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The Role of Emotions and Imagery in Financial Decision-Making: A Comparative Analysis of Neuromarketing and Self-Report Data

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ABSTRACT

Consumer financial decisions, traditionally viewed as rational, are increasingly recognized as being influenced by emotions and intuition. This study examines how imagery and emotions in financial contexts influence decision-making, specifically in hypothetical loan approvals where loan application documents include carefully selected imagery. Using a mixed-method approach, including neuromarketing methodologies such as eye-tracking and galvanic skin response (GSR), and a between-subjects experimental design utilizing self-report data, this study provides unique and granular insights into financial decision-making. In Study 1, respondents were individuals with 2 years of relevant education and business experience who were expected to apply for business loans themselves in the near future. Results indicate, via neuromarketing measures, that emotions, when influenced by imagery, take precedence over financial data in decision-making. Men (vs. women) respondents were more (vs. less) likely to approve applications with positive imagery. In Study 2, self-reported data revealed a discrepancy between emotional responses and self-reports across 320 participants. Overall, the results (1) show that specific imagery can influence loan approvals and (2) provide further evidence to the extant literature on the role of emotions in decision-making in an often perceived "calculative" financial context.

1 | Introduction

Unbiased and optimal financial decision-making processes are critical for business success and economic growth and relevant for retirement, savings, and investment decisions - yet often lacking in practice (Estelami 2014). As such, while financial decisions are often assumed to be rational and free of behavioral biases, such beliefs are challenged in recent studies (e.g., Dibb et al. 2021). Indeed, research indicates financial decisions are often made using emotions (Fenton-O'Creevy et al. 2011; Lipshitz and Shulimovitz 2007; Marston et al. 2018; Zaleskiewicz and Traczyk 2020) or intuition (Corgnet et al. 2018; Khatri and Ng 2000; Lipshitz and Shulimovitz 2007), despite the general belief that financial decisions are "cold," "analytical," and time-consuming. In reality, most financial behaviors are done heuristically via emotions and intuition to avoid undergoing stress and deliberation (Park and Sela 2018).

However, it is not only general consumers who use heuristics and emotions in financial decision-making. Financial

professionals are also shown not to be immune to behavioral biases. For example, Fenton-O'Creevy et al. (2011) found that high-performing traders were inclined to regulate their emotions to cope with potential losses but also used their emotions and intuition as information before making a trade. Further, a study on managers in IT, banking, and utility industries in the United States found intuition positively contributed to organizational performance in unstable environments, yet oppositely so in stable environments (Khatri and Ng 2000). As such, the role of emotional and intuitional heuristics on financial decision-making has conflicting views; some studies found intense emotions lead to greater performance (Fenton-O'Creevy et al. 2011; Seo and Barrett 2007), while others found emotions have an attenuating effect (Marston et al. 2018). Therefore, the role of emotions and intuition in financial decision-making has been widely debated and contested, with calls for further research to understand emotional influences in a financial context (Zaleskiewicz and Traczyk 2020).

Imagery is a powerful tool that has been found to heavily influence consumers' emotions and is often used to shape individuals' behaviors and decisions across various industries (Septianto et al. 2020). For example, there is evidence from the tourism industry that destination images can evoke emotions and influence tourists' decision-making processes (Kim and Stepchenkova 2015). Similarly, in the food industry, product imagery can affect consumers' perceptions of taste and quality, ultimately impacting their purchase decisions (Madzharov and Block 2010). Emotions can enable consumers to take advantage of opportunities or activate cognitive and motivational facets in decision-making scenarios (Orth et al. 2020). In financial contexts, imagery that evokes particular emotional responses can influence decision-making processes, including loan approvals. Specifically, the impact of imagery that evokes particular emotional responses could influence financial decision-making, potentially by increasing the likelihood of approval of a loan application. These decisions could have negative economic implications if a well-qualified loan application with negative imagery is rejected while a subpar loan application with positive imagery is approved. To the author's knowledge, extant research has primarily examined the impact of external factors or "natural" behavior biases in financial decision-making but has not considered how specific behavioral biases, such as imagery and emotions, can be triggered to achieve desired outcomes from a consumer perspective.

Measuring emotions accurately remains challenging, as individuals may not always express their true emotions in self-reported data (Hamelin and Bonelli 2022). Since individuals associate specific imagery or colors with emotions in ways unique to their personal experiences, traditional survey-based methods may not fully capture these emotional responses (Dzyabura and Peres 2021). From a methodological perspective, the majority of previous studies on emotional influence and decision-making have been conducted through surveys or experiments (Park and Sela 2018) or interviews (Lipshitz and Shulimovitz 2007). However, we acknowledge that these methods are not without limitations and should be interpreted as part of a holistic approach to understanding decision-making processes—wherein we thus take a multi-study approach. Specifically, this paper assesses the emotional and cognitive processing created by visual attention using eye-tracking and galvanic skin response (GSR) and self-report data. In doing so, we can track whether financial decision-making is influenced by affect heuristics and if decision-makers are aware of these mental shortcuts.

The contribution of the study is threefold. To our knowledge, we are the first to provide experimental insights about the roles of emotions and imagery in important capital market settings and hypothetical loan issuance scenarios, with participants who have the relevant financial education and experience for the task. This context was chosen as it is cognitively complex (Lipshitz and Shulimovitz 2007). Second, this study contributes to extant consumer decision-making literature, using neuromarketing techniques to explicate consumers' true emotional responses and reactions to imagery, overcoming the limitations of traditional self-reporting measures (e.g., surveys/interviews). Third, the findings have important socioeconomic implications by revealing what type of images could positively influence loan approval decisions and potentially alter the efficient and optimal allocation of scarce resources in the capital market.

2 | Literature Review

2.1 | Affect Heuristics

We base our study on the affect heuristic. The affect heuristic can be broadly understood as subjective responses (e.g., emotions) to a target as a determinant of its value (Pham and Avnet 2009). While individuals often use attribute comparisons or prior experience and schema, their emotional responses (but not their current mood) to a target are key determinants in any decision-making process (Pham 1998). In general, judgments are made on affective foundations in the face of uncertainty (Faraji-Rad and Pham 2017) and are often associated with System 1 processes so as to handle information with minimal cognitive effort (Schley et al. 2020). These affect heuristics processes broadly exist in two formats: (1) affect-as-information, which qualifies emotional responses and experiences as forming a judgment of a focal object and (2) priming account, where emotions influence judgments by influencing adjacent "content" that comes to mind due to memories or other activated network structures (Greifeneder et al. 2011). Our study focuses on the former mechanism. We propose that when individuals are presented with complex loan information, they rely on their emotional responses (affect-as-information) to make financial decisions.

Emotions are often intertwined in real-world decision processes (Quach et al. 2021). It is well accepted that emotions influence both individuals' attitudes and judgments and, subsequently, their decision-making process (Gupta et al. 2024; Kozlowski et al. 2017). Specific emotions may affect judgment and decision-making, such as caring for others has been found to evoke behaviors such as positive word-of-mouth while anger can evoke the spread of negative word-of-mouth (Kranzbühler et al. 2020). Emerging from this, the influence of emotions has a distinct effect on decision-making and behaviors (Lerner and Keltner 2001). Although emotions are often perceived as having a negative effect on decisions (Ou and Verhoef 2017), they can also aid decision-making (Yeh et al. 2017). For example, Pham et al. (2001) suggest emotions can have a positive influence on

judgment because those feelings can provide judgmental responses that are potentially (a) faster, (b) more consistent across individuals, and (c) more predictive of the number and valence of spontaneous thoughts regarding a target stimuli. This is especially true when limited information is available, and consumers use heuristics to embellish a product or service's story to justify their decisions (O'Donnell and Evers 2019). Consequently, it is expected that emotions, particularly in the case of consumers' financial decision-making, will greatly influence the acceptance outcomes of financial offers via imagery and affective responses.

However, the accuracy of emotional responses has been called into question. Individuals have difficulty pinpointing reasons for their attitudes and giving answers that may be socially undesirable (Ciuk et al. 2015). As emotion impacts attention, research on choice- and decision-making has begun investigating affect heuristics and their measurement (Liao et al. 2015). Research in this arena uses self-report or physiological measures to determine emotional responses. But in financial contexts purported to be "emotion-free," obtaining truthful self-report data can be challenging. This difficulty arises because these emotions may carry implicit biases and can be hard to verbalize, making it difficult for a trader or loan officer to explain why they felt certain about a buy/sell decision or loan application (Jaeger et al. 2013).

While affect heuristics have been studied in consumer contexts (Pham 1998), this research extends this theory by (1) identifying visual imagery as a novel, external trigger for heuristic processing in financial decisions and (2) disentangling subconscious affective arousal (via neuromarketing) from conscious emotional attribution (via self-reports). While prior work focusing on internal mood states or discrete emotions as affect heuristic triggers (Greifeneder et al. 2011), the role of imagery remains underexplored, particularly in contexts where decisions are presumed rational (e.g., loan approvals). Additionally, while subconscious processes are theorized to drive affect heuristics, empirical work rarely integrates objective measures (e.g., GSR) to validate this claim. Therefore, in this study, we use both types of measurement approaches (i.e., self-report and physiological) to understand how financially trained professionals reportedly, and physiologically, use affect heuristics in decision-making.

2.2 | Financial Decisions: Emotions and Intuitions

The study of financial decisions has a long history, with research showing that consumers' decisions are influenced by intuitions, biases, and emotions (Bacha and Azouzi 2019). For example, negative feelings can lead to conformity, while positive feelings can result in riskier decisions. As decision complexity increases, the importance of intuition also increases, with consumers relying more on intuition for familiar products or services than for newer ones (Trönnberg and Hemlin 2014). Intuition has emerged as a key factor in consumer decision-making literature and one we posit plays an important role in financial decisions, such as accepting loan offers. Decision theorists noted that there is a trade-off between decision accuracy and decision speed (Eisenhardt 1989). Indeed, Wu (2022) found that some consumers were more likely to use intuition when making financial decisions, as technical analysis can be considered inaccurate. As a means of dealing with this trade-off, consumers often turn to intuition. Therefore, as decision complexity grows, individuals may rely on emotions as proxies for more extensive System 2 thinking—consistent with the affect-as-information mechanism of the affect heuristic.

Dane and Pratt (2007, 40) conceptualize intuition as "affectively charged judgments that arise through rapid, nonconscious, and holistic associations." The authors note that qualitatively based decision making, such as intuition, is preferable in high complexity environments such as performance appraisals or whether to invest capital in particular areas over more quantitatively based decision making. In agreement, Lipshitz and Shulimovitz (2007) found intuitions, or "gut feelings," were more valid indicators of consumer acceptance of financial products than financial data alone. This shows that, even in stereotypically "rational" areas such as financial decision making, intuition is a vital aspect of consumer behavior (Sahi 2017; Wu 2022). For example, traders need to quickly process information and make decisions under uncertainty (Hamelin and Bonelli 2022) with Bossaerts et al. (2024) finding traders who were more emotionally engaged exhibited better performance—confirming the influence of affect-as-information within this high stakes context.

Turning toward our studies focus, and building on prior research, we propose that consumers utilize heuristics and cues (such as imagery) to reduce cognitive complexity in financial decision-making (Trönnberg and Hemlin 2012). The associations that consumers make based on particular facets of offers, based on intuition and behavioral biases, are proposed to impact their likelihood of acceptance. Next, the role of emotions as they influence consumer decision-making processes is discussed.

2.3 | Attention and Decision Making

Attention can be thought of as selective perception (Bundesen et al. 2005). Much research has been dedicated to understanding what garners attention and how to manipulate it accordingly (e.g., cigarette packaging warnings or nutrition labels) (Wedel 2015). An individual's attention manifests via their fixation frequency and duration—which can translate to memory (Wedel and Pieters 2000) and influence an individual's consideration set formation (Chandon et al. 2009). It is often assumed that individuals read all information that is provided, but this is often not the case and they only pay attention as far as heuristic cues enable attention (Bigné et al. 2023). Thus, understanding what is "grasping" consumers' attention in financial offers and influencing decision-making—which this paper posits is the valence of the attached imagery—remains of interest to understand.

Voluntary attention is the capacity to choose information related to specific behavioral goals and is indeed an essential part of human cognition (Paneri and Gregoriou 2017). The prefrontal cortex (PFC) is the area of the brain that covers the front part of the frontal lobe and is generally associated with planning complex cognitive behavior and decision making (Goulet-Kennedy et al. 2022). Such decision-making, in a consumer context, may be influenced by both rational and emotional systems as a result of ongoing feedback loops present within individuals that impact attention (Goulet-Kennedy et al. 2022). Utilizing eye-tracking and heat mapping, previous research suggests that

attention processes play an active role in constructing decisions (Hamelin et al. 2022). Following extant literature, this paper also relies on eye-tracking to measure attention in the forms of absolute and relative fixation time, and emotions.

While decision-making has been well documented in general purchase contexts and customer journeys (Lemon and Verhoef 2016), there remains a need to understand the role of affect heuristics in financial decision-making—especially in loan approval scenarios. Loan decisions are high stakes and complex financial decisions which amplify the need for a mental shortcut (i.e., affect heuristic) (Bacha and Azouzi 2019). Understanding how imagery can bias loan evaluations, and if it outweighs financial data, is a key consideration in determining the need for an analysis of emotional decisions. We also note literature considers affect and cognition separate (Duncan and Barrett 2007), whereas other research finds risk perception is "affectively based" (i.e., loan application decision-making) (Van Schaik et al. 2020).

Overall, this paper argues that there is a congruence between emotions and attention wherein emotional cues and heuristics, such as imagery, enhance greater attention and elicit emotional responses that influence decision-making. Imagery often elicits emotional and cognitive responses (Chowdhury et al. 2008). Hence, when consumers perceive imagery in financial offers, it is proposed that these imagery generate attention and emotions, leading to differential evaluations. Aligning with studies, such as that of Lipshitz and Shulimovitz (2007), this paper integrates aspects of intuition and emotion with a more "zoomed in" approach by testing subconscious checks and unambiguous facets of engagement (Harrell 2019). Therefore, the following is proposed:

H1. *The presence of emotionally valenced imagery in loan applications influences loan approval decisions.*

3 | Overview of Studies

We use a multi-study experimental design to explore how emotional imagery influences loan approval decisions through both subconscious and conscious processes. Through two studies we empirically show that loan approvals are influenced by (1) subconscious and emotional/attentional mechanisms (Study 1), and (2) conscious self-reported (implicit) biases (Study 2). By simultaneously measuring conscious and subconscious responses, we demonstrate that financial decisions are not exempt from emotional decision-making—even if individuals believe they are.

First, in Study 1, we used neuromarketing tools (eye-tracking and GSR) to objectively capture participants' real-time, subconscious responses to emotionally valenced images within loan applications. The effects demonstrated in this study find that there are gender differences in physiological responses. Specifically, men exhibited stronger responses to positive imagery, indicated by arousal and higher loan approval rates. Second, Study 2 built on these findings using a self-report methodology to examine expressed biases in loan approval decisions and the role of gender. This study replicates the found gender effects in a larger and more generalizable sample. We found that men relied on the affect heuristic (in particular for positive affect) across both studies in their loan approval likelihood.

4 | Study 1: A Neuromarketing Approach

4.1 | Study Context

In Study 1, we chose the context of loans and utilized a within-subject design. Considering the intricate balance between rational and emotional influences in financial decision-making. Loan approval processes are traditionally viewed as highly rational, predominantly driven by quantitative analysis of financial data. However, research has increasingly highlighted the role of non-rational, emotional factors in such decisions (Marston et al. 2018). These decisions are not merely mechanical but involve a significant subjective element where perceptions and first impressions can influence outcomes (Lipshitz and Shulimovitz 2007). This context is cognitively complex, and thus, heuristic tools, such as imagery, could evoke emotional responses as a way to process loan applications (Fenton-O'Creevy et al. 2011). Thus, the loan application setting was chosen to address a significant gap in the literature and enhance understanding of broader financial behaviors.

4.2 | Experimental Design

Limited evidence has considered visual attention or visual marketing on a granular level (Hamelin et al. 2017; Ladeira et al. 2019). This is especially the case for loan approval decision-making. As mentioned by Orth and Crouch (2014), visual attention could help and support the understanding of consumer judgment and decision processes through the search for information. This study employs neuromarketing methodology, including eye-tracking and GSR, to understand the emotional and cognitive processing created by visual attention (Hamelin et al. 2020; Verhulst et al. 2020; Yao and Wang 2024).

The respondents, 18 men and 16 women, were participants who have completed an MBA in Finance and Accounting. All the selected participants had a minimum of at least 2 years of work experience in a business setting. Taken together, these qualifications and experiences were deemed appropriate to evaluate financial information and loans. The participants were assigned to evaluate various firms' loan applications based on various financial information. Each participant was asked to indicate on a 5-point Likert scale their willingness to approve a loan to the corresponding company.

The financial information in this experiment was intended to capture similar loan quality. The key measures provided were the standard financial measures, such as past information about the number of loans the firm took out and how many it paid back on time, its ability in terms of CF to cover loan payments, and the value of the collateral. This is consistent with finance theory, which suggests that firms with better cash flow potential, fewer defaults in the past, and better assets in place should receive loan approval.

To assess whether the finance officers can be influenced by emotions, each loan application included an image void of any

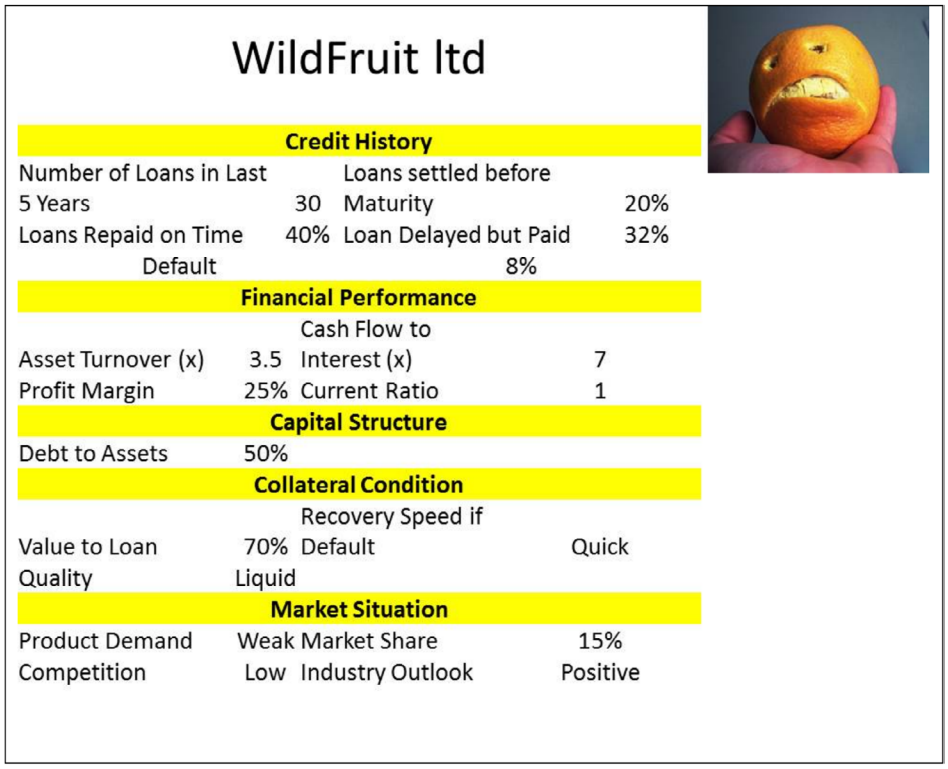

FIGURE 1 | Example of financial statements extract with emotional images, distributed for evaluation.

relevant financial information. The images were purely assigned to induce an emotional response by financial professionals, and none of the pictures had any relevant financial content. In the top right corner of the loan application file, a standardized emotional valence was inserted (Figure 1).

Although images can evoke strong emotions and impact decision-making (Zhao et al. 2018), the classification of emotions can pose great challenges because emotional responses are inherently linked to cultural background, past experience, personality, and social and situational environment (Zhao et al. 2018). Accordingly, research has focused on analyzing the affective content of images; such analysis is coined AICA or Affective Image Content Analysis (Zhao et al. 2018). A growing number of datasets are available for emotional images for performing AICA evaluation, such as the *ArtPhoto* Datasets. This study relies on *ArtPhoto* for the experiment because it contains professional images, each with a single emotion. Pictures labeled with Anger, Sadness, Disgust, Joy, Surprise, Fear, and Contempt were chosen from the ArtPhoto dataset. To avoid the issues of subjective perception, images from each valence group were selected by a multicultural research team, and only those that elicited a consensus on a given emotion were selected. Figure 1 provides an example of the financial statements with imagery for the fictional WildFruit Ltd. Company. Complete sets of all images that were provided with the fictitious companies are included in Appendix A.

4.3 | Data Collection: Eye-Tracking and Skin Response

Individual emotional responses can be measured using the self-report or autonomic measure. Self-reports or surveys suffer from heavy bias; for example, the Theory of Social Desirability posits that interviewees tend to avoid socially unacceptable responses or tend to provide answers that they perceive to match the value system of the interviewer (Benstead 2014). Autonomic measures directly assess the respondent's unconscious emotional appraisal of an issue and, as such, appear to overcome the limitations of self-report questionnaires (Lewinski et al. 2014).

Biometric data were acquired using the iMotions biometric platform. iMotions is a demonstratedly reliable platform due to its ability to integrate validated hardware and software (Farnsworth, n.d.). Data were collected using (1) a high-definition (HD) camera for facial expression analysis, (2) a Tobii eye tracker for gaze analysis, and (3) a Shimmer GSR system for electrodermal activity. Of note is the accuracy of an HD camera in capturing facial expressions as it has demonstrated validity when compared to EMG measurements (Kulke et al. 2020). As such, the combination of validated individual components and synchronized data acquisition contributes to the overall reliability of the iMotions platform. The determination of the exact position of the point of gaze of the subject's eyes can be monitored through standard eye-tracking technology. In this study, both fixation and gaze points are monitored. The former measures when and how long the information is acquired, and the latter refers to the exact item at the location that the respondent is looking at. When the eyes are locked on an object, the gaze points become very close to each other. This is defined as a fixation and is highly correlated to visual attention.

In addition to gaze mapping and fixation, emotional arousal, attention, and engagement can also be measured via eye-tracking and skin response (Juárez-Varón et al. 2023; Ohme et al. 2009). Typically, emotional stimuli activate the autonomic nervous

system, which entails subtle changes in skin perspiration and, consequently, the skin's electrical resistance. Such autonomic reaction is not under cognitive control and hence provides an unbiased appraisal of a respondent's emotional arousal (Wang and Minor 2008).

4.4 | Results

In this section, the overall results of loan approval and the impact of valence in general and with GSR are presented. Then, the later sections present detailed results with fixation and regression results to show how specific emotions may play a role in the decision-making among our respondents.

4.5 | Do Emotions Triggered by Images Influence Financial Decision-Making?

At first glance, some evidence of social anchoring bias is found, where the respondents, playing the role of loan officers, average around a loan approval ranking of 3 for almost all loan applications. This shows that they appear to worry about deviating from consensus or other agents (Michael et al. 2020). More importantly, it is found that imagery plays an important role in supporting our hypothesis. As summarized in Table 1, companies presented with positive valence imagery were given the highest loan approval ratings.

In examining the respondent's physiological responses during the experiment, a somewhat alleviated GSR for both men and women were recorded, suggesting that the respondents were emotionally stimulated. However, while there was a positive correlation of 23.85% between the image valence and the measured GSR among men, in the sample of women participants, the correlation was negative, though with a similar magnitude at −23.65%. It is also important to note the average GSR values for men and women were 27.09 and 12.77, respectively, indicating that the women were less excited overall during the process and by seeing the pictures. Both groups were excited about the "Date and Dating" company. However, while women respondents were most excited about the dating subject, it was of less interest than fitness and hair-related businesses among men.

Next, respondents' attention to the information provided using heat maps was examined (Gupta et al. 2024). This approach sheds light on how much attention the respondents are paying to specific regions (Hamelin et al. 2017), which in this case is the financial statement. For each financial statement, an area of interest (AOI) tool was used—specifically to select the specific region of an image to extract metrics specifically related to these regions. Figures 2 and 3, respectively, show an example of a heat map and AOI data for one financial statement by a male respondent. Heat mapping shows the area of gaze and the repeated gazes (i.e., fixation). Green areas show the least gazes, Yellow areas indicate a moderate level, and then Red areas reveal the highest number of gazes.

Interestingly, the financial statements accompanied by images with a face that can be recognized and exhibit an emotion would receive more attention (see heat maps in Figure 2). The areas of attention were found in the images and the overall financial statement information. This was the case for "Date and Dating," "KidSnack," "Infinite Fashion," "Hair Perfect," and "Happy Playgrounds." Similar findings were also found in animal and objective photos that were associated with an emotion, for instance, "WildFruit," "Vet food," and "Pest Gone." Other financial statements with buildings and objects without emotion drew attention to the overall information of the statements, but none or limited attention to the images. This happened to "Paints and paints," "Lucky Plast," and "True Vacation." Furthermore, Figure 3 shows the AOI data. Interestingly, most participants paid attention to the financial statements and financial information before they looked at the images. This could be explained by the fact that they were engaging in a task that focuses on financial assessment, which requires them to pay more and first attention to the actual financial information. Among all imagery, "Happy Playgrounds" and "WildFruit" attracted attention faster than the others. This could be due to the outstanding colors of the"WildFruit" and the facial expression of the young one in the "Happy Playgrounds."

Additionally, the attention duration and the various emotions that the respondent displayed during the experiment in total and relative time were measured. The key variables of interest here are the total attention time and the frequency of positive emotions (Hamelin et al. 2020). The summary of the key variables by men and women is shown in Table 2.

In terms of positive emotions, these were narrowed down to surprise and joy and established our key variables, such as "real attention time," which refers to the attention time relative to the total time available for evaluation and relative positive time (Hamelin et al. 2020). The heat mapping and AIO show that not all regions of the financial statements are considered by the financial analyst when deciding on loan approval. AIO data reveals that several respondents completely ignored some important financial information. More importantly, it is clear that at least some time has been dedicated to the emotional picture by all respondents, indicating not only potential time loss by loan officers but also an opportunity to influence them. These findings support the growing automated loan approval process where emotions are excluded entirely, with the exclusion of the human review process and our hypothesis overall. Table 2 summarizes women and men respondents' attention and the various emotional responses captured during the loan approval process.

4.6 | Regression Analysis of Emotions Role Triggered in Decision Making

After reporting the decision outcomes, the attention distribution during the evaluation process was examined by measuring respondents' attention to each part of the loan application. Table 3 shows that emotion, positive emotion, or in particular, happiness, was an influential variable in loan approval and determined by image valence, coloring, and content—providing further support for our hypothesis. Table 3A reports the regression results with loan approval as an outcome variable using the standard regression technique. The results were also confirmed

TABLE 1 | ArtPhoto image with emotional valence rating, and loan approval decision by all.

Comp#	Company	ArtPhoto images subjective valence	Image valence	Average loan approval rating (men)	Average loan approval rating (women)	FinData	GSR men	GSR women
1	Lucky Plast	Excitement	3	3.389	2.867	FINData2	14.8	14.54
2	Vetfood	Joy	3	3.556	3.625	FINData2	26.79	5.97
3	FitWest	Excitement	3	3.500	3.125	FINData2	47.56	19.87
4	Swimming Life	Contentment	2	3.056	2.813	FINData3	45.76	8.89
5	True Vacation	Contentment	2	3.056	3.563	FINData2	30.65	20.03
6	Paints and Paints	Neutral	2	3.000	2.875	FINData3	42.56	5.91
7	KidSnack	Neutral	2	2.944	2.500	FINData3	17.54	2.96
8	Date and Dating	Excitement	2	2.833	2.500	FINData1	17.95	9.95
9	Happy Playground	Excitement	2	2.833	2.313	FINData1	43.53	34.00
10	Infinite Fashion	Excitement	2	2.833	2.688	FINData3	20.78	2.97
11	Travel Alone	Sad	1	2.611	2.500	FINData3	17.79	11.95
12	Hair Perfect	Sad	1	2.500	2.688	FINData1	17.81	11.94
13	Wildfruit	Disgust	0	3.056	3.125	FINData2	17.88	11.91
14	Pest Gone	Disgust	0	2.722	2.938	FINData1	17.85	17.89

using multinomial logit regression with values of 3 and 5, suggesting a categorical loan approval outcome.

Table 3B shows that the positive effect of emotion was largely concentrated in the men respondent subsample. It is likely that the evidence in the pooled sample was driven by the larger size of the men respondent group. This finding is realistic as men tend to dominate in financial decision-making positions.

Overall, Study 1 supports H1 that imagery on loan application documents has an influence on the approval decision and the affective responses (and by extension, heuristics). Of interest was that gender played an important role for the impact (vs. none) of imagery on application's approval, with women (vs. men) less (vs. more) impacted. To investigate this on a more generalizable basis, we use a between-subjects design in our next study to see if this effect is also present in a self-report situation.

4.7 | Discussion

We found that emotionally valenced imagery, in contrast to common financial decision-making heuristics, biased loan approvals—even among trained and/or practicing professionals. Heatmapping showed that positive imagery prolongs visual attention and heightens arousal. What did emerge was gender differences in decision-making—not an initially predicted effect but a novel boundary condition for affect heuristics. Specifically, men were influenced by positive imagery to a greater degree than women. These findings extend prior work on affect heuristics (e.g., Greifeneder et al. 2011) but contrast others claiming gender neutrality in financial decisions (Wilson et al. 2007). In our next study, we wish to see if these effects hold true on a more generalizable level. We are interested in seeing if the previously reported gender differences emerge also in self-reported data. That is, does positive imagery play an integral influence on loan approvals, and are men disproportionately impacted by it?

5 | Study 2: Self-Reporting of Affect Heuristics and Loan Approval

In Study 2, we examine the emotional implications of the valence of imagery (low vs. high) with gender in the context of loan approval decision-making. We utilized the same stimuli in Study 1 to conduct a between-subjects design, specifically using the stimuli of Vet Food Ltd (positive valence—joy) and Travel Alone Plc (negative valence—sadness). We chose these as they were respectively the highest (vs. lowest) approval ratings in Study 1, as well as oppositely valenced, which allows us to test

FIGURE 2 | Heatmap analysis.

FIGURE 2 | (Continued)

whether valence would amplify or mitigate these trends in Study 2. Our main interest in this follow-up study is to see if financial professionals are aware of their internal biases and the presence of affect heuristics. Further, we wish to see if the gendered effect arises on a self-report level as well—specifically that men are more influenced by positive imagery than women.

5.1 | Method

We recruited 368 participants located in the United States from Prolific, who had either a degree in business and/or currently work in a business role. After deleting 45 individuals who did not answer all questions, 2 who answered the gender question

FIGURE 3 | AOI analysis.

FIGURE 3 | (Continued)

with "other" and 1 participant who failed the attention check, we were left with a usable sample of 320 (48.8% women, $M_{age} = 35.57$, SD = 11.82). We utilized Prolific as it provides representative data (Peer et al. 2022) and is known for high-quality data when compared to other platforms such as Amazon Mechanical Turk (MTurk) and/or Cloud Research (Albert and Smilek 2023).

Participants were randomly assigned to either a positive valence (Vet Food Ltd.) or negative valence (Travel Alone plc) (Appendix B) scenario. They were then asked to consider the loan application's financial data and, subsequently, their likelihood of approving the loan, which was followed by a battery of questions regarding their emotional reaction to the loan application.

5.2 | Measures

To measure emotions, participants were asked a series of questions regarding their affect using the Positive and Negative Affect Schedule (PANAS) (Watson et al. 1988). The PANAS was selected over discrete emotional scales (e.g., joy or anger) as the PANAS's broader dimensions (i.e., positive affect and negative affect) are ideal for detecting subconscious biases triggered by, in the case of this study, imagery and avoiding having to measure specific emotional reactions. We, therefore, use PANAS as a measure of affect.

Participants rated 20 emotional descriptors (10 for positive affect and 10 for negative affect) on a 5-point scale (1 = *very slightly or*

TABLE 2 | Summary of time spent for various sections of stimuli by women and men.

Panel A: Women respondents subsample, summarizing the total fixation time measured expressing certain emotion and attention, by companies

Women subsample	Anger	Sadness	Disgust	Joy	Surprise	Fear	Contempt	Engagement	Attention	Positive	Negative	Neutral	Image emotion	Exposure time
Date and dating	20	29	168	83	236	201	0	890	13,075	65	541	12,489	Excitement	45
FitWest	2	67	0	204	34	6	0	923	10,943	214	258	10,494	Excitement	45
Hair perfect	71	45	20	26	84	339	161	771	5021	17	217	4816	Sad	20
Happy playground	87	0	9	28	25	304	63	490	4842	4	180	4658	Excitement	20
Infinite fashion	74	20	0	123	45	227	1	561	4861	25	276	4565	Excitement	20
KidSnack	6	4	83	79	28	139	5	417	4786	67	138	4581	Neutral	20
Lucky plast	149	8	17	33	41	267	120	851	4969	35	302	4633	Excitement	20
Paints and paints	24	14	0	177	57	143	115	589	5080	59	407	4625	Neutral	20
Pest gone	0	0	0	145	0	111	90	519	4613	102	149	4362	Disgust	20
Swimming life	71	0	56	54	49	330	33	447	5034	13	171	4886	Contentment	20
Travel alone	18	1	3	69	35	163	0	630	7110	67	197	6849	Sad	30
True vacation	255	2	22	31	23	342	7	626	4919	41	290	4628	Sad	20
Vetfood	1	0	29	0	36	227	0	268	5035	1	20	5014	Neutral	20
Wildfruit	68	33	25	243	101	213	3	868	5077	40	400	4637	Disgust	20

Panel B: Men respondents subsample, summarizing the total fixation time measured expressing certain emotion and attention, by companies

Men subsample	Anger	Sadness	Disgust	Joy	Surprise	Fear	Contempt	Engagement	Attention	Positive	Negative	Neutral	Image Emotion	Exposure time
Date and dating	0	58	0	140	5	0	47	591	13,976	124	266	13,628	Excitement	45
FitWest	0	0	0	55	0	0	13	426	12,471	46	331	12,110	Excitement	45
Hair perfect	0	0	17	37	19	0	32	188	5620	44	52	5534	Sad	20

(Continues)

TABLE 2 | (Continued)

Panel B: Men respondents subsample, summarizing the total fixation time measured expressing certain emotion and attention, by companies

Men subsample	Anger	Sadness	Disgust	Joy	Sur-prise	Fear	Contempt	Engagement	Attention	Positive	Negative	Neutral	Image Emotion	Exposure time
Happy playground	0	0	189	0	10	0	21	290	5644	0	181	5506	Excitement	20
Infinite fashion	0	0	310	7	9	1	5	329	5507	5	217	5299	Excitement	20
KidSnack	0	0	0	19	0	0	31	221	5550	2	195	5382	Neutral	20
Lucky plast	0	0	182	11	0	4	26	175	5483	13	51	5437	Excitement	20
Paints and paints	0	0	1	11	0	6	0	118	5611	0	279	5347	Neutral	20
Pest gone	0	0	1	11	0	6	0	118	5611	0	279	5347	Disgust	20
Swimming life	0	0	2	49	0	0	12	468	5313	21	2	5341	Contentment	20
Travel alone	0	0	0	0	18	20	28	163	8244	0	44	8209	Sad	30
True vacation	0	0	70	8	1	8	1	211	5619	5	115	5500	Sad	20
Vetfood	0	0	33	146	0	0	97	237	5481	133	134	5235	Neutral	20
Wildfruit	0	0	90	129	1	0	4	199	5391	37	50	5380	Disgust	20

TABLE 3 | Regression analysis results of loan approval decision with emotional bias.

Panel A: Full sample panel regression

	(1)	(2)	(3)	(4)
Variables	**Creditall**	**Logcredit**	**Creditall**	**Logcredit**
CF/interest	0.625***	0.161**	0.620***	0.161**
	(2.66)	(2.41)	(2.64)	(2.41)
Value/loan	1.767	0.452	1.736	0.450
	(1.55)	(1.38)	(1.52)	(1.38)
Logattntime	−0.090	−0.049	−0.316*	−0.089**
	(−0.56)	(−1.08)	(−1.88)	(−2.43)
Relposattn	1.858***	0.549***		
	(3.58)	(4.09)		
Relhappy			2.057*	0.657**
			(1.90)	(2.41)
Constant	−2.027	0.142	−1.082	0.302
	(−0.83)	(0.20)	(−0.44)	(0.44)
Observations	475	475	476	476
R^2	0.044	0.038	0.045	0.040

Panel B: Regression results of loan approval with positive emotional bias by women and men respondents

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variables	**Creditall**	**Logcredit**	**Creditall**	**Logcredit**	**Creditall**	**Logcredit**	**Creditall**	**Logcredit**
	Man	Man	Woman	Woman	Man	Man	Woman	Woman
CF/interest	0.436	0.106	0.850**	0.230**	0.432	0.105	0.853**	0.232**
	(1.39)	(1.22)	(2.39)	(2.23)	(1.37)	(1.21)	(2.40)	(2.25)
Value/loan	0.878	0.210	2.840	0.766	0.864	0.207	2.859	0.780
	(0.58)	(0.50)	(1.64)	(1.52)	(0.57)	(0.49)	(1.64)	(1.54)
Logattntime	−1.270*	−0.423**	−0.274	−0.075*	−1.252*	−0.419**	−0.277	−0.077*
	(−1.74)	(−2.32)	(−1.44)	(−1.78)	(−1.69)	(−2.28)	(−1.46)	(−1.83)
Relposattn	2.242***	0.591***	0.531	0.320				
	(3.95)	(4.39)	(0.48)	(0.99)				
Relhappy					2.961***	0.754***	0.663	0.492
					(3.93)	(3.81)	(0.36)	(0.96)
Constant	4.590	2.173**	−3.633	−0.462	4.552	2.169**	−3.660	−0.484
	(1.16)	(2.06)	(−1.00)	(−0.44)	(1.15)	(2.05)	(−1.00)	(−0.46)
Observations	252	252	224	224	252	252	224	224
R^2	0.055	0.050	0.050	0.046	0.052	0.047	0.050	0.046

Note: The dependent variable, *Credit all*, is a linear scale measure ranging from 0 to 5, where 5 is the highest credit approval and 0 is outright loan rejection, indicating the likelihood of loan approval in Models 1 and 3. In Models 2 and 4, *Logcredit*, the natural logarithm of 1 + credit all, is used to adjust for the skewed distribution of the variable. The explanatory variables are *CF/Interest* coverage, *Value/Loan*, *Logattn time, Relposattn*, and *Relhappy*. The last two variables capture the total positive (happy) attention time relative to the total attention time. The coefficient estimates and *t* stats are reported from panel regression with robust standard errors. Robust *t* statistics in parentheses, ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

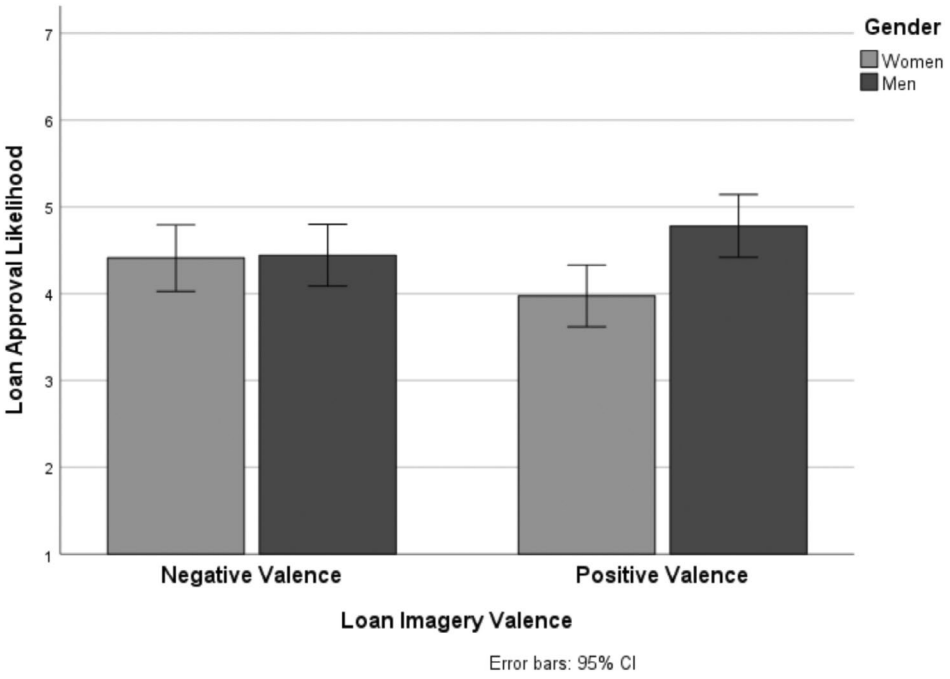

FIGURE 4 | Men versus women loan approval two-way ANOVA (Study 2).

not at all; 5 = *extremely*), indicating the extent to which they experienced each emotion after viewing the loan application ("To what extent did you feel _____ after viewing this loan application?"). The items for positive affect were "attentive," "active," "enthusiastic," "strong," "excited," "proud," "interested," "inspired," "determined," and "alert" (summed to create a measure of positive affect: $\alpha = 0.94$). The items for negative affect were "distressed," "guilty," "ashamed," "scared," "nervous," "upset," "hostile," "afraid," "irritable," and "jittery" (summed to create a measure of negative affect: $\alpha = 0.92$).

Following this, participants indicated their likelihood of approving the loan using a 7-point scale (1 = *not likely*; 7 = *very likely*).

5.3 | Results

5.3.1 | Loan Approval

We conducted a two-way ANOVA with the loan's imagery valence (−1 = *negative valence*; 1 = *positive valence*), gender (−1 = *women*; 1 = *men*) and their interaction as independent variables and loan approval likelihood as the dependent variable, controlling for future loan application intention and age. For our covariates, age ($F(1,314) = 1.515$, $p = 0.219$, $\eta_p^2 = 0.005$) and future loan application intention ($F(1,314) = 1.787$, $p = 0.182$, $\eta_p^2 = 0.006$) were nonsignificant.

The main effect of loan imagery valence on the likelihood of approving a loan application was nonsignificant ($F(1,314) = 0.072$, $p = 0.788$, $\eta_p^2 = 0.000$) but the main effect of gender was significant ($F(1,314) = 5.144$, $p = 0.024$, $\eta_p^2 = 0.016$), indicating that there are gendered differences in loan approval likelihood. Importantly, we found a significant interaction between a loan's imagery valence and gender ($F(1,314) = 4.372$, $p = 0.037$, $\eta_p^2 = 0.014$). Planned contrasts showed that men had higher loan approval likelihood for loans with positively valenced imagery than women ($M_{men} = 4.780$, SD = 1.578 vs. $M_{women} = 3.974$, SD = 1.639; $F(1,314) = 9.797$, $p = 0.002$, $\eta_p^2 = 0.030$). Further, for loans with negatively valenced imagery, there was no significant difference in approval likelihood between men and women ($M_{men} = 4.443$, SD = 1.825 vs. $M_{women} = 4.411$, SD = 1.518; $F(1,314) = 0.015$, $p = 0.903$, $\eta_p^2 = 0.000$) (Figure 4).

5.3.2 | Emotional Responses

To see if there were self-reported gendered differences between emotions and loan approval, we conducted a mediation analysis using PROCESS Model 4 with 5000 resamples (Hayes 2022). We used gender (−1 = *women*; 1 = *men*) as our independent variable, positive (positive PANAS) and negative affect (negative PANAS) as our mediators, and loan approval as our dependent variable. We again controlled for intention to apply for a loan in the future and age.

Results show that men (vs. women) had significantly higher loan approval likelihood through positive affect ($b = 0.086$, SE = 0.041, 95% CI [0.010, 0.175]). Contrastingly, no gender differences in loan approval likelihood via negative emotions were found ($b = 0.008$, SE = 0.012, 95% CI [−0.009, 0.037]). See Table 4 for full results.

5.4 | Discussion

In Study 2, we confirm the initial findings from Study 1, that imagery valence interacts with gender in financial decision-making, such as the decision for loan approvals. But while men participants' decisions remained biased toward positive imagery, self-report

TABLE 4 | Gender's impact on loan approval likelihood as mediated by positive and negative affect (Study 2).

Positive affect								
	Positive affect (*M*)				**Loan approval likelihood (*Y*)**			
	Coeff	**SE**	***t***	***p***	**Coeff**	**SE**	***t***	***p***
Constant	25.272	2.732	9.250	< 0.001	2.684	0.440	6.094	< 0.001
Gender (*X*)	1.315	0.590	2.229	0.027	0.130	0.085	1.530	0.127
Positive affect (*M*)	—	—	—	—	0.066	0.008	8.163	< 0.001
Age (covariate)	0.080	0.050	1.602	0.110	−0.016	0.007	−2.257	0.025
Future loan application intention (covariate)	1.758	1.219	1.443	0.150	0.152	0.175	0.871	0.385
Model summary	$R^2 = 0.032$, $F(3,316) = 3.475$, $p = 0.016$				$R^2 = 0.199$, $F(4,315) = 19.528$, $p < 0.001$			
Negative affect								
	Negative affect (*M*)				**Loan approval likelihood (*Y*)**			
	Coeff	**SE**	***t***	***p***	**Coeff**	**SE**	***t***	***p***
Constant	13.635	1.881	7.247	< 0.001	4.405	0.462	8.751	< 0.001
Gender (*X*)	0.383	0.406	0.944	0.346	0.208	0.093	2.247	0.025
Negative affect (*M*)	—	—	—	—	0.022	0.013	1.711	0.088
Age (covariate)	−0.009	0.034	−0.271	0.787	−0.011	0.008	−1.371	0.171
Future loan application intention (covariate)	1.854	0.839	2.209	0.028	0.227	0.192	1.181	0.239
Model summary	$R^2 = 0.019$, $F(3,316) = 2.039$, $p = 0.108$				$R^2 = 0.038$, $F(4,315) = 3.122$, $p = 0.015$			

data showed no recognition of this influence—suggesting the unconscious use of the affect heuristic. Women, aligning with Study 1, displayed no significant interaction or mediation of imagery and affect on loan approval likelihood.

This second study has two key implications. First, it suggests a conscious-subconscious bias which supports the idea of social desirability bias (e.g., financial professionals beliefs in their own objectivity) as distorting self-report data. Second, it contextualizes gender differences—namely that of men's susceptibility to imagery and possible emotional priming (Zhou et al. 2021).

6 | General Discussion

This research used neuromarketing techniques (GSR and eye-tracking) to examine the relationship between imagery and financial decision-making. In Study 1, we measured immediate and unambiguous emotional and attentional responses to imagery in loan applications. The findings suggest that the emotions elicited by imagery can bias decision-making, leading to more favorable evaluations of loan applications with positive emotional content, regardless of their financial content. This implies that the presence of imagery may weaken the quality of financial decisions by introducing factors unrelated to the applicants' financial standing. This result supports other research, such as that by Fenton-O'Creevy et al. (2011) and Seo and Barrett (2007), who found emotions can impact decision-making capabilities. Of interest are the gender differences in respondents' subconscious response to imagery and their ultimate approval (or rejection) of loans. Men were more likely to approve applications with images that elicit positive emotions, such as happiness, and less likely to approve applications with negative emotions, such as sadness and surprise. On the other hand, women were less likely to be influenced by imagery and less excited by visual effects. This does not corroborate with Wilson et al. (2007) who found gender did not impact financial decisions. These findings are consistent with cross-disciplinary literature which suggests that men are more visual beings (Wiens 2006).

In Study 2, we expanded these insights and analyzed the interaction between gender and imagery valence om addition to the mediation of affect on loan approvals. Here, we desired to gain more generalizable insights and to see the differences between "reality" (e.g., neuromarketing) and self-report data on the impact of emotions. Aligning with Study 1, men were more influenced by positive imagery, increasing their loan approval likelihood—contrasting women who may engage less with imagery cues (i.e., Wiens 2006). Overall, the present findings contribute to decision-making literature by providing direct fine-grained insights into the subconscious emotional and attentive reactions of imagery on loan applications.

6.1 | Implications

6.1.1 | Theoretical Implications

The findings of the current research make important theoretical contributions. First, we contribute to literature on affect heuristics. Our results indicate that emotionally charged imagery impacts affective responses as a cognitive shortcut, supporting the

"affect-as-information" findings of extant literature (Greifeneder et al. 2011). Specifically, when participants viewed a loan application with financial data, they relied on such emotional cues to inform decisions for loan approval. Importantly, the emotional implications triggered by imagery was more prevalent among men. Using our mixed-method approach, we provide contextual extension of affect heuristics in perceived financial risks and intuition—even among experienced financial workers meaning emotions serve as subtle determinants of financial decision-making (Zaleskiewicz and Traczyk 2020).

Second, to the author's knowledge, this paper is the first of its kind to test the impact of imagery on loan applications and the subsequent influence of emotions and attention on approval outcomes. This paper built upon the study of Lipshitz and Shulimovitz (2007) and found that, while taking into account financial facets, individuals are guided by "soft" decisions or intuitions when determining the validity of a loan application. For example, in Study 1, this paper found that including faces in loan-application imagery garnered far more attention than those that did not and demonstrated the important role of imagery and affect heuristics on decision-making.

Third, we address the gap between extant research's reliance on either interviews (e.g., Lipshitz and Shulimovitz 2007) and surveys or/experiments (e.g., Park and Sela 2018)—especially in the context of affect heuristics and loan approvals. While such methodologies have their merits when attempting to understand innate decision-making factors, self-reporting measures are insufficient alone (Hamelin and Bonelli 2022). With 90%–95% of choices made subconsciously (Niels 2019), measuring these involuntary reactions to particular stimuli is important as individuals often react and take action before realizing a conscious decision has been made (Smith 2008). The role of subtle emotional cues in shaping decisions suggests that even loan officers may be swayed by non-financial stimuli, with implications for designing and presenting financial information to ensure objectivity. In view of this study, participants may have made a decision on an application before being consciously aware of this—a fact wherein we propose imagery plays an important role. This echoes the research of Hsee et al. (2001), who suggest that emotions can distort the perception of risk and that the design and presentation of financial information should be carefully considered in promoting more objective evaluations. Overall, this study extends the scant body of knowledge of financial decision-making by using neuromarketing techniques to understand its subconscious mechanisms.

Fourth, our findings contribute to affect heuristic theory in two main ways. First, while prior studies focus on generalized moods or emotional states (Pham and Avnet 2009; Schley et al. 2020), this research demonstrates that emotionally valenced imagery on loan applications can be a *heuristic trigger*. By manipulating imagery in loan applications, we show that visually induced emotions can bias decisions toward loan approvals. This highlights that even "rational" financial judgments are susceptible to nonconscious affective influences, broadening the range of specific cues recognized in the affect heuristic framework. Second, after observing that the effect of emotionally-valenced imagery on loan approvals was not uniform across participants—namely gender—we found this may act as a boundary condition, with men showing a stronger reliance on affect heuristics (predominantly for positive imagery). While this was not predicted prior, our follow-up study (Study 2) confirmed and validated these findings. These insights refine our knowledge of affect heuristics by (1) confirming it operates in financial contexts—specifically loan approvals, and (2) revealing imagery as an underexplored trigger for such affect heuristics.

Finally, and more broadly, the gendered effects observed add meaningfully to extant literature on these differences in emotion and decision-making. Our results indicate that men (but not women) are impacted by imagery on loan applications. These results align with research finding women CEOs are more conservative in their credit decision-making processes in spite of emotional biases (i.e., optimism and/or overconfidence) (Bacha and Azouzi 2019). On the other hand, Gabbi and Zanotti (2019) found both genders were impacted by emotions in decision-making—specifically where men are driven by pride and hope, women by hedonic and general emotions. Additionally, Plotkina et al. (2024) argue that differential scores of women self-report themselves as more rational; our results—specifically Study 1—indicate that women are less impacted by emotions in financial decision-making overall (as induced by imagery). Therefore, we provide clear effects that there are gendered differences in financial decision-making—especially that men are more impacted by positively valenced imagery than women. This contributes to the ongoing discussion regarding the role of affect in financial decisions and highlights the importance of considering gender (e.g., Croson and Gneezy 2009).

6.1.2 | Financial Market and Managerial Implications

First, our results show that well-informed managers can potentially game the system and increase the probability of loan approval with positive imagery. The concern is that the inefficient capital allocation issue could be potentially exacerbated with less or not qualified companies receiving funding because of strategic imagery choices in loan application documents. To improve the efficacy of financial decision-making and ensure that decisions are based on relevant financial information, our findings suggest that financial documentation should minimize the use of imagery or other cues that may elicit emotions. Our findings indicate that affect heuristics can bias approval decisions toward less financially sound applicants, showing the need to limit emotional content in such documents.

Second, AOI analysis (Figure 3) indicates that only "Happy Playgrounds" and "WildFruit" have received attention faster than other images because of prominent color (i.e., the "WildFruit") and positive facial expression of the child (i.e., "Happy Playgrounds"). Hence, businesses could optimize the use of color and facial expressions in their advertising or financial information materials. Indeed, facial expressions can arouse the emotional state of an observer and, by extension, emotional decision-making (Zhou et al. 2021). For example, whereas smiling conveys honesty and friendliness, too much intensity when smiling can reduce perceived competence (Wang et al. 2017). Businesses could learn to "strike a balance" when using imagery and ensure proper expressions to avoid having their loan being rejected. Further, when it comes to selecting

imagery to elicit specific emotional responses, care needs to be taken to detect potential biases for or against particular groups (Townson 2020). Additionally, colors can be associated with various meanings that are different from the users' original intention—for example, red, often conveying passion, is appropriate for a dating company but not a swimming business (where blue or yellow is considered more appropriate) (Ferreira 2023). Finally, previous research finds that visual elements are more influential among younger children, suggesting the potential effects of age (Hota and Charry 2014).

Third, our findings show the importance of financial professionals' affective heuristics and intuition in their decision-making processes—this may lead to suboptimal lending decisions in the presence of loan imagery (Lipshitz and Shulimovitz 2007). We recommend training focused on emotional intelligence and cognitive bias awareness by financial institutions that can enhance the objectivity of loan approval processes (Hamelin and Bonelli 2022). Training could help professionals identify when their judgments may be erroneously swayed, and more standardization, or broader lack of imagery, could promote a fairer and more efficient loan application process. Affect heuristics played a role in this paper's context and show the importance of ongoing education and procedural safeguards (Faraji-Rad and Pham 2017).

6.2 | Limitations and Future Research Directions

There are several limitations to the study. First, though neuroscience research experiments are more widely adopted to understand and predict individual behaviors, it is also observed that brain activity can be different when in a lab versus in a mall or at work (Singh 2015). Therefore, the findings of this research need to be replicated in a field study. It would be recommended to perform field studies at major banks globally. In this study, the first experiment was carried out in Australia among graduate students, primarily from Asia, while the second study recruited online participants in the United States. Loan officers generally self-select in the profession and might be less emotional and less influenced by imagery as they tend to be more "number-oriented." Overall, to support the external validity of our findings, we would encourage future research via a field study. Second, through the field of neuromarketing, it is observed that excessive reductionism occurs—meaning that neuromarketing can only occur when the stimuli's complexity is decomposed into smaller and simpler portions. Finally, many of the studies done in the neuromarketing field are purely correlational, leading to complexity within experiment designs.

Due to the overall novelty of the study and the fine-grained insights provided, there are multiple interesting areas of future research available. First, our findings can be extended through a theoretical framework. In particular, it is recommended that future research utilize the appraisal-tendency framework (Lerner and Keltner 2001) to further deepen the explication of how emotions influence decision-making through a series of experiments. In particular, greater insights into *what* image combinations best indicate loan approvals (vs. rejections) and how the layout and structure of forms can be made to place the most pertinent information needed for loan officers (e.g., default history). Second, studies could investigate the accuracy of emotional drivers behind decision-making to test, in the case of loans via simulations, whether "soft" decisions are of merit overall (Lipshitz and Shulimovitz 2007). Third, we further recommend using attention as a mediator prior to emotional responses – this would enable a stronger understanding of how the attention type influences affective cues leading to loan approval (vs. disapproval).

7 | Conclusion

This research addressed the need for understanding the underlying mechanisms of the relationship between emotions/attention and decision-making in the context of loan-application approvals. By combining eye-tracking, GSR, and self-report data from Study 2, we show how imagery affects decision-making that individuals are aware of versus those they are not. In Study 1, our neuromarketing approach offered insights free from biases (Benstead 2014), while Study 2 asked financially trained individuals their self-report perspectives—both highlighting discrepancies between subconscious reactions and emotional reactions that individuals say did (vs. did not) impact their decision-making. The findings provide proof that imagery elicits particular responses and emotional/attentive influences within a loan-approval scenario. These influences, when taken together with gender differences, provide differing impacts on loan application approval rates.

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Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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Appendix A

See Table A1

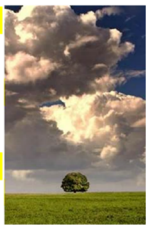
TABLE A1 | Imagery used with the company loan applications.

Wildfruit 	Pest Gone 	Travel Alone 
Hair Perfect 	Paints and Paints 	Infinite Fashion 
Data and Dating 	Swimming Life 	True Vacation 
Happy Playground 	KidSnack 	Fitwest 
Vetfood 	Lucky Plast 	

Appendix Study 2 Stimuli B

Negative Valence

Travel Alone plc



Credit History			
Number of Loans in Last 5 Years	30	Loans settled before Maturity	20%
Loans repaid on Time Default	40%	Loans Delayed but Paid	32%
			8%
Financial Performance			
Asset Turnover (x)	3.5	Cash flow to Interest (x)	7
Profit Margin	25%	Current Ratio	1
Capital Structure			
Debt to Assets	50%		
Collateral Condition			
Value to Loan	70%	Recovery Speed if Default	Quick
Quality	Liquid		
Market Situation			
Product Demand	Weak	Market Share	15%
Competition	Low	Industry Outlook	Positive

Positive Valence

Vet food ltd

Credit History			
Number of Loans in Last 5 Years	30	Loans settled before Maturity	20%
Loans repaid on Time Default	40%	Loans Delayed but Paid	32%
			8%
Financial Performance			
Asset Turnover (x)	3.5	Cash flow to Interest (x)	7
Profit Margin	25%	Current Ratio	1
Capital Structure			
Debt to Assets	50%		
Collateral Condition			
Value to Loan	70%	Recovery Speed if Default	Quick
Quality	Liquid		
Market Situation			
Product Demand	Weak	Market Share	15%
Competition	Low	Industry Outlook	Positive