



# The structure of intuitive abilities and their relationships with intelligence and Openness to Experience

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## ARTICLE INFO

### Keywords:

Intuition  
Intelligence  
Openness  
Implicit learning  
Insight

## ABSTRACT

In this study, we aimed to explore the relationships between intuitive abilities, intelligence (explicit cognitive ability) and personality. We found that intuition is not homogenous and there are three types of intuitive ability: *Coherence & Insight*, *Implicit Learning* and *Subjective Intuitive Abilities* that showed different patterns of relationships with explicit cognitive ability and personality. *Coherence & Insight* was predicted by intelligence and Openness to Aesthetics. *Implicit Learning* was weakly predicted by explicit cognitive ability. *Subjective Intuitive Abilities* was predicted only by Openness subscales: Fantasy, Action and Ideas. We demonstrated that intuition is not a unitary psychological construct but rather a complex cognitive conglomerate that incorporates diverse processes and mechanisms and these intuitive abilities are largely independent from psychometric intelligence.

## 1. Introduction

### 1.1. The intelligence of the unconscious

An increasing body of evidence points to the important role of implicit processes and intuition in social cognition (Greenwald et al., 2002), creativity (Dorfler & Ackermann, 2012; Pétervári, Osman, & Bhattacharya, 2016; Raidl & Lubart, 2001), expertise (Klein, 2011), and decision making (Bechara, Damasio, Tranel, & Damasio, 2005; Gigerenzer, 2008; Kahneman, 2011; but also see Newell & Shanks, 2014, for a critical perspective).

However, there is still little known about individual differences in intuitive abilities and their structure, and whether intuition is really ‘the intelligence of the unconscious’ (Gigerenzer, 2008; Kaufman, 2011). Is there one intuition or are there more intuitive abilities? Can people differ in the extent to which they use and benefit from using their intuitions? In this study, we aimed to explore relationships between intuitive abilities, intelligence and personality. Moreover, we attempted to test whether intuition is a unitary psychological construct or, alternatively, a complex cognitive conglomerate that incorporates diverse processes and mechanisms.

In intuition research there is no mainstream, golden standard or key theory. Rather, there are different paradigms and theoretical models which have their roots in very different traditions, such as decision making or Gestalt psychology. Because of this, it is difficult to provide a satisfactory universal definition of intuition (for a review, see

Hodgkinson, Langan-Fox, & Sadler-Smith, 2008). The majority of researchers agree that intuition predominantly operates implicitly, without cognitive control and awareness. Nevertheless, other characteristics of intuitive processes (for example, complexity, time, and metacognition) are disputable and depend on the phenomenon studied. We decided to define intuition as *the ability to implicitly learn and detect cognitive patterns, and to subconsciously combine information in complex ways to make correct judgments based on fragmentary cues*.

Intuition is based on various cognitive processes and mechanisms. One of the most fundamental and evolutionarily old of these is the ability to spontaneously acquire complex patterns on the basis of the procedural memory (i.e., implicit learning; Reber, 1993). For example, Reber (1967, 1993) showed that people can unintentionally learn artificial complex grammars (in the Artificial Grammar Learning task; AGL). Despite an absence of explicit knowledge about the rules, participants performed above the chance level (recognizing items as compatible vs. incompatible with a specific grammar), indicating the existence of implicit learning. Evidence for implicit learning has also been provided using different paradigms, for example, detecting hidden covariations (Lewicki, 1986; Lewicki, Hill, & Czyzewska, 1992) and by using the Serial Reaction Time task (SRT, Kaufman et al., 2010).

Furthermore, intuitive abilities are likely to govern the integration of cues into a whole in a complex way, without aware access to this process. Individuals can correctly recognize things based on little information (Westcott, 1968a), or even subconsciously combine them in order to find new solutions (Bowers, Regehr, Balthazard, & Parker,

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1990; Mednick & Andrews, 1967; Zander, Öllinger, & Volz, 2016). Even when people do not consciously know a solution, they can correctly guess which item is coherent with it (Bowers et al., 1990), and a solution to a problem can suddenly, and often surprisingly, appear in consciousness in the form of an insight. The latter effect is often accompanied by feelings of coherence, positive emotions and subjective certainty about the solution (Danek & Wiley, 2017; Nosal, 2011; Topolinski & Strack, 2009a, 2009b; Webb, Little, & Cropper, 2016). The ability to solve problems requiring insight is related to both convergent and divergent thinking, as well as to the ability to break a frame, allowing transitions between convergent and divergent thinking (DeYoung, Flanders, & Peterson, 2008). Furthermore, insightful individuals show greater diffuse activation in the visual cortex (which is related to more diffuse attention), and greater right hemisphere activation during resting-state EEG brain activity (Kounios et al., 2008; Kounios & Beeman, 2014), suggesting differences in brain structure (e.g., in gray and white matter volume; Smit, Boomsma, Schnack, Hulshoff Pol, & de Geus, 2012) between insightful and analytic individuals.

### 1.2. The structure of intuition

The structure of intuition is still unexplored. Hogarth (2010) even believes that *'the greatest challenge facing intuition researchers is to determine more precise ways of classifying different types of intuitive phenomena'* (p. 350).

Historically, intuition was rather treated as an homogeneous construct. For example, Carl Jung defined it as a *'psychological function that unconsciously yet meaningfully transmits perceptions, explores the unknown, and senses possibilities which may not be readily apparent'* (Hodgkinson et al., 2008, p. 5; Jung, 2014), and placed it at the second end of a dimension of 'sensing': the direct receiving of information through the senses. On the other hand, dual-process theories view intuition as being opposed to a rational and analytical mode of processing (Evans, 2008; Kahneman, 2011; Stanovich & West, 2000). Importantly, most dual-process models have regarded intuition as a unitary construct, although, as an exception to this, Epstein and Pacini (Epstein & Pacini, 1999; Pacini & Epstein, 1999) in their Rational-Experiential Inventory (REI) distinguished two types of intuition: *Experiential Ability* and *Experiential Engagement*. However, such a distinction does not include the different types of processing that might plausibly underlie intuition (as mentioned in previous paragraphs), and only differentiates perceived ability from the motivation to use it.

The dual-process tradition's explanation seems unsatisfactory and some researchers (e.g., Glöckner & Witteman, 2010; Gore & Sadler-Smith, 2011) have strongly emphasized the need for differentiation within both processes/systems. Nonetheless, their proposals are based only on theoretical considerations and have not been investigated empirically.

An alternative classification, based on questionnaire and psychometric approaches, has been proposed by Pretz and colleagues (Pretz et al., 2014; Pretz & Totz, 2007). Their distinction between Heuristic/Inferential, Holistic (Abstract and Big Picture) and Affective intuition is very promising. This differentiation is based on mechanisms described in the literature, has been confirmed empirically, and the different scales predicted different outcomes. For example, Holistic intuition has been shown to predict performance in clinical case studies, while Inferential intuition has predicted musicians' performance (Pretz et al., 2014). However, this work has been limited to self-report questionnaires, and has not included objective cognitive tests of intuition (akin to intelligence tests). Thus, these studies have tested the structure of intuitive preferences but not abilities.

Intuitive abilities are generally underestimated in the field of individual differences, and little attention has been paid to developing cognitive tests that measure individual differences in implicit, non-conscious abilities (for notable exceptions, see: Danner & Funke, 2017;

Kaufman et al., 2010; Westcott, 1968b). Because of this, only a few studies have explored relationships between different measures of intuition, what makes the understanding of the structure of intuitive abilities difficult. Moreover, inconsistent results have been found in research that has employed tasks measuring intuition. For example, implicit learning and self-report scales measuring intuition correlate positively but weakly (Kaufman et al., 2010), and have been shown to correlate only when participants are in a positive mood (Cicero, Hicks, & King, 2015), or only where participants are not aware of a rule (Woolhouse & Bayne, 2000). Also, sometimes no significant relationship between these measures has been observed (Pretz, Totz, & Kaufman, 2010). Moreover, other studies have either found no significant relationship between two tasks testing individual differences in implicit learning (the AGL and SRT tasks: Pretz et al., 2010; Salthouse, McGurthy, & Hambrick, 1999), or that this relationship is significant only when explicit instructions to search for a rule are provided (Gebauer & Mackintosh, 2007). Similar patterns of results (non-significant correlation with an intuition questionnaire) have also been observed for the Accumulated Clues Task (ACT), which measures the amount of information required by a participant to produce a correct hypothesis/guess (Langan-Fox & Shirley, 2003), and the Remote Associates Test (RAT), which measures the ability to activate a broad semantic network and experience insight (Barr, Pennycook, Stolz, & Fugelsang, 2015). Furthermore, even correlations between the most popular self-report scales measuring intuition (the Intuition scale of the Myers-Briggs Type Indicator based on Jung's theory [MBTI Intuition, Myers, McCauley, Quenk, & Hammer, 1998], and the Rational-Experiential Inventory [REI Experiential, Pacini & Epstein, 1999], grounded in the dual-process tradition) are either low or not statistically significant (Kaufman, 2009; Pretz & Totz, 2007).

Different patterns of correlations have been observed between these traditional self-report measures and more recent subscales of the Types of Intuition Scale proposed by Pretz et al. (2014). This questionnaire consists of four largely independent subscales: Holistic-Big Picture, Holistic-Abstract, Inferential, and Affective. On the one hand, the Affective scale correlates strongly with the REI Experiential dimension, and weakly with MBTI Intuition. On the other hand, the Holistic-Abstract scale is strongly related to MBTI Intuition, and weakly to the REI Experiential scale. The Inferential scale is moderately related to REI Experiential but not to MBTI Intuition, and the Holistic-Big Picture scale does not correlate with the MBTI Intuition and REI Experiential measures.

Generally, these results show that each test/questionnaire measures a separate aspect of intuitive processing. Therefore, we argue that there is a strong need to empirically distinguish between different types of intuitive abilities.

### 1.3. Relationships between intuitive abilities and intelligence

Much research on individual differences in cognitive abilities focuses on controlled and explicit tasks: working memory tests, verbal analogies, Raven's Matrices, etc. Nevertheless, the recent Dual-Process Theory of Human Intelligence (Kaufman, 2011) integrates dual-process theories of human cognition (Epstein, 2009; Evans, 2003; Kahneman, 2011) with the traditional approach to intelligence. It is argued that spontaneous and implicit cognition (related to intuition) is independent of, but complementary to, explicit cognitive ability or IQ (Danner, Hagemann, Schankin, Hager, & Funke, 2011; Kaufman, 2011; Nosal, 2011). Depending on task requirements, these two forms of cognitive abilities – explicit and implicit – dynamically interact, giving rise to intellectual functioning. Moreover, flexible switching between these two modes of cognition is likely to result in adaptive and optimal behavior.

Indeed, empirical studies have revealed that implicit learning is largely independent of general intelligence showing no, or very low, relationships between AGL or SRT tasks performance and scores on

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