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The Arousing Effect in Decision Making: A Distinction Between Valence and Arousal in the Measurement of Emotional Awareness and Cognitive Processing

Navn:	Bolette Sofie Ingeberg, Marianne Lindberg Frøshaug

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Marianne Frøshaug and Bolette Sofie Ingeberg

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Abstract

This thesis examines the effects of emotional awareness on cognitive processing in a subsequent decision making case. We assert that emotional awareness has valuable implications for mental health and well being, but also decision speed and learning. Rather than taking a purely valence-based approach, our findings suggests that other emotional aspects than subjective valence are indeed important in the study of emotions and decision making. Our results highlight the importance of subjective arousal, and emphasize the inclusion of emotional awareness in future studies in the field of judgment and decision making. Further results showed that emotional awareness had a strong positive correlation with intuitive processing, and a negative correlation with analytical processing. As predicted, subjective arousal was negatively related to analytical processing style and positively related to intuitive processing style. Both subjective arousal and valence were further significant in explaining the relationship between emotional awareness and intuitive processing.

Overall, findings imply that studies may benefit from going beyond valence when investigating emotion and its effects on cognitive processing. Our findings further provide an insight into how individuals evaluate emotions as information in cognitive processing, and thereby decision making behaviour. Findings, practical implications, future research and limitations will be discussed.

1.0 Introduction

Due to the arisen complexity and the need for speed in organizational decision making, there appears to be a current interest in emotions within work and organizational psychology. Yet, these interests have not led to a large body of published theory and evidence, nor to a range of practical techniques for assessing or intervening emotions in organizations. Researchers have certainly not ignored the role of feelings in judgment and decision making (JDM), however its focus has mainly concerned the constructs of risk-taking, motivation and job satisfaction. Although these constructs have served and continue to serve some limited but useful purposes, it has been increasingly apparent that if one wishes to develop a thorough understanding of individuals decision making processes, one needs to look more at specific emotional states. This thesis aims to look further into this inquiry, and seeks to understand to what extent emotions guides decision making behaviour.

Emotions has been defined along the dimensions of both valence and arousal (Russell, 2003). Research has mainly focused on emotions as predominantly positive or negative, thus taken a valence-based approach (Lerner et al., 2015). Recently, scholars have begun to realize that valence may not be sufficient to fully explain the influence emotions have on JDM, and include the (re) introduction of arousal (Blanchette & Richards, 2010). However, findings have been inconsistent and underlying mechanisms are not clear. Although previous research indicates that there is a big difference in the way individuals think and behave when they are emotionally aroused compared to when they are unemotional (Epstein, 1994), research on individual differences in levels of emotional awareness and utilization of emotions as cues is scarce. This thesis asserts that emotional awareness constitutes better decisions as it may enable for decision speed and learning. Emotions encountered as information may further facilitate for mental health and well-being both for individuals and in the context of organizations. One of the concepts used to explain the propensity to use emotion as information is termed *Affective Orientation* (AO), and can be understood as the degree to which individuals use their emotions as valid information when making decisions (Booth-Butterfield & Booth-Butterfield, 1990). Individuals are likely to be influenced by affect in JDM either because of a stable trait, or because of a momentary mood which infuses affect into their

information processing (Sinclair, Ashkanasy & Chattopadhyay, 2010). Collectedly, this thesis investigates how, and to what extent emotional awareness, as a relatively stable affective trait, will influence cognitive processing styles. It will further explore whether emotions (i.e. arousal and valence) moderates this relationship. We expect that preferences for cognitive processing is dependent on individuals' level of affective orientation, as they may differ on types of information that are most salient to them in reaching their conclusion. If this is the case, individuals could be trained to improve their decision making by means of emotional awareness and regulation.

Rather than taking a purely valence-based approach, our results highlight that a distinction between valence and arousal is indeed important in the study of emotions and decision making. Emotional awareness and intuitive processing had a strong positive correlation, whereas a negative correlation was found for analytical processing style. Our regression analysis shows that subjective arousal was negatively related to analytical processing and positively related to intuitive processing. Both subjective arousal and valence were further significant in explaining the relationship between emotional awareness and intuitive processing style. We will continue by reviewing literature and present our hypothesis before discussing and presenting implications for our research findings.

2.0 Theoretical Framework and Hypotheses

2.1 Emotions and Cognitive Processing Style

Forgas (1995) proclaims that mood is a feeling of good or bad, and has "low-intensity, diffuse and relatively enduring affective states without a salient antecedent cause and therefore little cognitive content" (p.41). Emotions, on the other hand, are feelings of for example anger or fear, and are *"*more intense, short-lived and usually have a definite cause and clear cognitive content". Researchers are often inconsistent in their definition, and display relative homogeneity in methodology of affective states. Interestingly, research by McCraty, Atkinson and Bradley (2004) shows that the heart plays a role in the processing of pre-stimulus information. Although the heart and brain were directly involved, their research indicates that the heart receives pre-stimulus information before the brain, demonstrating an embodiment of emotions and information processing. This is an

interesting finding, because some individuals appear to be more sensitive to their emotions and remain aware of what they are feeling, while others pay little attention to their emotional state, and weigh logic and "facts" more heavily in guiding their decision making behaviour. Thus, some individuals may be more bodily and mentally affected by emotions than those not attending their emotions. Such differences in how individuals typically weigh emotion as information have specific implications for which types of information that are most readily encoded, and how different individuals learn most effectively (Booth-Butterfield & Booth-Butterfield, 1990). Notably, it is evident that emotions in fact do play a central role in the dual-process models of decision making (Slovic et al., 2007). The dual-process asserts that there are two basic ways in which individuals process information; an analytical system and an intuitive system, where "both systems operate in parallel and compete for control of cognition and behaviour" (Bakken et al., 2016, p. 4). Whereas intuitive processing style is considered as nonconscious, fast, associated with affect, and operating in an automatic, holistic manner, analytical thinking is characterized as slow, deliberative, rule-governed, primarily verbal and conscious (Epstein, 2008; Kahneman, 2003). Although individuals use both processes interactively, they have been found to differ in whether they habitually respond primarily analytical or intuitively in JDM, thus the preference to either follow their heart or their head (e.g., Langan-Fox & Shirley, 2003).

As mentioned, Epstein (1994) proclaims that there is a big difference in the way individuals think and behave when they are emotionally aroused, compared to when they are unemotional. Individuals high in emotional intensity typically think in a way that is categorical, action oriented and associative, labeled intuitive processing. Mandler (1975; cited in Weick, 1990) suggested that increased arousal leads to attentional selectivity where the attention to internal autonomic activation reduces the information processing capacity. This suggestion is supported by Arnsten (2009) who argues that increased levels of stress, which has been referred to as a state of high arousal (Boucsein, 2012), can impair cognitive abilities quite dramatically. Prefrontal cortex may explain this inquiry as this area of the brain is involved in the decision making process. Specifically, when psychological stress occurs, higher-order prefrontal cortex functions will become impaired while stress pathways are activated. In turn, this strengthens the

amygdala function, resulting in more reflexive, rapid and emotional thinking. Contrariwise, lower levels of stress will interfere less with the prefrontal cortex, and induce a more thoughtful and deliberate thinking (Arnsten, 2009). Evidently, stress put strains on individuals cognitive abilities. The distinguished systems have been used to explain contradictory results in previous research. We will contintinue with a further investigation of emotional states in order to deepen the understanding of the relationship between emotions and cognitive processing.

2.1.1 Affective Orientation and Cognitive Processing

According to Sinclair and colleagues (2010), 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 cognitive processing. Previous research proposes that some individuals rely upon affective labeling, and attend emotional cues more regularly than others in processing information about events (Booth-Butterfield and Booth-Butterfield, 1990). As noted, a term used to explain affect as information is known as *Affective Orientation* (AO), which entails components of *awareness and use of emotional cues* that guides decision making behavior. It is argued that affectively oriented individuals have a highly differentiated category system to recognize emotions, and that they are sensitive to intensity levels within those emotions. By comparison, individuals not affectively oriented either do not recognize, or do not attend to their emotions (Booth-Butterfield and Booth-Butterfield, 1990). Awareness of emotions may have little focus in their information processing pattern, thus be more inclined to logic and objective facts. From this line of reasoning, AO concerns individuals responding to their emotional cues. Specifically, AO individuals may not only be aware of their emotions, but also perceive them to be a valid source of information, hence use the emotional information retrieved to guide their decision making. In consideration of individual differences and emotions as information, this may result in diverse consequences for decision making behaviour.

Generally, whereas negative emotions signals that the situation is problematic and threatening, fostering analytic processing (e.g., Fiedler, 2001; Schwarz, 1990, 2000), positive emotions do not signal the same threat or problems, triggering intuitive processing (Batra & Stayman, 1990). In terms of

individual differences, some individuals may process information depending on their emotional awareness, regardless of whether the emotion is positive or negative. As Chaiken and colleagues (1989) suggested, individuals stop processing information when they have attained "a sufficient degree of confidence that they have accomplished their processing goals" (p. 221). Arguably, it may not be an individual's emotions that causes them to engage in different types of processing, but rather the individuals interpretations of the emotions. The concept of AO employs an information processing approach, in which the associative network developing around emotions are weighed as valid and important. Due to the strength of the network, even low-intensity emotions are more likely to be accessible to an individual.

The use of intuition is claimed to depend on whether decision makers are in touch with their emotions (Sinclair et al., 2010). Further, since emotions are proposed to come before cognition (Zajonc, 1980), this thesis expects that individuals affectively oriented will process information faster than those not affectively oriented, taking an intuitive approach to JDM due to the associative network developed by emotions. Specifically, individuals may direct their attention toward either intuitive or analytical processing, depending on their level of AO. Based on the overall discussion, this thesis find it plausible that affectively oriented individuals will use their emotions as information, thus have a stronger access to intuitive processing style. Given the novelty of this line of reasoning, we hypothesize that;

H1: Affective orientation will be positively related to intuitive processing style in the subsequent decision making case.

Despite the overall discussion that AO may facilitate for stronger access to intuitive processing style, this thesis also finds it plausible that AO may facilitate for analytical processing style. As previously mentioned, individuals may stop processing information when they have attained a sufficient degree of confidence in their goal accomplishment when processing (Chaiken et al., 1989). AO may thus provide individuals with emotional cues which signals to approach information processing more analytically. Because individuals affectively oriented may be more sensitive to emotional cues, they may also be more sensitive to

stimulus information, hence recognize more clearly whether to approach decision making in a holistic or deliberate manner. This may indicate that it is the awareness and interpretation of emotions which causes individuals to engage in different types of processing styles.

Specifically, Zajonc (1980) argued that affective reactions to stimuli are often the very first reactions, occurring automatically, and subsequently guiding information processing and judgment. Damasio (1994) proclaim that intuition and emotions play crucial roles in the ability to make smart, rational decisions. If the researchers are correct, then emotional reactions may serve as an orienting mechanism, helping individuals to make efficient decisions. Nevertheless, researchers now recognize that the intuitive and the analytic way of thinking are continually active. While individuals may be able to "do the right thing" without analysis, it is unlikely that they can use analytic thinking without guidance from affect somewhere along the line. To our knowledge, the role of emotional awareness in analytical processing remains unexplored. Notably, whether analytical processing behaviour is in fact guided through emotional awareness and the interpretation of emotions. It may not be an individual's emotional state that causes them to engage in different types of processing, rather the interpretations of their emotions. Based on this line of reasoning, we propose a contradicting hypothesis:

H1': Affective orientation will be positively related to analytical processing style in the subsequent decision making case.

In order to receive a deeper understanding of the notion of AO and cognitive processing, this thesis finds it insightful to further review how emotions, understood through core affect (i.e., arousal and valence), may influence cognitive processing.

2.2 Core Affect

Russell (2003) defines core affect as "a neurophysiological state that is consciously accessible as a simple, non-reflective feeling that is an integral blend of hedonic (pleasure–displeasure) and arousal (sleepy–activated) values (p.147). Whereas core affect exists within the person, affective quality exists in the

stimulus. Posner, Russell, & Peterson (2005) proposes that all affective states can be characterized in two dimensions, namely in the dimensions of arousal and valence. In the valence dimension, the feeling is an assessment of one's current condition, and its value can be positive or negative. In the arousal dimension, the feeling is one's sense of mobilization and energy, and its value can be high or low (see figure 1). Each emotion can be understood as a combination of these dimensions, or as "varying degrees of both valence and arousal" (Posner, Russell & Peterson, 2005, p. 716).

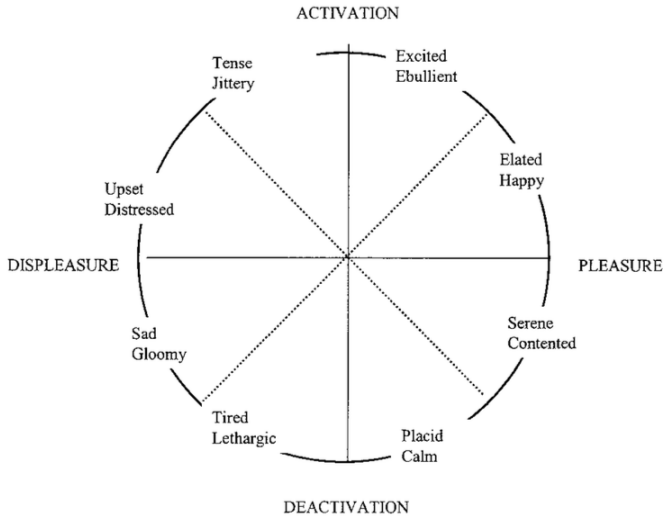


Figure 1: Core affect (Russell, 2003, p.148).

2.2.1 Measuring Cognitive Processing - Valence or Arousal?

Despite an increase in research on affect and cognition, Lerner and Keltner (2000) propose that relatively few theories have systematically addressed the influence of specific emotions in decision making. A valence-based approach has either implicitly or explicitly been used when investigating the differing effects of positive versus negative feeling states in decision making (Schwarz & Clore, 2007). However, valence-based approaches face one obvious shortcoming; they fail to specify whether different emotions of the same valence influence decision making in different ways. Although valence is central to emotion, the valence-based approach might by default predict that diverse emotions of the same valence (e.g. sadness, anger or fear) would exert similar influences in decision making.

The process of *affect infusion* is widely used to explain the large body of research on the effect of valence on cognitive processing (Schwarz & Clore,

2007). Forgas (1995) defines affect infusion as "the process whereby affectively loaded information exerts an influence on, and becomes incorporated into the judgmental process, entering into the judge's deliberations and eventually coloring the judgmental outcome" (p.39). According to the Affect Infusion Model (AIM), affect infusion only occurs when the emotion fails to trigger motivated processing (Dix, Reinhold, & Zambarano, 1990). Thus, the role of affect varies because positive and negative affect are likely to facilitate different types of information processing in terms of the degree of rational involvement (Forgas, 1995). Specifically, positive valence informs approach tendencies, and negative valence informs withdrawal tendencies (Harmon-Jones & Allen, 1998). Negative valence signals that the situation is problematic and threatening, requiring the individual to process information more carefully, thereby fostering analytic processing (e.g., Fiedler, 2001; Schwarz, 2000). In contrast, positive valence does not signal the same threat or problems, leading individuals to attend more to pre-existing knowledge and routines (Bless et al., 1996), triggering intuitive processing (Batra & Stayman, 1990). However, Watson, Clark and Tellegen (1988) proposed that the effects of positive and negative affect are not necessarily opposite. Research shows that individuals in a positive valence, compared with those in a negative valence, produce more unusual associations (Isen et al., 1985), show improved creative problem solving (Isen, Daubman, & Nowicki, 1987), prefer heuristic over exhaustive decision making strategies (Isen & Means, 1983), and form more inclusive categories in a sorting task (Isen & Daubman, 1984). Thus, while positive valence may relate to several valuable outcomes, such as creativity, negative valence may enhance performance on tasks requiring a systematic and analytic approach (Forgas, 2007).

Much evidence shows that activation influences cognitive performance in a curvilinear manner: optimal performance occurs at intermediate levels of activation, with higher levels for simpler tasks and lower for more complex tasks (Humphreys & Revelle, 1984). Whereas negative affect generally leads to more detailed and critical thinking, and positive affect leads to more heuristic and divergent thinking (Park & Banaji, 2000), there are exceptions. For example, Bodenhausen, Sheppard, and Kramer (1994) found contradicting results to the valence-based approach. Specifically, sadness (an emotion low in arousal) and anger (an emotion high in arousal) had opposite effects on cognitive processing

style (CPS), where anger leads to an intuitive processing style . Nonetheless, Bodenhausen et al.'s angered subjects might have been simultaneously higher in activation than their sad or neutral counterparts. In a related study, Bodenhausen, Kramer, and Süsser (1994) found that happy individuals made more stereotypic judgments than individuals in a neutral condition, indicating similar effects of anger and happiness. Both anger and happiness appear to include a set of cognitions that prime other cognitions (Lerner & Keltner, 2000). Different effects of anger and sadness, and similar effects of anger and happiness, indicate that arousal is more important than assumed by advocates of the valence-based approach.

Nonetheless, this thesis acknowledges that the two dimensions tend to correlate in at least two ways. First, arousal and valence are often asymmetrically correlated *between* valences. Negative stimuli (for example, a mutilated body) are typically more intense and arousing than positive scenes (a puppy). Second, arousal and valence are often correlated *within* a valence. An aversive stimulus (fingernails scratching a chalkboard) typically becomes more unpleasant, or acquires greater negative valence, as it becomes more intense (Anderson et al., 2003). Notably, an individual who experiences strong positive emotions may also be a person who feels strong negative emotions. This indicates that positive and negative affect covary together on an intensity dimension. Nevertheless, whereas valence is consistently defined as a subjective experience along dimensions of pleasure–displeasure, definitions of arousal vary in terms of how broad or narrow they are (Russell, 2003). Narrow definitions concern somatic markers such as blood pressure, pupil dilation, olfaction, heart rate or electrodermal response (Russell, 2003; Anderson et al., 2003; McCraty, Atkinson, & Bradley, 2004). This thesis will follow Russell's (2003) definition, viewing arousal as "a state of readiness for action or energy expenditure at one extreme versus need for sleep or rest at the other'' (p.156), in which increased levels of stress has been referred to as a state of high arousal (Arnsten, 2009; Boucsein, 2012).

It is evident that a distinction between valence and arousal is needed in the measure of cognitive processing. Forgas (1995) propose that emotions high in intensity may trigger the same type of information processing regardless of their positive or negative distinction. Emotional intensity may explain these results because arousal has been linked to the use of cognitive shortcuts (Wilder, 1993).

As Bodenhausen (1993) noted, even negative emotions at higher levels of intensity can cause a general sense of restlessness, leading to disruption of cognitive processing style (CPS) and the use of simpler, less resource-intensive strategies. The overall discussion demonstrates the importance of including arousal in the study of emotion. Various research points to high levels of arousal as a factor causing intuitive processing, and lower levels to engage in analytical processing (Arnsten, 2009; Posner, Russell & Peterson, 2005). Valence on the other hand, yield inconsistent results which is presumed to be dependent on levels of arousal. This thesis asserts that arousal may exert more influence on cognitive processing, thus important when understanding the influence of emotions in CPS. Consequently, we will test for possible effects of arousal on CPS, while controlling for valence.

2.3 The Subjective Feeling of Arousal

Ever since William James (1884) argued that emotions are secondary to physiological phenomena, emotion theorists have been concerned with the question of what constitutes emotional experience (Dalgleish, 2004). A key distinction is drawn between physiological reactions to stimuli and subjective experiences of these (Schachter & Singer, 1962). Contemporary theories on emotion vary in the extent to which they emphasize one or the other (Russell, 2003). Whereas, physiological arousal represents a narrow definition, Russell's (2003) definition of arousal also includes the subjective feeling of being aroused. Further, self-reported assessments of arousal do not cleanly correlate with physiological, neurobiological, or behavioral observer rated assessments (Mauss & Robinson, 2009). This lack of convergence has created mixed findings in the field of psychology. Findings have been difficult to interpret, as individuals respond differently following the same emotional stimulus. However, to some extent the strongest implications for clinical work are simply the client's reported experience of emotional arousal at key moments in an intervention (Pascual-Leone et al., 2016). We will extent this view in the context of JDM. Since self-reported emotions may let us see whether there is any cognitive individual differences depending on subjective arousal, as opposed to physiological, this thesis focuses on the subjective dimensions, as we want to investigate preferences for CPS.

Particularly, our previous discussion demonstrates the importance of considering arousal in the investigation of emotions on cognitive processing. Various research points to high levels of arousal as a factor causing System 1 engagement (i.e., intuitive processing), and lower levels to engage in System 2 (i.e., analytical processing; Arnsten, 2009; Posner, Russell & Peterson, 2005). One may assume that the degree of arousal can have an impact on the two systems of cognitive processing: as the arousal level increases, System 1 may be involved to a higher degree as it operates fast. Further, lower levels of arousal may engage system 2, where operations are slower. Since Mandler (1975; cited in Weick, 1990) suggested that increased arousal leads to attentional selectivity, where the attention to internal autonomic activation reduces the information processing capacity, it is likely that subjective arousal will impair the cognitive abilities. This inquiry may be explained by specific hormone levels released from the hypothalamus and central amygdala due to high-arousal states (Owens & Nemeroff, 1991). Thus, this thesis hypothesize that subjective arousal will facilitate for intuitive processing style. In formal terms;

H2a: Subjective arousal will be positively related to intuitive processing style in the subsequent decision making case.

H2b: Subjective arousal will be negatively related to analytical processing in the subsequent decision making case.

2.4 The Moderating Role of Valence and Arousal

Probably all of us have experienced that when we encounter depressed emotions, our attention appears to be focused in a rigid and narrow way, whereas when we experience happy emotions, our minds seem to bubble over with ideas and sometimes far-fetched associations. These everyday impressions are supported by a growing body of empirical evidence showing that positive and negative moods are in fact accompanied by qualitatively different information processing modes (e.g., Gray, 2001; Kuhl, 2000). For instance, individuals with positive emotions, compared to those with negative emotions, produce more unusual associations (Isen et al., 1985), show improved performance on tests of creative problem solving (Isen, Daubman, & Nowicki, 1987), prefer heuristic over exhaustive

decision-making strategies (Isen & Means, 1983), and form more inclusive categories in a sorting task (Isen & Daubman, 1984). Since we have argued that affectively oriented individuals have a highly differentiated category system to recognize emotions, and that they are sensitive to emotions within all intensity levels, it is likely that the emotions within the dimension of subjective valence (i.e., positive and negative), and the temporary effects of emotions will moderate the relationship between AO and intuitive processing style. In formal terms;

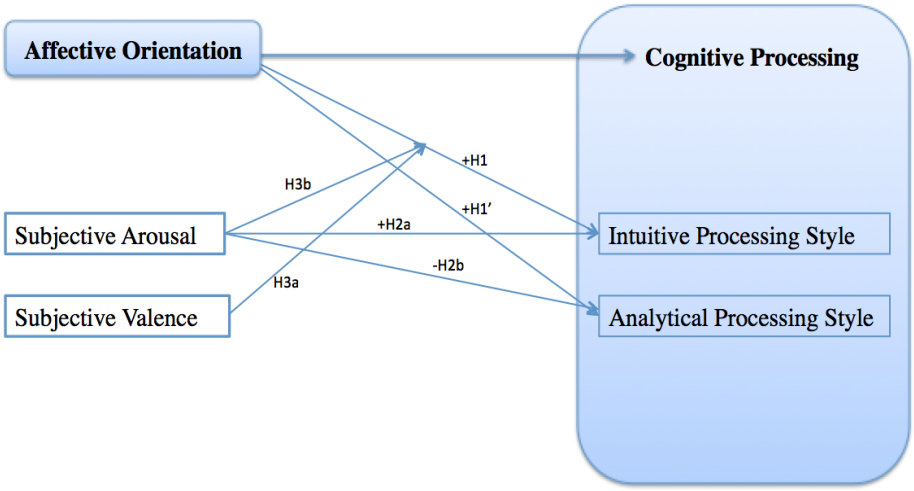
H3a: Subjective valence will moderate the relationship between affective orientation and intuitive processing style in the subsequent decision making case.

Further, beside the thesis' assumptaion that AO has direct effects on cognitive processing, subjective arousal will moderate the extent to which individuals use their emotions as information when making decisions. As aforementioned, the dual-process approaches suggest that conditions high in mobilization and energy (i.e., high arousal) interfere with rational, deliberative processes ought to cause decision makers to fall back on more intuitive, automatic processes (e.g., Kahneman & Frederick, 2002). Interestingly, Booth-Butterfield and Booth-Butterfield (1990) found that AO were positively related to affect intensity, indicating that AO individuals are likely to be aware of subtle and minor emotional cues, interacting with their emotions more strongly. On the other hand, individuals low in AO may not realize the emotional signals unless they have high intensity, or at least recognize these signals as valuable. This indicates that when individuals experience a sense of energy or readiness, and at the same time are subtle to minor emotional cues, may in fact be more exposed to perceptions of stress as their energy level increases, thus engaging in intuitive decision making behaviour. This thesis expects that subjective arousal will moderate the strength of the relationship between AO and intuitive processing style, as individuals will recognize emotional signals caused by arousing conditions and be more affected than those who do not attend to their emotions to the same degree. Given the novelty of this line of reasoning, we hypothesize that:

H3b: Subjective arousal will moderate the relationship between affective orientation and intuitive processing style in the subsequent decision making case.

2.5 Theoretical Model

Based on the overall assumptions, we present the following theoretical model:



Model 1: Theoretical model.

3.0 Methodology

Illuminated by psychological constructs of cognitive processing, this thesis aims to investigate how emotional awareness, measured through AO influence cognitive processing in JDM. Further, it seeks to understand to what extent emotional intensity (measured in terms of valence and arousal) influences and moderates this relationship.

The following methodology section will elaborate on the collected data, as well as providing a description of the equipment and measures that were used.

3.1 Data Collection

In total, 141 subjects participated in the web-based experiment. The majority of subjects were students at a large academic institution in Norway. Due to missing data, the final sample consisted of 129 participants, in which 83 of the participants (64,3%) were female.

3.1.1 Experimental Design and Equipment

The web-based experiment was designed and ran through Qualtrics, a software tool that provides a precise timing of event and data collection. We randomly assigned subjects to four different experiment conditions, differing only in the target emotion induced in the experiment.

3.1.2 Experimental Procedure

The experiment was presented electronically through a web-based experiment. The web format was selected to facilitate manipulations of a relatively large sample within brief periods of time.

Before starting the experiment, participants were asked to fill out a consent form in order to participate in the experiment. Participants were then randomly assigned through Qualtrics (Qualtrics, Provo, Ut) into four different experimental conditions. Specifically, the conditions concerns positive emotion/high arousal, positive emotion/low arousal, negative emotion/high arousal, and negative emotion/low arousal. Emotions were manipulated by having the subjects read a randomly assigned vignette (i.e. positive or negative) adapted from Johnson and Tversky (1983), which has also been used by Mittal and Ross (1998). The positive vignette describes a student who is lucky enough to become accepted into medical school with a scholarship, while the negative story describes another student's struggle with leukemia (see appendix 1). According to Mittal and Ross (1998), this method of inducing emotion closely resembles the kind of situations that individuals might encounter in a real life setting.

After reading the story, the participants were introduced to the Asian Disease scenario in the gain frame dilemma (see Appendix 2). The Asian disease scenario has been used in decision making research (Tversky & Kahneman, 1981) and is a suitable decision making case as the subjects are equally likely to apply either analytical or intuitive processing style, which makes this task suitable for studying the effects of emotions on CPS. Further it does not itself put strong constraints on subjects' CPS (unlike for example the "Cognitive Reflection Test" (Frederick, 2005), and has no right or wrong answer (unlike for example the Iowa gambling task (Bechara, Damasio & Damasio, 2000).

The impact of emotion inducement on valence and arousal levels has yet to be systematically studied (Jallais & Gilet, 2010). In order to manipulate arousal in the web-based experiment, half of the participants were shown a ticking clock when solving the Asian Disease case. Our pilot study showed that a countdown timer of 25 seconds were able to induce significant subjective feeling of arousal, and was used to manipulate arousal in our main experiment. We expect that an increased level of stress (caused by a ticking clock) impair the participants

cognitive abilities dramatically. By doing so, we took an exploratory attempt to manipulate arousal, which has not been validated by previous research.

After the case, subjects answered several questions regarding their subjective emotional experience of the vignette and the solving of the Asian disease problem, through the self-assessment manikin (SAM) of valence and arousal (Bradley & Lang, 1994). Further, to assess CPS and AO during the decision making case, subjects answered The Rational Experiential Inventory (REI; Pacini & Epstein, 1999; see appendix 3) and the 20-item Affective Orientation Scale (Booth-Butterfield & Booth-Butterfield, 1990; see appendix 4). The subjects ended the survey by scoring their level of English proficiency.

3.2 Measures

3.2.1 Dependent Variables

Cognitive processing style. In order to measure the participants habitual preferences for CPS, REI was used to assess whether the participants engaged in analytical or intuitive processing style, when responding to the decision making task. REI have been validated in several studies (Pacini & Epstein, 1999; Shiloh, Salton, & Sharabi, 2002; Björklund & Bäckström, 2008), and have been found to be internally consistent and highly reliable, with Cronbach's alpha ranging from 0.74 to 0.91. It constitutes a four-dimensional construct in assessing cognitive processing, rational ability, rational engagement, experiential ability and experiential engagement. The items were rated on a scale ranging from strongly disagree (1) to strongly agree (5). For our final analyses, we used the two high-ordered dimensions of analytical (consisting of rational ability and rational engagement) and experiential processing (consisting of experiential ability and experiential engagement). Descriptive statistics for the cognitive processing questionnaire are presented in table 3.1.

Table 3.1: *Descriptive statistics for REI (means, standard deviations and intercorrelations).*

	Mean	SD	1	2	3	4
1. Rational ability	38.9	5.4	-			
2. Rational Engagement	33.3	5.2	.721***	-		
3. Experiential Ability	36.7	6.3	-.249**	-.167†	-	
4. Experiential Engagement	29.5	6.9	-.433***	-.270**	.771***	-

Note*. Predictors centered at their means. Robust standard errors due to heteroscedasticity. † p < 0.10 * p <0.05. ** p <0.01 *** p < 0.001*

Intercorrelations in table 3.1 are in expected directions. The correlation between the Rationality and Experientiality scales is negatively correlated supporting the notion of a two-dimensional construct that operates with separate dimensions of information processing modes (Bakken et al., 2016). As noted above, we combined the rational ability and rational engagement into an analytical processing style, and experiential ability and experiential engagement into an intuitive processing style, to ease subsequent analyses.

3.2.2 Independent Variables

Affective orientation. In order to provide us with information about the participants emotional awareness, and whether they use emotions as information, the 20-item Affective Orientation Scale was utilized which relies on awareness and use of emotions even at low levels (Booth-Butterfield & Booth-Butterfield, 1990; Buck 1985). Responses are on a 5-point scale, which ranges from 'strongly agree' to 'strongly disagree'. Previous research by Sinclair, Ashkanasy & Chattopadhyay (2010) have reversed the scores on this scale, so that higher scores indicate a more affect orientation and alpha for this scale was .86. We thus followed the same procedure.

Subjective Arousal and Subjective Valence. In order for subjects to assess their emotions, a subjective rating called the Self-Assessment Manikin (SAM) of arousal level and valence was applied. Subjects rated both the affective dimensions of valence and arousal with on a 9-point Likert scale, including graphic pictures (see Appendix 4). The subjects indicate whether they felt

"unhappy - happy" (valence), and "calm - excited" (arousal; Bradley & Lang, 1994).

Control variables. Numerous studies have found that men and women respond differently to the same emotional stimulus (e.g., Fessler, Pillsworth, & Flamson, 2004; Hofer et al., 2006). Women tend to respond more negatively to negative stimuli, and men tend to respond more positively to positive stimuli (Stevens & Hamann, 2012). There is also a tendency for women to rate negative stimuli as more arousing, in contrast to men, who tend to rate positive stimuli as more arousing (Bradley et al., 2001). To further limit the confounding effects gender differences represent, we controlled for gender (female=2) in all regression models.

3.3 Manipulation Checks

English proficiency. This variable was included in order to mitigate the 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 5 point-scale ranging from "poor" to "excellent" was employed, with higher scores indicating a higher proficiency. Subjects scoring "poor" on the point-scale range were taken out from the analysis.

Emotion induction. To investigate the effectiveness of our emotion induction, we carried out a series of between-subjects t-tests (see table 3.1 for an overview of experiment conditions and observed means). Manipulation checks showed that subjects in the two positive conditions (M = 6.84, SD = 2.027) reported significantly higher valence than subjects in the two negative conditions (M = 2.74, SD = 1.567). Furthermore, subjects in the positive high arousal condition (M = 5.74, SD = 2.428) reported significantly higher arousal than subjects in the positive low arousal condition (M = 4.31 SD = 2.287).

Table 3.2: Experimental conditions and observed means (and standard deviations) of subjective valence and subjective arousal.

Condition	Subjective Valence	Subjective Arousal	Experimental Condition
Positive valence, low arousal	7.00 (2.000)	4.68 (2.483)	Positive vignette, Asian disease problem without time pressure
Positive valence, high arousal	6.67(2.072)	5.76 (2.670)	Positive vignette, Asian disease problem with time pressure
Negative valence, low arousal	2.88 (1.513)	3.94 (2.044)	Negative vignette, Asian disease problem without time pressure
Negative valence, high arousal	2.57 (1.643)	5.71 (2.158)	Negative vignette, Asian disease problem with time pressure

In sum, our emotion induction was effective in producing expected differences in both subjective valence and arousal between experimental conditions.

4.0 Results

4.1 Descriptive Statistics

Table 4.1 shows correlations between all dependent and independent variables in the study. In addition, we included task response time (in seconds) in order to validate the two cognitive processing dimensions. According to theory, the response time may indicate the use of intuitive or analytical processing style. Pointedly, Sinclair (2004) argued that there is a positive association between processing speed and intuitive cognitive style, and a negative relation between processing speed and analytical cognitive style. Thus, Bakken et al. (2017) argued that the intuitive processing should correlate negatively with response time, while the analytical processing should correlate positively with response time. We found a positive and significant correlation between analytical processing style and task response time without countdown. However, we did not observe a significant correlation for intuitive processing and task response time. We assume that this is due to time constraints put in the two randomized conditions (ticking clock), which will be further discussed in practical implications. As expected, there was a significant negative correlation between the two processing modes.

The correlation matrix (table 4.1) shows a strong, significant correlation between AO and intuitive processing style, supporting our assumptions for hypothesis 1. Further, AO had a negative, significant correlation to analytical processing. The analysis shows a significant positive correlation between subjective arousal (SA) and intuitive processing style. Subjective valence (SV) was not correlated with analytical processing in expected direction. However, analytical processing style was significantly correlated with task response time without countdown. We also controlled for gender and AO and found a positive, significant correlation. As mentioned, this is an expected finding, and can be explained by the research of Stevens & Hamann (2012).

Table 4.1: *Correlation matrix*

	1	2	3	4	5	6
1. Intuitive processing	-					
2. Analytical processing	-.32***	-				
3. Subjective arousal	.27**	-.30***	-			
4. Subjective valence	.16†	.05	.08	-		
5. Affectively oriented	.75***	-.35***	.24**	-.05	-	
6. Gender	.15†	-.14	.03	-.04	.28**	-
7. Task response time with countdown	.09	.06	-.24†	.05	.06	-.02
8. Task response time without countdown	-.03	.36**	-.05	.07	.03	-.12

Note. *Predictors centered at their means. Robust standard errors due to heteroscedasticity.† $p < 0.10$. * $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.*

4.2 Emotions and Cognitive Processing Style

In order to evaluate the main effect of experiment conditions on the dependent variables, we performed ANOVA tests of group means. We found no significant main effect of experimental conditions on analytic processing style ($p>.05$) or intuitive processing style ($p>.05$). Also, there were no significant main effects between positive and negative valence, or arousal and cognitive processing. Although this is contradictory to previous research, the results may come from the relatively small sample in our case (*N=129*). Nevertheless, this may be in line with our expectations that individuals can experience the same emotional stimulus very differently. We did not find any significant effects for experimental

conditions and AO, thus supporting the assumption that there may be individual differences in emotional awareness. This strengthens our arguments for regression analyses based on subjects' individual responses. In the analysis below, we took this assumption as our starting point.

In order to test our hypotheses, we performed hierarchical linear regressions analysis with intuitive and analytic processing style as dependent variables in separate models. Preliminary analyses were to ensure no violation of the assumptions of normality, linearity, multicollinearity and homoscedasticity. In all models, the variance inflation factor (VIF) values were slightly above 1, indicating a moderate correlation. Overall, this means that we have not violated the multicollinearity assumption (Pallant, 2013).

In our first linear regression analysis, significant effects were found in the opposite direction than hypothesized. Based on the overall discussion, we assume that this was because valence and arousal were not distinctly separated, meaning that arousal and valence appeared to influence CPS differently. Consequently, we acknowledged the need to conduct further hierarchical linear regressions analysis with intuitive and analytic processing style as dependent variables, however separated SA and SV in the following analysis (table 4.2.1 and 4.2.2).

Intuitive processing style as dependent variable. A hierarchical multiple regression was used to predict preferences in intuitive processings, after controlling for the influence of AO, SA, SV and gender (see table 4.2.1). AO and gender was entered in model 1, explaining 56 % of the variance in intuitive processing style. After entry of SA in model 2, the total variance explained by the model as a whole was 57%, $F(1, 123) = 2.3$, $p>.10$ (marginally significant). In model 3, an addition of 58 % of the variance in intuitive processing style was explained after controlling for the moderating effect of AO and SA, overall 58%, $F (1, 122) = 3,7$, $p <.10$, meaning that the additional moderator (AO x SA) in model 3 contributed to a better model fit, as compared to model 1 and 2. In model 4, the additional moderator of AO and SV were entered. We did not find any significant relationship, but the overall model fit increased to 59%. Further, the linear regression did find a significant p-value for SA and intuitive processing style, supporting hypothesis 2b. Lastly, a significant p-value was found for SV and intuitive processing style.

Analytical processing style as dependent variable. A hierarchical multiple regression was also performed for analytical processing style as a dependent variable. As shown in table 4.2.2, we did not find any significant findings of moderating effects for analytical processing style. Nonetheless, we did observe a significant negative relation with AO and analytical processing, explaining overall 12% of the model fit. After entry of SA, the model fit increased to 18%. A significant negative effect was found for SA and analytical processing style in all the models. The linear regression did not find a significant p-value for SV on analytical processing style.

***Table 4.2.1**: Multiple linear regression analyses. N=129.*

Dependent variable: Intuitive Processing Style

	Model 1		Model 2		Model 3		Model 4	
	β	P-value	β	P-value	β	P-value	β	P-value
Affective Orientation	.762	.000***	.739	.000***	.717	.000***	.700	.000***
Subjective Arousal			.092	.013*	.107	.081†	.102	.095†
AO x SA					.115	.056†	.110	.067†
AO x SV							0.86	.154
Gender	-.055	.374	-.052	.405	-.045	.462	-.046	.446
R^2		.56		.57		.58		.59
Adj. R^2		.55		.56		.57		.572
F for change in R^2		79.19		2.29		3.72		2.06

	Model 1		Model 2		Model 3		Model 4	
	β	P-value	β	P-value	β	P-value	β	P-value
Affective Orientation	.762	.000***	.770	.000***	.771	.000***	.738	.000***
Subjective Valence			.193	.001**	.195	.001**	.180	.002**
AO x SV					-.10	.086†	.082	.164
AO x SA							.079	.176
Gender	-.055	.374	-.049	.410	-.050	.404	-.047	.433
R^2		.56		.60		.60		.61
Adj. R^2		.55		.59		.59		.59
F for change in R^2		79.19		11.34		0.30		1.85

***Note**. We used standardized beta values and mean centered predictors. Robust standard errors due to heteroscedasticity. † $p < 0.10$ * $p < 0.05$. ** $p < 0.01$ *** $p < 0.001$.*

***Table 4.2.2**: Multiple linear regression analyses. N=129.*

Dependent variable: Analytical Processing Style

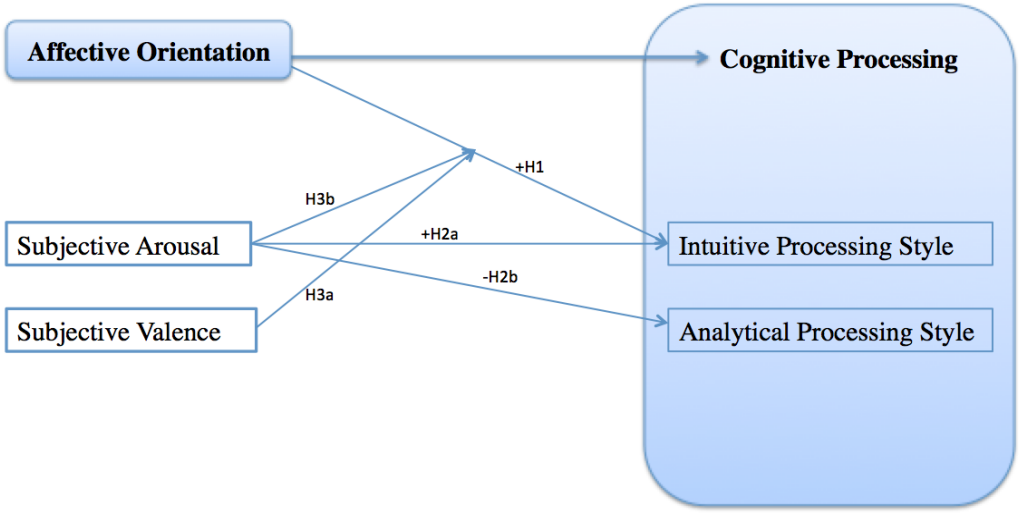
	Model 1		Model 2		Model 3		Model 4	
	β	P-value	β	P-value	β	P-value	β	P-value
Affective Orientation	-.33	.000***	-.274	.002**	-.285	.002**	-.276	.003**
Subjective Arousal			-.236	.006**	-.229	.008**	-.227	.009**
AO x SA					.056	.507	.058	.492
AO x SV							-.040	.637
Gender	-.044	.616	-.054	.531	-.050	.557	-.050	.563
R^2		.12		.17		.18		.18
Adj. R^2		.11		.15		.15		.14
F for change in R^2		8.53		7.83		.44		.22

	Model 1		Model 2		Model 3		Model 4	
	β	P-value	β	P-value	β	P-value	β	P-value
Affective Orientation	-.33	.000***	-.33	.000***	-.321	.001***	-.33	.000***
Subjective Valence			.031	.714	.034	.690	.025	.767
AO x SV					-.050	.568	-.054	.539
AO x SA							.084	.335
Gender	-.044	.616	-.043	.625	-.042	.631	-.038	.664
R^2		.12		.12		.12		.13
Adj. R^2		.11		.10		.09		.09
F for change in R^2		8.53		.14		.33		.94

***Note.** We used standardized beta values and mean centered predictors. Robust standard errors due to heteroscedasticity. † p < 0.10 * p <0.05. ** p <0.01 *** p < 0.001.*

In sum, the results largely support our hypothesis concerning the primacy of AO and preferences for CPS. AO exhibits a significantly positive correlation with intuitive processing style, supporting hypothesis 1, and a significant negative relationship with analytical processing style, rejecting hypothesis 1'. Moreover, whereas both SA and SV appears to be important for intuitive processing style, only SA seems to explain the preference for analytical processing style with a negative significant effect. As for our two moderating hypotheses, illustrated in the table 4.2.1, SA was found to be the closest significant moderator (.056), in comparison to SV (.086).

For clarity, the model below illustrates the hypotheses that were supported in the experimental study.



Model 2: Supported hypotheses.

5.0 Discussion

The main aim of this thesis was to investigate emotional awareness (measured through AO) and the effects that emotions (i.e., subjective arousal and valence) have on CPS in a subsequent decision making case. The study made several discoveries, with interesting theoretical, methodological, and practical implications.

5.1 Theoretical and Methodological Implications

5.1.1 Implications for the study of emotions and its effect

Our findings highlight that it is in fact a difference in individuals' emotional awareness and how they use their emotions to guide their decisions. Individuals affectively oriented are more inclined to emotional cues, and use them as information to guide their decision making behaviour. These individuals appear to be affected by the intensity of their emotions and its positive or negative labeling. Specifically, the use of intuition is influenced independently by affective traits as well as arousing states. However, caution should be given when generalizing these findings as our results showed a very high correlation between AO and intuitive processing, even with a reliable alpha in the 20-item Affective Orientation Scale. Further, since the interaction between AO and SA were nearly significant in the

model for intuitive processing style, this may indicate a tendency for the relationship between AO and intuitive processing to differ depending on SA. This suggests that individuals with an emotional awareness are more aware of the intensity of their emotions, thus utilize intuitive processing depending on the interpretation of the emotional intensity. We encourage future research to include measures of physiological arousal in order to investigate differences in physiological arousal and subjective arousal and its relation to affective orientation. This will be further discussed in the section on limitations in this thesis.

In consideration of hypothesis 1', we expected that it was the awareness and interpretation of emotions which causes individuals to engage in different types of processing styles. Our results showed that both AO and SA had a negative significant correlation to analytical processing, explaining 17% of the total variance. These results are not surprising, as previous research suggests that lower levels of arousing conditions lead to a more thoughtful and deliberate thinking style (Arnsten, 2009). Consequently, our findings indicate that AO is not a variable explaining how emotions takes part in rational engagement.

Our findings also have further implications for the measurement of emotion. When controlling for the influence of SV, we presumed a significant correlation between AO and analytical processing style since previous research have proposed that negative valence engages system 2 (i.e., analytical processing) during decision making tasks (Kahneman, 2003). Although we managed to induce emotions in expected directions in the experimental conditions, we question whether our vignettes contained content beyond valence in the subsequent decision making case. This may indicate that other factors than valence could explain preferences for analytical processing. Future research should engage in detailed investigations on emotion induction with vignettes.

Since there are different aspects when understanding emotions, and the study of emotion and its effect is undeniable complex, we also provide another argument for our findings. As Wichary, Mata & Rieskamp (2016) note, while negative valence and arousing conditional states are heterogeneous in a number of aspects, they share many biological underpinnings that lead us to predict similar impacts on decision making behavior. High arousal and negative valence for example, are characteristics of "emotional stress" because both affective states are

induced by threatening stimuli (Christianson, 1992). Additionally, even negative emotions at higher levels of intensity can cause a general sense of restlessness, leading to disruption of CPS and the use of simpler, less resource-intensive strategies (Bodenhausen, 1993). We assume that our inducement of valence and arousal had homogeneous effects because our vignettes together with the ticking clock in the decision making task, induced a general sense of emotional stress. This may explain why there were no markedly mean differences in the effects of valence and arousal (i.e. in experimental conditions) for preferences in CPS. We acknowledge the fact that the arousal induction may have been too intense to be conducive to control for valence.

Additionally, our emotion inducement were not isolated to specific emotions in the core affect dimensions. We were not able to detect specific emotions, for example, if anger or happiness were induced. As mentioned, these emotions have similar effects on cognitive processing, thus our results may have been influenced by this notion.

We further assume that the reason why we did not find any significant correlation between CPS and response time is due to the ticking clock in two of the experimental conditions. Although our pilot study showed that a countdown of 25 seconds induced significant subjective feeling of arousal, we suspect that this is due to the fact that subjects were "forced" to answer quickly, thus "forced" toward an intuitive processing style. Despite our ability to induce arousal, the way it was exerted may have put strains on the control for response time and preference for CPS. Potentially, a simple clock could have induced the same levels of arousal, allowing us to measure response time in a more suitable manner. Nevertheless, whereas previous research proclaim that decision makers rely on intuition in conditions of for example time pressure (Fredrickson, 1985; Wegner, 1986), Elbanna, Child, Dayan (2013) assert that preferences for intuitive processing may be due to stable individual differences in thinking styles. We thus encourage future research to look at specific personality traits in this respect.

5.1.2 Practical Implications

Our findings have important implications for practice. In general, they highlight that organizations should pay more attention to workers' emotional experiences at work and outside work. Individuals are faced with arousing situations every-day,

as well as multiple cognitive-demanding tasks. Stress (i.e., referred to as high arousal by Arnsten (2009)) may take different forms, such as physical (e.g. headache), behavioural (e.g. isolation), emotional (e.g. irritability), or cognitive (e.g. memory problems). Thus, stress should be of great concern for organizations as cognitive stress symptoms have been associated with conflicts (Albertsen, Nielsen & Borg, 2001), violence at work (Hogh & Mikkelsen, 2005), and negatively with the sense of coherence (Albertsen, Nielsen & Borg, 2001). Our study found that SA were unrelated to the task at hand may influence how individuals process information capacities. This is a highly relevant finding, since workers are continuously exposed to arousing situations, such as strict deadlines, open-plan offices or example when experiencing increased workload (Bawden & Robinson 2008). Overload can also arise from constant changes in work habits. For example, overloaded individuals may perceive the changes that technology cause in their daily routines and habits as a burden, and they have difficulties in adapting appropriately. Thus, an actual or perceived increase in workload may also be stressful, consequently decrease the capacity to make good decisions (Himma, 2007), as individuals not only have to work more, but also have to work faster to cope with the amount of information available (Wang, Shu & Tu, 2008).

Performance can also decline if a task is performed in for example competing background noise, such as in open-plan offices (Sörqvist, Halin, & Hygge, 2009). Working Memory processes are of crucial importance when working with complex tasks because they process information necessary for the task at hand and temporarily store and handle the needed information. A study by Jahncke and colleagues (2011) found that participants cognitive performance did increase when there was low noise compared to high noise in the open-plan office. This indicates that employees working in less arousing environmental conditions may have an increased cognitive performance in their decision making behaviour. This is in line with Kjellbergs (1997) studies indicating less motivation, irritability and fatigue among groups exposed to noise in open-plan office.

Additionally, mindfulness may facilitate for adaptive appraisal of stressful events. Two theoretical articles on the potential role of mindfulness in the workplace have suggested that mindfulness has a relevant role in work-related outcomes such as task performance (Dane, 2011; Glomb et al., 2011) or physical and psychological health (Glomb et al., 2011). Mindfulness involves a receptive

awareness and registration of inner experiences (emotions, thoughts, behavioral intentions) and external events, and is characterized by a present-oriented consciousness. The experience of stress (i.e., arousing conditions) emerges not only from an event itself but also from the appraisal of the event as being negative and as exceeding an individual's coping capacity (Weinstein, Brown & Ryan, 2009). Thus, it may not be the things themselves, but our interpretations about things that trouble us. When mindful individuals attend to the present moment in a receptive, non-judgmental way, they observe stressful events more objectively and refrain from attaching a meaning or evaluation to it. This helps individuals not to be influenced by biased, negative thought patterns which may lead to an overly dramatic appraisal of the situation. Hence, mindfulness may facilitate for adaptive appraisal of stressful events. Thus, it seems that mindfulness could be a useful technique to enhance individuals emotional awareness. To the extent that mindfulness affects individuals' appraisal of challenging work events as less stressful, this elicit more positive and less negative affective reactions, which in turn, may lead to a more positive evaluative judgment of one's work situation (i.e., job satisfaction).

Altogether, it seems that workplaces nowadays are a source of arousal for individual, which may have important implications on the quality of JDM, such as problems with concentration and clarity in thinking. We emphasizes the need for organizations to account for the effects of emotions on employees' cognitive abilities and how employees manage stress. As demonstrated, emotions influence how individuals think and behave, hence, precautions must be taken for individuals to make beneficial decisions.

5.2 Limitations

This thesis constitutes some limitations. Firstly, our study has limitations with regards to its generalizability and relevance for real-life settings. The sample was quite homogenous, as it consisted of mainly students, recruited largely from an academic institution in Norway. In addition, our sample only included in total 129 respondents, approximately 30 participants in each of the four experimental conditions. The results may have been more robust if more participants were included. This put strings on the generalization of our results.

Since the experiment was conducted in open landscapes, environmental factors such as room temperature, noise, and the presence of others may have had an effect on the recordings. These disturbances could have been reduced if the experimental procedure was conducted in a laboratory setting. On the other hand, a laboratory setting is an artificial context for the study of human behaviour in general, and particularly emotion. The situation is likely to elicit specific emotions in itself and can make people more aware of their cognitive and emotional processes (Mauss & Robinson, 2009).

There are also potential constraints regarding decision making measurement. Although we evaluated cognitive processing using two instruments in an attempt to compare the effects of affective variables on each measure, both of them were self-reports. We advise future research to include an objective index of intuition. In order to capture a decision making process in an actual decision in business settings, it might be necessary to resort to physiological testing. Progress has been made in this respect in detecting patterns in heart beat corresponding to entrepreneurial intuition (Gillin et al., 2007). These methods, however, are yet to be developed into reliable measures suitable for large-scale organizational studies.

Further, because of limited resources, this thesis did not include the physiological aspect of arousal when measuring arousal. As mentioned, a measure of physiological arousal could have provided us with more insight into the effect of emotion on physiological reactions in a decision making context. For example, measure of electrodermal activity (EDA) is an indication of subjects' physiological arousal. EDA has been found to capture small changes at lower levels of physiological arousal better than other measures (Boucsein, 2012). Thus, it could have been likely that we would have captured essential differences between individuals in our study. Also, other measures from psychophysiology, such as heart rate and pupil dilation could have been useful. Different physiological measures of emotion do not necessarily converge (Mauss & Robinson, 2009), and the inclusion of more than one measure could have given us a more nuanced picture of the physiological aspects of emotion and cognitive effects.

Supplementary, the variables AO and CPS were based on a self-report questionnaire that subjects answered after the experiment, requiring them to assess their cognitive processing in retrospect. This method allowed us to measure

several aspects of AO and CPS circumventing an overly restrictive definition of the phenomenon. However, as with all self-report measures, one is dependent on subjects' ability and willingness to correctly assess and report their level of AO and CPS. Thus, we encourage future research to continue exploring how to best capture the various aspects of AO and CPS with other means than self-report.

5.3 Future Research

We believe that intuitive confidence would be intriguing to include in future research. Interesting results have been found regarding individual confidence and its influence for intuitive processing style. More specifically, the manner in which intuition is generated (easy vs. difficult) is proclaimed to determine the intuitive confidence of the decision maker. This is in line with a large body of research demonstrating that decision makers rely on metacognitive feelings as information when they make decisions (Loewenstein & Lerner, 2003; Loewenstein et al., 2001). Thus, future research should also include the notion that individuals use intuitive confidence as a navigation tool to rely on their intuition in their decisions. That is, the more easily generated intuition is, the higher intuitive confidence (Wanke & Bless, 2000). We also suggest that future research could investigate whether individuals will choose intuitive options with greater frequency as intuitive confidence increases, and whether high intuitive confidence may signal decision accuracy.

As aforementioned, mindfulness is another concept of interest when examining the influence of emotions on CPS. We think that it would be interesting to explore how the use of mindfulness would moderate the relation between subjective arousal and CPS. It has been argued that bodily information is conditioned by mindfulness (Tsur, Berkovitz, & Ginzburg, 2015). Future research should therefore extend the research on whether the use of mindfulness affect body awareness, and whether the coherence between subjective arousal and specific emotional states will increase.

Another interesting concept when measuring the emotional effect on CPS is emotion regulation. Emotional regulation is said to regulate the impact of emotions during cognitive processes (Martin & Delgado, 2011). Emotion regulation constitutes, among others, two techniques referred to as cognitive reappraisal and expressive suppression. Cognitive reappraisal is a form of

cognitive change and involves reinterpreting an emotional stimulus in a way that changes its emotional impact. Expressive suppression on the other hand, involves the inhibition of a current emotional state in order to regulate its impact. Research has found emotion regulation to act over cognitive evaluations and the behavioral response that in turn changes both the physiological reaction and perception of the situation (Gross & John, 2003). Consequently, we are of the assumption that emotion regulation is of importance for individuals exposed to arousing situations. Research shows that individuals being stress-sensitive, are more inclined to mental disorders (Myin-Germeys & van Os, 2007). By having the ability to recognize emotions, individuals may reduce their stress-levels which in turn facilitates for mental health and well-being. Based on this, future research should consider investigating the effects of emotion regulation in the relation between emotional awareness, core affect and cognitive processing.

Also, emotional intelligence has been the subject of a significant amount of literature over the past two decades, ranging from debate over whether emotional intelligence is innate or learned, to the categorization of specific behaviors that define emotional intelligence. Emotional intelligence can be understood as the way in which individuals perceive, use, understand and manage their emotions (Salovey & Grewal, 2005). The way individuals experience emotions is critical in determining not only the motivations behind decisions, but also the impact of those decisions on others. Individuals who understand the emotions of others may utilize that perceptivity to head off potential negative outcomes by addressing those emotional issues in advance of the decision (Huy, 1999). Likewise, individuals who perceive and understand their own emotions may be much more effective in managing those emotions in decision making, as for example in high arousal conditions. Consequently, emotional intelligence may be of great concern when investigating the relationship between emotional awareness and cognititve processing. We therefore suggest that is should be included in future studies.

6.0 Concluding Remarks

We thrive on more research in the investigation of emotions and its effect on decision making behavior. The valence-based approach has long dominated the study of emotions and JDM outcomes. By going beyond this approach, we

discovered that aspects other than valence are important in explaining individuals emotional experience and its effects on cognitive processing. Findings highlight the importance of subjective arousal, and motivate for the inclusion of affective orientation in future studies. In addition, the establishment of the negative relation between arousal and analytical processing, strengthens existing researchs' findings on the effect of emotions on information processing. This thesis further demonstrates that both subjective aspects are essential to individual emotional experience. To our knowledge, our study is the first of its kind to explore the interplay between affective orientation, emotions (i.e., arousal and valence), and its influence on cognitive processing in the field of judgment and decision making. Overall, our study may represent one step towards an integration in the field, and we can only hope that others will continue to expand the understanding of emotion and its effects beyond the valence-based approach.

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8.0 Appendices

Appendix 1: Vignettes

Positiv vignette

It was an exceptionally nice day, John Evans thought, as he walked home from the exam. He felt he did very well on the test. Although his applications to medical schools had been sent out months ago, John thought that these grades still might matter. John's thoughts turned to that evening. He was going out to dinner with his girlfriend at their favorite restaurant. The food there was very good, and he really did enjoy his girlfriend's company. As he turned the corner he noticed that the mail had come. He anxiously opened the box and took out the mail. Flipping through the envelopes, he saw an envelope with the return address of his first choice medical school. He was almost afraid to open it, thinking he might already have been rejected. Still it seemed to thick to simply be a rejection. Nervously, he sat down on the steps to open it. As he read down the page, he realized that it as an acceptance! Not only that, but the chances of financial aid seemed to be very good. He sat back in the sunshine and realized that his date tonight would be a real celebration.

Negative vignette

The recent death of John Graham, 20, gives us an insight into the ordeal of young cancer victim. Graham, a student at the university, had always considered himself healthy. Since his freshman year his only illness has been a headcold. After his exam he noticed he was feeling tired, but attributed it to overwork in preparing for the tests. Sleep did not help his condition, and Graham now felt exhausted after climbing the two flights of stairs to his dorm room. His girlfriend noticed his condition and mentioned that he seemed less active than usual. He assured her it was nothing, but secretly suspected that he had contracted mononucleosis. When he finally went to the Student Health Center, the doctor seemed very concerned. After seeing the results of blood tests, the physician ordered Graham into the hospital "for a few more tests". He never left.

The diagnosis was an advanced case of leukemia, a cancer of blood. Intense radiation therapy was tried. This last-ditch effort caused severe side effects that

were extremely painful and caused Graham to lose much of his hair. Despite the treatment, the disease spread. Heavy doses of pain-relieving drugs were tried, but even this did not relieve his agony. He lost weight, but it became too painful to ingest food. His acquaintances found it difficult to recognize their friend who only months ago appeared active and energetic. As the pain became unbearable, he could no longer read og walk through the hospital corridors. All that was left for Graham was intense suffering and, in two months, death.

Appendix 2: Asian Disease Scenario (Gain Frame)

Imagine that your country is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimates of the consequences of the programs are as follows:

Program A: 200 people will be saved
Program B: there is a ⅓ probability that 600 people will be saved, and ⅔ probability that no
people will be saved.

Which of the two programs would you favor?
(Select the program by pressing “A” or “B”).

Appendix 3: The Rational Experiential Inventory

Please use the following scale to answer these questions.

completely false completely true

1 2 3 4 5

1. _____ I have a logical mind.
2. _____ I prefer complex problems to simple problems.
3. _____ I believe in trusting my hunches.
4. _____ I am not a very analytical thinker.
5. _____ I trust my initial feelings about people.
6. _____ I try to avoid situations that require thinking in depth about something.
7. _____ I like to rely on my intuitive impressions.
8. _____ I don't reason well under pressure.
9. _____ I don't like situations in which I have to rely on intuition.
10. _____ Thinking hard and for a long time about something gives me little satisfaction.
11. _____ Intuition can be a very useful way to solve problems.
12. _____ I would not want to depend on anyone who described himself or herself as intuitive.
13. _____ I am much better at figuring things out logically than most people.
14. _____ I usually have clear, explainable reasons for my decisions.
15. _____ I don't think it is a good idea to rely on one's intuition for important decisions.
16. _____ Thinking is not my idea of an enjoyable activity.
17. _____ I have no problem thinking things through carefully.
18. _____ When it comes to trusting people, I can usually rely on my gut feelings.
19. _____ I can usually feel when a person is right or wring, even if I can't explain how I know.
20. _____ Learning new ways to think would be very appealing to me.
21. _____ I hardly ever go wrong when I listen to my deepest gut feelings to find an answer.
22. _____ I think it is foolish to make important decisions based on feelings.
23. _____ I tend to use my heart as a guide for my actions.

24. _____ I often go by my instincts when deciding on a course of action.
25. _____ I'm not that good at figuring out complicated problems.
26. _____ I enjoy intellectual challenges.
27. _____ Reasoning things out carefully is not one of my strong points.
28. _____ I enjoy thinking in abstract terms.
29. _____ I generally don't depend on my feelings to help me make decisions.
30. _____ Using logic usually works well for me in figuring out problems in my life.
31. _____ I think there are times when one should rely on one's intuition.
32. _____ I don't like to have to do a lot of thinking.
33. _____ Knowing the answer without having to understand the reasoning behind it is good enough for me.
34. _____ Using my gut feelings usually works well for me in figuring out problems in my life.
35. _____ I don't have a very good sense of intuition.
36. _____ If I were to rely on my gut feelings, I would often make mistakes.
37. _____ I suspect my hunches are inaccurate as often as they are accurate.
38. _____ My snap judgements are probably not as good as most people's.
39. _____ I am not very good at solving problems that require careful logical analysis.
40. _____ I enjoy solving problems that require hard thinking.

SPSS_REI_analytical_mean: we re-coded (in qualtrics, had to remove recoding done in spss) the variables and found the mean

(REI_1 +REI_2 + 6- REI_4_r + 6- REI_6_r + 6- REI_8_r + 6- REI_10_r + REI_13 + REI_14 + 6- REI_16_r + REI_17 + REI_20 + 6- REI_25_r + REI_26 + 6- REI_27_r + REI_28 + REI_30 + 6- REI_32_r + 6-REI_33_r + 6- REI_39_r + REI_40) / 20

SPSS_REI_intuitive_mean: we re-coded (in qualtrics, had to remove recoding done in spss) the variables and found the mean

(REI_3 + REI_5 + REI_7 + 6- REI_9_r + REI_11 + 6- REI_12_r + 6- REI_15_r + REI_18 + REI_19 + REI_21 + 6- REI_22_r + REI_23 + REI_24 + 6- REI_29_r + REI_31 + REI_34 + 6- REI_35_r + 6- REI_36_r + 6- REI_37_r + 6- REI_38_r) / 20

Appendix 4: Affective Orientation Scale

Directions: The following statements refer to the feelings and emotions people have and how people use feelings and emotions to guide their behaviour. There are no right or wrong answers. Also realize that emotions and feelings can be positive or negative. A person can feel anger; another can feel love and tenderness. Both cases, however, are emotion. These statements refer to both types, positive and negative.

Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
5	4	3	2	1

____ 1. I am very aware of my feelings.

____ 2. I use my feelings to determine what I should do in situations.

____ 3. My feelings and emotions are very important to me.

____ 4. I listen to what my "gut" or "heart" says in many situations.

____ 5. My emotions tell me what to do in many cases.

____ 6. I try not to let feelings guide my actions. *

____ 7. I trust my feelings to guide my behaviour.

____ 8. I don't pay much attention to my emotions most of the time. *

____ 9. My feelings tell me a lot about how to act in a given situation.

____ 10. The intensity of my emotions does not change much from situation to situation.*

____ 11. I use my feelings to determine whether to trust another person.

____ 12. I learn a lot about myself on the basis of my feelings.

____ 13. I am not usually aware of my feelings at any given moment. *

____ 14. Feelings are a valuable source of information.

____ 15. My feelings don't seem to be very intense or strong. *

____ 16. I use feelings to guide me more than most people do.

____ 17. Feelings only interfere with behaviour. *

____ 18. I orient to people through my emotions.

____ 19. My emotions have many different levels of intensity; I can be angry, for example, or very angry.

____ 20. I seem to have just a few basic emotions.

SPSS AO_mean (re-coded from qualtrics, removed recodes done in Spss):

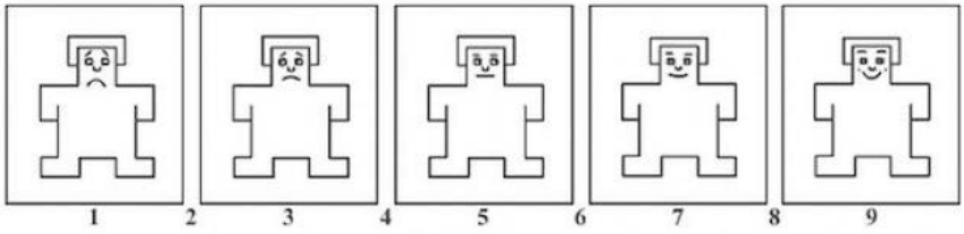
(AO_1 + AO_2 + AO_3 + AO_4 + AO_5 + 6- AO_6_r +AO_7 + 6- AO_8_r + AO_9 + 6- AO_10_r + AO_11 + AO_12 + 6- AO_13_r + AO_14 + 6- AO_15_r + AO_16 + 6- AO_17_r + AO_18 + AO_19 + 6- AO_20_r) / 20

Appendix 5: Self-Assessment Manikin

SAM Valence (Self-reported valence)

Please indicate, using the scale represented below, how you FELT when viewing the picture

Unhappy **Happy**



SAM Arousal (Self-reported arousal)

Please indicate, using the scale represented below, how you FELT when viewing the picture

Calm **Excited**