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## Validation of a Measure of Affective, Inferential and Holistic Intuition

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Running Head: AFFECTIVE, INFERENTIAL, AND HOLISTIC INTUITION

Validation of a Measure of Affective, Inferential, and Holistic Intuition

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Abstract

A new theory of intuition synthesizes current theoretical models suggesting the existence of three types of intuition: affective, inferential, and holistic (Pretz & Totz, 2007).

However, current intuition measures inadequately assess these types. In response, a new intuition inventory, the Types of Intuition Scale (TIntS), was created containing subscales measuring affective, inferential, and holistic intuition. The current study attempted to establish the factor structure and validity of the TIntS. A factor analysis of TIntS data from 332 participants revealed four distinct factors of intuition: affective, inferential, abstract holistic, and incubation. Additionally, 227 of these participants completed other measures of intuition and personality. Correlations among the four revised scale scores of the TIntS, past measures of intuition, and personality characteristics suggested convergent and discriminant validity.

## VALIDATION OF A MEASURE OF AFFECTIVE, INFERENTIAL, AND HOLISTIC INTUITION

When an experienced jeweler looks at a diamond, he can quickly discern the authenticity of the jewel. When asked about his decision process, he is likely to respond that he decided based on a feeling, and could not describe his thought process in words. Rather, he just knew automatically. It is evident that the jeweler used intuition processes because he was able to take several pieces of information into consideration at once without conscious thought. However, to describe intuition using a single, concrete definition is difficult.

Intuition is challenging to define precisely because of its abstract qualities, and because different definitions are used in the research literature. According to Vaughn (1979), intuition is “knowing without being able to explain how we know...” (p. 46 as cited in Shirley & Langan-Fox, 1996). Early theorists, however, such as Westcott and Ranzoni (1963), described intuition as “the process of reaching a conclusion on the basis of little information which is normally reached on the basis of significantly more information” (p. 595). Yet, other researchers have defined intuition as being an “immediate, uncritical perception of the whole rather than the parts” (Hill, 1987, p. 138). Yet, intuition is also said to be a judgment based on emotion (Bastick, 1982 as cited in Pretz & Totz, 2007). Given these differences, a synthesis of definitions is necessary to clarify the nature of intuition.

A new theory of intuition states that each of these definitions represents a subtype of intuition. Specifically, this theory proposes there are three different aspects of intuition: affective, inferential, and holistic (Pretz & Totz, 2007). According to Pretz and Totz, affective intuitions are responses made utilizing emotions. The basis of these emotions is difficult to explain (Pretz & Totz). Inferential intuition, however, is an automatized, analytical process. The analytical process is quickened due to experience,

and the steps no longer require concentration. On the other hand, holistic intuition, which does not use analytical processes, integrates information “from the whole rather than the parts” (Hill, 1987, p. 138). It is when the unconscious, unknowingly integrates information into a global assessment to provide an answer.

Individually, the ideas of affective, inferential, and holistic intuition are not new. However, a single theory has never incorporated all three before. A review of past and current intuition literature describes the progression of the conceptualization of intuition through history to the new theory of intuition. Given this new theory, an analysis of current intuitive inventories found that each measure does not capture the same aspects of intuition. Thus, a new inventory of intuition was needed and developed. The validation of this measure would be beneficial in understanding the complexities surrounding the conceptualization of intuition.

### Historical Theories of Intuition

Multiple theoretical models exist that explain how people think and process information. One of the first theorists to conceptualize intuition was C.J. Jung (1971) who described intuition in his theory of personality types. This theory suggests that people use four basic mental processes known as sensing, intuition, thinking, and feeling. People differ on the use of these processes by the amount they let one process dominate over another. In this view, intuition is a basic mental function that operates through the unconscious (Jung). It is the opposite of the basic mental function, sensing, because it allows the perception of information beyond what the senses can pick up resulting in a sudden insight of a problem (Myers & McCaulley, 1985). An example of this type of intuition is a person suddenly realizing the solution to a complex problem, such as deciding on which house to purchase, without consciously attending to and analyzing

each intricate attribute of the decision. Instead, the unconscious perceives and integrates complex information leading to a sudden solution. This conceptualization of intuition is very similar to a holistic understanding of intuition because an unconscious integration of information occurs instead of analyzing singular parts.

Several years after Jung's (1971) theory of psychological types was developed, Myers and McCaulley (1985) developed a personality inventory using Jung's theory. This inventory, the Myers-Briggs Type Indicator (MBTI), includes subsections that measure the dominance of one basic mental function over the other. The subscales that are important to the understanding of intuition are the sensate/intuitive and thinking/feeling subscales. The sensate/intuitive scale distinguishes between people who rely on concrete facts and occurrences that are received through the senses (sensate), from those who understand phenomena after it has been unconsciously worked out in the mind (intuitive) (Myers & McCaulley). The thinking/feeling scale assesses a person's preference when making a judgment to rely on thinking versus their feelings (Myers & McCaulley). Using the MBTI subscales along a continuum to measure the dominance of one function over the other has been found to be reliable (Hunsley, Lee, & Wood, 2003).

Herbert Simon was another influential theorist in the study of intuition. According to Simon, intuition is "subconscious pattern recognition" that results from a rational, yet unconscious analytical thinking style (1987 as cited in Frantz, 2003, p. 268). He also stated that intuition results from experience and habit (1965 as cited in Frantz). This is because when a person is repeatedly presented with the same problem, he is able to respond without having to consciously rethink the appropriate action. As with Simon's conceptualization, inferential intuition is assumed by Pretz and Totz (2007) to be based

on automatized, analytical processes that allow a person to quickly know the correct response to a problem without conscious rethinking.

### Explaining Intuition Using a Dual Process Model

A dual process model of understanding intuition follows the theoretical models proposed by Jung and Simon. In general, a dual process model suggests that people have the opportunity to use two distinct processing systems when making judgments (Dijksterhuis & Nordgren, 2006; Epstein, Pacini, Denes-Raj, & Heier, 1996; Hogarth, 2001). Intuition is a product of one of these systems. Depending on the version of dual process theory discussed, the system that produces intuition is known as the tacit system, experiential system, or unconscious system. The opposing system uses more analytical, conscious thought and is known as the deliberate system, rational system, or conscious system. Regardless of the name, all theories are referring to the same conceptual systems.

One version of the dual process model proposes that the two distinct thought systems differ based on whether or not cognitive effort is used. The system that uses conscious effort is the deliberate system, whereas the system that does not is the tacit system (Hogarth, 2001). The conscious aspect of the deliberate system allows for explicit reasoning based on precise rules but also abstract thought (Hogarth, 2005). The tacit system, however, is automatic, sensitive to context, and unconscious. To define intuition using this model is to label intuitions as an output of the tacit system. Specifically, intuitions are “...reached with little apparent effort, and typically without conscious awareness. They involve little or no conscious deliberation” (Hogarth, 2001, p.14). The automaticity of intuition within this theory suggests a relationship to an inferential or holistic type of intuition. However, Hogarth (2001) also states that emotion may be a correlate of intuition, providing a connection to affective intuition as well.

Another dual-processing theory, Cognitive-Experiential Self-Theory (CEST), proposes that people have two parallel, but interacting ways of processing information (Epstein et al., 1996). These two systems are the rational and experiential systems. The rational system is more conscious, intentional, effortful, analytic, and affect-free whereas the experiential system is more preconscious, automatic, effortless, holistic, and closely linked to affect (Epstein et al.). CEST thus proposes that intuition is the result of processing by the experiential system.

According to CEST, the degree to which a person uses one of these systems over the other depends on individual differences in preference, the type of system conducive to responding, and the degree of emotional involvement (Epstein et al., 1996). Because of this difference in response mode, a measure was created to assess individual differences in processing information. This measure, the Rational Experiential Inventory (REI; Pacini & Epstein, 1999; Epstein et al), contains two subscales: an experiential subscale to measure intuitive processes and a rational subscale to measure analytical processes. Each of these subscales is further broken down to measure a person's favorability and ability toward the type of thought process. The REI is a reliable and valid measure that provides evidence for the two distinct, interactive modes of processing (Epstein et al.).

The experiential scale contained within the REI contains heuristic, holistic, and affective components. The heuristic component of the experiential scale was demonstrated when Epstein and colleagues (1996) found people who scored highly on the REI experiential scale also used more heuristic processing when responding to vignettes. This indicates that the experiential scale contains a heuristic, inferential component of intuition. However, Epstein and colleagues also describe the experiential system as



“holistic” and “intimately linked to affect” raising the possibility that the REI experiential scale takes a holistic and affective approach to understanding intuition as well (p. 391).

The Unconscious Thought Theory (UTT), another dual process theory proposed by Dijksterhuis and Nordgren (2006), suggests that there are two distinct modes of thought known as the conscious, when attentional processes are used, and unconscious, when processes occur without awareness. Based on this theory, intuition is a comprehensive judgment from the unconscious (Dijksterhuis & Nordgren). This definition takes a holistic approach to understanding intuition, as a process that integrates information from many sources over time to gain a complete representation of a problem. To study this holistic type of intuition, Dijksterhuis (2004) proposed a situation in which participants had to choose the best apartment among a list of apartments, each with several differing attributes. This type of complex problem relies on holistic processes of intuition because it requires participants to integrate several attributes about multiple apartments, which can be beyond the capacity of conscious thought.

The UTT also understands intuition to be based on gut feelings that one experiences because of unconscious past experiences (Dijksterhuis & Nordgren, 2006). This conceptualization of intuition is similar to an affective understanding of intuition because emotions are utilized to progress to a problem’s solution.

The above dual process theories can be related to the three subtypes contained within the new theory of intuition. Specifically, Hogarth’s (2001) theory provides an understanding of both inferential and holistic intuition with a hint of an affective component. CEST (Epstein et al., 1996), however, displays evidence of all three types, while the UTT (Dijksterhuis & Nordgren, 2006) contributes mainly to the understanding of holistic and affective intuition.

### Types of Intuition

While the past dual process model theorists define intuition according to one distinct process, other researchers have proposed the existence of more than one type of intuition. These different types of intuition still exist within the dual process model, with all types being encompassed by the tacit, unconscious system.

One of these researchers, Oliver Hill (1987), provided evidence that multiple types of intuition exist. His ideas were based on the finding that various measures of intuition as measured by the MBTI and Psychoepistemological Profile (PEP) were uncorrelated with an inferential intuitive measure created by Westcott (1961). Thus, Hill conceptualized intuition as having two distinct aspects. Hill labeled these two types of intuition as classical intuition and inferential intuition.

Hill (1987) describes classical intuition to be an “immediate, uncritical perception of the whole rather than the parts” (p. 138). In this view, an uncritical perception refers to a non-analytical thinking style. This definition has intuition operating as a holistic process. For example, people may choose to use classical (holistic) intuition when deciding what graduate school to attend. This situation is very complex; it contains a vast amount of incomplete information that must be gathered. It is difficult to make such a decision based on rational thinking alone. Instead, it is helpful to allow the unconscious to unknowingly integrate information to help produce a decision using a holistic process.

Hill (1987) defines the second aspect of intuition, inferential intuition, as “a heuristic that represented a logical (inferential) process in which several intermediary steps have been omitted or obscured” (p. 138). Hill’s definition of inferential intuition builds on a previous conceptualization of intuition by Westcott (1961).

Westcott's (1961) inferential definition of intuition is described as the ability to make a decision based on a few key pieces of information when significantly more information is normally needed. Based on this idea, Westcott conducted a study that required participants to solve series or analogy problems relating to either verbal or numerical series. Participants had the option of receiving clues, one by one, to help solve the problem. Westcott classified those who were able to come up with the correct solution based on few clues as successful intuitive thinkers. His idea of intuition is very inferential because he specifies people as intuitive if they are able to apply appropriate heuristics to find solutions to problems. This concept of intuition is similar to Hill's (1987) definition of inferential intuition because a short cut is used to solve an analytical problem. However, Hill expanded on Westcott's definition of intuition by suggesting that people's experience in a given situation may also be related to their experience with a problem. This experience allows them to automatize the appropriate steps needed to come up with a quick intuitive response.

Using this idea that intuition is learned through experience, Baylor (2001) created a different theory of intuition which acknowledges both its holistic and inferential aspects. She distinguished between two types of intuition: immature and mature. Immature intuition can best be described as intuition of a novice (Baylor). It is a precursor to analytical thinking that people demonstrate prior to their progression through the school system (Baylor). This is similar to holistic intuition because multiple facts are taken into account at once, without distraction of analytical processes focusing on only a few key ideas. On the other hand, mature intuition is intuition of an expert who has gained significant experience in a given domain (Baylor). This type of intuition is a consequence of advanced knowledge structures that are a result of the acquisition of

analytical thinking strategies (Baylor). Like Hill (1987) and Westcott's (1961) understanding, mature intuition is associated with inferential intuition because it is a thought process that has become automatized through experience by an acquisition of analytical thinking strategies in a given domain.

The researchers Raidl and Lubart (2000-2001) offer another theory surrounding different types of intuition based on the domain in which intuition is used. To them, intuition is composed of three different types: socioaffective, applied, and free intuition. Socioaffective intuition is interpersonal intuition that is used when trying to understand people and situations (Raidl & Lubart). This idea of a socioaffective intuition is similar to the use of affective intuition, but only when used in a social setting. Applied intuition is intuition used when trying to solve a problem or complete a task (Raidl & Lubart). This kind of intuition is considered more holistic and inferential in nature than affective. The third type of intuition, free intuition, is as a sense of foreboding that people feel about future events (Raidl & Lubart). This idea of free intuition relates to affective intuition that uses gut-feelings and emotions to make decisions.

#### Evaluation of the Current Measurement of Intuition

Based on the idea that different types of intuition appear to be discussed in the literature, Pretz and Totz (2007) wished to understand what aspects of intuition are measured by common intuition questionnaires like the REI and MBTI. Factor analyses of the REI experiential, MBTI thinking/feeling, and MBTI sensate/intuitive items and scales found that each questionnaire focused on a different kind of intuition that the other questionnaire did not.

Specifically, factor analyses of the REI experiential items revealed that the scale encompasses all three types of intuition by containing affective and inferential/holistic

components. However, items do not distinguish between inferential and holistic processes within this second factor. Instead the component describes more of a nature of automaticity, trust in intuitive ability, and making snap judgments that are theoretically related to both inferential and holistic intuition.

REI factors were then entered into a factor analysis with MBTI intuition and feeling subscales. They found that the REI experiential affective factor was significantly correlated with MBTI feeling. Because MBTI feeling describes decisions being made with emotions by weighing issues and a person's values (Myers & McCaulley, 1985) it is also closely tied to an affective understanding of intuition.

Though counterintuitive, Pretz and Totz (2007) also found MBTI intuition was moderately, positively correlated to the REI rational favorability subscale. To understand this relationship, another factor analysis was conducted on the individual items of the MBTI intuition and REI rational subscales. They found in particular, one factor that contained all of the MBTI intuition items as well as a strong loading on the REI item "I enjoy thinking in abstract terms." This shows that MBTI intuition uniquely assesses holistic intuition because it measures a preference for imagination, possibility, and abstract thought (Pretz & Totz). This finding is consistent with the explanation of intuition provided by the developers of the MBTI, Myers and McCaulley (1985), that intuition is a "hunch" that comes to the surface of consciousness after a person perceives a situation.

In sum, the REI experiential scale measures aspects of affective intuition and inferential/holistic intuition, but does not distinguish between inferential and holistic items. MBTI feeling measures an aspect of affective intuition while MBTI intuition measures an aspect of holistic intuition. Based on this, none of the current measures of

intuition measure all three types of intuition. This provides evidence that each measure is distinctly different at gauging the different aspects of intuition.

#### Relation of Types of Intuition to Personality Characteristics

Past research has shown that intuition relates to certain personality characteristics and not others. Knowing which past measures of intuition are and are not correlated to certain personality characteristics allows a distinction between the relationships between affective, inferential, and holistic intuition. Of particular interest are the relationships that have been found between the REI experiential and MBTI intuition subscales and the Big Five personality characteristics, MBTI feeling, ambiguity tolerance, and cognitive ability.

#### *Big Five Characteristics*

A lot of research has compared intuitive measures to the Big Five theory of personality consisting of the characteristics of openness, conscientiousness, extraversion, agreeableness, and neuroticism. Of particular interest is the relation of the REI and MBTI to these characteristics.

#### *Openness*

Openness, defined through the Big Five as a tendency to be open to experiences, intellectually involved, and participate in new situations (Furnham, Moutafi, & Crump, 2003), has been consistently found to be positively correlated to intuition. Specifically, Langan-Fox and Shirley (2003), Furnham and colleagues, and McCrae and Costa (1989) have all found that MBTI intuition is significantly positively correlated with openness. Recalling that the MBTI sensate/intuitive scale uniquely characterizes intuition as a holistic process (Pretz & Totz, 2007), it can be theorized this relationship may be unique to a holistic type of intuition. A weak positive relationship was also found between

openness and intuition as measured by the experiential scale of the REI (Pacini & Epstein, 1999). These results may be due to a holistic aspect of the experiential subscale found by Pretz and Tetz as well. All of these findings can be supported by Westcott and Ranzoni's (1963) research that found participants who did well on their intuitive task often accepted challenges, enjoyed risk, and sought out instabilities; characteristics that are easily linked to the Big Five's conception of openness to experience. Jung (1971) also conceptualized extroverted intuitives as having a tendency to seek out new possibilities, while stability seemed to "suffocate" them.

### *Conscientiousness*

A person who is "persistent, self-disciplined, and demonstrates a need for achievement" is labeled as conscientious (Furnham et al. 2003, p. 578). It has been found in research that when the MBTI sensate/intuitive scale is scored along a continuum, conscientiousness is weakly, though significantly, negatively correlated with intuition in males, and in the same direction, though not significantly so, for females (McCrae & Costa, 1989). Despite this, a significant weak, positive relationship between conscientiousness and the REI experiential subscale was also found (Pacini & Epstein, 1999). The discrepancy in these weak findings leads to an inconclusive suggestion of how conscientiousness should be related to any type of intuition.

### *Extraversion*

The personality characteristic of extraversion is also positively correlated with intuition. According to Furnham and colleagues (2003) a person who is extraverted is social, with high levels of activity and an inclination to feel positive emotions.

Researchers have found that extraversion is significantly positively correlated with MBTI

intuition (Langan-Fox & Shirley, 2003; McCrae & Costa, 1989). Once again, because MBTI intuition has been found to be an assessment of holistic intuition (Pretz & Tetz, 2007), these findings provide evidence for a relationship between extraversion and holistic intuition. A weak positive relationship was also found between extraversion and intuition as measured by the REI experiential subscale (Pacini & Epstein, 1999). This finding may be a result of the holistic aspect of the REI experiential subscale as found by Pretz and Tetz as well.

### *Agreeableness*

According to the Big Five, the personality characteristic of agreeableness describes a friendly person who is considerate and has modest behavior (Furnham et al., 2003). Furnham and colleagues and McCrae and Costa (1989) found that no correlation existed between agreeableness and MBTI intuition. However, Pacini and Epstein (1999) found a significant, weak, positive correlation between agreeableness and the REI experiential subscale. Despite this, there seems to be no theoretical basis to suggest a relationship between agreeableness and any type of intuition.

### *Neuroticism*

Evidence suggests that neuroticism, the propensity to display negative emotions, anxiety, depression, and anger, is either uncorrelated or negatively correlated to all types of intuition (Furnham et al., 2003). Whereas McCrae and Costa (1989) found no significant correlation between neuroticism and MBTI intuition, Furnham and colleagues found a significant but small, negative correlation. Likewise, whereas Pacini and Epstein (1999) found no significant correlation between neuroticism and the REI experiential



subscale, Epstein et al. (1996) found a significant but small negative correlation between the REI experiential subscale to depression, anxiety, and stress in college life.

### *MBTI Thinking/Feeling*

The MBTI thinking/feeling scale judges a person's preference for basing a decision on logical thought (thinking) or emotions (feeling). Making a judgment based on emotions is a characteristic of affective intuition. Pretz and Totz (2007) found that MBTI thinking was significantly, positively correlated to rational ability as measured by the REI. Theoretically, if thinking is the opposite of feeling and thinking is positively related to the REI rational subscale, then it follows that affective intuition should be negatively correlated with rationality as well.

### *Tolerance of Ambiguity*

Another personality characteristic that theoretically relates to intuition is a tolerance of ambiguity. If someone is tolerant of ambiguity, they tend to accept and not feel threatened by that which is uncertain and vague. Westcott and Ranzoni's (1963) findings support this idea by discovering that people who do well on an intuitive task tend to live with doubt and uncertainty as well as are drawn to abstract issues. They also found that successful intuitives tend to be flexible and impulsive which can be linked to a tolerance for ambiguity. Despite these claims, there is a lack of empirical evidence that addresses the relationship between tolerance for ambiguity and intuition. However, theoretically, having a tolerance for ambiguity is positively correlated to holistic intuition due to the fact that openness was correlated with holistic intuition in past research and it plays a part in ambiguity tolerance.

### *Cognitive Ability*

The Intelligence Quotient (IQ) has been found to be unrelated to implicit learning, a phenomenon closely related to intuition (Reber et al., 1991). Implicit learning, a primitive system, is similar to intuition because it is a process that works without conscious awareness. When participants engaged in an implicit learning task as well as an explicit learning task, their IQ's were positively correlated with explicit learning, yet uncorrelated with implicit learning (Reber et al.). The proposed development of implicit learning prior to conscious functioning explains the lack of relationship between implicit learning and IQ. Based on this, it could be suggested that all types of intuition are unrelated to cognitive ability.

Despite this, it is possible that cognitive ability might be slightly related to inferential intuition. This is because Westcott and Ranzoni (1963) found that participants who did well on an intuition task were slightly more mathematically inclined than those who did poorly. The task that used series and analogy problems was a very inferential task that used automatized analytical ability. Because of this, cognitive ability might be uniquely related to inferential intuition.

### *The Current Study*

Inadequacies of the REI and MBTI to distinguish between affective, inferential, and holistic intuition in one inventory necessitated the development of a new measure of intuition that contains all three types of intuition. Therefore, a new inventory, the Types of Intuition Scale (TIntS), was created to measure each distinct type (Pretz & Brookings, 2007, unpublished scale). This measure contains three subscales that allow the individual assessment of affective, inferential, and holistic intuition. The current research wished to establish the TIntS as an appropriate measure by first establishing the factor structure in

Study 1. Then in Study 2, convergent and discriminant validity was assessed by comparing the different types of intuition to past measures of intuition as well as other well-established measures of personality and cognitive ability.

### Rationale & Hypotheses

In Study 1, the goal was to administer the TIntS to several hundred participants so that a factor analysis could be conducted and a factor structure determined. A broad sample was used so that an appropriate amount of participants could be obtained for analysis. It was hypothesized that a factor analysis of the TIntS would reveal three factors of affective, inferential, and holistic intuition.

In Study 2, the goal was to establish convergent and discriminant validity by comparing the affective, inferential, and holistic subscales of the TIntS to scores on other well-established measures of intuition and personality inventories completed by college-aged students. These measures included the REI (Pacini & Epstein, 1999; Epstein et al., 1996), MBTI (Myers, McCaulley, Quenk, & Hammer, 1998), the Big Five factors of personality as measured by items from the International Personality Item Pool (IPIP; Goldberg et al., 2006), Ambiguity Tolerance Scale (AT-20; MacDonald, 1970), and ACT scores as a proxy of cognitive ability. It was predicted that the three subscales of intuition would differentially correlate to the past measures of intuition and personality characteristics in line with past research to support convergent and discriminant validity of the TIntS. Refer to Table 1 for a correlation matrix of hypotheses.

### STUDY 1

The TIntS was administered to several hundred participants in order to establish a factor structure. It was hypothesized that a factor analysis would reveal the three factors of affective, inferential, and holistic intuition.

## Method

### *Participants*

Four hundred and fourteen participants were tested. The sample included 269 undergraduate students and 145 practicing nurses (282 women, 90 men, and 42 who did not report gender). Undergraduate students consisted of general psychology pool participants and nursing students from two Midwestern liberal arts universities and one large state university in the Southeastern United States. Those recruited from the general psychology subject pool received research credit for participation. Nursing students and practicing nurses were recruited via email, listserv postings, and word of mouth and were entered into a drawing for a chance to win an Amazon gift certificate for compensation. One in ten participants received a gift certificate valued between \$10 and \$100. A sample of nurses and nursing students were included in this study due to their participation in a nursing study that also administered the TIntS.

Ages of participants ranged from 18 to 68 ( $M = 25.64$ ,  $SD = 11.48$ ) with 9.9% not reporting age. The ethnicity of the sample was representative of the population: 4.3% of participants reported their ethnicity as Black, Non-Hispanic, 1.0% as Hispanic, 3.9% as Asian or Pacific Islander, 0.2% as American Indian or Alaskan, 77.3% as White, Non-Hispanic, 2.4% reported as other, and 10.9% were unreported.

### *Materials*

The newly developed 37-item, Types of Intuition Scale (TIntS), was given to all participants to measure three proposed aspects of intuition: affective, inferential, and holistic (Pretz & Brookings, 2007, unpublished scale, See Appendix for scale). Affective questions gauged how much a person relies on their feelings when using intuition. Affective intuition was measured by 10 questions such as the reverse item “I prefer to

follow my head rather than my heart.” Inferential intuition items related to the idea that there is an aspect of intuition that is automatized through experience. It was assessed using 12 questions such as, “There is a logical justification for most of my intuitive judgments” or “If I have to, I can usually give reasons for my intuitions.” Holistic intuition questions tried to gauge intuition as a holistic process in which a person sees a broad range of influences that contribute to a problem’s solution. This was assessed using 15 questions such as, “I enjoy thinking in abstract terms,” or “I would rather think in terms of theories than facts.” Respondents were asked to indicate how well the statement described their personality on a five-point Likert-type scale ranging from definitely true to definitely false with the midpoint being undecided/neither true or false. Scores on the TIntS subscales represented means on individual response items.

Most of the TIntS items were created to follow the theoretical components of affective, inferential, and holistic intuition. However, five items from the REI experiential scale were used within the TIntS affective subscale and one item on the holistic subscale. Three other items also were used on the TIntS from different intuitive measures.

### *Procedure*

Participating undergraduate students were required to come into a computer lab and complete a computerized version of the TIntS over the Internet. Research assistants greeted participants at the door and situated them in front of a computer at which point informed consent was obtained.

Students first completed a set of creativity tasks unrelated to the current study. Then research assistants supervised as participants completed the TIntS. Other measures were also completed at this time pertaining to Study 2. The session ended with

participants completing a Creative Achievement Questionnaire unrelated to the current study and demographic information. Nursing students also completed nursing measures, but this data was not analyzed in the current study.

Practicing nurses also completed the TIntS and other measures over the Internet in an unsupervised location. Each testing session lasted approximately forty-five minutes to an hour.

## Results & Discussion

### *Reliability*

Internal consistency reliability analyses of the *a priori* TIntS subscales revealed the affective subscale to be sufficiently reliable ( $\alpha = 0.85$ ,  $N = 371$ ). However, reliability of the inferential and holistic subscales only reached 0.44 ( $N = 359$ ) and 0.45 ( $N = 362$ ), respectively.

Two to six weeks prior to completing the TIntS for the current study, 129 participants from the sample also completed a paper-pencil version of the TIntS as a part of a large, mass testing session. Due to this, test-retest reliability was calculated. Analyses demonstrated strong test-retest reliability for the affective ( $r = 0.83$ ,  $p < .01$ ), inferential ( $r = 0.60$ ,  $p < .01$ ), and holistic subscales ( $r = 0.65$ ,  $p < .01$ ).

### *Principal Components Factor Analysis*

For the factor analysis of the TIntS, it was decided to only include participants who provided complete data. This limited the sample to 332 participants of the original 414.

A principal-components factor analysis (PCFA) with Varimax rotation was conducted on the 37-item TIntS to determine existing factors. Based on scree plot examination, four factors emerged instead of the proposed three-factor structure of

affective, inferential, and holistic subscales. The four-factor solution explained 34.02% of the total variance.

The four factors were composed of items that appeared related to different aspects of intuition (see Table 2). One factor that explained 14.15% of the total variance contained all of the items from the original affective subscale of the TIntS plus one additional item from the holistic subscale. The items most heavily loading on this factor were the reverse statement “I prefer to follow my head rather than my heart” and “I tend to use my heart as a guide for my actions.” The item from the holistic subscale, “I almost always trust my intuition because I think it is a bad idea to analyze everything”, was the lowest loading item contained within this factor. The inclusion of this item among the rest may be due to the phrasing of the word “trust”; to some participants “trust” may be interpreted as an emotional experience. However, this was considered a poor item because it also loaded on another factor. Based on the items contained within this factor, it can be considered as gauging the affective nature of intuition.

Another factor that explained 7.27% of the variance was composed of items from the original inferential subscale as well as one item from the holistic subscale. The items most heavily loading on this factor were “There is a logical justification for most of my intuitive judgments” and “If I have to, I can usually give reasons for my intuitions.” These items provided a sense of having a rational justification for intuitive decisions, while other items contained a sense of automaticity and experience. These components theoretically relate to the concept of inferential intuition. However, the inclusion of the reverse scored holistic scale item “I am not very good at keeping in mind the big picture when working on a problem,” was unexpected. Despite this, the factor can best be

described as inferential intuition because of its relation to justification, automaticity, and experience.

A third factor that explained 7.48% of the total variance contained several items from the original holistic subscale of the TIntS with also one item from each the affective and inferential subscales. The items most heavily loading on this factor were from the *a priori* holistic subscale: “I enjoy thinking in abstract terms” and “I would rather think in terms of theories than facts.” Other items in this factor from the holistic subscale also related to complexity and ambiguity. The inclusion of the affective item “I like to rely on my intuitive impressions” can be seen to contain an aspect of automaticity that is related to holistic intuition, but this item also loaded heavily on the affective factor, making it a poor item. The inferential item, “Intuition is an accurate and reliable shortcut for problems that would otherwise require a lot of analysis,” relates to an idea of complexity as well. Despite this, the most heavily loading items represent an abstract nature of holistic intuition suggesting this factor could be best labeled as an abstract holistic factor.

A final factor explained 5.11% of the total variance and was composed of some of the remaining items from the holistic subscale with one item loading from the inferential subscale. The items that most heavily loaded on this factor were “After working on a problem for a long time, I like to set it aside for a while before making a final decision” and “When working on a problem, I prefer to work slowly so that there is time for all the pieces to come together.” All items within this factor seemed to gauge a sense of incubation except for the item, “My instincts in my areas of expertise are much better than in areas I do not know well” from the inferential subscale.

Overall, it was unexpected to find items loading on factors of intuition unrelated to their *a priori* subscale. Several of the items that were not loading on any factor or



loading on a different factor may be seen as poor items that are not representative of the intuitive construct they were intended to measure. Therefore, these items and any that were loading on multiple factors were removed when calculating revised scale scores. The items that remained in each scale score are listed in bold in Table 2.

Correlations among these new scale scores were calculated. The affective scale positively, though weakly, correlated to the inferential and abstract holistic scales ( $r = 0.114, p < .05$ ;  $r = 0.168, p < .01$ , respectively). The affective and incubation scales were uncorrelated. The inferential scale was weakly, positively correlated to the abstract holistic scale ( $r = 0.246, p < .01$ ) and uncorrelated to the incubation scale. The abstract holistic scale was uncorrelated to the incubation scale. The small correlations among these revised scale scores could be expected because each scale theoretically relates to a general idea of intuition. However, the weak nature of these correlations also suggests that these scales are in fact gauging distinct components of intuition.

Reliability analyses of the revised scales found once again that the nine-item affective scale was sufficiently reliable ( $\alpha = 0.849$ ). However, the four-item inferential scale, the four-item abstract holistic scale, and the three-item incubation scale were not reliable ( $\alpha = 0.552, \alpha = 0.541, \alpha = 0.504$ , respectively).

#### *Interpreting the Holistic Subscale*

The finding that the original *a priori* holistic subscale was broken up into two factors of abstract holistic and incubation suggests that the subscale was actually measuring two distinct concepts. Based on past theories, holistic intuition appears to encompass both abstract holistic qualities and incubation. For instance, concerning the abstract holistic factor, Pretz and Totz (2007) argued that MBTI intuition is a unique assessment of holistic intuition because it measures a preference for imagination,

possibility, and abstract thought. Also, the complex nature contained within this factor can be related to the idea that complex situations are conducive to holistic intuitive responding. Recall that Dijksterhuis's (2004) research proposed a situation in which participants had to choose the best apartment among a list of apartments, each with several differing attributes. This type of complex problem relies on holistic intuitive processes because it requires participants to integrate several attributes about multiple apartments, which can be beyond the capacity of conscious thought. Thus, complexity can also be seen to be a part of holistic intuition.

However, incubation can be thought of as a component of holistic intuition as well. Incubation is considered to be "the process whereby a problem is consciously ignored for awhile, after which the unconscious offers a solution" (Dijksterhuis, 2004, p. 588). In other words, incubation allows time for the complex attributes of a problem to come together to form a decision. This is similar to the integration of information that takes place unconsciously in the conceptualization of holistic intuition as suggested by Dijksterhuis. It is also similar to Jung's conceptualization of intuition as operating unconsciously by picking up information from beyond the senses resulting in a sudden insight of a problem (Myers & McCaulley, 1985).

Despite this theoretical speculation, the fact that the abstract holistic and incubation revised scale scores were distinctly different suggests that a key difference exists between the abstract holistic and incubation components of holistic intuition. It is possible that the conceptualization of holistic intuition needs to be broken down further into two components: an abstract holistic component and an incubation component. An analysis of correlations to past measures of intuition and personality characteristics may shed more light on the role of incubation in holistic intuition.

## STUDY 2

The intended goal of Study 2 was to establish convergent and discriminant validity of the TIntS. However, due to the fact that all four TIntS scales aside from affective intuition were unreliable, it is theoretically inappropriate to suggest conclusions concerning validity for these scales. Despite this, for the purposes of the current study, validity analyses were continued as if the four revised scales found in Study 1 were reliable. Based on the four factor structure found in Study 1, convergent and discriminant validity of the TIntS was investigated by comparing the affective, inferential, abstract holistic, and incubation scale scores to scores on other well-established measures of intuition and personality inventories. The previous predictions for the original three subscales hypothesized that the distinct types of intuition would differentially correlate to past measures of intuition and personality characteristics to support convergent and discriminant validity.

### Method

#### *Participants*

A subset of participants from Study 1 also completed additional measures for Study 2. These were 227 undergraduate students from two Midwestern liberal arts universities and one large state university in the Southeastern United States. These students were either from the undergraduate psychology pool and received research credit for participation or other students who were entered into a drawing to win an Amazon gift certificate. The sample consisted of 152 women and 74 men, ages 18 to 28 ( $M = 19.65$ ,  $SD = 1.54$ ). One person did not report gender and one person did not report age. The sample contained 27.3% first-year students, 22.8% second-year, 15.9% third-year, 10.1% fourth-year, and 0.9% fifth-year, with 22.0% of students not reporting class

year. Of these students, 6.2% reported their ethnicity as Black, Non-Hispanic, 1.3% as Hispanic, 4.8% as Asian or Pacific Islander, 0.4% as American Indian or Alaskan Native, 82.8% as Caucasian, and 2.6% as other. Four students, or 1.8% of the sample, did not report their ethnicity.

### *Materials*

Participants completed self-report measures to assess personality characteristics and intuitive ability. After completing the TIntS items analyzed in Study 1, participants also completed the REI (Pacini & Epstein, 1999; Epstein et al., 1996), MBTI (Myers, McCaulley, Quenk, & Hammer, 1998), a subset of the IPIP (Goldberg et al., 2006), and the AT-20 (MacDonald, 1970). Participants' ACT scores were also used as a proxy of cognitive ability. These additional measures were sufficiently reliable with alphas no lower than 0.73.

### *REI*

The REI was given as a measure of a person's thinking style. This questionnaire was created to measure a person's favorability and ability towards rational thinking as well as towards intuition (Pacini & Epstein, 1999; Epstein et al., 1996). There are two subscales on the REI that each contain a subscale for favorability and ability. The first subscale, the rational scale, measures rational thinking. This subscale contains 20 questions such as, "I would prefer complex to simple problems" or "I have difficulty thinking in new and unfamiliar situations." The second subscale, the experiential scale, measures an individual's intuitive thinking. Twenty questions in this subscale are similar to the statements, "I am a very intuitive person" or "My initial impressions of people are almost always right." Respondents indicated how well each statement described their personality on a Likert-type scale ranging from completely false to completely true.

Scores on the REI subscales were calculated by finding the mean across individual response items.

### *MBTI*

The MBTI (Myers, McCaulley, Quenk, & Hammer, 1998) was given as a measure of personality, including preference for using intuition over rational thinking. Two of the four subscales of the MBTI were used. These included 26 sensate/intuitive items and 24 thinking/feeling items. The questions contained in this measure were forced choice questions that began with a statement of preference and choices that participants chose from. For example, a question asked participants, “When you go somewhere for the day, would you rather... (a) plan what you will do and when, or (b) just go?” (Myers & McCaulley, 1985, p. 142). This measure also contained questions that asked participants to choose the most appealing word to them between two words. For example, participants were asked, “Which of these words appeal to you more? (Think what the words mean, not how they look or how they sound). (A). scheduled (B) unplanned” (Myers & McCaulley, p. 142). The MBTI was scored by summing scores of items related to each subscale.

### *IPIP*

Fifty items from the IPIP were used to measure the five personality characteristics of openness, conscientiousness, extraversion, agreeableness, and neuroticism (Goldberg et al., 2006). The IPIP is an open Internet database with over 300 personality items for researchers’ use (Goldberg et al., 2006). Items on the IPIP were short phrases that describe a personality trait. Participants were asked to respond to how accurately the statement matched their personality on a scale from very inaccurate to very accurate. For example, items included, “Am able to disregard rules,” or “Believe in an eye for an eye,”

(Goldberg et al., p. 87). Scores on the IPIP were found by calculating means across individual response items.

#### *AT-20*

The AT-20 developed by MacDonald (1970), was given to measure a person's openness to ambiguity. A person who is open or tolerant to ambiguity tends to "(a) seek out ambiguity, (b) enjoy ambiguity, and (c) excel in the performance of ambiguous tasks," (MacDonald, p. 791). Respondents were asked to respond true or false to items based on how well a statement described their personality. For example, one item stated, "It bothers me when I don't know how other people react to me," (Rydell & Rosen, 1966 as cited in MacDonald, p. 793). This scale has been found to be reliable and valid with good internal consistency in comparison to other measures of ambiguity tolerance (MacDonald). It also has high retest reliability and construct validity (MacDonald). Scores on the AT-20 were found by summing individual response items.

#### *ACT Scores*

ACT composite scores were used as a proxy for cognitive ability. Permission was obtained from the participants at Illinois Wesleyan to release these scores from the Registrar.

#### *Procedure*

Data from Study 2 was collected in the same sessions for Study 1. The measures were completed in the following order for all participants across sessions: TIntS, REI, MBTI, IPIP, and AT-20. It is standard procedure in individual differences research for a fixed order to be used (Gebauer & Mackintosh, 2007). Permission to receive ACT composite scores was obtained.

#### Results & Discussion

### *Correlational Analyses*

Due to the four-factor structure of the TIntS found in Study 1, all correlational analyses were conducted using the affective, inferential, abstract holistic, and incubation scale scores. A correlation matrix of findings between the four scales of the TIntS, REI, MBTI, IPIP, AT-20, and ACT scores are shown in Table 3. Cohen's (1988) conventions were used to determine correlational strength (as cited in Aron & Aron, 2003). *R* values higher than or equal to 0.5 were considered large, 0.49 to 0.30 were considered moderate, and 0.29 to 0.10 were considered small.

#### *Affective Scale Scores*

*Convergent validity.* The affective scale scores were found to be significantly, positively correlated to both the REI experiential favorability and ability subscales ( $r = 0.781$ ,  $r = 0.517$ , respectively,  $p < .01$ ). This finding is in line with the original hypothesis because the affective factor found by Pretz and Totz (2007) was contained within the experiential scale. The affective scale scores of the TIntS were also strongly, positively correlated to the feeling portion of the MBTI thinking/feeling subscale as predicted ( $r = .578$ ,  $p < .01$ ).

*Discriminant validity.* As hypothesized, a significant negative correlation was found between the affective scale scores and the REI rational favorability and ability subscales ( $r = -0.171$ ,  $r = -0.378$ , respectively,  $p < .01$ ). The affective scale scores were also unrelated to ACT scores as predicted.

Contrary to the hypothesis that the affective scale scores would be unrelated to MBTI intuition, a positive relationship was found ( $r = .168$ ,  $p < .01$ ). However, this relationship was weak. Also contrary to the prediction that agreeableness would be unrelated to all types of intuition, a significant, moderate positive correlation was found

between agreeableness and the affective scale scores of the TIntS ( $r = 0.317, p < .01$ ).

However, past research has found agreeableness to be significantly, though weakly, correlated to the experiential scale of the REI (Pacini & Epstein, 1999). Given the fact that Pretz and Totz (2007) found an affective factor contained within the REI experiential scale, this may be seen as a replication of Pacini and Epstein's findings. However, the theoretical basis for this relationship remains unclear. A significant positive correlation was also found between the affective scale scores and neuroticism ( $r = 0.157, p < .05$ ). However, this correlation was weak.

*Exploratory analyses.* It was unknown how affective intuition would relate to openness, conscientiousness, extraversion, and ambiguity tolerance. It was found that the affective scale scores were uncorrelated to openness, conscientiousness and ambiguity tolerance. The affective scale scores were weakly positively correlated to extraversion ( $r = 0.150, p < .05$ ).

### *Inferential Scale Scores*

*Convergent validity.* A significant, positive correlation was found between the inferential scale scores and the REI experiential favorability and ability subscales ( $r = 0.310, r = 0.480$ , respectively,  $p < .01$ ). These findings were expected due to the original hypothesis that inferential intuition would be positively related to the REI experiential subscales because Pretz and Totz (2007) had found an inferential/holistic factor contained within the experiential scale.

Contrary to predictions, the inferential scale scores were uncorrelated to ACT scores as a proxy of cognitive ability. This finding is possibly due to the nature of the



ACT. The ACT contains several subsections that relate to different areas of ability such as English, math, or reading. It will be recalled that Westcott and Ranzoni (1963) found that participants that were successful on their intuition task that was very inferential in nature were specifically more mathematically inclined. Unfortunately, a breakdown of ACT scores into analytical scores was not possible. Therefore, this relationship may be obscured by the use of a composite score.

*Discriminant validity.* As predicted, no relationship existed between the inferential scale scores and MBTI feeling. A significant negative, weak correlation was found between the inferential scale scores and neuroticism ( $r = -0.138, p < .05$ ). These results replicate the findings of Furnham and colleagues (2003) and Epstein and colleagues (1996).

However, there were findings that were not in line with predictions. The inferential scale scores of the TIntS were significantly positively correlated to MBTI intuition. This relationship, however, was weak ( $r = 0.232, p < .01$ ). Also, the inferential scale scores of the TIntS were significantly, moderately, positively correlated to REI rational favorability and ability ( $r = 0.353, r = 0.298$ , respectively,  $p < .01$ ). This finding makes sense once the rational nature of inferential intuition is considered. Inferential intuition develops out of a rational way of thinking because the process is considered to be an automatized, analytical process. Therefore, it is no wonder that inferential intuition can be related to a rational basis. There was also a small, significant positive correlation between the inferential scale scores and agreeableness ( $r = 0.211, p < .01$ ). As mentioned previously, past research has found agreeableness to be significantly, though weakly, correlated to the experiential scale of the REI (Pacini & Epstein, 1999). Given the fact that Pretz and Totz (2007) also found an inferential/holistic factor contained within the

REI experiential scale, this may be seen as a replication of Pacini and Epstein's findings. However, the theoretical basis for these relationships remains unclear.

*Exploratory analyses.* It was unknown how inferential intuition would relate to openness, conscientiousness, extraversion, and ambiguity tolerance. It was found that the inferential scale scores were unrelated to conscientiousness. This scale was also weakly positively correlated to extraversion and ambiguity tolerance ( $r = 0.167, p < .05$ ;  $r = 0.144, p < .01$ , respectively). It was also, however, moderately, positively correlated to openness ( $r = 0.320, p < .01$ ).

#### *Abstract Holistic Scale Scores*

*Convergent validity.* Similar to the findings of Pretz and Totz (2007), a significant, moderate, positive correlation was found between the abstract holistic scale scores and MBTI intuition ( $r = 0.555, p < .01$ ). The abstract nature that Pretz and Totz found within MBTI intuition provides evidence for why the abstract holistic scale scores would be positively correlated to the intuitive scale.

A significant, moderate, positive correlation was found between the abstract holistic scale scores and the REI rational favorability subscale as well ( $r = 0.466, p < .01$ ) when only a small positive correlation existed to the REI rational ability subscale ( $r = 0.136, p < .05$ ). These findings are in line with the findings of Pretz and Totz (2007); they found that MBTI intuition (a measure of holistic intuition) was correlated with the REI rational favorability subscale only.

The abstract holistic scale scores were also significantly positively correlated to the REI experiential favorability and ability subscales, though weakly ( $r = 0.294, r = 0.254$ , respectively,  $p < .01$ ). Once again, these findings are in line with the original hypothesis that holistic intuition would be positively related to the REI experiential

subscales because Pretz and Tetz (2007) found an inferential/holistic factor within the experiential scale.

The abstract holistic scale scores were significantly, moderately, positively correlated to openness and ambiguity tolerance ( $r = 0.428$ ,  $r = 0.474$ , respectively,  $p < .01$ ). The positive relationship between the abstract holistic scale scores and ambiguity tolerance provides support for the theory that intuitive people, in a holistic sense, are more tolerant of ambiguity.

The current study also replicated the weak, positive relationship that has previously been found between intuition and extraversion ( $r = 0.199$ ,  $p < .05$ ).

*Discriminant validity.* In line with hypotheses for holistic intuition, the abstract holistic scale scores of the TIntS were unrelated to MBTI feeling, agreeableness, and ACT scores. Though a negative correlation was found between the abstract holistic scale scores and neuroticism as predicted, the relationship was not significant ( $r = -0.118$ ,  $p = .076$ ).

*Exploratory analyses.* It was unknown how holistic intuition would relate to conscientiousness. In the case of the abstract holistic scale scores there was a small, significant, negative correlation ( $r = -0.267$ ,  $p < .01$ ). If a high scoring conscientious person is likely to be “persistent, self-disciplined, and demonstrate a need for achievement” (Furnham et al. 2003, p. 578), it is likely they may also be uncomfortable with ambiguity and prefer concrete to abstract thought.

#### *Incubation Scale Scores*

*Convergent validity.* Because the incubation scale scores were contained mainly within the holistic subscale, it would be expected to have similar positive relationships to those predicted by the holistic intuition hypotheses. However, the correlations among

incubation, past measures of intuition, and personality characteristics did not support these hypotheses. It was found that the incubation scale scores had significant, weak, negative correlations to the experiential ability subscale of the REI and ambiguity tolerance ( $r = -0.161, p < .01$ ;  $r = -0.118, p < .05$ , respectively). Also, the incubation scale scores were uncorrelated to MBTI intuition, the REI experiential favorability subscale, the personality characteristics of openness and extraversion, and the rational favorability subscales of the REI.

*Discriminant validity.* In line with hypotheses for holistic intuition, the incubation scale scores were found to be unrelated to REI rational ability, MBTI feeling, neuroticism, and ACT scores. But it was also found that the incubation scale scores were significantly, though weakly, positively correlated with agreeableness ( $r = 0.152, p < .05$ ).

*Exploratory analyses.* It was unknown how conscientiousness would relate to holistic intuition and thus the incubation scale scores. No significant relationship was found.

### *General Findings*

In sum, the correlational analyses of the affective scale scores provide support for convergent and discriminant validity. Also, if the inferential and abstract holistic scales had been reliable, the correlational analyses of the inferential and abstract holistic scale scores to past measures of intuition and personality characteristics would have supported convergent and discriminant validity.

The findings that incubation was unrelated to most of the past measures of intuition and personality characteristics suggest that incubation may be unrelated to holistic intuition and a distinctly different phenomenon from intuition. However, this

finding may also be due to the unreliability of the scale. Because of this, little can be said about its relationship to past measures and personality characteristics.

Overall, several of the significant findings for discriminant validity may be due to the large number of people contained within the sample. Though the relationships were significant, they were also relatively weak. Therefore, it is possible that the significant weak correlations may be attributed to the sample size contained within the study and not due to an actual relationship.

## GENERAL DISCUSSION

Researchers have found that current intuition inventories measure different aspects of intuition, creating the need for a new measure of intuition to accurately gauge different types of intuition. Though the goal of the current study was to validate the new measure of intuition, The Types of Intuition Scale, the attempt was only partially successful. Reliability analyses, factor analysis, and validity correlations found that the TIntS only partially measured the components of affective, inferential, and holistic intuition.

### Affective Intuition

The TIntS measure of affective intuition was sufficient due to the high reliability of its *a priori* subscale. Further support of this was provided when all of the affective items formed an affective factor during factor analysis. Therefore, this subscale needs only slight modification, if any. The convergent and discriminant validity of the affective scale was also established. Specifically, the affective scale scores were positively related

to past measures of intuition that also measured affective intuition, and uncorrelated to personality characteristics found to be unrelated to intuition.

### Inferential Intuition

The inferential factor was composed mainly of items from the original TIntS inferential subscale. However, several items from the original inferential subscale were not included. Because of this and low internal consistency, the TIntS subscale of inferential intuition needs revisions. Future research should develop a more reliable scale by creating items that are gauging the same qualities as those contained within the items loading highly on the inferential factor. These are items such as “There is a logical justification for most of my intuitive judgments.” The newly created items should be based off of this factor because it measures the inferential components of justification, automaticity, and experience. However, the low reliabilities of this factor and the revised scale limit the applicability of any validation findings. Given that the correlational findings were in line with hypotheses for convergent and discriminant validity of inferential intuition, I am optimistic that validity would be found if a reliable scale was used.

### Holistic Intuition

The breakdown of the holistic subscale into two separate factors and its low reliability suggests that the original subscale did not accurately gauge the original theoretical conceptualization of holistic intuition. It is possible, though, that the abstract holistic scale score items more accurately represent holistic intuition because past measures of holistic intuition, like the MBTI sensate/intuitive scale, also contain abstract components (Pretz & Totz, 2007). Because of this, I suggest future researchers increase reliability of the holistic subscale by creating more questions on the holistic subscale that

gauge the same qualities found in the abstract holistic scale score items. These would be items like “I enjoy thinking in abstract terms.” Based on the current correlational findings, I would predict that convergent and discriminant validity of a reliable scale would be found. This is because the abstract holistic scale scores of intuition strongly related to past measures of holistic intuition and personality characteristics as would be theoretically suggested.

The incubation scale score items, on the other hand, may be less related to holistic intuition due to a discrepancy in literature about whether or not intuitions are quick or can encompass incubation processes. Hill (1987) stated that the problem solving occurring in holistic intuition is more likely to be an *immediate* perception of the whole, not over a period of time as through incubation. However, Hogarth (2001) argued that speed is a correlate of intuition, not a prerequisite. Therefore, some people may use their intuition after an incubation period of unconscious thought. The finding that incubation was unrelated to most of the past measures of intuition and personality inventories also suggests that it less likely related to holistic intuition. However, this finding may be also due to past measures not being able to tap this construct as a part of intuition or the low reliability of the scale. Therefore, the question becomes whether or not incubation should be included as a new form of intuition, or considered a different process from intuition. Future researchers should analyze this by trying to understand the theoretical involvement of incubation in intuition. They may also choose to include incubation items in future intuitive measures to gain a better understanding of its relationship to other types of intuition and personality characteristics.

#### Scale Score Correlations

Although statements cannot be definitively made about the validity of the inferential and holistic TIntS subscales, the unique relationships found between the four TIntS scale scores, past measures of intuition, and personality characteristics provide evidence that different types of intuition do exist. This is because the scale scores were differentially correlating to some past intuitive measures and personality characteristics but not others. Creating reliable scales may provide further support of this theory.

### Strengths

A strength of this study was the large sample. Because of the large number of participants, a factor analysis could be conducted on the 37-item TIntS accurately. Also, the fact that well-established, reliable measures of intuition and personality characteristics were used provides strength to the findings. The study also used a diverse sample of participants that varied in age as well as level of expertise. The findings are then better able to be applied across a large population.

### Limitations

Despite these strengths, there are also limitations. A major limitation of the current study concerns the method of administration. Although it is convenient and easy to use, Internet data collection can result in participant attrition. Those that drop out may be systematically different from those who continue to participate in terms of their motivation, interest in intuition, and personality characteristics leading to self-selection bias (Smith & Leigh; Stanton; as cited in Epstein & Klinkenberg, 2001). Unfortunately, a comparison of TIntS data for those who finished versus those who dropped out could not be completed due to their missing data.



The Internet also poses the problem of an uncontrolled environment, particularly for the nurses who completed the TIntS in a location of their choice (Davis, 1999; Smith & Leigh, 1997; Stanton, 1989; as cited in Epstein & Klinkenberg, 2001). However, due to the nature of the current study, an uncontrolled environment is less likely to have an impact on an individual's response to an item. This is specifically because questions were asking participants about their personality, which does not have a right or wrong answer. Therefore, participants would not be enticed to look up answers on other Internet websites.

Despite these limitations, there are also benefits to using Internet administration. Participants are able to control their environments allowing them to feel more comfortable and increasing accurate responses (Epstein & Klinkenberg, 2001). Internet administration is also beneficial to the research because of its ease of use and ability to collect data rapidly. It appears, as with any method of administration, that research administered over the Internet has both strengths and weaknesses.

The disproportionate amount of females in the study also poses a potential bias in results. It is possible that women are more intuitive than males, possibly causing stronger correlations than would be found in the general population. To analyze this, the factor scores of men and women could have been compared. However, the sample size for males would have been marginal creating less than accurate factor analysis results. Past research, though, has also used overwhelmingly female samples (Pacini & Epstein, 1999).

#### Future Research

It is my belief that a reliable version of the TIntS is feasible because the current study provides evidence for the theory of different types of intuition. Once an adequate

version of the TIntS is available, comparing the TIntS subscales to intuitive behavioral tasks can establish external validity. A valid measure of the TIntS would permit researchers to easily use one inventory, the TIntS, to assess all types of intuition. This would be highly convenient and allow researchers the opportunity to explore individual differences in affective, inferential, and holistic intuition. Specifically, it would be interesting to understand what type of intuition experts use. Would their experiences lead them to have higher inferential scores than novices, or would no difference be found? It would also be intriguing to understand the role that gender socialization could play in fostering an affective type of intuition in females. If people do differ on these types of intuition, employers may also find the TIntS useful to gauge intuitive styles conducive to different jobs and projects.

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*Hypothetical Relationships between the TIntS, Past Measures of Intuition, and Personality Characteristics*

	Subscale of TIntS		
	Affective	Inferential	Holistic
REI subscales.			
Experiential.			
Favorability.	+	+	+
Ability.	+	+	+
Rational.			
Favorability.	-	o	+
Ability.	-	o	o
MBTI subscales.			
S/N (Intuition).	o	o	+
T/F (Feeling).	+	o	o
Big Five.			
Openness.	?	?	+
Conscientiousness.	?	?	?
Extraversion.	?	?	+
Agreeableness.	o	o	o
Neuroticism.	o/-	o/-	o/-
Ambiguity Tolerance.	?	?	+
ACT scores.	o	+	o

*Note.* + = Positive relationship, o = No relationship, - = Negative relationship, ? = Unknown relationship.

Table 2.  
Principal Components Factor Analysis of TIntS Items.

Item	Affective	Inferential	Abstract Holistic	Incubation
15. I prefer to follow my head rather than my heart. (-)	.730			
03. I tend to use my heart as a guide for my actions.	.708			
09. I think it is foolish to make important decisions based on feelings. (-)	.694			
06. I generally don't depend on my feelings to help me make decisions. (-)	.682			
12. When making decisions, I value my feelings and hunches just as much as I value facts.	.675			
29. I believe in trusting my hunches.	.647			
22. I often make decisions based on my gut feelings, even when the decision is contrary to objective information.	.609			
18. Rather than spend my time a problem situation, I prefer to use my emotional hunches.	.608			
32. I rarely allow my emotional reactions to override logic (-).	.588			
26. I like to rely on my intuitive impressions.	.483		.439	
36. I almost always trust my intuition because I think it is a bad idea to analyze everything.	.465			
19. I enjoy thinking in abstract terms.			.554	
23. I would rather think in terms of theories than facts.			.529	
13. When I get stuck working on a problem, the answer frequently comes to me suddenly at some later point in time.			.447	
37. Intuition is an accurate and reliable shortcut for problems that would otherwise require a lot of analysis.			.412	
10. Ambiguity makes me very uncomfortable. (-)			.405	
35. There is a logical justification for most of my intuitive judgments.		.550		
21. If I have to, I can usually give reasons for my intuitions.		.541		
16. I am not very good at keeping in mind the big picture when working on a problem. (-)		.480		



25. <b>My intuitions come to me very quickly.</b>	.460	
08. <b>When I have much experience or knowledge about a problem, I almost always trust my intuitions.</b>	.445	
04. <b>After working on a problem for a long time, I like to set it aside for a while before making a final decision.</b>		.632
07. <b>When working on a problem, I prefer to work slowly so that there is time for all the pieces to come together.</b>		.546
01. <b>I usually make a better decision if I sleep on it first.</b>		.539
14. My instincts in my areas of expertise are much better than in areas I do not know well.		.454

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*Note.* Factor loading under .4 have been omitted. Reverse-coded items are marked (-). **Bold** items are contained within revised scale scores.  $\lambda_{\text{affective}} = 5.238$ ,  $\lambda_{\text{inferential}} = 2.768$ ,  $\lambda_{\text{abstract holistic}} = 2.691$ ,  $\lambda_{\text{incubation}} = 1.892$ .

Table 3

*Correlations among the Four Factors of the TIntS, Past Measures of Intuition, and Personality Characteristics*

	TIntS Factor			
	Affective	Inferential	Abstract/ Holistic	Incubation
REI subscales.				
Experiential.				
Favorability.	<b>.781**</b>	<b>.310**</b>	<b>.294**</b>	-.082
Ability.	<b>.517**</b>	<b>.480**</b>	<b>.254**</b>	-.161**
Rational.				
Favorability.	<b>-.171**</b>	.353**	<b>.466**</b>	-.001
Ability.	<b>-.378**</b>	.298**	.136*	<b>-.060</b>
MBTI subscales.				
S/N (Intuition).	.168**	.232**	<b>.555**</b>	-.065
T/F (Feeling).	<b>.578**</b>	<b>-.039</b>	<b>.005</b>	<b>.095</b>
IPIP subscales.				
Openness.	-.120	.320**	<b>.428**</b>	-.047
Conscientiousness.	-.108	-.063	-.267**	.126
Extraversion.	.150*	.167*	<b>.199**</b>	.014
Agreeableness.	.317**	.211**	<b>.037</b>	.152*
Neuroticism.	.157*	<b>-.138*</b>	<b>-.118</b>	<b>-.004</b>
Ambiguity Tolerance.	.066	.144**	<b>.474**</b>	-.118*
ACT scores.	<b>-.112</b>	-.097	<b>.081</b>	<b>-.068</b>

*Note.*  $N = 227$  for all measures except ACT scores,  $N = 130$ . **Bold** correlations confirm hypotheses. \*  $p < .05$ , \*\*  $p < .01$ .

## Appendix

**Types of Intuition Scale (TIntS)**

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. Write the number corresponding to your response on the line before each statement.

1	2	3	4	5
Definitely false	Mostly false	Undecided true	Mostly true	Definitely true
(Neither true nor false)				

- \_\_\_ 1. I usually make a better decision if I sleep on it first.
- \_\_\_ 2. I've had enough experience to just know what I need to do most of the time without trying to figure it out every time.
- \_\_\_ 3. I tend to use my heart as a guide for my actions.
- \_\_\_ 4. After working on a problem for a long time, I like to set it aside for a while before making a final decision.
- \_\_\_ 5. My approach to problem solving relies heavily on my past experience.
- \_\_\_ 6. I generally don't depend on my feelings to help me make decisions.
- \_\_\_ 7. When working on a problem, I prefer to work slowly so that there is time for all the pieces to come together.
- \_\_\_ 8. When I have much experience or knowledge about a problem, I almost always trust my intuitions.
- \_\_\_ 9. I think it is foolish to make important decisions based on feelings.
- \_\_\_ 10. Ambiguity makes me very uncomfortable.
- \_\_\_ 11. When I have little experience with a problem, I prefer not to trust my intuition.
- \_\_\_ 12. When making decisions, I value my feelings and hunches just as much as I value facts.
- \_\_\_ 13. When I get stuck working on a problem, the answer frequently comes to me suddenly at some later point in time.
- \_\_\_ 14. My instincts in my areas of expertise are much better than in areas I do not know well.
- \_\_\_ 15. I prefer to follow my head rather than my heart.
- \_\_\_ 16. I am not very good at keeping in mind the big picture when working on a problem.
- \_\_\_ 17. My intuitive judgments are based on a few key pieces of information.
- \_\_\_ 18. Rather than spend my time trying to think of how to deal with a problem situation, I prefer to use my emotional hunches.
- \_\_\_ 19. I enjoy thinking in abstract terms.
- \_\_\_ 20. When I analyze my problems, I tend to miss important information and make a worse decision than if I had trusted my intuition.
- \_\_\_ 21. If I have to, I can usually give reasons for my intuitions.
- \_\_\_ 22. I often make decisions based on my gut feelings, even when the decision is contrary to objective information.

- \_\_\_\_ 23. I would rather think in terms of theories than facts.
- \_\_\_\_ 24. I rely on my intuition when I have little experience or knowledge about a problem.
- \_\_\_\_ 25. My intuitions come to me very quickly.
- \_\_\_\_ 26. I like to rely on my intuitive impressions.
- \_\_\_\_ 27. When I have a specific plan for solving a problem, I always stick to it and do not allow myself to get distracted.
- \_\_\_\_ 28. When I trust my intuition, I come to the same conclusion as if I had carefully analyzed the situation.
- \_\_\_\_ 29. I believe in trusting my hunches.
- \_\_\_\_ 30. Even after I have a specific plan for solving a problem, I make an effort to remain open to other approaches.
- \_\_\_\_ 31. In a familiar area, I am comfortable making a decision based on limited information when I have to.
- \_\_\_\_ 32. I rarely allow my emotional reactions to override logic.
- \_\_\_\_ 33. When making decisions, I try to suspend my assumptions and prior beliefs.
- \_\_\_\_ 34. I am more likely to trust my intuition on complex problems than simpler ones.
- \_\_\_\_ 35. There is a logical justification for most of my intuitive judgments.
- \_\_\_\_ 36. I almost always trust my intuition because I think it is a bad idea to analyze everything.
- \_\_\_\_ 37. Intuition is an accurate and reliable shortcut for problems that would otherwise require a lot of analysis.