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More than meets the gut: a prototype analysis of the lay conceptions of intuition and analysis

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ABSTRACT

Using a prototype approach, we assessed people's lay conceptions of intuition and analysis. Open-ended descriptions of intuition and analysis were generated by participants (Study 1) and resulting exemplars were sorted into features subsequently rated in centrality by independent participants (Study 2). Feature centrality was validated by showing that participants were quicker and more accurate in classifying central (as compared to peripheral) features (Study 3). Centrality ratings suggested a single-factor structure describing analysis but revealed that participants held lay conceptions of intuition as involving two different types of processes: (1) as an automatic, affective, and non-logical processing, and (2) as a holistic processing that can assist in problem-solving. Additional analyses showed that the centrality ratings of intuition's facets were predicted by participants' self-reported intuitive style, suggesting intuition is differently perceived by intuitive and non-intuitive people. We discuss the implications of these results for the study of intuition and analysis.

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> There is probably no cognitive process that suffers from such a gap between phenomenological reality and scientific understanding. Introspectively, intuition is one of the most compelling and obvious cognitive processes; empirically and theoretically, it is one of the processes least understood by contemporary cognitive scientists. (Reber, 1989, p. 232)

We can ask ourselves "What is intuition?", but perhaps just as important a question from a psychological perspective is: "What best describes intuition to you?"

As Reber (1989) noted in the opening quote, although, on a lay level, intuition is an obvious cognitive process experienced by most of us throughout the course of our lives, on an empirical and theoretical level researchers are still trying to map and understand "intuition, the mysterious Lady in Black" (Hoffrage & Marewski, 2015, p. 157). The wide interest in intuition across a wide range of academic (and non-academic) domains has led to many different definitions of intuition (for a review, see Dane & Pratt, 2007). In fact, in the 1940s, Belton (1946, as cited in Andow, 2015) had already pointed out that no other word was in more critical need of an accepted definition and no other word carried such different meanings.

From a psychological perspective, it should be important to understand people's lay conceptions of intuition, as many decisions and behaviours are typically described by people as unfolding "intuitively" (often in contrast to "analytically"). Such an understanding should tell us about whether these lay conceptions sometimes differ from conceptualizations employed by researchers. This is especially relevant when considering that abundant research on intuitive and analytic decision-making relies on people's self-reports of their use of intuition or analysis. In this paper, we directly examine lay conceptions of intuition and analysis from a prototype approach. Before discussing the prototype effort, itself, we review

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how the psychology literature has conceptualised intuition and analysis.

Intuition as a theoretical construct

Intuition has become a topic of great research interest in several academic domains (see Sinclair, 2013, 2014). Such wide interest led to many different definitions of intuition. Some have argued that because intuition has been given so many different meanings, one should wonder whether the term has, in fact, any meaning at all (Epstein, 2008). It is not our aim to provide here an extensive review of existing definitions of intuition, but it is nonetheless important to acknowledge the existence of several attempts to define it. Based on the analysis of many of these definitions, researchers (Dane & Pratt, 2007; Shapiro & Spence, 1997) suggested some consensus in defining intuition as an affectively charged process that arises quickly and unconsciously, through holistic associations. Briefly, intuition is proposed as a process that arises from unconscious operations, imbued with emotionally charged content (Epstein, 2008), supported by the activation of basal ganglia and related structures associated with implicit learning (see Lieberman, 2000, 2007). This process is characterised by operating relatively automatically and rapidly (Bargh, 1996; Bargh & Chartrand, 1999; Epstein, 1994), involving holistic associations (Epstein, 1994; Shapiro & Spence, 1997) that might derive from cognitive heuristics (e.g. Gigerenzer & Goldstein, 1996; Tversky & Kahneman, 1974) or patterns developed with training and experience (Simon & Chase, 1973).

Intuition is usually described as a non-elaborative process that contrasts with a more demanding and rational type of process, generally integrated in different dualistic views of the human mind (e.g. Chaiken & Trope, 1999; Evans, 2009, 2011; Evans & Stanovich, 2013; Gawronski & Creighton, 2013). These dual-process theories share the core assumption that information processing is accomplished in different but complementary ways: intuitively (through automatic, unconscious, fast, low-effort processes) and analytically (through deliberate, conscious, slower, controlled mechanisms; for overviews, see Evans, 2009, 2011).[1]

Although, for these approaches, intuition defines a decisional process that opposes analytic thinking, there is not a consensus over the idea that intuition can be simply defined as the opposite of analysis. Intuition can be thought of as multiple types of non-analytic processes (Evans, 2009). The debate surrounding the nature and functioning of intuitive processes (Glöckner & Witteman, 2010), has led some researchers to argue for the possibility of different types of intuition. For instance, Pretz and Totz (2007) distinguished between intuitive judgements based on: (1) emotional reactions (affective intuition), (2) automated inferences and processes that have become more intuitive over time (inferential intuition), and (3) qualitative processes and decisions made by integrating multiple cues into a whole that might or might not be explicit in nature (holistic intuition). Dane and Pratt (2009) distinguished between different types of intuition as based on: (1) affective and automatic reactions to issues with moral/ethical content (moral intuition), (2) acts based on pattern matching recognition (problem-solving intuition), and (3) processes through which knowledge is combined in novel ways (creative intuition). And Glöckner and Whitteman (2010) proposed that intuition results from the activation of four different overlapping processes based on: (1) simple learning-retrieval and stimulus-response (association), (2) learning of exemplars/prototypes and retrieval based on the matching of stimuli to these exemplars/prototypes (matching), (3) automatic integration of evidence derived from associative or exemplar learning (accumulation), and (4) activation of related information and the formulation of mental representations (construction).

Although some degree of overlap can be observed in these different proposals, more notably, these suggest intuition is likely not a homogeneous concept but rather an umbrella term for different cognitive mechanisms (Glöckner & Witteman, 2010).

Relevance of approaching intuition as a lay concept

Intuition plays an important role in lay psychological reasoning, as people are routinely asked to "trust their intuition" or to "go with their gut". But what lay conceptions of intuition do people hold when asked to follow their intuitions, and what processes do they describe when referring to their intuitions? To date, these are questions without a clear answer.

Lay conceptions are schematic semantic knowledge structures that encompass beliefs about different attributes that define a concept, influencing our perception, feelings, thoughts and behaviours (Dweck et al., 1995; Ross, 1989; Schneider, 1973). The study of lay conceptions is important not only

for its contribution to the development of theory and research about a concept but also for its clear implications for measurement (e.g. Bharara et al., 2019; Kearns & Fincham, 2004; Weigel, 2008). Because research on intuition is heavily based on self-reports of its use, understanding its lay conceptions is vital for an accurate interpretation of "acting intuitively". Additionally, a study of lay conceptions of intuition might facilitate its operationalisation in ways that correspond to how people represent the concept, and also help in the creation or refinement of various types of measures.

Existing attempts in the literature to capture peoples' lay conceptions of intuition have followed different approaches. For instance, Burke and Miller (1999) interviewed managers, Rogers and Wiseman (2005) sought open-ended descriptions by self-identified highly intuitive individuals, and Sadler-Smith (2016) used de-nominalization methods with human resource practitioners. However, it is noteworthy that these approaches only partially characterise lay conceptions of intuition. By targeting specific populations of participants, these studies overlooked the possibility that those who are more reliant on intuitions might possess different conceptions of intuition than a broader sample of participants. This is important because intuition might be perceived differently by intuitive and non-intuitive individuals. For example, the subjective experience of intuition differs across individuals' sensitivities to different bodily states (Dunn et al., 2010) and to different modalities in which intuition is experienced (e.g. as an "inner vision"; Vaughan, 1979, p. 73). This is especially relevant considering people with different cognitive styles differ on how much they rely on intuition or analysis (e.g. Allinson & Hayes, 1996; Betsch, 2004; Cacioppo et al., 1984; Pacini & Epstein, 1999; Scott & Bruce, 1995). As such, in the investigation of the lay conceptions of intuition and analysis, it might prove particularly relevant to control for such individual differences in intuitive and analytic cognitive styles. Additionally, these approaches do not provide any indication of whether or how the identified features of intuition overlap or the extent to which these constitute features that are relatively central (prototypic) or peripheral to the concept of intuition.

In sum, lay conceptions of intuition are relevant to understanding human experience with implications for theory, research, measurement, and operationalisation of intuition. As reviewed, authors have defined intuition based on different processes. It is an empirical question whether lay conceptions of intuition differ from theoretical conceptualizations, but also whether these distinguish between different types of intuition, and whether intuitive and analytic individuals conceive intuition differently. Thus far, no systematic work has been conducted to examine these questions.

Current studies

We followed a prototype approach (Cantor & Mischel, 1977; Rosch, 1975) to study lay conceptions of intuition. Compared to previous qualitative research on intuition, this approach provides distinct benefits, by defining a construct as a set of features organised in terms of their degree of association with the concept, i.e. their centrality. Thus, the aim is not to identify necessary features of a concept but rather to flag its most central features and differentiate them from more peripheral features. This is done by using participant-driven identification of critical aspects of their lay conceptions and validation of those features by different participants.

This approach should allow us to go beyond researcher definitions of intuition, which have held rather little consensus. One reason for the difficulty in reaching a consistent agreement on a formal definition might be that the concept does not have a classical definition. It has been argued that such a classical approach fails to adequately capture people's experiences and conceptions of emotions and other blended states (see Russell, 1991, for a review). Evidence has shown that a prototype approach better resembles the way people represent subjective constructs such as emotion (Fehr & Russell, 1984; Shaver et al., 1987), love (see Fehr, 2006, for a review), anger (Russell & Fehr, 1994), forgiveness (Kearns & Fincham, 2004), gratitude (Lambert et al., 2009), modesty (Gregg et al., 2008), disillusionment (Maher et al., 2020), prayer (Lambert et al., 2011), and *saudade* – while there is no direct translation for this Portuguese expression, it closely resembles a melancholic longing or yearning (Neto & Mullet, 2014). Consistent with prototype theory, these studies have shown that people organise these concepts around central and peripheral features and that these are processed differently. Specifically, central features are more accessible in memory (Cantor & Mischel, 1977) and hence more likely to be correctly recalled (e.g. Hepper et al., 2012; Kinsella et al., 2015; May & Fincham, 2018), more quickly identified (e.g. Fehr

et al., 1982; Kinsella et al., 2015; May & Fincham, 2018) and falsely recognised – due to being more falsely ascribed to otherwise prototypical targets (e.g. Hepper et al., 2012; Kearns & Fincham, 2004; Kinsella et al., 2015) in comparison to peripheral features.

In three studies, we analysed people's lay conception of intuition and analysis through a prototype approach. This allowed us to learn whether people perceive both concepts as independent or complementary. To develop a prototype structure of intuition and analysis, some conditions must be met: a set of features associated with the two concepts must be identified and capable of being rated on their centrality to the concept, and features' centrality should have implications for information processing (Gregg et al., 2008; Hassebrauck, 1997; Hepper et al., 2012; Rosch, 1975). To meet these conditions, Study 1 was directed at obtaining a pool of prototypical features of "intuition" and "analysis". These features were subsequently rated for centrality by independent samples in Studies 2 and 3. Exploratory factor analyses of the centrality ratings allowed us to identify different facets of intuition and analysis and to address whether participants' intuitive and analytical cognitive styles predicted the observed centrality of identified underlying factors. In Study 3, we also examined the impact of centrality on information processing, by analyzing response latencies when categorising features as representative of intuition or analysis and the consensus on classifying central and peripheral features as belonging to their respective category. Across the three studies, number of participants was determined based on sample sizes used in previous prototype research, noting that smaller sample sizes can be justified here by each participant providing multiple data points (e.g. Gregg et al., 2008; Hepper et al., 2012; Maher et al., 2020).

Study 1

Participants and procedure

Participants were 209 North Americans recruited online on Prolific Academic (42.1% women, M_{age} = 31.60, SD_{age} = 10.71), who were invited to participate in a study about people's understanding of daily actions. After providing informed consent, participants were randomly assigned to describe intuition (n = 103) or analysis (n = 106), being told the focus of the research was to understand what people mean by using their intuition or "acting intuitively" or by using their analysis or "acting analytically". Participants were asked to write down all the features and characteristics that, in their opinion, best described what it means to "act intuitively" or to "act analytically" in an open-ended item designed for this purpose. Participants were further informed there were no correct or incorrect answers, and the researchers were particularly interested in their personal views. After submitting their responses, participants were thanked and debriefed.

Results

We broke down participants' responses into distinct feature exemplars (N_{total} = 778, M = 3.72 per participant; $N_{intuition}$ = 350, $M_{intuition}$ = 3.40; $N_{analysis}$ = 428, $M_{analysis}$ = 4.04). There were no significant sex differences in the number of features reported for intuition, $t(101) = -1.18$, $p = .239$, or analysis, $t(104) = -0.26$, $p = .799$, and no significant association between participants' age and the number of features generated for intuition, $r(101) = .14$, $p = .149$, although this association did reach significance for the features generated for analysis, $r(104) = .20$, $p = .045$.

Features were defined as one item from a list, or one "unit of meaning" (Joffe & Yardley, 2003) from responses with multiple descriptions. Following practices from previous prototype research (e.g. Hepper et al., 2012), the resulting features were coded by two independent coders into superordinate thematic categories by grouping (a) identical features, (b) semantically related features (e.g. "acting on feelings" and "taking action from your feelings"), and (c) meaning-related feature exemplars (e.g. "believing in yourself" and "trusting yourself"). Discrepancies between coders were resolved through discussion. A final coding scheme contained 35 feature categories for intuition and 19 feature categories for analysis (see Tables 1 and 2). The validity of this coding scheme was evaluated by a third and fourth coder who independently applied the coding scheme to all original exemplars, assigning each exemplar to the categories identified for intuition and analysis. Inter-rater agreement was good (84% and 94.6% for the coding of intuition and analysis exemplars, respectively).

Study 2

The features identified in Study 1 were here evaluated on their centrality for their respective categories. This

Table 1. Features of "acting intuitively" generated in Study 1 ordered by average centrality ratings (Study 2) – factor loadings based on EFA of centrality ratings (Study 2).

		Study 2		
		Centrality	Factor loadings	
Rank	Feature	*M*(*SD*)	1	2
1.	Following your gut	6.82(1.52)	.696	
2.	Acting based on what feels right	6.81(1.33)	.657	
3.	Following your instinct	6.69(1.69)	.701	
4.	Acting based on what's natural	6.26(1.66)	.659	.315
5.	Avoiding what feels wrong	6.26(1.67)		.323
6.	Trusting yourself	6.21(1.58)	.524	.354
7.	Going with one's first impression	6.18(1.43)	.563	.218
8.	Acting automatically and effortlessly	6.10(1.67)	.787	
9.	Using your senses	6.10(1.80)		.514
10.	Acting based on feelings and emotions	6.05(1.70)	.484	
11.	Acting based on unexplained knowledge	6.01(2.00)	.520	
12.	Thinking quickly	5.95(1.75)	.454	
13.	Reading people	5.85(1.82)	.346	.223
14.	Acting quickly	5.77(1.62)	.652	
15.	Doing things easily and fluently	5.57(1.75)	.456	
16.	Acting in uncertain situations	5.40(1.86)	.418	
17.	Predicting something will happen	5.39(1.86)	.379	
18.	Acting without thinking	5.33(2.19)	.655	−.240
19.	Fitting to the situation	5.33(1.53)		.368
20.	Acting impulsively	5.32(1.90)	.694	
21.	Acting in a personal and unique manner	5.29(1.84)	.270	.652
22.	Acting in an unplanned manner	5.21(1.92)	.639	
23.	Solving problems	5.14(1.79)		.539
24.	Acting with integrity	5.14(2.00)		.696
25.	Acting based on prior experience	5.10(2.26)		.626
26.	Thinking abstractly	5.03(1.82)		.557
27.	Engaging in imagination	4.91(1.82)		.312
28.	Acting calmly	4.73(1.83)		.655
29.	Acting without reasoning or logic	4.71(2.25)	.580	−.410
30.	Acting upon superstition or a supernatural force	4.71(2.26)	.451	
31.	Acting in a carefree manner	4.66(2.16)	.534	
32.	Focusing on the big picture	4.43(1.71)	−.388	.451
33.	Acting thoughtfully	4.28(2.08)	−.267	.645
34.	Acting in a biased manner	4.10(1.89)	.402	
35.	Disregarding objective and concrete facts	4.05(2.11)	.343	−.208

Note: Extraction Method: Maximum Likelihood; Rotation Method: Promax with Kaiser Normalisation. Omitted loadings (.2).

allowed us to assess feature centrality and to identify possible factors within the categories of intuition and analysis based on the centrality ratings. We further examined whether perceptions of centrality of any obtained factors were influenced by participants' cognitive styles, assessed through Faith in Intuition (Pacini & Epstein, 1999) and Need for Cognition (Cacioppo et al., 1984).

Method

Participants

An independent sample of 199 North American participants was recruited on Prolific Academic (41.2% women, $M_{age} = 31.59$, $SD_{age} = 11.36$). Participants were randomly assigned to one of two versions of an online survey, consisting either of rating the centrality of the features of intuition ($n = 97$) or the features of analysis ($n = 102$).

Procedure and measures

Participants were invited to a study about people's understanding of daily actions. After providing informed consent, participants were directed to instructions that either asked them to rate a set of features on how closely each related with their personal views of "acting intuitively" (35 features) or with their personal views of "acting analytically" (19 features). Features were randomly and individually presented at the centre of the screen, each accompanied by up to three common exemplars (obtained in Study 1) provided in brackets. As an example, for the feature "Acting based on what feels right", participants saw as examples "Doing something that feels

Table 2. Features of "acting analytically" generated in Study 1 ordered by average centrality ratings (Study 2) – factor loadings based on EFA of centrality ratings (Study 2).

		Study 2	
Rank	Feature	Centrality *M*(*SD*)	Factor loadings
1.	Organising and analyzing information	7.15(1.15)	.718
2.	Thinking objectively and logically	7.13(1.35)	.818
3.	Acting based on facts and data	7.11(1.27)	.724
4.	Acting objectively and logically	7.07(1.27)	.670
5.	Assessing and observing the situation	6.96(1.27)	.794
6.	Making rational and unbiased decisions	6.87(1.28)	.704
7.	Thinking about outcomes and consequences	6.84(1.46)	.797
8.	Weighting and considering all options and perspectives	6.84(1.42)	.606
9.	Gathering evidence	6.83(1.22)	.770
10.	Examining problems	6.80(1.33)	.805
11.	Paying attention to detail	6.75(1.49)	.755
12.	Thinking before acting	6.71(1.61)	.733
13.	Implementing method	6.60(1.53)	.721
14.	Reflecting and deliberating	6.37(1.62)	.636
15.	Analyzing people	6.28(1.63)	.484
16.	Acting carefully	6.11(1.50)	.547
17.	Resisting impulses	5.93(1.80)	.621
18.	Ignore feelings and emotions	5.81(1.71)	.507
19.	Acting slowly and calmly	5.67(1.75)	.588

Note: Extraction Method: Maximum Likelihood.

right or like the right thing to do; Doing what feels right". Centrality ratings were made on a scale from 1 (not at all related) to 8 (extremely related).

Afterwards, participants completed the Need for Cognition scale (Cacioppo et al., 1984), which assesses individual differences in one's intrinsic enjoyment and motivation to engage in thoughtful thinking (α = .93, in the present study). Participants then completed the Faith in Intuition scale (Pacini & Epstein, 1999), which measures one's reliance on and confidence in intuition (α = .93, in the present study). For both measures, participants indicated the extent to which each item was characteristic of them on a scale from 1 (not at all like me) to 5 (very much like me). After completing both measures, participants were thanked and debriefed.

Results

Feature centrality and underlying factors

The mean centrality ratings for each feature are presented in Tables 1 and 2. Suggesting a shared representation of both constructs, intraclass correlations (ICC) showed an overall good inter-rater reliability for the obtained centrality ratings of the features of intuition (ICC for average measures = .83, 95% confidence interval = .78 to .88) and for the features of analysis (ICC = .93, 95% confidence interval = .91 to .95).

Based on the ratings of feature centrality, we performed an exploratory factor analysis (EFA) to examine the extent to which perceptions of feature centrality relate with each other. Emerging factors distinguish between different facets of people's lay conceptions of "intuition" and "analysis".

Intuition. Both a scree plot (see Figure 1) and parallel analysis (Fabrigar & Wegener, 2012) suggested a two-factor structure (Rotated Factor Loading Matrix for a Maximum Likelihood EFA with 2 common factors and a Promax rotation: $\chi^2/df = 1.50$, $p < .001$, RMSEA = .072; see factor loadings above .2 in Table 1). An analysis of the features composing each factor suggests as likely that people hold lay conceptions of intuition as involving two different types of processes: (1) Intuition as an automatic, affective and non-logical process (Factor 1, henceforth "Affective factor", with features such as *acting based on what feels right, following your gut, acting automatically and effortlessly, acting without thinking*); and (2) Intuition as a holistic processing that can assist in problem solving (Factor 2, henceforth "Holistic factor", with features such as *thinking abstractly, focusing on the big picture, acting based on prior experience*). The two factors differed significantly in their mean centrality, $t(96) = 2.95$, $p = .004$, $d = 1.56$, with the first (affective) factor being viewed as more central ($M_{Factor\ 1} = 5.61$, $SD = 1.04$) than the second (holistic) factor ($M_{Factor\ 2} = 5.15$, $SD = 1.09$). Both factors showed good levels of internal consistency (Factor 1 α = .91; Factor 2 α = .83). They correlated negatively, albeit weakly (−.12, based on factor correlation matrix). A centrality index was created for each factor by averaging the centrality ratings of the features of each factor.

Analysis. A scree plot (see Figure 1) and parallel analysis suggested a single-factor structure ($\chi^2/df = 2.39$, $p < .001$, RMSEA = .117; see factor loadings in Table 2), with a mean centrality of 6.62 ($SD = 1.02$) and displaying high reliability (α = .94).

Association with cognitive styles

We next examined whether participants' own intuitive and analytical cognitive styles predicted the observed centrality ratings for the two identified underlying factors of intuition and the general factor of analysis.

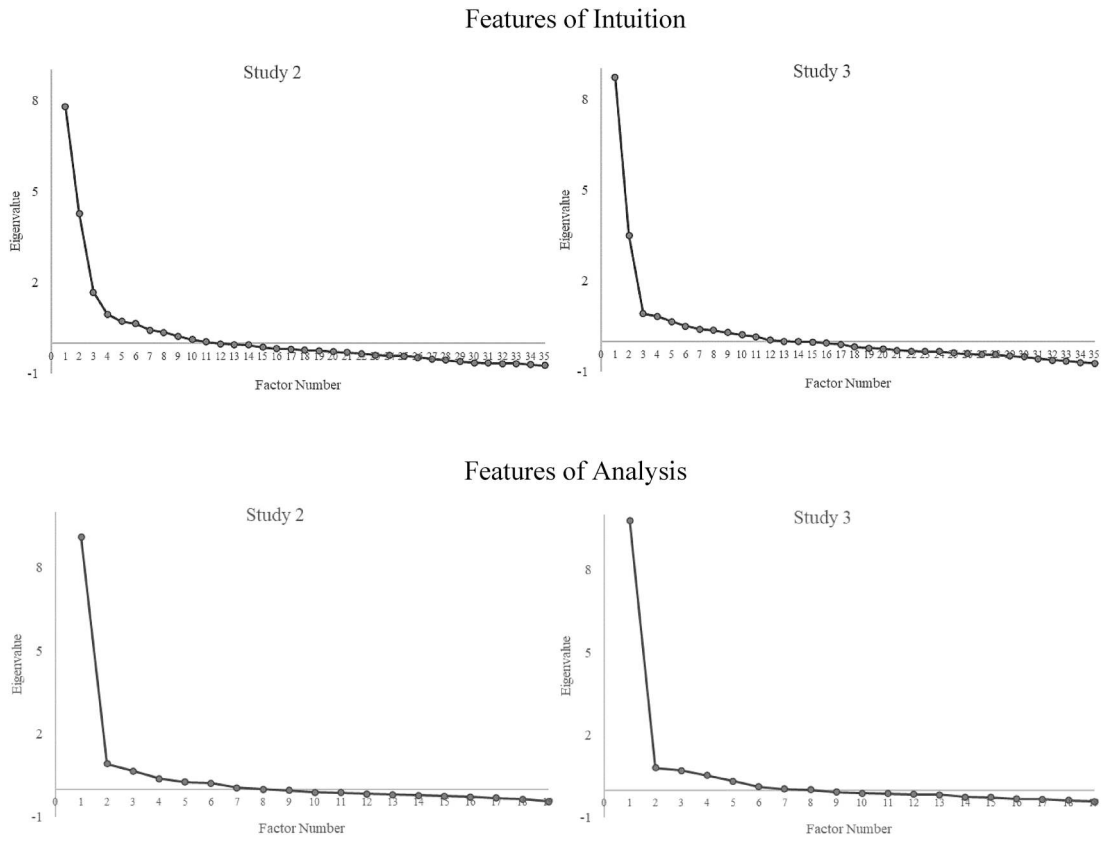

Figure 1. Scree plots for the features of intuition and analysis (Studies 2 and 3).

Faith in Intuition (FI) and Need for Cognition (NC) did not significantly correlate with one another, both for the participants who rated the intuition features, $r(95) = .12$, $p = .231$, and for the participants who rated the analysis features, $r(100) = .07$, $p = .474$.

Two-step hierarchical regression models were built for each centrality index of the factors of intuition and analysis, entered as dependent variables, with FI and NC as continuous predictors. Scores on FI and NC were mean-centered by subtracting their means from the observed scores (Aiken & West, 1991). Main effects of the predictors were interpreted in the first step of the model and their interaction was interpreted in the second step (Cohen et al., 2003).

Intuition. Higher levels of FI significantly predicted higher levels of rated centrality of the Holistic features of intuition, $B = .78$, $t(94) = 5.78$, $p < .001$, but FI did not relate to the rated centrality of the Affective features, $B = -.09$, $t(94) < 1$. NC did not predict the rated centrality of the Holistic features of intuition, $B = -.04$, $t(94) < 1$, nor did it show a clear relation with the centrality of the Affective features, $B = .24$, $t(94) = 1.72$, $p = .088$. The FI × NC interaction did not significantly predict the centrality of the Holistic features, $B = -.10$, $t(93) < 1$, or the Affective features of intuition, $B = .27$, $t(93) = 1.73$, $p = .086$.

Analysis. Higher levels of NC marginally predicted higher levels of the rated centrality of the features in the Analysis factor, $B = .24$, $t(99) = 1.91$, $p = .059$, but neither FI, $B = -.23$, $t(99) = -1.55$, $p = .124$, nor the FI × NC interaction, $B = .21$, $t(98) = 1.52$, $p = .131$, predicted the rated centrality of features of this factor.

The findings concerning these regression analyses are discussed in the Discussion section of the paper.

Study 3

Study 3 was designed to further validate the perceived centrality of the identified features of intuition and analysis by testing the impact of centrality on the processing of these features. We expected that participants would classify relatively central features as belonging to the prototype (of intuition or analysis) faster than relatively peripheral features (Fehr et al.,

1982; Hassebrauck, 1997; Kinsella et al., 2015; May & Fincham, 2018). We also expected higher consensus in these classifications for the central features and evidence of greater disagreement on peripheral features (Fehr & Russell, 1984; Mervis & Rosch, 1981). Additionally, though not the primary purpose, we further examined whether individual differences in intuitive and analytical cognitive styles significantly predict the centrality of the identified factors, aiming to validate the results obtained in Study 2.

Because of the focus on reaction times in this study, experimental sessions were conducted in a laboratory setting, thereby also extending to a new type of sample.

Method

Participants

A sample of 126 Ohio State University undergraduates participated in this laboratory study for partial course credit (61.1% women, $M_{age} = 18.9$, $SD_{age} = 1.41$).

Procedure and measures

Participants were welcomed into the laboratory and seated in front of a computer station running the DirectRT software (Jarvis, 2008). After providing informed consent, participants learned that their first task would consist of classifying a series of features (i.e. actions described in 2–7 words) into one of two categories: as features that represent "acting intuitively" or "acting analytically". Features were randomly and individually presented at the centre of the screen, with the categories "acting intuitively" and "acting analytically" presented side by side on the lower half of the screen. Participants classified each feature using the keys [S] and [L] of the keyboard to indicate whether the feature represented the category presented on the left or on the right of the screen, respectively (the side of the categories was counterbalanced between participants and promoted no differences in reaction times).

To become familiar with the task, participants first completed a set of 10 practice trials, in which they were presented with 8 neutral actions (*reading a book; typing an email; jogging; crossing a street; playing video games; talking to a stranger; riding a bike; driving a car*) and 2 target actions (*acting intuitively; acting analytically*) and instructed to ascribe them to the category that best represents each action. Participants were asked to put their index fingers on the [S] and [L] keys of the keyboard, and to use these keys to assign each feature to "acting intuitively" or "acting analytically" as quickly and accurately as possible. After the practice trials, participants initiated the main task, classifying the 54 features describing intuition (N = 35) and analysis (N = 19). This task was divided into two sets of a series of 27 features (randomly presented), to avoid task fatigue. Each response and its speed (in ms) were recorded.

Participants were then instructed to rate the centrality of each feature according to their own views of intuition and analysis (replicating the procedures of Study 2, but here with participants rating all 54 features). After this, participants completed the Need for Cognition scale (Cacioppo et al., 1984) followed by the Faith in Intuition scale (Pacini & Epstein, 1999; α = .86 and α = .82, respectively, in the present study) before they were thanked and debriefed.

Results

Validation of feature centrality

We first aimed to validate the perceived feature centrality obtained in Study 2, by testing whether participants classify central features as belonging to their respective categories faster than relatively peripheral features. Secondly, we tested whether more central features were more often classified to their respective categories, compared to more peripheral features.

To compare classification speed for central and peripheral features, we followed conventions (Greenwald et al., 2003) recoding extremely fast (<300 ms) and slow (>3000 ms) responses to 300 and 3000 ms respectively. Correct-response times were then averaged across central features and peripheral features, and we applied a logarithmic transformation to further normalise their distributions and homogenise their variances. Following prior prototype research (Gregg et al., 2008; Hassebrauck, 1997; Hepper et al., 2012; Kearns & Fincham, 2004), central and peripheral features were defined based on a median split of the centrality ratings for features of intuition and analysis. This convention was applied merely to aid design and analysis of the experimental studies, but we note centrality of the features to the prototype more likely functions as a continuum. Response times were hence also analysed using feature centrality as a continuum (with feature as unit of analysis), controlling for the number of syllables of each feature (typically used as a measure of word length; e.g. Friedman & Kohn, 1990; Kay & Ellis, 1987). Based on the median split, results showed that participants were quicker

Table 3. Classification of prototype features.

	Intuition		Analysis	
	Feature type		Feature type	
Dependent measure	Central *M*(*SD*)	Peripheral *M*(*SD*)	Central *M*(*SD*)	Peripheral *M*(*SD*)
Percent verified	80.11 (12.04)	58.22 (12.82)	92.30 (11.88)	75.40 (15.37)
Response speed (ms)*	1502.11 (268.56)	1585.10 (307.11)	1444.35 (288.83)	1434.41 (317.26)
Response speed (log)*	7.30 (0.19)	7.35 (0.20)	7.25 (0.20)	7.25 (0.22)

Note: *For verifications (i.e. "correct responses").

for central versus peripheral features of intuition, $t(125) = -3.48$, $p < .001$, $d = 0.31$, but this difference was nonsignificant for analysis, $t(125) < 1$ (see Table 3). Considering feature centrality as a continuum, centrality ratings in Study 2 correlated significantly with classification speed in Study 3 for features of analysis, $r(16) = -.75$, $p < .001$, but not for features of intuition, $r(32) < 1$.

Next, we tested the impact of centrality on the classification of features to their respective categories (also using both a categorical and continuous approach). Central features were classified to their respective categories more often than peripheral features, both for intuition, $t(125) = 18.72$, $p < .001$, $d = 1.67$, and analysis, $t(125) = 11.15$, $p < .001$, $d = 0.99$ (see Table 3). Centrality ratings (as a continuum) in Study 2 and the probability of the feature being classified correctly in Study 3 correlated significantly both for the features of intuition, $r(35) = .45$, $p = .007$, and analysis, $r(19) = .87$, $p < .001$. Additionally, centrality ratings across features of intuition, $r(35) = .56$, $p < .001$, and analysis, $r(19) = .85$, $p < .001$, correlated significantly between Studies 2 and 3.

Relation between feature centrality and classification speed at an individual level

Next, we focused on the prediction of classification speed at an individual and feature level of analysis. In this study, besides assessing classification speed we also obtained participants' feature centrality ratings and individual differences in intuitive and analytical styles. This allowed us to relate the indicators across participants within features. Two linear mixed models (one for the features of intuition and another for the features of analysis) aimed at predicting features' classification speed (the dependent variable) taking into account each feature's centrality ratings, number of syllables, and individual differences in FI (for the intuition model) and NC (for the analysis model), as fixed factors, and features as repeated effects. Subject was entered as a random factor. The models further substantiated the results obtained in the previous analyses.

Intuition model. A main effect of feature centrality (*estimate* = −0.02, $t = -3.71$, $p < .001$) confirmed that features rated as more central were classified as fitting the category more quickly. Feature syllables (*estimate* = 0.05, $t = 21.19$, $p < .001$) and FI (*estimate* = −0.06, $t = -4.30$, $p < .001$) also predicted how quickly participants classified the features. In addition, FI and feature centrality interacted to predict classification speed (*estimate* = −0.02, $t = -2.32$, $p = .020$). As the graphic in Figure 2 suggests, the effect of feature centrality on classification speed was stronger as the participant's level of FI increased.

Analysis model. Features rated as more central were classified more quickly (*estimate* = −0.03, $t = -3.36$, $p < .001$) and features with more syllables were classified more slowly (*estimate* = 0.03, $t = 9.96$, $p < .001$). However, neither individual differences in NC (*estimate* = 0.00, $t < 1$) nor the interaction

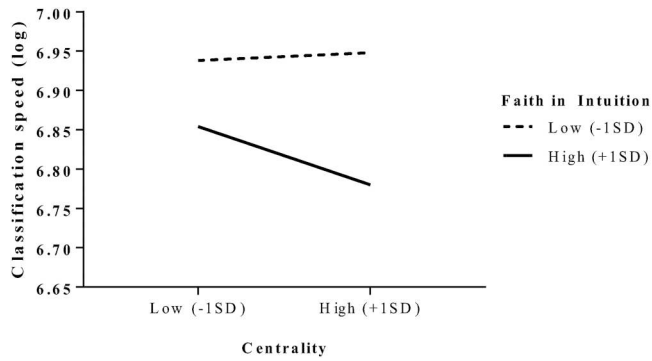

Figure 2. Classification speed (log) as a function of centrality and Faith in Intuition.

between NC and feature centrality significantly predicted classification speed (*estimate* = 0.00, $t < 1$).

Feature centrality and underlying factors

We next studied the factorial structure of the centrality ratings in Study 3, with the aim of providing a validation of the underlying factors of intuition and analysis found in Study 2.

Intuition. Results of a scree plot (see Figure 1) and parallel analysis provided evidence for the previously found two-factor structure ($\chi^2/df = 1.50$, $p < .001$, RMSEA = .062). To objectively validate the similarity of the features composing these two factors across both studies, we performed a Procrustes Factor Rotation, followed by the evaluation of Tucker's congruence (proportionality) index (e.g. Lorenzo-Seva & ten Berge, 2006; Tucker, 1951; Wrigley & Neuhaus, 1955). Analyses revealed a Tucker's congruence coefficient of Φ = .94 for the first factor (Affective factor), and of Φ = .82 for the second factor (Holistic factor). These congruence coefficients suggest a fair amount of similarity in the factor loadings across both studies (e.g. Chan et al., 1999; Lorenzo-Seva & ten Berge, 2006; Vijver & Leung, 1997).

Both factors exhibited comparable levels of internal consistency (Factor 1 α = .92; Factor 2 α = .81) as in Study 2. Replicating Study 2, the Affective factor was perceived as more central (M = 6.63, SD = 1.10) than the Holistic factor (M = 4.80, SD = 1.43), $t(125) = 11.17$, $p < .001$, $d = 0.99$, and the two latent factors correlated weakly ($r = -.03$). A centrality index was created for each factor by averaging the centrality ratings of the features of each factor.[2]

Analysis. A scree plot (see Figure 1) and parallel analysis replicated the previously found single-factor structure for analysis ($\chi^2/df = 3.59$, $p < .001$, RMSEA = .144; internal consistency α = .95), with a mean centrality of 6.94 (SD = 1.16).

Association with cognitive styles

We replicated the analyses of Study 2 to examine whether cognitive styles predicted the centrality ratings for the two factors of intuition and the general factor of analysis (FI and NC did not significantly correlate with each other in this study, $r(124) = -.03$, $p = .758$).

Intuition. FI predicted the rated centrality of intuition's Holistic features, $B = .47$, $t(121) = 1.83$, $p = .069$, (in the same direction of Study 2), however, non-significantly, and significantly predicted the centrality of the Affective features, $B = .71$, $t(121) = 3.84$, $p < .001$ (adding to Study 2). Clarifying the results of Study 2, NC significantly predicted the rated centrality of the Affective features, $B = .41$, $t(121) = 2.87$, $p = .005$ (replicating Study 2), and was not a significant predictor of the centrality of the Holistic features, $B = .02$, $t(121) < 1$ (replicating Study 2). Contrary to Study 2, the interaction between FI and NC was significant in predicting the centrality of both the Affective features, $B = -.78$, $t(120) = -2.90$, $p = .004$, and the Holistic features, $B = .93$, $t(120) = 2.47$, $p = .015$. As Figure 3 suggests, participants low in both FI and NC did not perceive the Affective features as representative of intuition. Simple slope analyses clarify that the previously observed relation of FI with the rated centrality of these features occurred only for relatively low-NC (−1SD) participants, $b = 1.29$, $p < .001$, but not relatively high-NC (+1SD) participants, $b = 0.29$, $p = .216$. Contrastingly, the observed relation of FI with the rated centrality of the Holistic features was only observed for relatively high-NC (+1SD) participants, $b = 0.97$, $p = .003$, but not relatively low-NC (−1SD) participants, $b = -0.22$, $p = .553$.

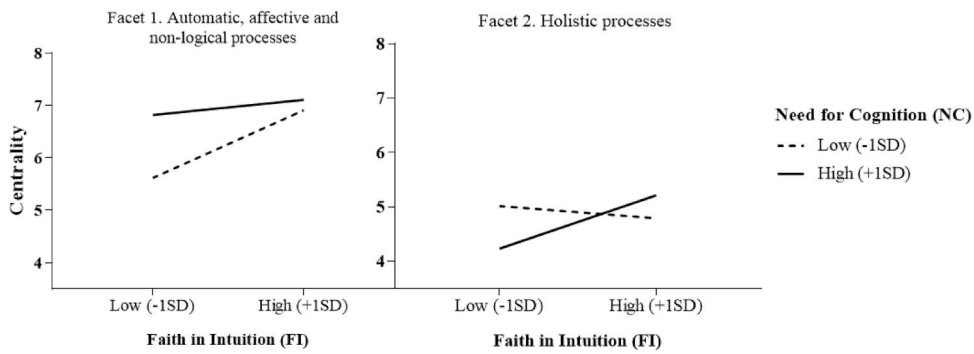

Figure 3. Intuitions' facets centrality as a function of FI and NC.

Analysis. NC was not a significant predictor of the rated centrality of the features in the general factor of analysis, $B = .15$, $t(121) < 1$ (contrasting with Study 2). Rated centrality was positively predicted by FI, however, $B = .42$, $t(121) = 2.03$, $p = .045$ (also contrasting with Study 2). The interaction between FI and NC was nonsignificant, $B = .03$, $t(120) < 1$.

Discussion

The primary goal of this research was to examine people's lay conceptions of intuition and analysis. We proposed that intuition and analysis are amenable to a prototype approach. That is, many specific features can be associated with these constructs, some being more central than others. In three studies, we support this idea and provide findings that aid understanding of how people conceive and represent intuition and analysis.

In general, a number of aspects of the lay conceptions of intuition resemble existing conceptualizations and features that are common across scientific definitions of intuition (see Dane & Pratt, 2007). Specifically, relatively central features characterised intuition as an affectively charged process (e.g. *acting based on what feels right*), as a process that arises from operations that occur on an automatic and nonconscious level (e.g. *acting automatically and effortlessly; acting without thinking*), as a process that draws from holistic associations (e.g. *focusing on the big picture*), and as a process that arises rapidly through immediate discernment (e.g. *going with one's first impression; thinking quickly*). Additionally, lay conceptions of intuition also reflected features typically associated with intuitive processing, such as *following your gut* and *following your instinct* – terms that, too, reflect the affective meaning of intuitive judgments (Dane & Pratt, 2009). Nevertheless, some of the features mentioned by participants do not in fact resemble existing scientific theories and research. For instance, "thinking abstractly" has been regarded as a feature of analytic thinking (as a type of contextualised thinking), while content-based contextualised processes have been regarded as features of intuition (Evans, 2011). Also interesting is the fact that opposite features were mentioned for intuition (e.g. acting impulsively and acting thoughtfully), suggesting that lay people, like researchers, may have varied and distinct perceptions of intuition.

Lay conceptions of analysis also resembled features associated with how dual-process theories (e.g. Chaiken & Trope, 1999; Evans, 2009, 2011; Gawronski & Creighton, 2013) typically describe analytical thinking. Specifically, analysis was characterised through features associated with deliberation and slower mechanisms (e.g. *reflecting and deliberating; thinking before acting*), the treatment and examination of information and facts (e.g. *organising and analyzing information; acting based on facts and data*), a logical and rational approach towards problems (e.g. *thinking objectively and logically; implementing method*), and a deliberate opposition to processes typically associated with intuitive thinking (e.g. *ignore feelings and emotions; resisting impulses*). Nevertheless, logical and rational approaches towards problems as a feature of analysis has also been criticised (Evans, 2017; Evans & Stanovich, 2013; Gigerenzer, 2004), and not all dual-process theorists equate analysis with logical processing (e.g. De Neys, 2023; Griffin et al., 2012).

The centrality of these features was corroborated across Studies 2 and 3 (using different experimental settings and samples). Specifically, features of intuition and analysis classified as more central in Study 2 were generally more quickly and consistently identified as reflecting the intended category in Study 3, in comparison to more peripheral features. Centrality ratings across features of intuition and analysis also correlated significantly between studies.

These data complement previous lay-perspective approaches to intuition (e.g. Burke & Miller, 1999; Rogers & Wiseman, 2005; Sadler-Smith, 2016) by allowing us not only to distinguish between different features according to their centrality, but also by informing the literature on several new aspects. First, the current data suggest that lay conceptions distinguish between different facets of intuition (affective vs. holistic). Second, the current data were able to identify differences in how individuals varying in intuitive and analytical cognitive styles differed in their perceptions of central features of intuition and analysis. We discuss each of these key findings in the following sections.

Different facets of intuition: a case for a multidimensional perspective?

Centrality ratings for features of intuition and analysis suggested a single-factor structure for analysis and a two-factor structure for intuition. Specifically, data

distinguished between a facet of intuition as automatic, affective, and non-logical (an Affective factor) and a facet of intuition as holistic processing that can assist in problem-solving (a Holistic factor). Importantly, the two-dimension structure of the lay conceptions of intuition was corroborated across different samples.

The Affective factor parallels existing aspects of current multidimensional perspectives on intuition. Specifically, this facet can be compared to Pretz and Totz's (2007) affective and inferential aspects of intuition, Dane and Pratt's (2009) problem solving type of intuition, and Glöckner and Whitteman's (2010) associative and matching processes of intuition. This factor seems to refer to the most common conceptualisation of intuition in the literature, which might explain why this facet was perceived as the most central to intuition by participants across Studies 2 and 3.

The Holistic facet of intuition that can assist in decision-making also parallels aspects of existing multidimensional perspectives on intuition. Specifically, this facet can be compared to Pretz and Totz's (2007) holistic intuition, Dane and Pratt's (2009) creative and moral types of intuition, and Glöckner and Whitteman's (2010) accumulative and constructive processes of intuition. All of these "holistic" conceptions are theoretically based on primarily bottom-up processes, depending on data-driven, holistic integration of several cues. The notion of holistic processing has been traditionally based on the Jungian concept of "big picture" (see Andersen, 2000) and, more recently, on the ability to synthesise unconnected memory fragments into new information (Mintzberg et al., 1998). Such deliberate use of intuition also parallels findings in the judgment and decision-making field, arguing for a rational use of intuition, suggesting that people are more likely to deliberately rely on intuition when they perceive intuitive information as diagnostic to the decision at hand (Loureiro & Garcia-Marques, 2018).

Interestingly, the fact that people distinguish between these facets suggests intuition is not only perceived as a process that is opposed to analysis (as represented here by the automatic and affective factor, with features such as "acting without thinking") but also as an independent way of thinking, here characterised by a more deliberate facet (i.e. assisting on decision-making) of intuition.

The two identified factors in lay conceptions of intuition provide a fruitful contribution to the discussion of intuition as a label for different cognitive mechanisms and phenomena, and not as a homogeneous concept. Even though recent approaches tried to disentangle different dimensions of intuition, a multidimensional perspective is not yet well established. When used, there is a lack of agreement on the relevant dimensions in which to conceptualise intuition, with different researchers using different (although sometimes relatable) dimensions, as reviewed earlier. The present prototype analysis will not arbitrate between different researcher conceptions, but it did provide evidence that people's lay conceptions distinguish between affective/automatic and holistic/deliberative processes involved in intuition. This alone, should be a strong point in favour of differentiating between distinct aspects of intuition before conclusions about it or its performance are made.

Intuition for the intuitive: how cognitive styles predict feature centrality

Our data also suggested the potential importance of taking individual differences into account when aiming to understand lay conceptions of intuition and analysis. We analysed how intuitive and analytical cognitive styles predicted the rated centrality of the two factors of intuition and the general factor of analysis. Across Studies 2 and 3, participants with higher FI perceived the features of intuition as a holistic process as more central to intuition, compared to participants with lower FI. Results were less consistent regarding how FI predicted the centrality of intuition as an automatic and affective process (by predicting this facet's centrality in Study 3, but not in Study 2). A possible explanation for this inconsistency might lie in the observed interaction between FI and NC in Study 3. Specifically, the relation between FI and the rated centrality of the Affective features of intuition was more clearly noticed for participants with lower (vs. higher) NC in Study 3. As such, samples that distribute differently in any of these features could promote different results. Congruent with this possibility, participants in Study 2 showed higher levels of NC compared to Study 3 ($M_{Study\ 2} = 3.47$ vs. $M_{Study\ 3} = 3.23$) and lower levels of FI ($M_{Study\ 2} = 3.09$ vs. $M_{Study\ 3} = 3.43$). Future studies should address relations between FI and perceptions of feature centrality in samples with a larger range of individual differences. An additional potential explanation for these results might derive from methodological

divergences across studies. Specifically, whereas in Study 2 participants only rated the centrality of the features describing either intuition or analysis (i.e. centrality was assessed between participants), in Study 3, participants rated the centrality of the features describing both intuition and analysis and, additionally, also first classified all the features as intuitive or analytical in the classification task. Considering the fuller set of features might have primed (or reinforced) a context within which intuition and analysis were perceived as opposing processes, promoting a contrast effect that led intuitive participants to perceive features more typically associated with intuition (i.e. the Affective features) as more central, in comparison to less intuitive participants.

The pattern of results across the two studies suggests that lay conceptions of analysis might be more consensual across individuals, with its features being less likely to be influenced by individual differences in cognitive styles. Although the present work provided no consistent evidence that participants prone to think more or less analytically perceive analysis in different ways, such conclusion relies on the use of NC as a measure to assess individuals' analytic style. This measure was originally developed to assess the extent to which people engage in and enjoy effortful thinking (Cacioppo et al., 1984; Cacioppo & Petty, 1982), and it is likely that such a trait is associated with a more analytical cognitive style, predicting more thinking prior to decision-making (e.g. Levin et al., 2000), reasoning (e.g. Fleischhauer et al., 2010), and greater processing of the quality of information presented in persuasive communications (see Cacioppo et al., 1996; Petty et al., 2009). However, some authors (see Appelt et al., 2011) propose that NC is better described as a measure of epistemic motivation, which assesses motivated cognition related to information processing and thinking, and distinguish it from other measures of cognitive and decision style–such as the REI (Epstein et al., 1996; Pacini & Epstein, 1999) and the GDMS (Scott & Bruce, 1995). Additionally, Amit et al. (2021) recently provided evidence that NC better captures deliberate thinking (i.e. "deep and effortful thinking"; Amit et al., 2021, p. 766) and not analytical/systematic thinking (i.e. "planned and structured"; Amit et al., 2021, p. 766). As such, it is a question for future studies whether lay conceptions of analysis are consensually viewed across individuals, or whether other measures that better capture individuals' "analytic" styles will predict such lay conceptions.

Additionally, the use of Faith in Intuition as a measure to assess individuals' intuitive style should also be discussed. This measure has been extensively used in the literature for such end, however, as suggested by our data, intuition is complex, and relatively lacking consensus. Thus, using this single measure to provide conclusions about those who are more intuitive or less intuitive is not without limitations. Hence, future studies could consider replicating the patterns of results here presented with different (multidimensional) measures of intuition, or different measures that put both decision-making approaches into opposition (e.g. Cognitive Reflection Test; Frederick, 2005).

Limitations and future research

In addition to the questions raised above, another possible limitation of our approach is that it depended on language labels. The choice of the labels "intuitive" and "analytic" to refer to the processes adopted by people in decision-making relied on the consensual approach distinguishing between the intuitive/analytical dimensions (e.g. Allinson & Hayes, 1996; Hammond, 1996; Nygren & White, 2002). At a lay level, these are familiar terms and, hence, people seem capable of thinking about them when considering how they make decisions. Nevertheless, future research could look to replicate or extend the current findings by considering other terms that might be employed to refer to these two dimensions of decision-making. Additionally, future research could also consider having people generate, in the first stages of a prototype approach, different ideas or descriptions of different modes of decision-making, without providing the "intuitive" and "analytic" labels, thus allowing to investigate whether people spontaneously provide features related to such a dualistic view, also ensuring that the responses generated are not restricted by the use of these labels. Future research could also assess the perceived valence associated with the two decision-making dimensions and their specific facets to control for the possibility that the effects of individual differences on centrality ratings might be due to the perceived desirability of the features of each decision-making dimension.

Finally, our approach relied on conscious retrieval processes. This is important because it conflicts with the notion that intuitions are based on information activated in memory that is not accessible to

consciousness or verbal report (Bolte & Goschke, 2005). It has been argued there is a barrier of metacognitive awareness in the ability to report or describe intuitive processes (Klaczynski et al., 1997), and individuals might not have introspective access to specific cognitions or forms of thinking that are suitable to introspection (Nisbett & Wilson, 1977). However, despite the fact that intuitive processes themselves might remain unconscious, their products, such as intuitions or gut feelings, might nonetheless be attended to consciously (Dane, 2010). The lay conceptions reported in this research refer, hence, to products of such processing. Linked with this limitation, the current results allow us only to draw conclusions about the way individuals think about and perceive intuitive processing, not about the way individuals actually intuit. Future studies could focus on understanding whether, in fact, intuitive and non-intuitive people intuit in different ways, and whether their performance on "intuitive" tasks differs as a function of the ways they intuit.

Finally, this work provides the first systematic analysis of lay conceptions of intuition and analysis. The identified central features regarding how people perceive intuitive and analytic processing grants us greater understanding of such conceptions and should support future research that aims to operationalise intuitive and/or analytic measurements and settings.

Notes

1. The distinction of two kinds of thinking by dual-process theories is not without criticism (see Evans & Stanovich, 2013). In fact, revisions to these theories have been made by dual-process theorists themselves (e.g. De Neys, 2023; Evans, 2017; Pennycook et al., 2018). For the purposes of this paper, we simply use the terms "intuition" and "analysis" to refer to different types of decision processes adopted by people, regardless of whether the types have any kind of dualistic nature rather than activation along a single processing continuum.
2. For Factor 1, the features "Acting in a personal and unique manner" and "Engaging in imagination" were not included because these displayed similar loadings on both factors in this study, whereas, in Study 2, they had loaded higher on Factor 2. For Factor 2, the features "Predicting something will happen" and "Reading people" were also not included due to their inconsistency across studies (loading higher on Factor 1 in Study 2). Additionally, "Avoiding what feels wrong" was also not included due to this feature's low loading on Factor 2 in this study.

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