processes that have become automatic; and affective intuitions are based on feelings. Current intuition measures inadequately assess these distinct types. We report four validity studies: Study 1 reports the reliability and factor structure of the TIntS and correlations with extant intuition and personality measures. Study 2 presents a confirmatory factor analysis. Studies 3 and 4 examine the predictive validity of the TIntS with respect to clinical decision making in occupational therapy and musical performance. Scales were internally consistent and stable over time, and factor analyses supported the predicted distinctions among them. Correlations with existing measures of intuition, personality, and behavior showed that the TIntS is unique in its assessment of all three types of intuition in one measure. Copyright © 2014 John Wiley & Sons, Ltd.

KEY WORDS intuition; judgment; decision making; cognitive style; personality

THREE TYPES OF INTUITION

“Intuition” refers to concepts ranging from gut feelings to snap judgments to premonitions about the future. We present a new measure of intuition, the Types of Intuition Scale (TIntS), based on the theoretical view of intuition as three distinct types: holistic, inferential, and affective. Holistic intuitions are judgments based on a qualitatively non-analytical process, decisions made by integrating multiple, diverse cues into a whole that may or may not be explicit in nature. Inferential intuitions are judgments based on automated inferences, decision-making processes that were once analytical but have become intuitive with practice. Affective intuitions are judgments based primarily on emotional reactions to decision situations. These three types were previously outlined in an empirical and theoretical analysis of current and historical work on intuition (Pretz & Totz, 2007).

Theoretical views of intuition

Many researchers have emphasized the holistic nature of intuition. Jung (1971) described intuition as an unconscious, primary mode of perception. Intuitive individuals are inward-

focused, processing information in a holistic manner, in contrast to sensate individuals whose processing is grounded in outward sensory experience. Hammond (1996) also viewed intuitive judgments as the result of a holistic process, comparing intuition to perception. Just as Brunswik (1956) described perception as the integration of multiple visual cues, Hammond argued that intuition is based on the holistic integration of diverse informational cues in the environment. This process yields intuitive judgments that are produced quickly and without awareness. According to the Unconscious Thought Theory, these holistic judgments may be superior to analytic judgments under certain circumstances because holistic processing is not limited in the way that working memory constrains the capacity of the analytic mode of processing (Dijksterhuis & Nordgren, 2006).

Inferential intuition, in contrast, corresponds to intuitive judgments based on automated analyses. Westcott (1968) described intuitive processing involving “intuitive leaps,” the result of previously analytical processing that had become automatic with practice. Westcott’s participants were considered intuitive when they could predict a pattern in a series with few clues. That is, intuition was defined as accurate judgment in the absence of complete information. This type of intuition is inferential and characterizes expert judgment. Expert knowledge is chunked in meaningful patterns based on vast stores of knowledge in relevant situations (e.g., Chase & Simon, 1973), allowing experts to skip steps in their cognitive process. Intuition in decision making is most accurate when experience has been acquired in a “kind” environment, one that provides clear and immediate feedback about the accuracy of judgments (Hogarth, 2001). Once expertise has been established, inferential intuitions may be considered highly reliable.

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Affective aspects of intuition have been emphasized by several researchers. Bastick (1982) viewed intuition as a feeling of certainty or confidence in a judgment, regardless of any explicit, rational support for the intuitive belief. Epstein's (1994) theoretical perspective also assumed that the implicit, intuitive system is involved in emotional processing, whereas the explicit, analytical system is not. Yet, others who hold a dual process view have hesitated to consider the affective nature of intuition as a necessary component of the construct (e.g., Hogarth, 2001). Neuroscientific evidence has shown that emotional processing has a critical impact on decision making (Bechara, Damasio, & Damasio, 2000). Individuals with brain damage in the ventromedial prefrontal cortex failed to exhibit typical learning on the Iowa Gambling Task, a task that relies on implicit learning. Such individuals have also been shown to lack the typical skin conductance response in anticipation of risky choices in the task, suggesting that their decision-making processes are related to a deficit in emotional processing. Affect certainly plays a role in intuitive decision making, and we should "acknowledge that our emotions are part of our intuitive apparatus and treat them as data" (Hogarth, 2001, p. 210).

Intuition has become a hot topic in cognitive and social psychology in the past few decades. Researchers have emphasized its limitations (Tversky & Kahneman, 1974) as well as its strengths (Gigerenzer, 2008). Recent work has begun to identify variables that affect the validity of intuition, including task complexity and expertise (e.g., Hogarth, 2001; Kahneman & Klein, 2009; Pretz, 2008). Many researchers have concluded that intuition will be better understood when its definition is clarified and better understood in the context of other cognitive processes.

Dual process theorists place intuition in contrast with analysis (e.g., Epstein, 1994; Hogarth, 2001). Such theories propose two distinct modes of cognition, referred to as System 1 and System 2, implicit and explicit, or intuitive and analytical. The intuitive system is characterized by processing that is holistic, implicit, automatic, affective, and nonconscious. The analytical system, in contrast, is based on analytic, explicit, effortful, and conscious processing. Hogarth (2001) described intuitions as "...reached with little apparent effort, and typically without conscious awareness. They involve little or no conscious deliberation" (p. 14). Glöckner and Witteman (2010) have argued that the dual process view should be further articulated to distinguish among various types of cognitive processes underlying the intuitive mode. Specifically, they suggest that intuition may result from one or more of four different (but overlapping) processes. Associative intuition is based on simple learning-retrieval processes (e.g., conditioning and affective arousal). Matching intuition is based on learning and retrieval of exemplars. Accumulative intuition is based on the automatic weighted integration of associative or exemplar learning, and constructive intuition is based on a more top-down constructive process, including use of mental representations.

We agree with Glöckner and Witteman (2010) that intuition is not a unitary construct. We differentiate among affective, holistic, and inferential types of processing in the intuitive mode. Affective intuition is most similar to

associative intuition, and inferential intuition is most similar to constructive intuition in the sense that inferential intuition is based on expertise that consists of well-developed schemas or mental representations of knowledge. Holistic intuition may be best compared with accumulative intuition in that it is theoretically based on a primarily bottom-up process and depends on a data-driven, holistic integration of diverse cues. Our view is that these types of intuition are distinct, may rely on different cognitive mechanisms, and lead to different outcomes (see Pretz, 2011, for more detail).

Measurement of intuition

There are several extant measures of self-reported preference for intuition. The well-known Myers-Briggs Type Indicator (MBTI; Myers, McCaulley, Quenk, & Hammer, 1998) is based on Jungian theory. On the Intuitive/Sensate scale items, individuals indicate their preference for theory (intuitive) over fact (sensate) and the abstract (intuitive) over the concrete (sensate). This scale may reflect the holistic or inferential types of intuition. The affective aspect of intuitive decision making is assessed by the Thinking/Feeling scale, which assesses reliance on the heart (feeling) over the head (thinking) in decision making.

A newer measure of intuition is the Rational Experiential Inventory (REI; Pacini & Epstein, 1999). The REI, based on Epstein's dual process theory, measures preferences to engage in rational (analytical) and experiential (intuitive) processing as well as self-reported ability to use each mode. The REI has shown reliability and validity across multiple samples (Witteman, van den Bercken, Claes, & Godoy, 2009). However, the REI Experiential scale does not explicitly distinguish among affective, holistic, and inferential processing. There are several other recent measures of intuition, including the Perceived Modes of Processing Inventory (Burns & D'Zurilla, 1999), Intuitive Behavior Questionnaire (Raidl & Lubart, 2000–2001), and the Preference for Intuition and Deliberation Scale (Betsch, 2004, 2008). The MBTI and REI were selected for use in this study because, when considered together, they theoretically measure multiple aspects of intuition and have been shown to be psychometrically strong in past research.

Pretz and Totz (2007) conducted a study to determine whether the MBTI and REI were measuring intuition as a single construct or whether each assessed variants of the construct. Item factor analysis showed that the REI Experiential scale was correlated with continuous scores on both MBTI Intuition and MBTI Feeling, but that MBTI Intuition was just as strongly correlated with REI Rational Favorability. Item analyses showed that MBTI Intuition reflected holistic intuition, whereas REI Experiential assessed automatic and affective intuition, supporting our theoretical view that affective, holistic, and inferential are distinct types of intuition.

Despite theoretical and empirical support for the three types of intuition, no single inventory exists to measure all three. Therefore, a new inventory, the TIntS, was created as a more comprehensive measure of intuition. Here, we report on the reliability and validity of the TIntS.

Scale development

Prior to the studies reported here, preliminary versions of the TIntS were administered to three independent samples totaling 802 participants, primarily college students. Items on each scale were evaluated using principal axis factor analysis and item–total correlations. Items retained for subsequent versions of the measure had corrected item–total correlations $\geq .20$ and loadings $\geq .30$ on their respective “target” factors. New items were written to better reflect the core concept of the type of intuition measured by the retained items from each scale prior to administering the measure to the next sample. After reducing the TIntS scales to 29 items, we conducted further validation studies of the measure.

STUDY 1

The 29-item version of the TIntS consisted of 8 Holistic, 12 Inferential, and 9 Affective items (Table 1). To assess the convergent and discriminant validity of the TIntS scales, we administered additional measures of intuition and personality. Predictions were derived from theory and prior research on the REI and MBTI (Pretz & Totz, 2007).

Relationship with existing measures of intuition

We expected the strongest correlations between Holistic Intuition and MBTI Intuition, and Affective Intuition and MBTI Feeling. All three types of intuition were expected to correlate with REI Experiential.

Relationship with openness to experience

Prior research found a positive correlation between openness to experience and MBTI Intuition (Langan-Fox & Shirley, 2003; McCrae & Costa, 1989) and to a slightly lesser extent, between openness to experience and REI Experiential (Pacini & Epstein, 1999). Given the theoretical prediction that MBTI Intuition is more strongly characterized by holistic intuition, Holistic scores were expected to be more strongly correlated with openness to experience than the other types of intuition. Specifically, we predicted that holistic intuition would correlate with the openness facet of the construct (esthetics, imagination, and fantasy) but not the intellect facet (quickness, ingenuity, and ideas) (Kaufman et al., 2010; McCrae, 1994).

Relationship with extraversion

Because extraversion was found to be more strongly related to MBTI Intuition (Langan-Fox & Shirley, 2003; McCrae

Table 1. Types of Intuition Scale (TIntS) items

We are interested in how you make decisions and solve problems in your life. Read each of the following statements and rate the extent to which you would agree that that statement is true of you using the scale below. These items have no right or wrong answers; just respond based on what is true for you.

	1	2	3	4	5
	Definitely false	Mostly false	Undecided (neither true nor false)	Mostly true	Definitely true
_____ 1. When tackling a new project, I concentrate on big ideas rather than the details. (HB)					
_____ 2. I trust my intuitions, especially in familiar situations. (I)					
_____ 3. I prefer to use my emotional hunches to deal with a problem, rather than thinking about it. (A)					
_____ 4. Familiar problems can often be solved intuitively. (I)					
_____ 5. It is better to break a problem into parts than to focus on the big picture. (R) (HB) ^b					
_____ 6. There is a logical justification for most of my intuitive judgments. (I)					
_____ 7. I rarely allow my emotional reactions to override logic. (R) (A)					
_____ 8. My approach to problem solving relies heavily on my past experience. (I) ^a					
_____ 9. I tend to use my heart as a guide for my actions. (A)					
_____ 10. My intuitions come to me very quickly. (I)					
_____ 11. I would rather think in terms of theories than facts. (HA)					
_____ 12. My intuitions are based on my experience. (I)					
_____ 13. I often make decisions based on my gut feelings, even when the decision is contrary to objective information. (A)					
_____ 14. When working on a complex problem or decision I tend to focus on the details and lose sight of the big picture. (R) (HB)					
_____ 15. When making decisions, I value my feelings and hunches just as much as I value facts. (A) ^a					
_____ 16. I believe in trusting my hunches. (A)					
_____ 17. When I have experience or knowledge about a problem, I trust my intuitions. (I) ^a					
_____ 18. I prefer concrete facts over abstract theories. (R) (HA)					
_____ 19. When making a quick decision in my area of expertise, I can justify the decision logically. (I)					
_____ 20. I generally don't depend on my feelings to help me make decisions. (R) (A)					
_____ 21. I've had enough experience to know what I need to do most of the time without trying to figure it out from scratch every time. (I) ^a					
_____ 22. If I have to, I can usually give reasons for my intuitions. (I)					
_____ 23. I prefer to follow my head rather than my heart. (R) (A)					
_____ 24. I enjoy thinking in abstract terms. (HA)					
_____ 25. I rarely trust my intuition in my area of expertise. (R) (I) ^a					
_____ 26. I try to keep in mind the big picture when working on a complex problem. (HB)					
_____ 27. When I make intuitive decisions, I can usually explain the logic behind my decision. (I)					
_____ 28. It is foolish to base important decisions on feelings. (R) (A)					
_____ 29. I am a “big picture” person. (HB)					

Note: Scores on items followed with an “R” are reversed. HB, Holistic–Big Picture; HA, Holistic–Abstract; I, Inferential; A, Affective.

^aItem was not included in the TIntS24 or TIntS23.

^bItem was not included in the final 23-item TIntS.

& Costa, 1989) than REI Experiential (Pacini & Epstein, 1999), a stronger relationship was expected between extraversion and holistic intuition as compared with the other types.

Relationship with other individual difference variables

Prior research regarding the relationship between intuition and agreeableness, neuroticism, and conscientiousness has yielded weak or inconsistent patterns of relationships, so no predictions were made with respect to those constructs.

Method

Participants

Undergraduate participants ($N=261$; 162 women, 96 men, and 3 who did not report gender; M age = 18.91, $SD=1.00$) from two small Midwestern universities received research credit for participation. Two to 6 weeks prior to completing the TIntS, 53 of these students also completed a paper–pencil version in a group testing session to enable us to calculate test–retest reliability of the measure.

Materials and procedure

Participants completed all measures individually or in small groups in a classroom. Each session lasted 45 to 60 minutes.

Rational Experiential Inventory (Pacini & Epstein, 1999). The REI measured ability and favorability in rational and experiential thinking using two 20-item scales. Mean scores were calculated from responses to a 5-point Likert scale (Rational $\alpha = .89$; Experiential $\alpha = .90$).

Myers–Briggs Type Indicator (Myers et al., 1998). The MBTI Intuition/Sensate (26 items, $\alpha = .93$) and Thinking/Feeling (24 items, $\alpha = .92$) scales were administered. Items were forced-choice questions to which participants gave either an “intuitive” or “sensate” response or a “thinking” or “feeling” response, and responses were summed to form a continuous score on each scale. Higher scores reflect preference for intuition and preference for feeling.

Big Five Aspect Scales (DeYoung, Quilty, & Peterson, 2007). This 100-item personality inventory included 10 items for each of two aspects of each Big Five personality trait: Neuroticism, Agreeableness, Conscientiousness, Extraversion, and Openness. Mean scores were calculated from 5-point Likert scale responses (all $\alpha \geq .83$).

Results

Factor structure of the Types of Intuition Scale

We examined item–total correlations and item factor loadings for the 29 TIntS items. Distributions for all 29 items were normal; no items had skewnesses $\geq |1.00|$, and all but two items had corrected item–total correlations above .30. Five items failed to load clearly onto their target factors in any exploratory factor analyses, so they were removed from the measure. This resulted in a 24-item measure whose statistics are reported in Table 2.

We conducted a principal axis factor analysis on the 24 items. A parallel analysis with 800 replications indicated five factors. However, parallel analyses of correlation matrices with squared multiple correlations on the diagonal tend to result in overfactoring (Buja & Eyuboglu, 1992), and Velicer’s (1976) minimum average partial test recommended four factors. Therefore, four factors, accounting for 45.19% of the common variance, were retained. Rotation to oblique simple structure (Promax) revealed generally low interfactor correlations (mean $r = .14$), so an orthogonal rotation (Varimax) was used to display the final solution in Table 2. Examination of the four-factor solution showed that the third and fourth factors corresponded to two parts of the Holistic scale: the third factor contained loadings from five Holistic items that referred to preference for the “big picture,” and the fourth factor reflected the remaining three Holistic items, referring to preference for “abstract” thinking. All 24 items had loadings $>.35$ on their target factor, and all cross-loadings were $<.30$.

Scale descriptives

Scale scores were calculated using the 24-item TIntS: 5 Holistic–Big Picture, 3 Holistic–Abstract, 8 Inferential, and 8 Affective. Descriptive statistics and internal consistency reliabilities (Cronbach’s α) for the TIntS scales and validation measures are displayed in Table 3. TIntS scores were calculated by averaging responses to all items on each scale. TIntS scores were normally distributed. All α s were $\geq .70$, and correlations among the three scales were low (r ’s from .023 to .153) with the exception of Affective and Holistic–Abstract ($r = .298$, $p < .001$). All three scales showed good test–retest reliability: r ’s were .547, .739, .594, and .873 for Holistic–Big Picture, Holistic–Abstract, Inferential, and Affective, respectively. The means on the three TIntS scales showed no differences between students who completed the measure during the pre-test session and those who completed it only during the main study session.

Relationship with existing intuition measures

Correlations of the TIntS scales with the REI and MBTI (Table 4) largely confirmed predictions: (i) As expected, Holistic–Abstract intuition correlated most strongly with MBTI Intuition, $r = .646$, and Affective intuition correlated with MBTI Feeling, $r = .441$. (ii) All three types of intuition were expected to correlate with REI Experiential scores. This was not the case for Holistic–Big Picture intuition ($r = .034$, ns), but Holistic–Abstract, Inferential, and Affective intuition were significantly and positively related with REI Experiential, r ’s = .208, .408, and .775, respectively. Holistic–Abstract intuition was positively related to Rational Favorability ($r = .380$), a relationship that has been found previously with MBTI Intuition (Pretz & Totz, 2007). Although fewer predictions were made with respect to Inferential intuition, it was also found to be correlated with both REI Rational Favorability ($r = .408$) and Rational Ability ($r = .550$). Affective intuition was found, unsurprisingly, to be negatively correlated with REI Rational Ability ($r = -.299$).

Table 2. Descriptive statistics and factor loadings for the TIntS24 items

Scale/item	<i>M</i>	<i>SD</i>	Item total <i>r</i>	Principal axis loading				CFA loading
				I	II	III	IV	
Holistic–Big Picture								
29. I am a “big picture” person.	3.30	0.92	.69	−.06	.04	.80	.06	.73
26. I try to keep in mind the big picture...	3.64	0.85	.63	−.07	.28	.74	−.01	.59
14. I tend to focus on the details...	3.39	0.94	.57	−.07	.13	.66	.02	.54
1. I concentrate on big ideas...	3.35	1.02	.56	.00	.04	.64	.09	.54
5. Better to break a problem into parts...	2.53	1.09	.34	.12	−.16	.43	.04	.11
Holistic–Abstract								
18. I prefer concrete facts...	2.42	0.97	.62	.24	−.13	.09	.75	.80
11. I think in terms of theories...	2.75	0.97	.59	.21	.08	.03	.69	.51
24. I enjoy thinking in abstract terms.	3.13	1.07	.55	.03	.11	.08	.66	.35
Inferential								
22. If I have to, I can give reasons...	3.87	0.83	.60	−.02	.76	−.06	.05	.58
27. When I make intuitive decisions...	3.90	0.81	.59	−.19	.75	−.01	.01	.62
19. When making a quick decision...	4.05	0.78	.42	−.22	.51	.09	−.11	.56
6. There is a logical justification...	3.81	0.83	.40	−.24	.48	−.04	−.06	.56
4. Familiar problems can be solved...	3.94	0.70	.40	.13	.44	.03	.09	.41
2. I trust my intuitions...	4.11	0.81	.40	.17	.42	.23	−.06	.48
10. My intuitions come to me...	3.61	0.89	.34	.28	.38	.11	.18	.43
12. My intuitions are based on...	4.07	0.69	.34	.23	.38	.11	.06	.28
Affective								
23. I prefer to follow my head...	2.75	2.11	.31	.76	−.10	−.04	.19	.74
9. I tend to use my heart for a guide...	3.31	1.02	.65	.73	.00	−.09	.12	.75
28. It is foolish to base decisions on feelings.	3.46	1.03	.66	.73	.05	.08	.03	.61
20. I don’t depend on my feelings...	3.50	0.97	.64	.72	.03	−.03	.04	.61
7. I rarely allow emotional reactions...	2.96	1.08	.60	.67	−.17	−.04	.18	.44
3. I prefer to use hunches...	2.71	1.02	.55	.63	−.18	−.01	.17	.52
16. I believe in trusting my hunches.	3.68	0.84	.50	.63	.28	.08	−.07	.48
13. I make decisions based on my gut...	2.98	0.99	.53	.60	.06	.03	.08	.48

Note: Item statistics and principal axis factor loadings (Varimax rotation) are from the developmental sample ($n = 261$). Factor loadings greater than or equal to .38 are highlighted in bold. The confirmatory factor analysis (CFA) values are standardized target loadings from a cross-validation sample ($n = 579$), based on a four-factor model with correlated factors (see Study 2). Holistic–Big Picture item #5 was removed because of its low CFA loading, resulting in a 23-item final TIntS that was used in Studies 3 and 4. TIntS, Types of Intuition Scale.

Table 3. Descriptive statistics and internal consistency for the TIntS24, REI, MBTI, and BFA scales

Scale	<i>M</i>	<i>SD</i>	α
TIntS Holistic–Big Picture	3.24	0.70	.77
TIntS Holistic–Abstract	2.78	0.82	.76
TIntS Inferential	3.92	0.47	.74
TIntS Affective	3.17	0.76	.79
REI Experiential	3.56	0.53	.90
Favorability	3.56	0.61	.86
Ability	3.55	0.55	.80
REI Rational	3.63	0.55	.89
Favorability	3.58	0.68	.85
Ability	3.67	0.59	.84
MBTI Intuition	14.58	7.40	.93
MBTI Feeling	14.20	6.78	.92
Big Five Openness to Experience	3.63	0.53	.83
Intellect	3.56	0.56	.74
Openness	3.71	0.71	.83
Big Five Neuroticism	2.74	0.58	.86
Big Five Agreeableness	3.96	0.51	.87
Big Five Conscientiousness	3.44	0.58	.88
Big Five Extraversion	3.84	0.53	.88

Note: MBTI scale scores are item sums; all other scale scores are item means. TIntS, Types of Intuition Scale; REI, Rational Experiential Inventory; MBTI, Myers–Briggs Type Indicator; BFA, Big Five Aspect Scales.

Canonical correlations with Rational Experiential Inventory and Myers–Briggs Type Indicator

To better understand the relationship between the TIntS and the REI and MBTI, canonical correlations were conducted between TIntS scales and each measure. Considering the TIntS and the REI scales, three pairs of canonical variates were statistically significant ($p < .001$; Table 5). The canonical structure coefficients (correlations between the canonical variates and the TIntS and REI scales) showed that TIntS Affective and both REI Experiential subscales were strongly related ($R_{C1} = .87$), TIntS Inferential was most strongly related to REI Rational subscales ($R_{C2} = .66$), and TIntS Holistic–Abstract was most strongly related to REI Rational Favorability ($R_{C3} = .47$). The total variance in the TIntS scales explainable by the REI scales, or *redundancy* (Stewart & Love, 1968), was 36.94%.

Considering the TIntS and the MBTI scales, two pairs of canonical variates were statistically significant ($p < .001$; Table 6). The first pair of canonical variables was defined by TIntS Holistic–Abstract and MBTI Intuition ($R_{C1} = .65$), and the second pair by TIntS Affective, Inferential (–), and Holistic–Abstract (–), and by MBTI Feeling ($R_{C2} = .58$). The redundancy between the TIntS scales and the MBTI scales was 19.18%.

Table 4. Bivariate correlations of the TIntS24 scales with the REI, MBTI, and BFA scales

Scale	TIntS scale			
	Holistic–Big Picture	Holistic–Abstract	Inferential	Affective
REI Experiential	.034	.208*	.408***	.775***
Favorability	.052	.224*	.290**	.825***
Ability	.009	.156	.473***	.595***
REI Rational	.091	.199*	.548***	–.133
Favorability	.000	.380***	.408***	.044
Ability	.169	–.067	.550***	–.299**
MBTI Intuition	.002	.646***	.046	.189 ⁺
MBTI Feeling	–.209*	.324***	–.238*	.441***
Big Five Openness to Experience	–.027	.303**	.394***	.131
Intellect	.051	.116	.513***	–.026
Openness	–.081	.359***	.179 ⁺	.215*
Big Five Neuroticism	–.076	.059	–.186 ⁺	.363***
Big Five Agreeableness	–.266**	.076	–.119	.165 ⁺
Big Five Conscientiousness	–.190 ⁺	–.093	.093	.122
Big Five Extraversion	.014	.266**	.265**	.381***

Note: TIntS, Types of Intuition Scale; REI, Rational Experiential Inventory; MBTI, Myers–Briggs Type Indicator; BFA, Big Five Aspect Scales.

⁺ $p < .10$;

* $p < .05$;

** $p < .01$;

*** $p < .001$.

Table 5. Loadings of the TIntS24 and REI scales on the canonical variables

Scale	CV1	CV2	CV3
Types of intuition			
Holistic–Big Picture	.026	.175	.309
Holistic–Abstract	.265	.079	–.990
Inferential	.329	.925	.016
Affective	.965	–.348	.258
REI			
Rational—Favorability	.161	.601	–.764
Rational—Ability	–.155	.975	.107
Experiential—Favorability	.986	.019	.025
Experiential—Ability	.788	.380	.018

Note: The canonical loadings reflect the bivariate relationship between each scale and the linear combinations (i.e., canonical variables). TIntS, Types of Intuition Scale; REI, Rational Experiential Inventory.

Table 6. Loadings of the TIntS24 and MBTI scales on the canonical variables

Scale	CV1	CV2
Types of intuition		
Holistic–Big Picture	–.051	–.418
Holistic–Abstract	–.991	.133
Inferential	–.130	–.511
Affective	–.211	.729
MBTI		
Intuition	–.992	.126
Feeling	–.395	.918

Note: The canonical loadings reflect the bivariate relationship between each scale and the linear combinations (i.e., canonical variables). TIntS, Types of Intuition Scale; MBTI, Myers–Briggs Type Indicator.

Relationship with openness

Regarding the Big Five, we predicted that Holistic intuition would be positively correlated with Openness to Experience. This prediction was supported for Holistic–Abstract scores,

for the Openness facet of Openness to Experience, $r = .359$. Inferential intuition was found to be correlated with the Intellect facet of Openness to Experience, $r = .513$. Affective intuition was positively related to the Openness facet of Openness to Experience, $r = .215$.

Relationship with extraversion

We also predicted that Holistic intuition would be the type of intuition most positively correlated with Extraversion, but this was only partly true. All types of intuition except Holistic–Big Picture were significantly correlated with Extraversion, r 's .265 to .381.

Relationship with other individual difference variables

No predictions were made regarding intuition and the remaining personality traits. Results showed that Holistic–Big Picture intuition was negatively related to Agreeableness ($r = -.266$), and Affective intuition was positively correlated with Neuroticism ($r = .363$).

Canonical correlations with Big Five Aspect Scales

A canonical correlation analysis was performed to more precisely locate the TIntS scales in the Big Five factor space. Two pairs of canonical variates were statistically significant ($p < .001$): $R_{C1} = .68$ and $R_{C2} = .63$ (Table 7). Results showed that participants who scored TIntS Affective were more neurotic, compassionate, and enthusiastic. Those scoring higher on TIntS Inferential were more open to experience, assertive, and engaged (not withdrawn). Both canonical variates were characterized by Holistic–Abstract scores as well. The total variance in the TIntS scales explainable by the personality scales was 23.54%.

Table 7. Loadings of the TIntS24 and BFAS on the canonical variables

Scale	CV1	CV2
Types of intuition		
Holistic–Big Picture	–.189	.148
Holistic–Abstract	.479	.476
Inferential	–.077	.876
Affective	.944	.033
BFAS		
Intellect (O1)	–.108	.812
Openness (O2)	.395	.460
Volatility (N1)	.671	–.108
Withdrawal (N2)	.224	–.480
Compassion (A1)	.553	–.039
Politeness (A2)	.008	–.292
Industriousness (C1)	.030	.113
Orderliness (C2)	.228	–.103
Enthusiasm (E1)	.536	.070
Assertiveness (E2)	.356	.698

Note. The canonical loadings reflect the bivariate relationship between each scale and the linear combinations (i.e., canonical variables). TIntS, Types of Intuition Scale; BFA, Big Five Aspect Scales.

Discussion

We proposed theoretical and empirical bases for three types of intuition. Empirical investigation of these constructs revealed that the TIntS measured four types: Holistic–Big Picture, Holistic–Abstract, Inferential, and Affective. The four TIntS scales are internally consistent and have good test–retest reliability. Patterns of relationships among the TIntS scales and other self-report measures are consistent with current theory and research. By measuring these multiple types of intuition, the TIntS provides a more comprehensive self-report measure of the construct than those currently used in the literature.

A multifaceted measure of intuition

Our research supports the theoretical view that these scales measure distinct and independent types of intuition. The scales were not strongly related to one another and related differentially to extant measures of intuition. TIntS Holistic–Abstract scores were moderately correlated to MBTI Intuition but less strongly correlated with REI Experiential and MBTI Feeling. TIntS Inferential scores correlated moderately with REI Experiential but unrelated to MBTI Intuition and negatively related to MBTI Feeling. TIntS Affective scores correlated positively with REI Experiential and MBTI Feeling but were unrelated to MBTI Intuition. Canonical analyses clarified these patterns, showing that the REI Experiential scale does not measure Holistic or Inferential intuition, and the MBTI scales do not measure Inferential intuition. Affective intuition is the only type measured by both the REI and MBTI.

Although the correlation of REI Rational scores with Holistic–Abstract intuition and Inferential intuition may appear counterintuitive, previous research (Pretz & Totz, 2007) showed that the relationship with the holistic type of intuition is largely based on a few items on the REI Rational favorability scale that refers to preference for abstract thinking, an aspect of both rational and holistic intuitive thinking. The

correlation of REI Rational with Inferential may be due to the fact that Inferential intuition is based on an analytical process that has become automatic with practice.

Validity of the Types of Intuition Scale

Results regarding the relationship between types of intuition and other aspects of personality and cognition followed expected patterns. Based on earlier research on MBTI Intuition, we predicted that Holistic intuition would correlate with Openness. Results showed that Holistic–Abstract intuition and Affective intuition were correlated with the Openness facet of the scale, whereas Inferential intuition was related to the Intellect facet. The expected relationship between holistic intuition and extraversion was significant; however, Inferential and Affective intuition were also correlated with Extraversion scores. The negative relationship between Holistic–Big Picture intuition and Agreeableness has some precedence in the literature, as McCrae and Costa (1989) found a similar negative pattern with MBTI Intuition, especially among men. Finally, TIntS Affective scores were also correlated positively with Neuroticism. Earlier work showed no relationship between REI Experiential and Neuroticism, suggesting that affective intuition is not redundant with the REI Experiential scale.

We expected to find evidence for three types of intuition, but our data show that the items on the TIntS Holistic scale do not represent a single construct. The distinction between preference for the big picture and preference for abstract thinking is understandable, especially given the fact that the term “big picture” was used in all of the items on the Holistic–Big Picture factor. These findings challenge our theory of three types of intuition. Whereas we argued that holistic intuition relied on processing information in an abstract rather than concrete sense and by focusing on the big picture rather than details, participants did not interpret items about those aspects of holistic intuition in the way we expected. Correlational analyses showed that Holistic–Abstract intuition was more likely to have the expected relationships with other self-report measures of intuition and personality, calling into question the validity of the Holistic–Big Picture scale. In order to further examine whether the TIntS is best represented by the originally proposed three types of intuition or the empirically validated four types, a confirmatory factor analysis was conducted, and additional data on the validity of the TIntS scales were obtained.

STUDY 2

In order to confirm the factor structure of the TIntS, additional data from a large new sample were collected.

Method

Participants, materials, and procedure

We obtained data from a large sample of 580 participants (324 female, 198 male, 58 unknown). The majority of this

Table 8. Goodness-of-fit indices for the TIntS24 factor models

Model	χ^2	df	χ^2/df	CFI	TLI	RMSEA
Null model	3316.357	276	12.016	.000	.000	.138
4 uncorrelated factors	1144.697	252	4.542	.706	.678	.078
4 correlated factors	1076.310	246	4.375	.727	.694	.076
3 uncorrelated factors	1271.672	252	5.046	.665	.633	.084
3 correlated factors	1241.969	249	4.988	.673	.638	.083

Note: CFI, comparative fit index; TLI, Tucker–Lewis index; RMSEA, root mean square error of approximation; TIntS, Types of Intuition Scale.

sample ($N=344$) were undergraduates who completed the TIntS in a classroom setting as part of a short battery of surveys. In addition, a sample of 100 German adults from the German Sport University in Cologne was included (69 male, 31 female; M age 27.80, $SD=5.063$), along with the data from participants in studies 3 and 4. We deleted one case with four missing values and imputed item means for two cases with two missing values and 28 cases with one missing value. This produced a final N of 579. Four scale scores were computed: Holistic–Big Picture, Holistic–Abstract, Inferential, and Affective. Reliabilities were .609, .568, .801, and .720, respectively.

Results and discussion

The analyses reported here were performed with AMOS 22 (Arbuckle, 2013). A model with four uncorrelated factors served as the target model for the confirmatory factor analyses. The fit of this model was assessed relative to a four-factor model with correlated factors and three-factor models with correlated and uncorrelated factors. None of the four models provided an acceptable fit to the data, but overall, the four-factor models fit the data better than did the three-factor models (Table 8). And even though the model with four correlated factors fit the data slightly better than the model with uncorrelated factors, the standardized factor correlations were small (mean $r=.11$).¹ For all of the models, one item (#5) failed to load significantly on its target factor and was subsequently deleted. Based on the four-factor correlated model, target loadings for the remaining items were all at least .35 with the exception of item #12 (.28) (see final column of Table 2). After removing item #5 from Holistic–Big Picture, the reliability of the scale improved to .690. The resulting 23-item TIntS was considered final. Items on each scale were 4 Holistic–Big Picture, 3 Holistic–Abstract, 8 Inferential, and 8 Affective.

These findings show that the four-factor model of the TIntS provided the best fit in this new sample. Subsequent studies were conducted on a variety of samples to establish the validity of the four types of intuition measured by the

23-item final version of the TIntS. We administered the TIntS to graduate students in occupational therapy (OT) and undergraduate musicians and non-musicians. In particular, we were interested in exploring whether clinical intuition would be related to preference for holistic intuition and whether intuition among experts would be related to preference for inferential intuition. Furthermore, we hoped that additional information on the validity of the Holistic–Big Picture scale would help determine whether it should be retained as part of the TIntS.

STUDY 3

To test the predictive validity of the 23-item TIntS, graduate students in OT were recruited. Researchers have long debated the validity of clinical intuition (Dawes, Faust, & Meehl, 1989); however, to the extent that clinical situations involve incomplete information, require time-sensitive decisions, and can involve high-stakes consequences, intuition is a necessary mode of judgment. Occupational therapists work with individuals to help them recover from an injury or other setback with the goal of involving the client in work, leisure, and daily activities. Part of the occupational therapist's role is to evaluate the client's abilities and limitations, and develop a therapeutic strategy that will help the client overcome obstacles in daily life (American Occupational Therapy Association, 2010). Occupational therapists must anticipate a client's needs, select applicable intervention, decide how much assistance to provide the client during therapy, make adjustments in the therapeutic plan when a client does not respond as expected, assess and interpret the outcomes of the intervention and the client's ability to engage in occupations, and make recommendations for discharge. Many of these decisions must be made without complete information or without the luxury of a thorough analysis, so intuition must be the basis for clinical judgment. In this study, we did not compare intuition with other strategies for clinical judgment, but we examined the relationship between preference for intuition and clinical judgment.

Clinical judgment was assessed via a reflective case study of a clinical experience the student had during a 12-week internship. Prior work on the limits of intuition in clinical judgment (e.g., Dawes et al., 1989) would predict that intuition will have a negative impact on clinical reasoning; however, our theory makes a more nuanced prediction. We expected that holistic intuition (in contrast to other types of intuition) would lead to better case study performance

¹We elected not to conduct a specification search (i.e., post hoc model revisions) to improve model fit because the parameters with the largest modification indices were either within-factor correlated errors (e2/e4, e13/e16) or cross-loadings that were not substantively meaningful (#7/Inferential, #16/Inferential). Also, specification searches, which are often driven by modification indices and/or standardized residuals, often converge on incorrect models (MacCallum, 1986).

because it would promote greater insight into the subtleties of the therapist–client relationship and client personality. Finally, we expected that domain-specific measures of intuitive preference would correlate more highly with performance than domain-general measures of intuition.

Method

Participants

Participants were 23 students (M age = 22.61, SD = 0.583) completing a fifth-year master's program in OT. They had completed 4 years of undergraduate coursework, including 240 hours of fieldwork under the supervision of a licensed occupational therapist. Students had also completed a full-time (40 hours per week) 12-week internship in which they were independently responsible for selecting, providing, and assessing interventions with clients while supervised by an occupational therapist. Following the study, all participants became qualified for entry-level practice after completing the master's degree, a research project, another 12-week internship, and passing the national licensure examination.

Measures

Participants completed the TIntS (TIntS Holistic–Big Picture α = .86, TIntS Holistic–Abstract α = .63, TIntS Inferential α = .75, TIntS Affective α = .85), the REI (Experiential α = .93), and the MBTI (Intuition α = .92, Feeling α = .91). Three additional measures, developed originally to study preference for intuition among nurses, were modified to refer to OT.

Acknowledges Use of Intuition in Nursing Scale (Rew, 2000). This 7-item scale (α = .66) included statements such as “There are times when I feel that I know what will happen to a patient, but I don't know why.” Ratings were given on a 5-point Likert scale.

Smith Intuition Instrument (Smith, 2006). This 27-item questionnaire (α = .86) assessed students' use of intuition. Participants indicated on a 5-point scale how frequently they engage in behaviors related to the use of intuition including having good or bad feelings about client condition, sensing spiritual connections with clients, reading nonverbal cues, and having physical reactions to a client.

Miller Intuitiveness Instrument (Miller, 1995). This 43-item instrument (α = .95) measures a nurse's self-perception of intuitiveness on a 6-point Likert scale. Items tap willingness to act on intuitions, innovation in problem solving, sensing spiritual connections with clients, interest in ethical issues, and risk taking.

Case study performance. Students' clinical judgment was assessed via a written case study based on an experience from a 12-week-long internship. Students reflected on the case using several theoretical approaches to clinical reasoning (Boyt Schell & Schell, 2008). Papers were scored by a faculty member in OT. High scores were given for quality of reflection on identifying problems, goals, and potential

strategies for therapeutic intervention; understanding of the client's viewpoint and future considerations for occupational engagement; and recognizing pragmatic considerations. Cases were not explicitly scored for use of intuition.

Participants were asked for permission to obtain their overall GPA in OT coursework.

Procedure

Students completed self-report measures in a 40-minute group session. Archival data were confidentially obtained from the OT department and the Office of Registration and Records.

Results and discussion

We correlated all intuition measures with case study performance (Table 9). Results showed that case study scores were negatively related to Affective intuition (r = $-.518$, p = .016). REI Experiential was also significantly correlated with case study performance (r = $-.486$, p = .025). Case study scores were marginally positively related to Holistic–Big Picture intuition (r = .378, p = .091) and Holistic–Abstract intuition (r = .375, p = .094).² Neither MBTI scale nor any of the OT-related scales correlated significantly with case study performance.

We also examined the relationship between case study scores and general knowledge in the field, as estimated by GPA in OT. Unsurprisingly, this relationship was strong, r = .573, p = .007. Affective intuition was negatively related to GPA (r = $-.569$, p = .005), as was REI Experiential (r = $-.493$, p = .017). In contrast to the case study results, Holistic–Big Picture and Holistic–Abstract intuition were unrelated to GPA (p 's > .711).

In sum, TIntS Affective and, to some extent, TIntS Holistic–Big Picture and Holistic–Abstract scores correlated significantly with clinical judgment in OT. These data also show the distinction between types of intuition and lend support for the validity of both Holistic scales. Affective intuition was negatively related to case study performance, yet Holistic–Big Picture and Holistic–Abstract intuition scores showed a trend toward a positive relationship with case study scores. These findings also lend support to our theory that intuition is not a unified construct. This theory and use of the TIntS can help to explain why intuition is not consistently accurate and reliable. In this study, we found that reliance on affective intuition was strongly associated with worse clinical judgment, yet holistic intuition had a slightly positive association. Past work revealing the limits of intuition may have focused on more emotional aspects of intuition in clinical judgment (e.g., Dawes et al., 1989).

Inferential intuition was unrelated to case study performance and actually negatively related to GPA. This suggests that the best students in the course were not willing to trust their intuitions based on their expertise in the field.

²When TIntS Holistic–Big Picture and TIntS Holistic–Abstract scores were combined into a single TIntS Holistic score, the correlation with case study performance was significant, r = .457, p = .037.

Table 9. Correlations among all domain-general and occupational therapy-specific intuition measures

Measure	1	2	3	4	5	6	7	8	9	10	11
1. REI—Experiential											
2. MBTI—Intuitive	.358										
3. MBTI—Feeling	.379	.518									
4. TIntS—Holistic—Big Picture	-.146	.318	-.199								
5. TIntS—Holistic—Abstract	.084	.720	.200	.415							
6. TIntS—Inferential	.409	-.056	-.422	.341	.034						
7. TIntS—Affective	.839	.408	.532	-.268	-.040	.140					
8. Rew	.439	.358	.170	.426	.369	.549	.311				
9. Smith	.467	.422	.136	.369	.510	.367	.345	.643			
10. Miller	.481	.332	.026	.230	.539	.565	.235	.632	.739		
11. Major GPA	-.493	-.089	-.162	.082	.057	-.425	-.569	-.413	-.252	-.177	
12. Case study	-.486	.232	.042	.378	.375	-.158	-.518	-.002	.054	.118	.573

Note: Statistically significant correlations are underlined. $|r|$'s $\geq .413$ are significant at $p < .05$; $|r|$'s $\geq .532$ are significant at $p < .01$. TIntS, Types of Intuition Scale; REI, Rational Experiential Inventory; MBTI, Myers–Briggs Type Indicator.

Although graduate students have had a great deal of experience, they are not experts by the 10-year rule. Students with the highest grades may be more analytical and less confident in their experience-based intuition. Similarly, research with nursing students also revealed a lack of confidence in intuition in nursing-related contexts (Pretz & Folse, 2011). The trending relationship between Holistic intuition and case study performance suggests that trust in a holistic perspective may be helpful when reflecting on clinical situations, perhaps because the ability to consider the “big picture” facilitates synthesis of a complex set of cues.

This study shows that the TIntS scales, although domain-general, predicted performance in OT better than domain-specific measures of preference for intuition, at least for this sample. The latter measures of intuition were developed and validated for the field of nursing, but the items are relevant for occupational therapists. The Smith Intuition Instrument was specifically developed for use with students, yet it did not correlate with case study performance at all. Again, it is possible that the students recruited in the current study did not yet have sufficient experience to trust their intuition in the field, accounting for the non-significant correlations between domain-specific intuition scores and performance.

We found a strong relationship between preference for specific types of intuition and clinical judgment. Future work should aim to establish the reliability of these findings in a larger sample. A next step would then be to test the causality of this relationship by manipulating strategy use and examining its effect on accuracy. Although Holistic intuition was more positively associated with success as compared with other types of intuition, other strategies may be even more successful modes of clinical judgment, for example, analysis and statistical models based on linear regression.

These results suggest implications for clinical training as well. Educators should consider decision-making preferences when interacting with their students. It may not be wise for students to trust intuition in general, but they should be educated about the potential value of holistic intuition in certain circumstances and warned about the danger of trusting intuition based on feelings alone.

STUDY 4

To assess performance correlates of the TIntS scales in a different domain, the measure was administered to an undergraduate sample that included music majors. Music is a good field for the study of expertise among undergraduates because of the large variability in experience in the college population. Some college students have little to no experience in music, whereas others have over 10 years of serious study of a single instrument. Musical performance is an activity that requires the use of intuition because it is done “in the moment” and does not allow time for reflection. Instead, musicians must overlearn their material so that they can avoid “overthinking” their performance. Musicians who are underprepared risk a performance that is mechanical and not natural. Prior work confirms that student musicians are more intuitive than the rest of the student population (MacLellan, 2011). Music educators and performers also favor reliance on MBTI Intuition and MBTI Feeling (Wubbenhorst, 1994). With regard to the three types of intuition, musicians may score higher on Affective intuition because of the emotional expression involved in musical performance. Music is a domain in which undergraduates often have a great deal of experience. By the time they start college, serious music students have had many years of experience in the specific skills involved in mastering an instrument, and some may be considered experts in the field by the 10-year rule (Ericsson, 2006). The musicians’ expertise may be reflected in preference for Inferential intuition.

We predicted that musicians would show a stronger preference for intuition relative to non-musicians, and we expected that intuition scores would correlate with musical performance. Specifically, we predicted that Inferential and Affective intuition would show the strongest relationships with performance.

Method

Participants

Participants were 71 undergraduates from a small liberal arts college (57 female, M age = 19.06, SD = 1.03). Non-musicians (N = 28; 19 women, M age = 18.62, SD = 0.79) were recruited

from introductory psychology classes and participated for course credit. Musicians ($N=43$; 38 women, M age = 19.35, $SD=1.03$) were recruited from music classes and ensembles, and participated for a chance at a gift card. Musicians had passed competitive auditions and diagnostic exams in music theory, aural skills, sight-singing skills, and keyboard skills. On average, music majors at the institution have 10 years of experience playing their instrument, and those in this sample practiced an average of 16 hours per week.

Materials and procedure

All participants completed the TIntS and a number of other measures as part of a 30-minute study of affect and depression. Reliability of the TIntS scales was acceptable (Holistic–Big Picture $\alpha=.73$, Holistic–Abstract $\alpha=.74$, Inferential $\alpha=.72$, Affective $\alpha=.76$). For a subset of 22 musicians, we were able to collect their scores on a performance evaluation by a jury of two to four faculty members. Each student performed a piece of their choice, and faculty rated each student's performance on a scale of 1 to 5 on tone, intonation, articulation, breathing, rhythm, and musicianship (phrasing and dynamics).

Results and discussion

Comparisons between musicians and non-musicians partially confirmed our hypotheses. Musicians scored higher than non-musicians on the Inferential scale of the TIntS, $t(69)=2.339$, $p=.022$. Affective scores were marginally higher among musicians, $t(69)=1.640$, $p=.106$. Although it was not predicted, musicians also scored significantly higher on Holistic–Abstract intuition, $t(69)=1.995$, $p=.050$. Holistic–Big Picture scores were not different between the two groups, $p=.949$ (Figure 1). Among musicians, TIntS Inferential scores were correlated with musical performance. Inferential intuition correlated significantly with ratings on musicianship ($r=.440$, $p=.041$) and had a marginal relationship with breathing ($r=.371$, $p=.089$).

Data supported our theory that Inferential intuition reflects preference for intuition based on experience. Although there was no overall measure of experience level in this study, students reported number of instruments played, which can

serve as a proxy for experience in musical performance. Musicians (vocalists and instrumentalists) who played a greater number of instruments also had higher Inferential scores, $r=.376$, $p=.013$. Contrary to our hypothesis, Affective intuition was unrelated to musical performance (all r 's $-.174$ to $-.371$, ns). Musicians scored marginally higher on Affective than non-musicians, but among musicians, variance in Affective scores bore no relation to variance in performance.

Our data confirm and extend prior research on musicians' preference for intuition. Participants with stronger preference for Inferential and, to some extent, Affective intuition were more likely to be musicians, and musicians who scored higher on Inferential intuition were better performers. The relationship between Inferential intuition and performance may have been due to increased musical experience, as reflected in greater number of instruments played. We speculate that preference for inferential intuition may underlie the difference between having experience and knowing how to use it or having automated the experience into real "expertise." Those with higher levels of Inferential intuition may be willing to trust that experience-based intuition, whereas some musicians with as much experience may be less confident in their intuition. Future research should explore this possible explanation.

Musicianship and breathing were the key aspects of performance related to preference for Inferential intuition, suggesting that intuition is most strongly related to the non-technical aspects of musical performance. Breathing is a technical skill, but it largely serves the musicality of the performance. The relationship between musicianship and Inferential intuition suggests that whereas all performers may have had technical skill, the best performers were those who played in a way that was natural, not mechanical, and relied on their intuitive expertise. More natural displays of musical ability are highly valued by listeners (Tsay & Banaji, 2011).

Although musicians reported somewhat higher preference for Affective intuition than non-musicians, the lack of correlation between Affective intuition scores and music performance is somewhat surprising given the emotional nature of musical expression. These findings suggest that students who choose music as a major are more emotional, but this tendency is unrelated to their success as performers.

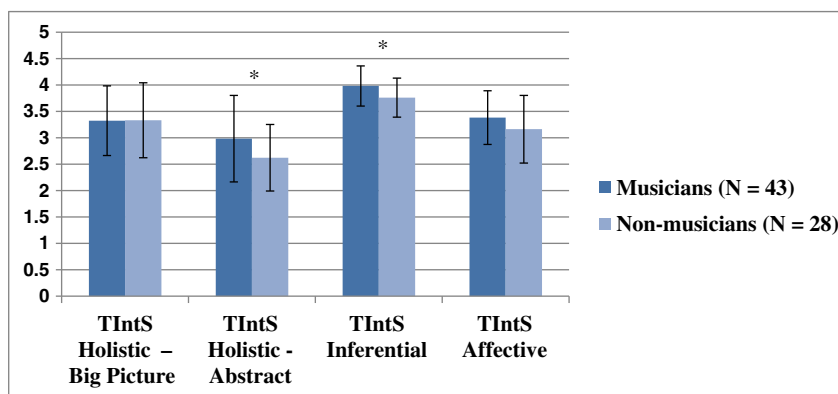


Figure 1. Descriptive statistics for musicians and non-musicians on Types of Intuition Scale (TIntS) scales

In fact, the negative trend in this relationship implies that reliance on emotional rather than experience-based aspects of intuition may be detrimental to performance.

This study also helps to demonstrate the independence of the three scales in the TIntS. Inferential intuition correlated with musical performance, but Holistic and Affective intuition did not. This supports the argument that Inferential intuition is a unique type of intuition that covaries significantly with rated performance.

Although the undergraduate music students in this sample had a great deal of experience in their field, it is arguable whether they were true experts by the 10-year, 10 000-hour rule (Ericsson, 2006). Future research should aim to replicate these findings in a sample of true experts.

GENERAL DISCUSSION

Types of intuition

We have argued that intuition is not a unitary construct and that three distinct types of intuition, holistic, affective, and inferential, can be measured using a new self-report tool, the TIntS. These types are largely uncorrelated with one another, and we provide evidence for both concurrent and predictive validity of the scales. We have shown that the TIntS provides a multifaceted, more comprehensive measure of intuition than the MBTI or the REI, and it is not redundant with Big Five personality.

Our theoretical understanding of the three types of intuition was initially not supported by the observed factor structure of the TIntS. We proposed items for the Holistic scale that reflected both preference for the “big picture” and preference for abstract over concrete. Participants did not respond to items about preference for the “big picture” the way that we had expected. When we examined the concurrent validity of the two Holistic scales in Study 1, we found that Holistic–Abstract scores showed most of the expected relationships, but Holistic–Big Picture scores did not. In Study 3, both Holistic scales showed similar patterns of relationships among OT students, but correlations with Abstract scores were overall relatively stronger than Big Picture scores, confirming the patterns observed in Study 1. Researchers who are eager to use the TIntS in their own work should expect the Holistic–Abstract scale to be the more valid measure of Holistic intuition. Until more evidence for the validity of the Big Picture scale is obtained, researchers who are pressed for time or space in their studies may choose to eliminate the Holistic–Big Picture items altogether.

Predictive validity

Preliminary evidence suggests that these scales predict different aspects of behavior that involve the use of intuition. Affective intuition was negatively related to clinical reasoning performance, and both types of Holistic intuition scores showed a tendency in the opposite direction. TIntS Holistic–Abstract scores were most closely related to MBTI Intuition, but MBTI Intuition did not predict clinical performance. TIntS Inferential scores were found to predict music

performance, a task requiring the use of automated expertise. TIntS Affective scores were less strongly related to performance on tasks requiring the use of intuition, but the Affective was correlated with MBTI Feeling and REI Experiential, as expected. Future work should identify tasks that clearly rely on emotional processing to best assess the predictive validity of the TIntS Affective scale.

Behavioral data demonstrated the distinction between the types of intuition. Clinical judgment was associated with lower scores on Affective intuition and higher scores on Holistic–Big Picture and Holistic–Abstract intuition. Skill in musical performance was associated with higher scores on Inferential intuition. These different patterns of findings could be due to differences in the level of experience among study participants and/or the nature of the tasks used in these studies. The case study conducted by OT graduate students was a written paper that naturally allowed more room for thoughtful reflection than the musical performance task. Inferential intuition was not associated with better case study performance, potentially because the participants did not have sufficient expertise to trust their experience. The finding that individual differences in intuition were uniquely associated with case study scores is noteworthy. Holistic intuition may have been related to case study performance because those with preference for Holistic were more likely to take a “big picture” view in approaching the case study, resulting in a better synthesis in articulating a complex clinical experience. In contrast, musicians in Study 4 were more experienced in their field than the OT students, allowing them to trust their experience-based inferential intuition. Musicians who trusted inferential intuition performed better, probably because their performance was not overthought and reflected their intuitive expertise.

Limitations and future directions

A weakness of the work reported here is that many of these studies tested primarily undergraduate students. Furthermore, Studies 3 and 4 had small samples and limited power. Future research should administer the TIntS to additional large and more diverse samples with varying domains of expertise. We believe that the study of intuition and expertise is a key direction for TIntS research. Use of the TIntS can facilitate research on the relationship between experience level and use of intuition as a strategy. Baylor (2001) proposed a U-shaped relationship between experience and availability of intuition, with intuition less available to those with intermediate levels of experience. Researchers should instruct participants to respond to the TIntS items in reference to a specific domain so that scores can be compared by level of experience to test the U-shaped model. Previous research suggests that the accuracy of intuition is influenced by both the level of experience of the individual and the complexity of the task (Hogarth, 2001; Pretz, 2008; Pretz & Zimmerman, 2009), and use of the domain-contextualized TIntS can help to test hypotheses about this relationship. Pretz (2011) has argued that holistic intuition is more likely to be accurate for novices and inferential intuition for experts.

Additional support for the validity of the TIntS requires a broader variety of tasks that rely on each type of intuition. If holistic intuition is based on holistic processing of non-conscious cues, TIntS Holistic scores should predict performance on tasks such as person perception, multi-attribute decision tasks (Glöckner & Betsch, 2008), and the Dyads of Triads task (Bowers, Regehr, Balthazard, & Parker, 1990). Inferential scores should predict intuitive leaps on Westcott's series completion puzzles and expert judgment. Affective scores should predict performance on tasks requiring emotional intelligence (Mayer, Salovey, & Caruso, 2004) or the emotional processing as detected in the Iowa Gambling Task (Bechara et al., 2000).

A potential limitation of the TIntS is that individuals may be unable to report accurately on nonconscious processes (Nisbett & Wilson, 1977). Research on the predictive validity of self-reported preference for intuition is inconclusive. The REI Experiential scale has shown some evidence of validity with respect to a heuristic laboratory task (Pacini & Epstein, 1999). Yet, the preliminary studies reported here demonstrate that all three types of intuition predicted at least one aspect of behavior. Future work should examine the predictive validity of the TIntS to determine if any one aspect of intuition is more accessible to introspection than another.

Our work is part of a larger research program aimed at better understanding the nature of intuition and its validity. We seek to predict when intuitions are likely to be accurate and when they will still be a source of irrational biases, and we believe that different types of intuition will yield more valid judgments depending on task conditions. Our preliminary findings on clinical judgment in OT provide an example of how a multifaceted theory of intuition can yield more nuanced understanding about its validity. If we focus on affective aspects of intuition, we may conclude that intuition is biased and irrational, but if we examine holistic and inferential aspects of intuition, we may recognize conditions under which intuitions can be valid and insightful. Other researchers are also working on disentangling the different conceptions of intuition used in the literature (e.g., Glöckner & Witteman, 2010), and we believe that this research strategy will move the field forward. Individuals differ to the extent that they prefer to rely on their intuition, and we urge researchers to use the TIntS to gain a more nuanced understanding of their participants' natural tendencies when evaluating the quality of their decision making.

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