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The Adaptive and Maladaptive Effects of Emotions on Human Decision-Making

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Abstract. Emotions have long been viewed as obstacles to rational decision making, yet recent research reveals they can also enhance judgement and choice. This essay asks how emotions exert both adaptive and maladaptive effects on human decision making, what cognitive and neural mechanisms explain this duality. Adaptive effects occur when integral emotions enhance attention, prioritization and when moderate emotional intensity boost performance as shown by higher affective reactivity leading to better investment outcomes. Maladaptive effects arise from unregulated affective bias and stress-induced shifts from goal-directed to rigid habitual control. Neurally, the amygdala detects emotional salience, the ventromedial prefrontal cortex integrates emotional and cognitive signals and stress tips balance towards dorsolateral striatum mediated habits. The essay concludes that emotion is neither uniformly helpful nor harmful. Its impact depends on the specific moderators including relevance, stress context and individual differences in emotional differentiation. Effective decision making requires not suppressing emotions but understanding when to trust them and when to regulate them.

Keywords: Emotions, decision making, heuristics

1. Introduction

Emotion is explained as the complex psychological and behavioral patterns that occur when individuals are experiencing personally notable events [1]. Decision-making is the process of selecting among alternatives [2]. Decision making can be altered by different factors, especially heuristics. According to Gigerenzer and Gaissmaier, heuristics are defined as the mental shortcut people take, and are usually based on past experiences [3]. This introduced bias into decision making as human are acting according to our pre-judgmental thoughts. There are two types of thinking patterns: system 1 and system 2 [4]. System 1 thinking pattern is when a person uses their heuristics to make decisions, often called intuitive thinking [4]. System 1 thinking is often used when people have to make decisions quickly, and is helpful for people to figure out how to act correctly if a similar situation appears again. This is for our brain to use minimized cognitive resources to make decisions, such as running away from a bear when encountering it in the wild. The characteristics of decisions made with system 1 thinking pattern is that it is fast and confident. System 2 thinking pattern is when a person utilizes a lot of its cognitive resources to process a decision, or often called rational thinking [4]. This thinking is often used when human have to make

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more significant and important decisions, in which human consider the up and down sides of the impact that this decision brings. This type of thinking pattern yields in-confident decisions as human carefully evaluate many related factors, in which human would often worry about the ones not being considered during the process. These thinking patterns have their own benefits and weaknesses, in which system 1 thinking helps yield more quick and intuitive decisions that help human to avoid danger and system 2 thinking helps to generate more rational decisions that help human find the best choice for the current situation.

However, there is one bias that is derived from system 1 thinking, anchoring bias. Anchoring bias is a type of bias in which human make decisions based on the first information human are exposed to [5]. In a study conducted by Englich and Mussweiler, they found out that by giving different sentenced prosecution time to two different groups of judges affects their decisions in the amount of time the culprit should be sentenced to jail [6]. This can be explained by the anchoring effect, in which the judges make decisions based on the first piece of information (the sentenced time recommended by the prosecutor) they were given. This is a type of bias that would be affecting the validity of decision making as the decision that people make would not be that rational. Studies have shown that anchoring bias has been playing the same role when people make decisions about emotional events [7].

For decades, the dominant view in decision making research was that emotions are mostly harmful. This is referred to as the "feeling as a bias inducer" perspective from Seo and Barrett [8]. It argues that emotions produce mood-congruent recall and biased risk judgments. In the last twenty years, however, an alternative view has emerged. The "feeling as a decision facilitator" perspective suggests that emotions can actually improve performance by boosting attention and motivation [8]. The appraisal tendency framework (ATF) and the distinction between integral and incidental emotions have helped researchers understand why the same emotion can be helpful in one situation but harmful in another.

This essay will answer the following research question: how do emotions exert both adaptive and maladaptive effects on human decision making, and what are the key cognitive and neural mechanisms that explain this duality? The main body first introduces the two contradictory sides and the variables that decide the role of emotions. Then it explains the adaptive effects and the maladaptive effects in detail, followed by a discussion of the neural circuits involved. Finally, it synthesizes the conditions under which emotion helps versus harms decision making.

2. The argument of adaptive and maladaptive effects emotions has on decision making

The first view, which Seo and Barret call the "feeling as bias inducer" perspective, holds that emotions introduce systematic distortions [8]. For instance, when people are in a negative mood, they recall more negative memories and they judge the things beside them negatively. This results in making decisions that are riskier than what they would do when they are not in a negative mood. Furthermore, they may also favor short-term gains over long term well-being [9]. From this angle, emotions are a problem to be managed.

The second, the "feeling as decision facilitator" perspective, argues that feelings are not the enemy of reason but its rally. Damasio showed that patients who lose the ability to generate emotional signals because of damage to the ventromedial prefrontal cortex make disastrous real-life decisions even though their logic remains intact [10]. Positive feelings can broaden thinking and boost creativity [11]. On the other side, negative feelings can trigger careful and systematic analysis of the choice [12]. In other words, emotions can be tools that help human decide.

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The reason why both sides both stands can be explained by the Appraisal Tendency Framework proposed by Lerner et al. The ATF argues that specific emotions have distinct effects on decision making based on their underlying cognitive appraisal patterns. For instance, anger makes human feel certain and in control, so human underestimate risks. Fear on the other hand, makes human feel uncertain and not in control, so human overestimate risks. Both are negative emotions, but they push the decisions made in opposite directions. This explains why it is not enough to ask whether an emotion is positive or negative, but to ask which emotion and in what context.

Another crucial point is the distinction between integral and incidental emotions [13]. integral emotions arise from the decision itself, such as the fear of a bear while hiking, which is directly relevant and usually helpful when human is making decisions. Incidental emotions are carried over from unrelated events such as the anger from a traffic jam that then affects the job interview consecutively. Incidental emotions make human have biased decisions without emotions.

Several factors have been noted to determine adaptive versus maladaptive outcomes. Factors such as emotion relevance (integral vs incidental) is the major component determining the adaptive or maladaptive outcomes. Integral emotions provide valid information while incidental emotions produce bias. Critically, incidental emotions often operate without conscious awareness, making their influence difficult to correct [13]. The emotion type can also produce opposite effects. As the example mentioned before, of fear and anger, they are shown to have opposite effects despite of in the same level of emotion. Multiple studies have shown that anger consistently reduced risk estimates and decreased intentions to take precautionary measures whereas fear increased both [13]. Similarly, sadness increases preferences for high-risk and high reward options while anxiety increases the preferences for low-risk and low reward options [13].

3. The mechanism of adaptive and maladaptive effects emotions has on decision making

According to the "feeling as decision facilitator" view, emotions improve decisions through many mechanisms.

Firstly, emotions can improve decisions by attention and working memory. Damasio argued that emotional reactions are necessary to keep attention focused on the relevant aspects of a problem [10]. Without emotional signals, the brain cannot decide which of the details matter or not. In a classic study, patients with ventromedial prefrontal cortex damage could not sustain the working memory needed to choose the more advantageous choice in a gambling task.

Secondly, emotions can offer prioritization and option generation for individuals. Daily decisions often involve too many options for a purely rational analysis. Feelings act as a shortcut as they mark some options as good and others as bad [14]. Ketelaar and Clore suggested that this effective tagging allows human to narrow down choices quickly and focus on what is most urgent [14].

The strongest direct evidence comes from Seo and Barrett's stock investment simulation. 101 real investors made daily decisions over 20 days while reporting their feelings [8]. The researchers measured the affective reactivity, which is how intensely each person felt emotions. The result was clear, in which the participants who experienced more intense feelings achieved higher investment returns. The statistical path coefficient was 0.85 ($p < 0.5$). This finding directly contradicts the old belief that the cooler head always prevails and makes good decisions. In fact, people with more intense emotions performed better.

Moreover, the appraisal tendency framework shows that fear is often adaptive because it makes human more sensitive to risks [13]. Thus, emotions can be powerful in decision making as they sharpen attention, guide prioritization and warn human of danger. The preceding section has shown that emotions are far from being mere obstacles to rationality. Through mechanisms such as

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enhanced attention, prioritization and affective states can substantially improve decision making performance. Despite all the benefits of emotions to decision making described above, emotions can also derail decisions. The feeling as bias inducer view identifies several pathways to maladaptive outcomes.

When people are in a certain emotional state, they remember information that matches the state more easily. A sad person recalls sad events and an angry person recalls times when they were really angry [15]. This biases the information available for the decision. Moreover, Slovic and his colleagues found that if a person feels good about something, they tend to believe that it has high benefits and low risks, even when the truth is the opposite [16]. This heuristic works well most of the time, but it can lead to serious errors when the feeling is based on irrelevant and wrong information. Additionally, emotions that have nothing to do with the current decision can be carried to the decision itself. According to Lerner et al, anger from one situation can carry over into another courtroom, making jurors more likely to blame a defendant in a completely unrelated case [13]. This happens without the person realizing it.

Within the "feeling as bias inducer" framework, one important pathway through which emotions impair decision making is stressed induced habit formation. Schwabe and Wolf reviewed a series of experiments showing that stress pushes the brain away from flexible and goal directed control toward their original rigid habits [17]. In one study, stressed participants continued to press a lever for food even after they were full. Non-stressed participants stopped pressing. This effect requires both cortisol and noradrenaline to act together in the brain. For example, in real life, stressed people may be overeating even when they are not hungry, while non-stressed people would not overeat. Additionally, Seo and Barrett measured affective influence regulation, which is the degree to which a person prevents current feelings from biasing their risk calculations [8]. Participants who scored higher on regulation performed significantly better. This means that the natural and unregulated influence of feelings was often harmful.

Finally, the ATF suggests that anger makes people feel certain and in control, so they underestimate risks. After the 911 event, researchers primed some participants with anger and others with fear. Angry participants thought future terrorists' attacks were less likely and wanted fewer safety measures. Fearful participants wanted more protection [13]. In a situation that called for caution, anger was clearly maladaptive.

In summary, emotions become maladaptive when they lead to biases, when they shift the brain from flexible control to habitual control mode and when anger leads to underestimating risks events.

4. The neural mechanism of emotions has on decision making

The neural mechanisms of emotions on decision making are regulated by amygdala, the ventromedial prefrontal cortex (vmPFC) and the striatum.

Amygdala detects emotionally significant events such as threats, rewards and surprises and triggers rapid bodily responses [18]. Bechara et al studied patients with amygdala damage. On the low gambling task, these patients could not develop the "gut feeling" that normally warns people before they pick a bad card [19]. As a result, they made more poor choices. It can thus be concluded that the amygdala is essential for attaching emotional value to options.

vmPFC receives signals from the amygdala and combines them with cognitive information from other brain regions [10]. People with vmPFC damage, such as Phineas Gage, can pass logic tests and IQ tests, but they make terrible real-world decisions. For example, Reber and colleagues conducted a lesion study in which patients with focal damage to the vmPFC were compared with healthy control participants on a food reward devaluation task. Unlike controls, the vmPFC patients

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persistently chose actions for a food outcome that had been devalued through selection satiation, indicating a selective impairment in goal-directed decision making [20]. This finding demonstrates that without an intact vmPFC function, individuals cannot flexibly adjust their choices when outcomes change. As Damasio concluded, without emotional signals integrated into the decision process, rationality alone is not sufficient for adaptive real-world choices [10].

Schwabe and Wolf explain that the dorsomedial striatum supports goal-directed, flexible decisions that are sensitive to changes in outcome value [17]. The dorsolateral striatum supports the rigid, habitual stimulus response actions. Under stress, the balance tips towards the habit system. Stress hormones and noradrenaline act together, likely through the amygdala to impair prefrontal control and strengthen striatal habits [17].

When people successfully reduce the biasing influence of emotions, which is what Seo and Barrett call affective influence regulation, they are using pre-frontal regions to control the amygdala [8]. A meta-analysis by Berboth and Morawetz found consistent connectivity between the amygdala and the left ventrolateral prefrontal cortex during emotion regulation [21]. When people actively reinterpret a negative situation, the dorsolateral prefrontal cortex becomes involved. Ochsner et al showed in an fMRI study that reappraisal increases activity in lateral and medial prefrontal areas and decreases activity in the amygdala [22].

In short, adaptive emotion-driven decisions rely on a well-functioning amygdala-vmPFC network that tags options with appropriate value. Maladaptive effects appear when this network is overridden by stress or when incidental emotions activate the amygdala without prefrontal correction.

5. Conclusion

This essay set out to answer how emotions can both help and harm decision making, and what mechanisms explain this duality. The evidence reviewed shows that emotions are not inherently good or bad, their indulgences depend on specific moderating factors. Adaptive effects arise when integral emotions enhance attention and prioritization. Seo and Barrett demonstrated that high affective reactivity directly improves investment performance, while the ATF explains why fear increases risk perception and promotes caution. Conversely, maladaptive effects occur when unregulated feelings bias risk calculations and when stress shifts behavior towards rigid habits. Schwabe and Wolf showed that stressed participants continue to show actions that no longer produce valued outcomes. Neurally, the amygdala detects emotional salience, the vmPFC integrates emotional and cognitive signals and the striatum mediates goal-directed versus habitual control.

These findings have practical implications. In finance, understanding the effect heuristic may reduce emotional trading errors. In clinical settings, training negative emotion differentiation could improve regulation and reduce maladaptive habits. Future research should examine whether the additive benefits of affective reactivity and regulation replicate in real world environments.

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