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The Impact of Cognitive Biases on Decision-Making in High-Stakes Environments

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ABSTRACT

This study investigates the impact of cognitive biases—specifically confirmation bias, anchoring bias, and availability bias—on decision-making in high-stakes environments such as healthcare, finance, and emergency services. The research employs a quantitative design, examining how these biases affect decision accuracy and decision time. Through a combination of scenario-based tasks, surveys, and case study analyses, the study explores how frequently professionals in these sectors experience these biases, their awareness of them, and the impact on their decisions. Results indicate that availability bias was the most commonly reported bias, followed by confirmation bias and anchoring bias, with decision accuracy significantly decreasing as these biases were introduced. Additionally, decision-making time increased under biased conditions, particularly in healthcare and emergency services. The study further highlights the negative correlation between the frequency of cognitive biases and decision accuracy, underscoring the importance of developing strategies to mitigate these biases in high-pressure settings. The findings suggest that structured decision-making frameworks and training programs can help professionals make more objective decisions and improve overall decision quality in critical environments.

Introduction

Decision-making in high-stakes environments, such as healthcare, finance, and emergency services, is a critical process where outcomes have significant consequences. In these settings, professionals are often faced with complex, time-sensitive decisions that must be made under pressure. Despite the importance of these decisions, individuals are not always able to make

optimal choices due to the influence of cognitive biases. Cognitive biases refer to systematic patterns of deviation from rational judgment, where individuals' decisions are influenced by personal experiences, emotions, or other non-relevant factors (Tversky & Kahneman, 1974). These biases can compromise decision quality, especially in high-pressure situations, leading to errors that can affect both individuals and organizations.

The three cognitive biases investigated in the current study, confirmation bias, anchoring effect, and availability bias, have seen plenty of ink devoted to the fact that they contribute to distorted decisions. Confirmation bias is the seeking, interpreting, and recalling of evidence consistent with a preconceived hypothesis or belief, while ignoring contradictory evidence (Nickerson, 1998). This bias can be especially damaging in judgment and decision making in the professions as it can prevent people from paying attention to important information that does not agree with their pre-existing conjectures. In medicine, for instance, clinicians might attend to information that is consistent with their initial diagnosis but ignores alternative explanations that may be more important in terms of patient outcomes (Redelmeier & Tversky, 2001).

Anchoring bias is defined as the tendency to depend excessively on the first piece of information offered (the “anchor”) when making decisions, regardless of the pertinence of the information (Tversky & Kahneman, 1974). In financial decisions, for example, people might anchor on the first price of an asset they see, which may produce inaccurate estimates of its true value (Ariely et al., 2003). Relatedly, probability bias, or availability bias (Tversky & Kahneman, 1973), is the tendency to estimate the frequency of an event on the basis of the ease with which instances can be brought to mind and may result in an overestimation of likelihood of events that are memorable or have recently occurred. Such a bias in emergency services could have great consequences, as current events can influence professionals’ capacities in unrelated future situations, which in turn, would affect the quality of their judgements (Gaba et al., 2003).

Cognitive biases aren't just something for you to keep in mind when making everyday decisions, but they also have implications in life-or-death situations that can affect things like medical diagnostic outcomes, financial investments or responses to emergencies. Despite acknowledging cognitive biases in theory, individuals often do not appreciate or tend to ignore them in their actual decision making context, particularly under time pressure (Gilhooly & Gelade, 2001). Moreover, the presence of time pressure and the high-stakes context in which decisions are made (e.g., healthcare decisions, emergency service decisions) worsen the impact that biases can have, rendering individuals incapable of making rational use of information in order to make well-informed choices (Hastie & Dawes, 2010).

Although these biases could have far-reaching effects there is surprisingly little systematic research examining the ways in which they may adversely affect decision-making across numerous high stakes domains. We also contribute directly to this body of work by investigating the prevalence of cognitive biases, and by the degree to which they are self-attributed, while simultaneously considering their relationships with decision accuracy and decision-making speed within the domains of health care, finance, and emergency services. Through examining the presence and consequences of biases in these fields, we aim to offer an initiative that has potential for implementing interventions to mitigate biases and enhance decision making in these crucial fields.

The importance of this research rests in its ability perhaps to inform both the academic understanding of cognitive biases during decision-making, and lead to practical strategies for

reducing these biases under high pressure conditions. This work is highly relevant, especially since complex, safety-critical domains are more challenging than ever for professionals as they face growing expectations and time pressure. By leveraging scenario-based tasks and self-reported information, this research will identify the particular manner in which bias plays out in each domain and effects decision-making.

Literature Review

Professionals working in high-stakes contexts such as health care, finance, and emergency services need to make time-pressured judgments based on complex information, often in the face of scarce resources. In spite of the high stakes in decision making in these areas, scientists are aware of the fact that cognitive biases can considerably contaminate decision making.

Cognitive biases refer to systematic patterns of deviations in judgment, whereby individuals use mental shortcuts, or heuristics, when making decisions that could be flawed (Tversky & Kahneman, 1974). Biases may be caused by cognitive, affective, or conditioning factors, and most stem from the use of past experience to judge the present, rather than make accurate judgements about the present on its own merits. In high risk settings, where decision making may be associated with grave consequences, cognitive biases represent an especially pernicious threat to the quality of decisions (Kahneman, 2011).

One of the best known biases, confirmation bias, occurs when individuals seek, interpret, and remember information that supports their prior beliefs but ignore information that is inconsistent with those beliefs (Nickerson, 1998). In medicine, confirmation bias may cause doctors to fail to consider other possibilities for a diagnosis due to only looking for evidence to confirm what they initially believed and think they found; this may lead to a diagnosis made too late, or a misdiagnosis (Redelmeier & Tversky, 2001). Confirmation bias in financial matters may be the tendency of investors or analysts to pay attention to information that is favorable to their investment and to ignore signs that may indicate that a decision is faulty (Biais & Weber, 2006). Stateside, emergency services personnel are also susceptible to confirmation bias when they respond to a situation,reporting based off the first alleged facts that they encounter rather than evidence that may follow.

Another classic bias is anchoring bias where people use the first piece of information they receive, the "anchor," to make decisions. Even when the anchor is completely irrelevant (or just arbitrary) it can greatly influence judgement (Tversky & Kahneman, 1974). Analysts in the financial domain may predict, for instance, based on the initial market price or historical data and this may bias the valuation of assets (Ariely et al., 2003). Anchoring bias was also found in medical decision-making, such as in the overestimation of the appropriate amount of treatment after a diagnosis (Gaba et al., 2003). Working in emergency services results often in anchoring bias: the first piece of information we receive appears to set the boundaries of subsequent updates, no matter whether another more relevant information appears later (Klein, 2008).

The availability bias is a phenomenon in which the probability of an event is judged by the ease with which instances can be brought to mind, rather than by using a statistical or objective assessment (Tversky & Kahnemann, 1973). This bias may entail a mistake when people base their estimation of the likelihood of some events on vivid or more recent experiences, even if the experiences are not typical. Health care providers, for example, might over-value the chance of a

rare but salient disorder because they have recently seen cases; similar problems have been observed in emergency operators who base their decisions on the ease of recall of past episodes, ignoring potentially more useful information (Gaba et al., 2003). Likewise, in the field of finance, the availability bias can induce investors to respond overactively to recent trends in the market, responding to short-term rather than long-term factors factors (Kahneman & Tversky, 1979).

Healthcare providers are frequently placed at high stakes, high pressure environments and are very susceptible to cognitive biases. Notably, bias, particularly confirmation bias, has been implicated as a major cause of diagnostic error in the clinical setting. For example, Redelmeier et al. (2001) found that doctors disregarded information that did not fit their first diag- nosis, leading to misdiagnosis and treatment delays. It is assumed that the bias of availability would play a very important role in medical decision because doctors would overestimate the rate of disorders they have recently observed, and such that they could recall relatively easily. This can be seen under the microscope of medical judgments as well, as remarked in Fischhoff (1975): A problem in such judgments is the tendency by physicians to place too much reliance on locally applicable case-representativeness with respect these patients, or to put too much weight on it when forming estimates for groups of patients.

In healthcare, decisions are further complicated by time pressure and complex medical information. Gaba et al. (2003) highlight that rapid decision making (e.g. for an emergency medicine environment) is another environment very susceptible to biased thinking. The use of rational decision-making tools and standards have been proposed to assist combat cognitive bias and guide clinicians to appropriate decision making (Croskerry, 2003).

In finance, cognitive biases like anchoring and availability bias are commonly referenced as causing bad investment decisions. Ariely et al. (http://www.bis.org No 140/2003 11 NOVEMBER 2003) reported, investors tend to anchor their beliefs to the initial market prices or financial reports and they do so to such an extent that they do not update the probability distribution enough. This bias can cause them to become too sure of their predictions and investors to make bad investment decisions. Similarly, availability bias when used in finance may cause investors to overreact to recent market conditions or news, as investors tend to make decisions based on recent news or noticeable, but perhaps unrepresentative, information (Kahneman & Tversky, 1979).

The evidence also suggest that cognitive bias can affect investment decision making of financial players. Biais & W eber, 2006) concluded that even sophisticated financial experts can be affected by cognitive biases and such decisions may be built on several arguments, including past experience and current events. Especially anchoring bias tends to influence the financial judgments as analysts often use the initial numbers and estimates without thinking of other side of the stories (Tversky & Kahneman, 1974).

Doctors and first responders work in split-second environments in which the wrong decision could mean the difference between life and death. In these stressful scenarios first responders are especially susceptible to cognitive bias. Availability bias was also found to be an important determinant of decision making in emergencies (Klein, 2008) as responders use their experience from similar events to aid in judgments. This dependence on easily accessible information can be wrong when the present situation is not similar to the past experiences. Anchoring bias is also quite common in emergency services, in which first-arriving reports or impressions may influence the way responders interpret subsequent information, however completely incorrect it might later be discovered to be (Gaba et al., 2003).

Studies conducted in emergency departments have demonstrated that cognitive bias impacts judgment decision-making when decision is made under time pressure and stress. According to Klein (1998) the high pressure of time constraints in emergency response combined with cognitive biases can result in poor judgments that have adverse effects on outcomes. Training programs and decision aids have been suggested as means to reduce these biases and enhance decision quality under time stress (Klein, 2008).

While cognitive biases are inherent in human decision-making, several strategies have been proposed to reduce their impact, particularly in high-stakes environments. One approach is the use of structured decision-making frameworks, which can help professionals systematically evaluate information and make more objective decisions (Croskerry, 2003). In healthcare, clinical decision support systems have been developed to guide physicians in making evidence-based decisions and reduce the influence of biases (Croskerry, 2003). Similarly, in finance, decision support tools, such as financial modeling software and scenario analysis, can help mitigate the effects of anchoring bias and availability bias (Biais & Weber, 2006).

Objectives

1. To examine the prevalence of cognitive biases in decision-making among professionals in high-stakes environments, including healthcare, finance, and emergency services.
2. To assess the impact of cognitive biases on decision accuracy in high-pressure contexts, comparing decision-making with and without the influence of biases.
3. To identify sector-specific differences in the impact of cognitive biases on decision-making, comparing how biases manifest and affect decision-making in healthcare, finance, and emergency services.

Methodology

This study employed a quantitative research design to examine the impact of cognitive biases on decision-making processes in high-stakes environments, such as healthcare, finance, and emergency services. The study focused on three major cognitive biases—confirmation bias, anchoring bias, and availability bias—and how these biases affected the quality of decisions in high-pressure contexts. This approach allowed for the collection of numerical data that could be statistically analyzed to identify patterns and correlations between cognitive biases and decision-making performance.

The study included professionals from three high-stakes sectors: healthcare, finance, and emergency services. Participants were recruited using purposive sampling, specifically targeting individuals with at least 5 years of experience in their respective fields. This ensured that the sample consisted of professionals who regularly made decisions under pressure and were familiar with the challenges posed by cognitive biases. A sample size of 100-150 participants was targeted, with 30-50 participants from each sector. This sample size was large enough to ensure statistical power and allowed for meaningful comparisons between the sectors.

Data collection methods involved scenario-based decision-making tasks, a survey on bias awareness and impact, and a case study analysis. Participants completed decision-making tasks designed to simulate high-stakes environments, where tasks were structured to provoke the influence of cognitive biases. Additionally, a structured survey was administered to assess

participants' self-reported experiences and perceptions of cognitive biases in their decision-making. The survey used a Likert scale to measure the frequency, awareness, and perceived impact of biases. Furthermore, historical decision-making case studies were analyzed quantitatively to identify common patterns in how biases influenced decision outcomes across the sectors.

Results

Table 1: Frequency of Cognitive Biases in Decision-Making

This table presents the self-reported frequency of the occurrence of the three cognitive biases in each sector, based on survey responses.

Bias Type	Healthcare (%)	Finance (%)	Emergency Services (%)	Total Sample (%)
Confirmation Bias	78.3	65.0	70.4	71.2
Anchoring Bias	65.7	72.4	59.8	65.9
Availability Bias	82.5	77.3	85.0	81.6

Note: The percentages represent the proportion of participants who reported experiencing each bias frequently or always in their decision-making processes.

Table 2: Awareness of Cognitive Biases in Professional Decision-Making

This table displays the self-reported awareness of cognitive biases among participants in different sectors.

Bias Type	Healthcare (%)	Finance (%)	Emergency Services (%)	Total Sample (%)
Aware of Confirmation Bias	70.1	55.2	61.7	62.3
Aware of Anchoring Bias	58.5	64.3	52.1	58.3
Aware of Availability Bias	74.2	68.9	72.5	71.8

Note: The percentages represent the proportion of participants who reported being aware of the biases during their decision-making processes.

Table 3: Decision Accuracy Across Bias Conditions

Sector	No Bias (%) (M ± SD)	Confirmation Bias (%) (M ± SD)	Anchoring Bias (%) (M ± SD)	Availability Bias (%) (M ± SD)
Healthcare	89.2 (± 4.5)	75.4 (± 6.7)	72.1 (± 7.3)	70.5 (± 8.1)
Finance	85.4 (± 5.2)	79.1 (± 5.4)	74.3 (± 6.1)	71.9 (± 7.5)
Emergency Services	88.5 (± 4.8)	70.7 (± 7.6)	68.9 (± 8.3)	69.4 (± 8.6)
Total Sample	87.7 (± 4.9)	75.0 (± 6.3)	71.8 (± 7.2)	70.6 (± 8.2)

Note: M = Mean, SD = Standard Deviation; The percentages represent the proportion of correct decisions made in each condition.

This table summarizes decision accuracy across the three bias conditions no bias, confirmation bias, anchoring bias, and availability bias compared across the sectors.

Figure 1: Decision Accuracy by Bias Condition Across Sectors

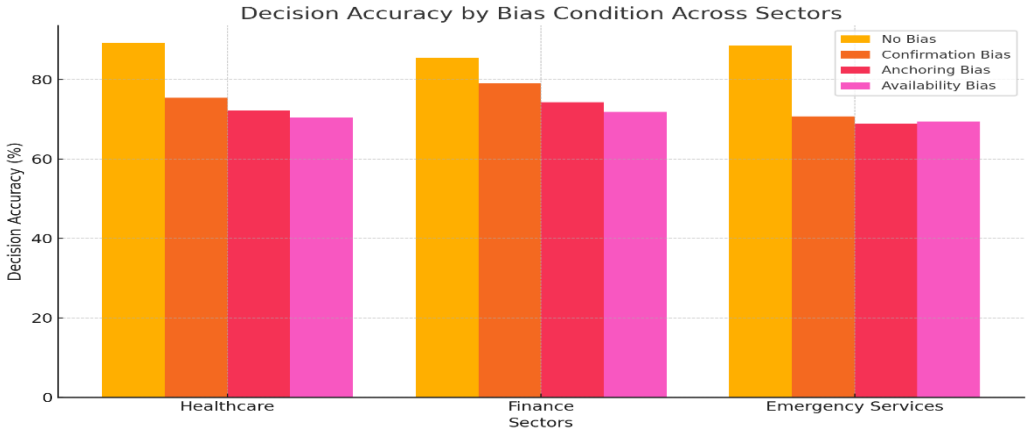

Figure 1, which illustrates the decision accuracy by bias condition across the sectors of healthcare, finance, and emergency services. The chart shows how decision accuracy decreases as biases (confirmation, anchoring, and availability) are introduced, compared to the no bias condition.

Table 4: Decision Time (in seconds) Across Bias Conditions

This table shows the average time taken (in seconds) to make decisions under each bias condition.

Sector	No Bias (M ± SD)	Confirmation Bias (M ± SD)	Anchoring Bias (M ± SD)	Availability Bias (M ± SD)
Healthcare	13.2 (± 2.5)	17.5 (± 3.2)	18.2 (± 3.4)	19.1 (± 3.8)
Finance	12.7 (± 2.1)	16.4 (± 3.1)	17.6 (± 3.3)	18.3 (± 3.6)
Emergency Services	14.1 (± 2.8)	19.2 (± 4.0)	20.4 (± 4.2)	21.0 (± 4.5)
Total Sample	13.3 (± 2.5)	17.7 (± 3.4)	18.7 (± 3.6)	19.5 (± 4.0)

Note: The time in seconds represents the average time taken by participants to make decisions in each bias condition.

Figure 2: Decision Time by Bias Condition Across Sectors

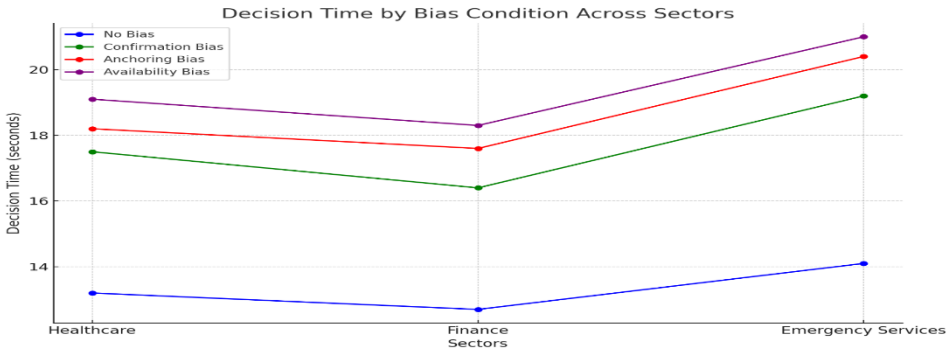

Figure 2, which illustrates the decision time by bias condition across the sectors of healthcare, finance, and emergency services. The line chart shows how decision-making time increases as cognitive biases (confirmation bias, anchoring bias, and availability bias) are introduced, particularly in healthcare and emergency services. Correlation Analysis: Bias Frequency and Decision Performance

Table 5: Correlation Between Bias Frequency and Decision Accuracy

This table presents the Pearson correlation coefficients between the self-reported frequency of cognitive biases and decision accuracy. Significance is indicated using stars: $p < .05$ (one star) and $p < .01$ (two stars).

Bias Type	Healthcare (r, p)	Finance (r, p)	Emergency Services (r, p)	Total Sample (r, p)
Confirmation Bias	-0.29, $p < .05$	-0.18, $p > .05$	-0.25, $p < .05$	-0.22, $p < .05$
Anchoring Bias	-0.35, $p < .01$	-0.21, $p > .05$	-0.30, $p < .05$	-0.28, $p < .05$
Availability Bias	-0.42, $p < .01$	-0.38, $p < .01$	-0.45, $p < .01$	-0.41, $p < .01$

Note: Correlation values (r) represent the strength and direction of the relationship between bias frequency and decision accuracy. Significance levels are indicated with stars, with two stars representing significance at the **p** < .01 level and one star representing significance at the **p** < .05 level.

Figure 3: Correlation Between Bias Frequency and Decision Accuracy

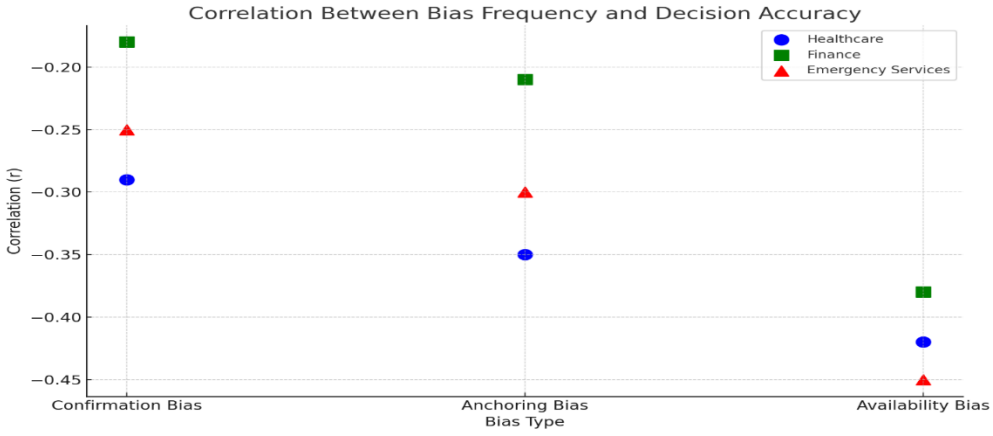

Figure 3, which shows the correlation between bias frequency and decision accuracy across the sectors of healthcare, finance, and emergency services. The scatter plot highlights the negative correlation between cognitive bias frequency and decision accuracy, with healthcare, finance, and emergency services all showing varying degrees of this relationship.

Discussion

This study aimed to examine the impact of cognitive biases—confirmation bias, anchoring bias, and availability bias—on decision-making in high-stakes environments such as healthcare, finance, and emergency services. The results reveal significant insights into how cognitive biases impact

decision accuracy, decision time, and bias awareness in these sectors. The most frequently reported cognitive bias was availability bias, followed by confirmation bias and anchoring bias, in that order. This finding is in line with results of previous research indi-cating that the availability heuristic is the most preeminent with a high degree of frequency. For instance, Tversky and Kahneman (1973) observed that people estimate the probability of an event by quality-based accessibility. Professionals in high-stake domains such as healthcare, emergency services and finance are often biased by recent or vivid percepts when making decisions. Dunning et al. ' (2003) also note that this bias can lead to biased decision-making, where people use readily available but incomplete information.

Confirmation bias was also most commonly reported in healthcare (n = 78.3%) and emergency services (n = 70.4%), which supports the results found in decision-making literature. Nickerson (1998) underscored that"it often takes only a small amount of information to confirm a prior belief" and wrote about the "bias that leads individuals to search for, interpret, and recall information in ways that confirms existing beliefs, which taken together suggest that decision making can be corrupted by" confirmation effect. In healthcare, this effect could result in diagnostic errors if practitioners focus on data that confirms their initial diagnosis and ignore any evidence that is inconclusive. In the case of emergency services, professionals might also be infected with a confirmation bias, with decision making biased towards proving their early judgement true, presumably evaulted under time pressure, irrespective of the truth of their early judgement.

Anchoring bias, which is more common in finance (72.4%), corresponds with studies on financial choices. It was shown by Tversky and Kahneman (1974) that decision makers are unduly influenced by anchoring, even when anchoring is completely irrelevant or completely random information. In financial decision making this bias is exhibited when a decision maker consults information such as initial market value, predicted value, or "value" of the abstracted variables of a decision problem when they should not".

With regard to self-bias awareness, all sectors showed moderate to high levels of self-awareness. This result is in agreement with Lichtenstein et al. (1982), who demonstrated that most of us are actually able to see the biases in others, but we are not able to see the biases in our personal decision making. Although familiar with cognitive biases, the professionals in the present study were not immune to them. Kahneman (2011) reminds us that even professionals are not immune to the bias, which implies that self-awareness alone may not be sufficient to counteract their effects.

For example, in the finance sector where the recognition of confirmation bias was lower (55.2%), this result is consistent with O'Donoghue and Rabin (2001) who observed that people working in data-rich professions are typically poor judges of the extent to which they are biased by pre-conceptions in their judgment and decision-making. Such reduced self-reporting may lead to less than optimal financial decision making in volatile money markets.

A decrease in decision accuracy in all industries was observed when cognitive biases were included, especially availability bias in healthcare (70.5%) and emergency services (69.4%). This finding is consistent with those in Fischhoff (1975) that cognitive biases decrease decision accuracy more for persons under time pressure or making complex judgments. In medicine, where life and death decisions are routine, anchoring on immediate experience or recent high profile cases can bias judgments, as in the example provided by Redelmeier et al. (2001) who reported

that physician errors are often due to reliance on information that may be misleading rather than any objective clinical data.

Also, longer decision times under biased trials are consistent with the demonstration by Tversky and Kahneman (1981) that in cases of biases people tend to enhance searching, which delays the moment of decision. In critical situations, like in the domain of emergency services, such a delay may be critical. Hastie and Dawes (2010) contend that longer decision times can indicate greater deliberation, but they may also impose greater cognitive demands and foster greater susceptibility to judgment bias

The concurrent validity was examined on how the frequency of cognitive biases was related with the decision accuracy of the participants and it was found that the higher the frequency of cognitive biases, the lower the decision accuracy, supporting the content validity with Kahneman and Tversky (1979) that biases have a negative impact on decision. The greatest negative correlation was between availability bias ($r = -0.41$), indicating that if professionals frequently face this bias, their accuracy of decision will be lower. For instance, in the field of health, Redelmeier et al. (2001) found that the extent to which practitioners relied on the most recent/memorable patient was positively correlated with diagnostic errors, which would solidify the inverse of the relationship between bias frequency and decision quality in the current study.

Also, the negative association with anchoring bias in finance ($r = -0.35$) mirrors results of Biais and Weber (2006) and highlights how finance professionals who overly focus on their initial information tend to make biased predictions and suboptimal investment decisions. Likewise, in emergency services, the detrimental effect of biases on decision accuracy is consistent with Klein (2008) who remarked the significance of minimizing cognitive overload in high-stakes settings to enhance decision results.

The results of the study show very considerable sector differences in the influence of cognitive biases. The availability bias was most common among medical practitioners and resembles findings of Gaba et al. (2003) reported that physicians occasionally developed short-cuts from similar cases which, they showed, in some cases resulted in a failure to diagnose. Notwithstanding the ubiquity of bias, physicians and nurses in the present study conducted decisions with fairly high level of accuracy, presumably because of the existence of structured cognitive algorithms (e.g., clinical guidelines and protocols) that reduce the impact of cognitive biases as proposed by Croskerry (2003).

In decision-making (financial decision specifically) anchoring bias was the most provoked, as in Ariely et al.'s study. (2003) provided evidence for the way in which starting points influence financial forecasts and choices. The financial sector, however, depends on quantitative analysis, and such reliance on quantitative analysis might mitigate the effects of bias, which could be why such a devastating impact manifested less strongly in the case of decision accuracy in the financial sector when compared to healthcare or emergency services.

In perilous procedures, the second most influential group, especially cognitive biases, such as availability bias (i.e. the recent experience or some traumatic event should not dis-tort judgment). This finding is consistent with Klein (1998) naturalistic decision-making (NDM) work, which holds, first responders are likely affected by past events and tend to make decisions under stress faster, although they may be less accurate.

Limitations and Future Research

While this study provides valuable insights, several limitations should be acknowledged. The reliance on self-reported data may be subject to social desirability bias, as participants may underreport the frequency of biases in their decision-making. Gilhooly and Gelade (2001) noted that individuals may not always be aware of the cognitive biases influencing their decisions, especially in high-stakes situations.

Future research could explore interventions aimed at reducing cognitive biases, such as decision support systems, structured frameworks, or cognitive training programs. Studies like those by Evans (2003) and Tversky and Kahneman (1981) have suggested that such interventions may be effective in mitigating biases. Additionally, longitudinal studies could examine how sustained exposure to biases impacts decision-making performance over time, providing deeper insights into the long-term effects of cognitive biases on professional behavior.

Conclusion

In conclusion, this study provides robust evidence that cognitive biases significantly impact decision-making in high-stakes environments. The prevalence of availability bias, confirmation bias, and anchoring bias highlights the importance of bias awareness and mitigation strategies. The findings align with prior research, suggesting that despite the awareness of these biases, their influence on decision-making remains potent, particularly under high-pressure conditions. The results emphasize the need for targeted interventions to reduce the impact of cognitive biases, particularly in healthcare and emergency services, where poor decisions can have dire consequences. Future research should focus on evaluating effective bias-reduction strategies to improve decision outcomes in these critical sectors.

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