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Affective antecedents of intuitive decision making

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ABSTRACT

Although the use of intuition in managerial decisions has been documented, many questions about the intuitive process and its antecedent stages remain unanswered, in particular the role of affective traits and states. The study reported in this article investigates whether decision makers who are more attuned to own emotions and experience a particular mood have an easier access to intuition. Our findings indicate that emotional awareness has indeed a positive effect on the use of intuition, which appears to be stronger for women. Surprisingly, positive and negative mood seem to influence intuition according to their intensity rather than positive/negative distinction.

Keywords: decision making; intuition; affect; mood; affective orientation; gender

As a consequence of increasing dynamism in the business environment, management researchers and practitioners have begun to question whether traditional rational models adequately address the newly arisen complexity and the need for speed in managerial decision making (Eisenhardt 1989; Eisenhardt & Zbaracki 1992; Langley, Mintzberg, Pitcher, Posada & Saint-Macary 1995). In response, the use of intuition has received considerable attention in the popular literature and lately also among scholars in a number of disciplines (e.g., Boucouvalas 1997; Dane & Pratt 2007; Hodgkinson, Langan-Fox & Sadler-Smith 2008; Shirley & Langan-Fox 1996). These conceptualizations provide considerable support for managerial intuition under certain conditions, when decision makers face ambiguity, time pressure, inadequate information or other constraints (Agor 1986; Andersen 2000; Kuo 1998). However, our understanding of intuitive processing is far from complete. In particular, we still lack knowledge about the relationship between intuition and affective factors that may influence its use. In times when the role of affect, encompassing mood, emotions and feelings, is being highlighted in the workplace (Ashkanasy & Cooper 2008), this becomes a critical issue. Our study therefore investigates whether emotional awareness, as a relatively stable affective trait, and mood, as a transient affective state, have an effect on the use of intuition. If this is the case, managers could be trained to improve their intuitive decision making by means of mood regulation and increased emotional awareness.

Although factors related to both cognition and affect have been theorized to trigger the use of intuition (Sinclair, Ashkanasy, Chattopadhyay & Boyle 2002), empirical studies have focused largely on cognitive aspects (e.g., Dane, Rockman & Pratt 2005; Khatri & Ng 2000; Klein 1998, 2003). Scholars seem to assume the presence of affect (Agor 1986; Cappon 1994; Dane & Pratt 2007) but empirical data is sparse and does not differentiate between affective traits and states. Furthermore, it is not clear at which point of the intuitive process affect enters the picture. Consistent with theorists such as Cacioppo and Gardner (1999), Forgas (1994, 1995) and Isen (1999; Estrada, Isen & Young, 1997), we investigate affect as an antecedent of an intuitive event. In doing so we answer Kahneman's (2003) call for a further study of the determinants of intuition. The gleaned knowledge will hopefully shed more light on why managers select one decision-making mode over another and how they can switch if it is more appropriate in the particular situation.

Based on the extant literature, we selected affective orientation as the most generic affective trait that may be linked to intuition, as it captures the extent to which individuals pay attention to all available affective information in their decision making (Booth-Butterfield & Booth-Butterfield 1990). Similarly, in terms of affective states, we focused on the more commonly experienced positive and negative mood (Elsbach & Barr 1999). In addition, since males and females are frequently cited as experiencing and being aware of different levels of affect (DePaulo 1992), we examined also the role of gender in the use of intuition. We based the investigation on two theories that are relevant to our arguments: Cognitive-Experiential Self-Theory (CEST: Epstein 1990) that separates affectively charged and relatively affect-free information processing, and the Affect Infusion Model (AIM: Forgas 1995) that provides an explanation of the role of affect in different information-processing strategies.

Intuition, affect and decision making

The role of affect in the intuitive process

For the purpose of this research, intuition is defined as 'direct knowing that results from non-conscious, holistic information processing, which draws on cognition and affect' (see Sinclair et al 2002). Managerial intuition was discussed already in the 1930s by Chester Barnard (1938) in his critique of rational analysis in strategic decision making, and later followed upon by such eminent scholars as Herbert Simon (1957, 1987) and Henry Mintzberg (1976, 1989). It was not until recently, however, that the management discipline turned its attention to a systematic examination of the construct and its measurement (e.g., Dane & Pratt 2007; Hodgkinson et al 2008; Sinclair & Ashkanasy 2005). Although there are still discrepancies among the newly coined definitions, most researchers agree that intuition is a non-conscious process where information is accessed and organized holistically. The non-sequential or holistic nature of intuition refers to the non-linear manner in which information is processed (Raidl & Lubart 2000-2001; Mintzberg, Ahlstrand & Lampel 1998; Shapiro & Spence 1997). This is consistent with Isenberg's (1984) and Simon's (1987) understanding of the phenomenon as a non-conscious, quick pattern recognition and synthesis of past experience and domain-specific expertise. Consequently, this experience-based type of intuition tends to be conceptualized as 'direct knowing without the use of conscious reasoning' (Myers 2002; Shirley & Langan-Fox 1996; Sinclair et al 2002), sometimes also called 'unconscious thought' (Dijksterhuis & Nordgren 2006).

In response to advances in emotion studies and recently also brain research, a growing number of scholars have started incorporating affect in addition to cognitive elements into their theorizing about intuition and its antecedents. This accords with the theoretical position adopted by

researchers such as Bastick (1982), Epstein (1998), and Petitmengin-Peugeot (1999). For example, Hogarth (2001: 61) concluded that different types of affect could represent 'important inputs to intuitive thought in the sense that they can induce responses without corresponding awareness.' Consistent with this position, we argue that the cognitive and affective understanding of intuition may in fact represent two aspects of the same multi-faceted construct. Our definition therefore recognizes that an intuitive event includes a cognitive (experience-based) *and* an affective element, although research to date does not offer a definitive conclusion whether affect has to be present at all times and in which form.

Sinclair and Ashkanasy (2005) proposed three stages of affective involvement in the intuitive process: before, during and after an intuitive event. Our research, in accordance with Kahneman's (2003) concern, investigates the first instance: the antecedent stage of intuitive decision making. Since the cognitive factors have received some attention previously (e.g., Allinson & Hayes 1996; Dane & Pratt 2007; Klein, 2003), we focus on affect and study it as an external factor influencing selection of the decision-making mode. In this framework, affect may inhibit or facilitate access to intuition, depending on the specific qualities of the affective reaction. Specifically, a clearer distinction among different types and attributes of affect, differentiating between affect-related traits and more transient moods, is needed to fully explore this relationship (Ashkanasy 2003). To our knowledge, research in this area is sparse, limited to the influence of mood (Elsbach & Barr 1999). Similarly, although empirical evidence suggests that female decision makers might be more intuitive (e.g., Agor 1986; Fisher & Nelson 1996), it is not clear whether the gender effect is a result of higher emotional awareness among females (DePaolo 1992). Further investigation is needed to map the role of trait affect in the antecedent stages of the intuitive process as well as to compare the effects of affective traits and states. As noted earlier, the findings will not only advance our theoretical knowledge but have also practical implications for management training in decision making.

Intuitive decision making

Epstein, in formulating Cognitive-Experiential Self-Theory (CEST: Epstein 1990, 1998, 2002; Epstein, Pacini, Denes-Raj & Heier 1996) differentiates between affectively charged and mostly affect-free information processing. CEST stipulates that information can be processed in parallel, allowing for a complementary use of rational-analytical and experiential-intuitive decision making where the former is conscious and relatively affect-free while the latter occurs non-consciously and is primarily affect-driven. Epstein et al (1996) argue further that experiential processing uses affect as a cue but do not elaborate how it may be linked to intuition. Forgas' Affect Infusion Model (AIM: Forgas 1994, 1995) offers help in understanding this relationship. According to AIM, the role of affect in the use of intuition varies because positive and negative affect are likely to facilitate different types of information processing in terms of the degree of rational involvement. Specifically, Forgas' model implies a positive correlation between positive mood and intuitive information processing and a negative relationship in the case of negative mood, as explained below.

Affective variables

Individuals are likely to be influenced by affect in their decision making either because of a stable trait that predisposes them to pay attention to affect or because of a momentary mood that infuses affect into their information processing (Sinclair et al 2002). In our study, we focused on affective orientation as a stable trait that allowed us to test the broader idea that individuals who pay attention to any affect-related information are more likely to use intuition. We also examined positive and negative mood as antecedents of intuitive decision making to test the notion that positive and negative affect differ in their

tendencies to invoke the use of intuition. Our approach therefore combines an examination of the two broadest categories of affect, investigating the influence of both state and trait affect on the use of intuition. Furthermore, we explore the mediating influence of affective orientation on gender in the intuitive process.

Affective orientation: Booth-Butterfield and Booth-Butterfield (1990) define affective orientation as the degree to which individuals are aware of affective cues, and subsequently use them to guide their decision making. The use of intuition is facilitated by affect-infused experiential processing and is argued to depend on whether the decision makers are in touch with their feelings (Epstein et al 1996). It appears therefore that a higher awareness of experienced affect will strengthen the accessibility of intuition (Kahneman 2003), and thus increase the decision maker's reliance on intuitive processing. In other words, affect-related information is likely to be accessed intuitively rather than analytically, and therefore decisions based on such information will be more intuitive. Conversely, it is reasonable to expect that non-affectively oriented decision makers may be unable to recognize their feelings, and will attempt to base their decisions on a logical analysis in compliance with their rational training (Martin 1993).

Hypothesis 1: The more affectively oriented decision makers are, the more likely it is that they will use intuition.

Mood: As a diffuse affective state (Frijda 1993), momentary mood seems to have a profound impact on information processing. Although it has different nuances, its effects on decision making appear to be governed by the overall differences between positive and negative mood. Forgas (1995) in his AIM theory argues that decision makers tend to circumvent a detailed evaluation of information when in a positive mood, which indicates favorable conditions to proceed. This is consistent with CEST (Epstein et al 1996), where experiential information processing (related to intuition) acts as default, and thus might be used until a need for reasoning has been evoked. Conversely, negative mood is argued by Forgas (1995) to evoke a sense of danger, and therefore to prompt a careful deliberation. Similarly, Cacioppo and Gardner (1999) concluded that positive affect serves as cue to stay on course and explore (which is consistent with intuition-conducive situations) while negative affect activates mental or behavioral adjustment (thus invoking rational processes). Their conclusions found some empirical support in a study of complex decision making conducted by Elsbach and Barr (1999).

As suggested by Watson and his colleagues (Watson, Clark & Tellegen 1988; Watson & Tellegen 1999), the effects of positive and negative mood are not necessarily opposite. In particular, they found that higher levels of activation along positive and negative dimensions result in independence between the dimensions. Since executive decisions are often made in situations that are described as urgent, stressful or challenging (Jackson & Dutton 1988), we might find higher levels of mood activation in those contexts. In other words, the effect of moods may vary independently at higher levels of activation rather than always having opposing influences. This view is supported by findings from neurological research that effects related to positive and negative affect are associated with independent neural pathways (e.g., Ashby, Isen & Turken 1999; Isen 1999). Therefore, positive and negative mood effects need to be tested separately.

Hypothesis 2a: Decision makers in a strong positive mood are more likely to use intuition than those in a weak positive mood.

Hypothesis 2b: Decision makers in a strong negative mood are less likely to use intuition than those in a weak negative mood.

Gender

The notion of female intuitive ability has found general support in research into gender differ-

ences in non-verbal communication. An explanation for these gender effects may be gleaned from a combination of evolutionary and social conditioning theories, based on the female's role as a mother and nurturer (e.g., Northrup 1998; Pinkola-Estes 1992). Graham and Ickes (1997) determined that this role has engendered better encoding and decoding skills in women (Hall 1984), which may account for the apparent proclivity of females for intuition. For instance, evolutionary psychology suggests that men and women differ in those arenas where they have faced separate adaptive problems during evolution (Buss 1995). Lieberman (2000) and other neurological researchers concluded that this effect could be caused by higher estrogen levels that lead to faster formation of pattern connections (e.g., Jennings, Janowsky & Orwoll 1998).

Hypothesis 3: Females are more likely than males to use intuitive, rather than analytical decision making.

Findings about gender differences in affective aspects of personal disposition imply, however, that these could be the reason for a higher use of intuition among female decision makers. Most of the differences are attributed to a divergent social conditioning for each gender. Ben Ze'ev (2000) concluded, for example, that females exhibit greater emotional sensitivity because of their focus on interpersonal relationships. As Maio and Esses (2001) pointed out, women are encouraged to cultivate emotional empathy while men are taught to suppress it since it is seen by the society as a weakness. This finds support also in empirical research. For instance, Raman, Chattopadhyay and Hoyer (1995) identified women having a higher need for emotion, while Booth-Butterfield and Booth-Butterfield (1990) detected a similar effect in a study of affective orientation. Their results indicate that women were more emotionally attuned because they register emotions more keenly and act upon them more directly. Consequently, if affect acts as conduit to intuition (Epstein 1998), then it would follow that emotional awareness (measured by the degree of affective orientation) may account for women adopting a more intuitive decision making approach.

Hypothesis 4: The effect of gender on intuitive decision making is mediated by affective orientation.

Methods

We tested the hypotheses in a web-based experimental study that was administered to management students at a large Australian university. An experimental design was selected in order to separate effects of affective states and traits. The methodology is described in the following sections.

Participants

The study was administered as part of the course curriculum with 984 enrolled management undergraduates (see procedure below). Only data from those 570 students who completed both parts of the study were retained for analysis, representing a 58% response rate. The age of respondents ranged from 17–49 years, with a mean of 19.4, and 95% from17–24 years. Forty-one percent were male, and 89% were employed or have been employed in the recent past. The median length of employment was two years. Seventy-two percent of respondents were Australian, the rest was from Asia, Europe and North America. English was the native language for 82% of respondents. There were no significant differences between respondents and non-respondents on any of the control or dependent variables. A series of independent sample *t*-tests confirmed that both groups had similar scores in English proficiency, car racing experience, intuitive and analytical decision making.

Procedure

The study, which was part of a larger research project, consisted of two web-based segments that were available on the Internet for two weeks

each. The web format was selected to facilitate manipulations of a relatively large sample within brief periods of time. Furthermore, interactivity features rendered the decision-making scenario more engaging. In the first segment, participants experienced mood inducement (see below), completed the decision task, described their decision-making process, completed the mood and decision-making questionnaires, and provided demographic information. In the second segment, participants completed a measure of affective orientation.

After completing each segment, participants were provided with personalized feedback, which consisted of their computed scores compared with benchmarks, and a brief explanation of particular strengths and weaknesses. Participation was voluntary and anonymous. As an incentive, participants were offered extra marks as part of class exercises (they could earn the same marks doing an alternate exercise). Participants logged on the password-protected research website during specified two-week periods from any computer with minimum technical requirements and Internet access. The data were electronically coded and stored in a database, and the computer generated a unique identifier based on the respondent's student number, which was matched across segments.

Mood inducement. To induce variability in mood, respondents were assigned to one of two mood inducement procedures, which we employed to increase generalizability of the results. Since intuition is believed to be non-verbal (Cappon 1993; Crossan, Lane & White 1999), both procedures were designed to reduce rational priming that might infiltrate into the subsequent decision task. Therefore, instead of using anagram solving (e.g., Elsbach & Barr 1999) or other methods that require reasoning, we applied an affect-based or musical inducement, reinforced by visual means.

The first procedure consisted of a modified Velten's (1968) technique, in three randomly assigned conditions: positive mood, negative mood, and no inducement. To induce positive and negative mood, we asked participants to recall winning or losing a sport competition respectively, and to describe their feelings. As an additional reinforcement, participants were asked to select and rate a photograph with a mood-congruent facial expression (Matsumoto & Ekman 1988). Members of the no-inducement condition were asked to describe their morning routine. Four hundred seventy-four respondents participated in this procedure.

To impose more stringent controls and have the opportunity to observe how participants navigate through the manipulation exercise, a second mood inducement procedure was conducted in a laboratory setting. There, further 96 respondents underwent a modified mood induction reinforced by the use of music (Daus 2001). As in the first procedure, respondents were randomly assigned to positive, negative, or no mood inducement procedures. Based on Velten's (1968) technique, the positive mood group was asked to describe their feelings about having passed an extremely difficult exam while listening to their choice of music from a pre-tested selection of favorite pop singers. The negative mood group task was to describe a fatal car accident of a friend while listening to a pre-tested sequence of somber classical music. The control group wrote a brief essay about the meaning of music without any audio reinforcement.

After mood inducement, respondents in all procedure groups completed (via the web) the mood scale (see below), followed by the remainder of the first segment.

Decision-making task: After mood induction, participants completed the decision-making task, where they were asked to take the role of the company owner and decision maker in a modified *Carter Racing Case* (Sitkin & Weingart 1995). Specifically, they were asked to decide whether the team should enter in a car race, given information about weather, engine conditions and financial implications, as well as opinions and feelings of team members. The scenario was

adjusted by Elsbach and Barr (1999) to provide a balanced choice for or against, and we pre-tested an abbreviated version for the web format to ensure adequate difficulty. We also verified that there were no effects of time pressure. This scenario performs well in terms of engaging the decision maker and is conducive to both analytical and intuitive decision making; it is characterized by ambiguity, information complexity, lack of precedence, and high importance, all of which are suitable for these requirements (e.g., Agor 1984; Behling & Eckel 1991; Burke & Miller 1999; Goodman 1993; Wally & Baum 1994).

Measures

Control variables

The variables were selected for methodological reasons (lab-web split) or on theoretical grounds (English proficiency and car racing experience). Age was not related to any of the variables in the study, and so was not included as a control.

Difference between laboratory and web-based mood inducement: After it was determined that both mood inducement methods produced comparable results (see Mood Inducement Check in Results section), the samples were combined and a lab-web dummy variable was created to control for possible differences in the strength of mood induction between the laboratory and web procedures. Participants of lab inducement were coded as 1 and those who participated in the web-based inducement as 2.

English proficiency: This variable was included in order to mitigate effects of different levels of language skills on decision making. It was assumed that a limited command of English might affect the length and detail of decision-making self-description, ability to work on the decision-making task and possibly also response to other decision-making measures. A 7-point scale ranging from 'poor' to 'excellent' was employed, with higher scores indicating a higher proficiency.

Racing experience: Since car racing experience was expected to influence the use of analysis in decision making (Leonard & Sensiper 1998), we controlled for its effects. It was assessed on a 5-point scale ranging from 'no experience' to 'very experienced,' with higher scores denoting more experience. We did not detect any differences between male and female participants in this respect. While expertise is theorized to be a determinant of intuitive decision making, the car racing experience scores and our debriefing of the laboratory sample indicated that the reported experience was of much lower level than expertise. Nonetheless, it was clearly appropriate to retain this variable as control.

Independent variables

Affective orientation: We used the Booth-Butterfield & Booth-Butterfield (1990) 20-item Affective Orientation Scale to measure this variable. The scale is based on a concept of affective information processing (Buck 1985), which relies on awareness and use of affect even at low levels. Responses are on a 5-point scale, which ranges from 'strongly agree' to 'strongly disagree.' Examples include 'My emotions have many levels of intensity; I can be angry, for example, or very angry.' and 'I don't pay much attention to my emotions most of the time.' We reversed the scores on this scale, so that higher scores indicate a more affective orientation (published reliability = .83). Alpha for this scale was .86.

Positive and negative mood: We used Elsbach and Barr's (1999) scale to measure mood. The scale comprises four positive and four negative mood items (published alphas = .89 for both scales), which were selected from the Dictionary of Affect (Whissel 1989). The 5-point scale ranges from 'very slightly or not at all' to 'a lot' with higher scores indicating a stronger intensity of either mood. Examples include 'glad' or 'happy' for the positive scale and 'annoyed' or 'frustrated' for the negative one. As positive and negative mood were correlated at –.47, which represents only 22% shared variance, it was appropriate to treat them as distinct variables. This is in accordance with the conclusions

reached by Ashby et al (1999) that each affect may vary independently. Alphas for the positive and negative mood scales were, respectively, .91 and .86.

Gender: This is represented with a dummy variable, males coded as 1 and females as 2.

Dependent variables

In order to capture differential effects of affect, we employed two different measures: (1) intuitive and analytical decision-making questionnaires modified for the study from an existing instrument; and (2) an open-ended self-description of the participant's approach to the decision, assessed for intuitive and analytical approach by three coders. The theoretical reasoning for our selection is discussed below.

Decision-making questionnaires (see Table 1): To assess decision-making approach by self-report questionnaire, we modified intuitive and rational-analytical scales from the General Decision-Making Style questionnaire (Scott & Bruce 1995). As we discussed earlier, the intuitive approach relies on non-conscious processing and hunches or feelings about the correctness of the decision, while the rational approach is characterized by a systematic and logical evaluation of alternatives. We selected those items that were consistent with the theoretical underpinnings of our construct definition. The resulting Intuitive Scale has five items, with an alpha of .80. The Analytical Scale consists of eight items with an alpha of .87. The 5-point scales ranged from 'strongly disagree' to strongly agree' with higher scores indicating a higher use of the particular approach. Although our research focuses on intuition, we included a measure of analysis for theoretical and methodological reasons. It allowed us to study the differential effects of our independent variables on intuition and analysis and examine discriminant validity.

Self-description: Immediately after registering their decision, respondents were asked to write an open-ended description of their decision-making process. The instructions encouraged them to disclose honestly whether they logically evaluated the available facts, relied on their gut feeling or instinct, or applied a combination of both.

To determine the used decision-making approach, we conducted content analysis of the answers. Since we anticipated some degree of ambiguity in the coding process (Holsti 1968), instead of developing an extensive rulebook, we provided coders with operationalized definitions

Table 1: Confirmatory factor analysis of decision-making measures

Factor loading	First -order	Second -order
Analytical decision-making questionnaire (alpha = .87)	**.62**	
I analyzed all available information in detail.		.81
I evaluated systematically all key uncertainties.		.72
I made the decision in a logical and systematic way.		.72
I considered all consequences of my decision.		.70
When making the decision I considered both options in terms what is best for Jim Carter.		.65
I considered carefully both alternatives.		.64
I can describe step-by-step how I made my decision.		.63
Before I started deliberating, I double-checked the available information to make sure I have the right facts.		.60
Intuitive decision-making questionnaire (alpha = .79)	**–.75**	
I based the decision on my inner feelings and reactions.		.91
I relied on my instinct.		.83
It was more important for me to feel that the decision is right than have a rational reason for it.		.68
I made the decision because it felt right to me.		.48
I knew the answer before I started analyzing the data.		.45
Intuitive self-description	**–.74**	

of analytical and intuitive decision making (e.g., Zajac & Westphal 1995). The coders were instructed to evaluate each decision-making approach independently and determine to what extent respondents relied on logical reasoning or information analysis (for analytical decision making) and on their feelings, gut response or a sense of direct knowing (for intuitive decision making). Three assistants independently coded the statements for both constructs on a 6-point scale ranging from 'stated disbelief in this approach' to 'exclusive use of this approach' with a higher score indicating a higher employment of the respective approach. A 6-point scale without mid-point was selected to force coders to avoid a neutral assessment. The rate of inter-coder pre-negotiation agreement was 91% for analysis and 62% for intuition. Most of the differences were minor issues of interpretation, and were easily resolved in discussion and clarification. After reconciliation, the correlations between raters ranged from .86 to .93 for analytical approach ($p < .01$) and from .82 to .92 for intuitive approach, which suggests acceptable resolution of ambiguity in the coding scheme. Since the approaches were strongly correlated ($r = .91$, $p < .01$), we used only the intuitive scale. It appears that despite the instruction to evaluate each decision making independently, the coders were unable to assess one approach without a comparison with the other. We verified in regression analyses, however, that all results on the intuitive self-description and the intuitive questionnaire are in the same direction, which indicates that the coders were responding to the instrument in a theoretically consistent fashion. The analytical scale provided the same results in the opposite direction.

Confirmatory factor analysis: We used confirmatory second-order factor analysis to verify that our decision-making measures were related yet distinct (Tabachnick & Fidell 1996). Primary factors in this model, testing the two investigated modes of information processing, comprised the two measures of decision making (intuitive and analytical decision-making questionnaires and intuitive self-description). Secondary factors were the 13 questionnaire items corresponding to intuitive (5 items) and analytical (8 items) decision making. This enabled us to verify that all items loaded sufficiently on the respective scale. Intuitive self-description was represented as a single-item factor with unit variance and measurement error fixed at alpha at .75 (sensitivity tests at .50 and .25 found no differences) (e.g., Hayduk 1987). The CFA model provided an acceptable fit, Chi-Square = 209.19, df = 82, AGFI = .93, NFI = .94, CFI = .96, RMSEA = .05 (Hu & Bentler 1995, 1999), verifying the factorial and discriminant validity of the measures (Fornell & Larcker 1981). Table 1 lists the factor loadings determined from this analysis.

Results

Mood inducement check

We compared the outcome of mood inducement via the laboratory and web procedures and determined that both models worked as intended. Two-way ANOVA analysis found that the three groups differed significantly in their positive and negative mood, irrespective of the method of mood induction (positive mood $F(2,564) = 32.42$, $p < .01$, negative mood $F(2,564) = 43.90$, $p < .01$), although there was a lab-web interaction (positive mood $F(2,564) = 10.17$, $p < .01$, negative mood $F(2,564) = 10.79$, $p < .01$). Simple effect analysis showed, however, that while the lab inducement was stronger (positive mood $F(2,93) = 26.49$, $p < .01$, negative mood $F(2,93) = 27.34$, $p < .01$), the inducement using the web was also successful (positive mood $F(2,473) = 15.28$, $p < .01$, negative mood $F(2,473) = 11.38$, $p < .01$). Moreover, a series of independent sample *t*-tests did not detect any significant difference between both samples on any of the dependent variables. Consequently, we pooled the sample across the mood inducement methods, but included a dummy lab-web variable in the first step of hierarchical regression (Cohen, Cohen, West & Aiken 2003) to control for any

residual effect. For the full sample, the mood inducement groups differed significantly, $F(2,564) = 38.02$, $p < .01$ (positive mood means = 12.91, 11.69, and 10.15 for positive, no, and negative mood induction respectively; negative mood means = 6.21, 6.77, and 8.94 for positive, no, and negative mood induction respectively).

Descriptive statistics

Table 2 shows means, standard deviations, and bivariate correlations. As stated earlier, negative and positive mood correlated only at –.48, which warrants their independent measurement. As expected, the dependent variables were related. Intuitive questionnaire and self-description correlated at .43, which represents only 18.5% of shared variance, and therefore supports their use as separate measures. Other expected findings were that analytical decision making is negatively correlated with intuitive decision making and self-description.

Test of hypotheses

The tests of our model were accomplished using separate hierarchical regressions for each decision-making measure. The results are presented in Table 3.

Step 1 of the hierarchical regression introduced all three control variables: lab-web dummy, English proficiency, and car racing experience. In Step 2, we entered gender in order to separate it from other independent variables. Step 3 included all three affective variables (affective orientation, positive and negative mood).

Affective orientation: Results indicated a significant positive relationship of affective orientation with intuitive decision making and intuitive self-description, providing support for hypothesis 1. No significant effect was detected on analytical decision making.

Positive mood: We found a significant positive relationship with intuitive decision making, thus providing a partial support for hypothesis 2a. Nevertheless, this result did not carry across to the intuitive self-description. We also noted that positive mood did not affect analytical decision making.

Negative mood: Opposite to our expectations stipulated in hypothesis 2b, there was a significant positive relationship between negative mood and intuitive decision making, and a marginally significant effect in the same direction on intuitive self-description. No effects were identified on analytical decision making.

Gender: In accordance with hypothesis 3, there were significant results on both intuitive measures (indicating stronger effects for females) and on analytical decision making (indicating stronger effects for males).

Table 2: Descriptive statistics

	Variable	Mean	SD	1	2	3	4	5	6	7	8	9	10
1	Gender 1=male; 2=female	1.59	.49	–									
2	Lab-web split 1=lab; 2=web	1.83	.38	.09*	–								
3	English proficiency	6.05	1.08	.05	.09*	–							
4	Car racing experience	1.73	.98	.38**	.02	–.05	–						
5	Affective orientation	54.47	9.18	.22**	–.05	.20**	.15**	(.86)					
6	Positive mood	11.59	4.22	.02	–.03	.07+	.08+	.06	(.91)				
7	Negative mood	7.29	3.59	.01	.00	.12**	.02	.02	.48**	(.86)			
8	Intuitive DM	18.45	4.51	.08+	–.07	.02	.01	.27**	.11**	.07	(.80)		
9	Intuitive self-description	3.05	1.08	.11*	–.06	–.04	–.03	.18**	.05	.05	.43**	–	
10	Analytical DM	32.41	6.54	.17**	–.04	.06	.16**	.10*	.08+	.04	.36**	.36**	(.87)

Note. + $p < .10$; * $p < .05$; ** $p < .01$; $n = 570$; Scale reliabilities are given in parentheses on the diagonal.

TABLE 3: RESULTS OF HIERARCHICAL REGRESSION

Variable		Intuitive DM β / ΔR^2	Int. self-description β / ΔR^2	Analytical DM β / ΔR^2
Step 1: Controls				
Lab-web split		–.08	–.06	–.05
English proficiency		.02	–.04	.08*
Car racing experience		.00	.00	.17**
	ΔR^2	**.01**	**.01**	**.04****
Step 2: Gender				
Gender		.10*	.12**	–.12**
	ΔR^2	**.01***	**.01****	**.01****
Step 3: Affective variables				
(Gender)		.05	.09*	–.11*
Affective orientation		.26**	.16**	–.06
Positive mood		.16**	.07	.06
Negative mood		.15**	.08+	.00
	ΔR^2	**.09****	**.03****	**.01**

Note: $^+p < .10$; $*p < .05$; $**p < .0$

Test of mediation hypothesis

Hypothesis 4 stipulated that affective orientation mediates the effect of gender on decision making. We tested it in a series of hierarchical regressions on all dependent variables using the method described by Baron and Kenny (1986). In Step 1, gender was related to intuitive and analytical decision-making questionnaire, $b = .10$, $p < .05$; $b = .12$, $p < .01$; and intuitive self-description, $b = .12$, $p < .01$. In Step 2, we verified that gender was related to affective orientation, $b = .23$, $p < .01$. In Step 3, affective orientation predicted intuitive decision making, $b = .26$, $p < .01$, and self-description, $b = .16$, $p < .01$ but not analytical decision making, $b = .06$, ns. Step 4 involves adding the mediator variable significant at Step 3 to each gender-predicts-dependent-variable model. When affective orientation was entered, gender was no longer a significant predictor of intuitive decision-making questionnaire, $b = .05$, ns, indicating full mediation. The coefficient for gender diminished in level of significance to $b = .09$, $p < .05$, suggesting partial mediation for intuitive self-description, and retained significance for analytical decision making, = 11, $p < .05$. We verified the mediation of the relationship between gender and both intuitive measures using a Sobel test (Preacher & Hayes 2004). The Sobel test statistic ($z = 3.68$, $p < .001$) confirmed that the effects of gender on intuitive decision-making questionnaire were fully mediated by affective orientation. In case of intuitive self-description, the Sobel test also confirmed that gender effects were mediated ($z = 2.90$, $p < .01$). Although we did not find sufficient theoretical evidence to assume that mood might act as a moderator, we verified in our analysis that it did not have any moderation effects on any independent variable.

DISCUSSION

In this study we investigated the role of affect as an antecedent to intuitive decision making. Our findings indicate that the use of intuition is influenced independently by affective traits as well as states. We also detected significant effects of gender on all decision-making measures, indicating a higher proclivity of females to use intuition. This tendency appears to be mediated at least partially

by affective orientation. Surprisingly, affective variables do not seem to have any impact on analytical decision making.

Self-awareness of affective cues had a positive impact on intuitive decision making. It seems that when decision makers are in touch with their emotions, they have also an easier access to intuitive processing because of its strong affective component (e.g., Epstein et al 1996). As for affective states, our findings support reasoning by Watson and Tellegen (1999) about the independent effects of positive and negative mood, which should therefore be measured and evaluated separately in future studies. Positive mood was found to lead to intuition, as assessed by the intuitive questionnaire. This confirms previous conclusions that decision makers in a positive mood are more likely to rely on the default option of intuition as there is nothing in their cognitive mechanism that would activate conscious deliberation (Cacioppo & Gardner 1999). These findings have important implications for management training. They suggest that decision makers could indeed develop an easier access to intuition by means of increased emotional awareness and mood regulation. The first step is to learn how to register and differentiate experienced moods, emotions, and feelings. The next step is to practice positive mood regulation and use it to switch from one decision-making approach to another. This mechanism could enable decision makers to access intuition consciously whenever appropriate in the given situation (e.g., Dane & Pratt 2007; Sinclair et al 2002).

An intriguing finding in our study was that, contrary to previous research (Elsbach & Barr 1999), negative mood was also conducive to the use of intuition. The relationship with intuitive decision making seems to be governed by affect *intensity*, irrespective of whether the mood is positive or negative. As noted by Bodenhausen (1993), even negative affect at higher levels of intensity can cause a general sense of restlessness, leading to disruption of cognitive processing and the use of simpler, less resource-intensive strategies. Our manipulation, in contrast to that of Elsbach and Barr (1999), may have produced a more intense negative mood by having participants subjected to two reinforcing mood manipulations. More generally, arousal has been linked with the use of cognitive shortcuts (Wilder 1993), supporting this line of reasoning. We also speculate that the lack of any relationship between negative mood and the use of analysis many be explained in a similar manner: the negative mood in our participants was too intense to be conducive to the use of analysis. This is consistent with Forgas' (1995) conclusion that high intensity emotions can trigger the same type of information processing regardless of their positive/negative distinction. As Sinclair et al (2002) theorized, the intensity might activate intuition if the decision maker uses the energy as conduit to the decision outcome. Since organizational decisions are often made in urgent, stressful or challenging contexts (Jackson & Dutton 1988) where affect intensity and arousal may be high, future research should examine whether our pattern of results is replicated in organizational contexts. If this is the case, training managers how to work with the experienced 'emotional charge' would be advisable.

Results regarding gender differences were rather unequivocal. As predicted, female decision makers appear to rely more heavily on intuition because they can access it more easily through their heightened awareness of emotions. Affective orientation mediates the effect of gender on intuition because its activation is much stronger in female decision makers, possibly for neurobiological and social reasons discussed earlier (Graham & Ickes 1997; Jennings et al 1998). Male decision makers, on the other hand, tended to prefer analysis. It is possible, however, that male professionals with a heightened emotional awareness may have similar decision-making preferences as females. For example, empathy experienced by male nurses is likely to help them use their intuition more effectively. Hopefully future neurological research will offer some clues but more testing in management context is needed. In the

meantime, HR managers should consider more substantive training in emotional awareness for male employees.

Limitations and future direction

Arguably, the principal constraint of the present study is that it was a web-facilitated experimental design based on a hypothetical decision. Even though the compatibility of web-based surveys and experiments has now been established (e.g., McGraw, Tew & Williams 2000; Schmidt 1997), the effectiveness of mood induction via web remains unmapped territory. In support of the effectiveness of web-induced mood, however, our research found that the web and laboratory induction procedures were statistically indistinguishable. Moreover, our observation of those who filled in the first segment in the laboratory, together with examination of the decision-process protocols, suggests that respondents did effectively identify with their role. Thus, while field replication is recommended in future research, there does appear to be grounds for confidence in the external validity of our findings.

A further issue is that, although our data were collected in time-separated segments, and therefore less prone to common method bias (Podsakoff, MacKenzie, Lee & Podsakoff 2003), this method still involves respondents making a call as to their own decision approach. Further, we had concerns about the relevance of the task to the respondents as well as possible contamination through participants sharing their experience. In anticipation of these limitations, we minimized exposure by making the segment available only for a short period of time when the participants had a limited opportunity to communicate. Moreover, we selected a realistic and interesting scenario, which was found relevant for management students (Elsbach & Barr 1999; Sitkin & Weingart 1995). Feedback from participants during laboratory debriefing confirmed that they found the study engaging and enjoyable. It is nevertheless advisable to verify whether practicing managers with extensive work experience would respond in the same manner. Following up on the lack of mood moderation effects, it would be also interesting to conduct a longitudinal study, with affective awareness training as intervention, to test whether mood has a stronger effect on the information processing mode if the respondent is aware of the experienced affective state.

There are also potential constraints regarding decision-making measurement. Although we evaluated intuition using two instruments in an attempt to compare effects of affective variables on each measure, both of them were self-reports. In the future, it would be advisable to include an objective index of intuition use. In order to capture a decision-making process in an actual decision in business settings, it might be necessary to resort to physiological testing, such as eye movement (Cappon 1993) or limbic responses (Suzuki 2002). Progress has been made in this respect in detecting patterns in heart beat corresponding to entrepreneurial intuition (Gillin, La Pira, McCraty, Bradley, Atkinson, Simpson & Scicluna 2007). These methods, however, are yet to be developed into reliable measures suitable for large-scale organizational studies.

The high correlation of intuitive and analytical self-description poses another methodological concern. As stated above, we used two decision-making instruments in the interest of triangulation. The results were consistent across both intuitive measures, although they were weaker on intuitive self-description, in particular for mood. This occurred possibly because of the weaker psychometric properties of the scale we constructed from the decision-making protocol. It seems that our coders were incapable of assessing each approach in isolation. This explanation is supported by the fact that the same issue was not detected in the questionnaire measures of analysis and intuition that were correlated at a much lower level. Further investigation of this phenomenon is warranted. As noted earlier, we used only the intuitive self-description scale after we verified that its results are in the same direction as those on the intuitive questionnaire.

We included also a measure of analytical decision making and determined that, while the correlations were small, it was negatively related to both intuition instruments, thus supporting their discriminant validity. The low correlations suggest that intuitive and analytical decision making are indeed independent and can occur in parallel, as stipulated by CEST theory (Epstein et al 1996). This finds support in previous exploratory research (Burke & Miller 1999; Isenberg 1984) and also in a number of self-descriptions in our study where participants reported using a combination of both approaches. Therefore, we recommend that researchers do not study intuition and analysis as mutually exclusive but rather as complementary decision-making modes that may coexist.

In conclusion, our study tells us that both affective traits and states play an important role in the use of intuition in decision making. Their impact, however, appears to be more differentiated than suggested by previous research. So far, our findings suggest that managers could be trained to improve their intuitive decision making by means of mood regulation and increased emotional awareness. We are hopeful that future research, especially in field settings, will help us fill some of the remaining gaps in our knowledge, and improve further our understanding of how we make decisions.

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