

Investigating the Effect of Verbal Intelligence on Investors' Financial Anxiety with the Mediating Role of Financial Literacy

1. Amirhossein. Khaleghi Targhi[✉]: Master's, Department of Finance, Faculty of Management, Alborz Campus, University of Tehran, Iran

*corresponding author's email: amir.khaleghi76@ut.ac.ir

ABSTRACT

This study examines the effect of verbal intelligence on investors' financial anxiety, considering the mediating role of financial literacy. In this research, financial anxiety is the dependent variable, verbal intelligence is the independent variable, and financial literacy serves as the mediating variable. The study is applied in terms of purpose and follows a descriptive–correlational design based on structural equation modeling. The required data were collected using a questionnaire instrument. The statistical population consists of all investors in the stock exchange market in Iran. Using Cochran's formula for large and dispersed populations, a sample size of 335 participants was estimated and selected through simple random sampling. To test the hypotheses, structural equation modeling (SEM) was employed using SPSS and AMOS. The findings indicated that verbal intelligence has a negative and significant effect on investors' financial anxiety. Furthermore, the second hypothesis confirmed that verbal intelligence has a positive and significant effect on investors' financial literacy, and the third hypothesis showed that financial literacy has a negative and significant effect on investors' financial anxiety. The fourth hypothesis demonstrated that financial literacy significantly mediates the relationship between verbal intelligence and investors' financial anxiety. Therefore, financial literacy, independent of the effects of verbal intelligence, has a direct impact on investors' financial anxiety and supports the potential usefulness of financial literacy education. Accordingly, it is recommended that investors become more familiar with factors such as their level of verbal intelligence, financial literacy, and financial anxiety in order to make better decisions and achieve their desired objectives in the stock market.

Keywords: Verbal intelligence, financial anxiety, financial literacy, investors, Tehran Stock Exchange.

Introduction

Financial decision-making in contemporary capital markets has become increasingly complex due to rapid technological advancement, financial innovation, and the proliferation of digital financial services. Investors are required not only to interpret vast amounts of financial information but also to make timely and rational decisions under conditions of uncertainty and risk. In such an environment, psychological and cognitive factors have gained significant attention in explaining variations in financial behavior. Among these factors, financial anxiety has emerged as a critical construct influencing investors' decision-making processes, risk perceptions, and ultimately their financial outcomes. Financial anxiety refers to the emotional distress and apprehension individuals experience when dealing with financial matters, which can impair judgment and lead to suboptimal investment decisions (1, 2).



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The growing body of literature suggests that financial anxiety is not merely an emotional response but is closely linked to individuals' cognitive abilities and their capacity to process financial information effectively. Cognitive functioning, including reasoning ability, memory, and verbal intelligence, plays a fundamental role in how individuals understand financial concepts and make decisions in complex financial environments (3). In particular, verbal intelligence, as a dimension of general cognitive ability, is associated with language comprehension, analytical reasoning, and the capacity to interpret abstract information. These skills are essential for understanding financial reports, market analyses, and investment guidelines, which are often communicated through complex textual and numerical formats (4).

Verbal intelligence contributes to individuals' ability to interpret financial information accurately and to engage in reflective decision-making processes. Individuals with higher levels of verbal intelligence are more likely to process information systematically, evaluate alternative investment options, and avoid impulsive decisions driven by emotional biases. Conversely, individuals with lower verbal intelligence may struggle to comprehend financial information, leading to increased uncertainty and anxiety in financial contexts. Empirical evidence indicates that cognitive limitations can exacerbate financial anxiety by reducing individuals' confidence in their financial decision-making abilities (5).

At the same time, financial literacy has been widely recognized as a key determinant of financial behavior and financial well-being. Financial literacy encompasses individuals' knowledge and understanding of financial concepts, as well as their ability to apply this knowledge in practical decision-making contexts. It plays a crucial role in enabling individuals to manage their finances effectively, plan for the future, and respond to financial risks (6, 7). Early research demonstrated that individuals with higher levels of financial literacy are more likely to engage in sound financial practices, such as budgeting, saving, and investing, highlighting the strong link between financial knowledge and behavior (8).

Recent studies have further emphasized the importance of financial literacy in the context of rapidly evolving financial ecosystems. The integration of digital technologies, such as financial technology (FinTech), big data analytics, and artificial intelligence, has transformed the way individuals interact with financial systems. While these developments provide new opportunities for investment and financial inclusion, they also increase the complexity of financial decision-making, thereby intensifying the need for higher levels of financial literacy (9, 10). Moreover, financial literacy has been identified as a critical factor in enhancing financial resilience and reducing vulnerability to financial shocks, particularly in uncertain economic environments (11).

In addition to its direct effects, financial literacy may serve as a mediating mechanism through which cognitive abilities influence financial outcomes. Theoretical and empirical research suggests that cognitive skills, including verbal intelligence, contribute to the development of financial literacy, which in turn affects financial behavior and emotional responses. For instance, individuals with higher cognitive abilities are more likely to acquire and retain financial knowledge, thereby enhancing their financial literacy and reducing their susceptibility to financial anxiety (4). This mediating role highlights the importance of considering both cognitive and knowledge-based factors in understanding financial behavior.

Furthermore, financial literacy has been shown to influence a wide range of financial outcomes, including investment decisions, savings behavior, and entrepreneurial performance. Studies indicate that individuals with higher financial literacy are better equipped to allocate assets efficiently, manage risks, and achieve long-term financial goals (12, 13). In the context of entrepreneurship and small business management, financial literacy has

been identified as a key driver of sustainable performance and resilience, enabling individuals to navigate complex financial environments and respond effectively to market challenges (14, 15).

Moreover, financial literacy plays a significant role in promoting financial inclusion and reducing inequalities in access to financial services. In the digital age, the interaction between financial literacy and digital literacy has become increasingly important, as individuals must possess both sets of skills to effectively utilize financial technologies and participate in modern financial systems (16). Educational interventions and technological innovations, such as the use of generative artificial intelligence in financial education, have been proposed as effective strategies for enhancing financial literacy and improving financial outcomes (17).

Despite the extensive research on financial literacy and its outcomes, there is still a need to explore the underlying mechanisms through which cognitive abilities influence financial anxiety. While previous studies have examined the direct effects of cognitive factors on financial behavior, limited attention has been paid to the mediating role of financial literacy in the relationship between verbal intelligence and financial anxiety. Addressing this gap is particularly important in the context of emerging financial markets, where investors may face higher levels of uncertainty and information asymmetry.

Additionally, socio-demographic and psychological factors, such as gender differences, risk attitudes, and stereotype threats, have been shown to influence financial literacy and financial decision-making processes. For example, gender-based disparities in financial literacy may arise from differences in socialization and access to financial education, which in turn affect individuals' confidence and anxiety in financial contexts (18). These findings underscore the need for a comprehensive framework that integrates cognitive, educational, and psychological factors in explaining financial anxiety.

Recent empirical evidence has also highlighted the role of contextual and environmental factors in shaping financial behavior. Regulatory frameworks, institutional trust, and perceived financial risks can interact with individual-level characteristics to influence financial outcomes. For instance, financial literacy has been shown to moderate the relationship between financial regulations and financial misconduct, such as money laundering, indicating its broader implications for financial system stability (19). Similarly, the increasing reliance on digital financial platforms has raised concerns about security risks and the need for greater financial awareness among investors (10).

In educational contexts, financial literacy has been linked to learning outcomes and academic performance, particularly in the digital era where financial knowledge is increasingly integrated into broader educational frameworks (20). This highlights the importance of early and continuous financial education in equipping individuals with the skills necessary to navigate complex financial environments. Furthermore, assessments of financial literacy among different population groups reveal significant variations in knowledge levels, suggesting the need for targeted interventions to address these disparities (21).

Taken together, the existing literature indicates that financial anxiety is influenced by a complex interplay of cognitive abilities, financial knowledge, and contextual factors. Verbal intelligence, as a key cognitive resource, may enhance individuals' ability to acquire financial literacy, which in turn can reduce financial anxiety by increasing confidence and competence in financial decision-making. However, empirical evidence on this mediating mechanism remains limited, particularly in the context of stock market investors.

Therefore, the present study aims to investigate the effect of verbal intelligence on financial anxiety among investors, with a particular focus on the mediating role of financial literacy.

Methods and Materials

This study is applied in terms of purpose and descriptive–correlational in nature, conducted using a quantitative approach. The research strategy is based on the Tehran Stock Exchange and its investors, and the data were collected cross-sectionally. The primary objective of the study is to explain the causal relationships between verbal–linguistic intelligence and financial anxiety, as well as to examine the mediating role of financial literacy in these relationships.

In this study, the statistical population includes all investors in the Tehran Stock Exchange. Due to the large size and dispersion of the population, sampling was used instead of a full census, as sampling is more cost-effective, increases the speed of data collection, and enhances the accuracy and quality of the information.

To determine the sample size, Cochran's formula was applied, and the sample size was estimated at approximately 200 individuals. Considering the possibility of incomplete or defective questionnaires, 250 questionnaires were distributed both manually and online. After removing incomplete questionnaires, a total of 210 valid questionnaires were collected and used as the final sample for data analysis.

The data collection instrument was a researcher-developed questionnaire based on theoretical foundations and prior valid studies. The questionnaire consisted of three main constructs: verbal intelligence (12 items), financial literacy (12 items), and financial anxiety (10 items), measured using a five-point Likert scale. The content validity of the instrument was confirmed by experts in public sector accounting and auditing, and construct validity was assessed through convergent and discriminant validity. Reliability was also examined and confirmed using Cronbach's alpha and composite reliability (CR) (Table 1).

For data analysis, structural equation modeling (SEM) was employed using AMOS. In this process, the measurement model was first evaluated to assess construct fit, followed by estimation of the structural model to test the research hypotheses and direct and indirect effects (mediating role of financial literacy). Model fit indices and path coefficients were used to assess the significance of relationships. All statistical analyses were conducted using specialized structural equation modeling software.

Table 1. Reliability of Measurement Instrument

Variable	Cronbach's Alpha	Composite Reliability (CR)	Status
Verbal Intelligence	0.83	0.86	Acceptable (> 0.70)
Financial Literacy	0.88	0.91	Acceptable (> 0.70)
Financial Anxiety	0.81	0.84	Acceptable (> 0.70)

Findings and Results

The results obtained from the descriptive analysis of demographic characteristics are summarized in Table 2.

Table 2. Demographic Characteristics

Variable	Category	Frequency	Percentage
Gender	Male	152	72.4
	Female	58	27.6
Age	Under 30 years	32	15.2
	30 to under 40 years	88	41.9
	40 to under 50 years	66	31.4
	50 years and above	24	11.5
Education Level	Bachelor's	76	36.2
	Master's	108	51.4
	PhD	26	12.4
Work Experience	Less than 5 years	18	8.6

Familiarity with Stock Market Investment	5–10 years	46	21.9
	10–15 years	82	39.0
	15–20 years	38	18.1
	More than 20 years	26	12.4
	Low	38	18.1
	Moderate	96	45.7
	High	76	36.2
Total	—	210	100

The results related to the demographic characteristics of respondents indicate that the composition of the sample, in terms of gender, age, education, and work experience, is consistent with the actual composition of investors. The majority of respondents are male, hold a master's degree, have 10 to 15 years of work experience, and possess a relatively high level of familiarity with stock market investment. Therefore, the collected data are highly valid in terms of diversity and expertise for examining the relationships among verbal intelligence, financial anxiety, and financial literacy.

Initially, statistical assumptions were examined using kurtosis, skewness, and the Kolmogorov–Smirnov test to identify outliers, and subsequently, outliers were removed using the Mahalanobis test. Furthermore, the results of the Average Variance Extracted (AVE) and the Fornell–Larcker criterion were evaluated for all constructs, indicating acceptable and desirable discriminant and convergent validity for all research constructs (Tables 3 and 4).

Table 3. Average Variance Extracted (AVE) for Research Constructs

Construct	AVE	Acceptable Level
Verbal Intelligence	0.627	0.50
Financial Literacy	0.679	0.50
Financial Anxiety	0.610	0.50

Table 4. Fornell–Larcker Criterion for Discriminant Validity

Construct	1	2	3
Verbal Intelligence	0.792		
Financial Literacy	0.641	0.824	
Financial Anxiety	-0.438	-0.512	0.781

Based on the results in Table 4, the square root of AVE for each construct (values on the main diagonal) is greater than the correlations between that construct and other constructs. This confirms discriminant validity according to the Fornell–Larcker criterion.

It is also observed that the correlations between financial anxiety and other constructs are negative, which is consistent with the theoretical foundations of the study and the conceptual nature of the variables. Overall, the results indicate that the measurement model of the study possesses satisfactory discriminant validity.

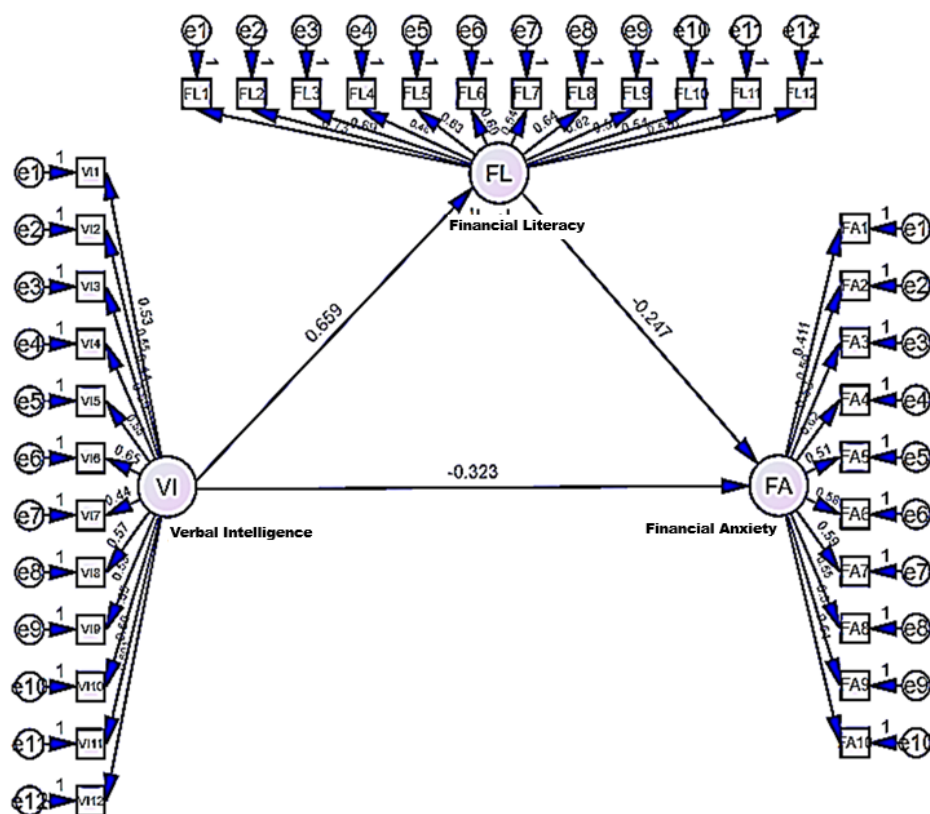


Figure 1. Fitted Research Model

To evaluate the goodness-of-fit of the structural model, a set of absolute, comparative, and parsimonious fit indices was employed, the results of which are presented in Table 5.

Table 5. Structural Model Fit Indices

Fit Index	Abbreviation	Acceptable Value	Model Value
Chi-square/df	χ^2/df	< 3	1.69
Root Mean Square Error of Approximation	RMSEA	< 0.08	0.064
Root Mean Square Residual	RMR	< 0.08	0.04
Non-Normed Fit Index	NNFI	> 0.90	0.97
Comparative Fit Index	CFI	> 0.90	0.96
Incremental Fit Index	IFI	> 0.90	0.97
Goodness of Fit Index	GFI	> 0.80	0.92
Adjusted Goodness of Fit Index	AGFI	> 0.80	0.88

The chi-square (χ^2) index, as one of the absolute fit indices, indicates the degree of discrepancy between the observed covariance matrix and the covariance matrix estimated by the model. The smaller the value of this index, the more satisfactory the model fit. Additionally, if the significance level of the χ^2 test is greater than 0.05, the model fit is considered ideal, and if it falls between 0.01 and 0.05, the model fit is regarded as acceptable. Given that the significance level of the chi-square for the present model lies within the range of 0.01 to 0.05, it can be concluded that the model fit is acceptable according to this index.

Another widely used index is the normed chi-square (χ^2/df), obtained by dividing the chi-square value by the model's degrees of freedom. Values between 1 and 3 generally indicate a good model fit. As shown in Table 5, the value of χ^2/df is 1.69, which reflects a satisfactory model fit.

Furthermore, the RMSEA value is 0.064 and the RMR value is 0.04, both of which are below the threshold of 0.08, indicating an acceptable estimation error of the model. In addition, the comparative and incremental fit indices, including NNFI (0.97), CFI (0.96), and IFI (0.97), all exceed the benchmark value of 0.90, demonstrating a good fit between the theoretical model and the empirical data. The goodness-of-fit indices GFI (0.92) and AGFI (0.88) are also within acceptable ranges.

Overall, considering the obtained values for the various fit indices and their consistency with standard thresholds, it can be concluded that the theoretical model of the study demonstrates a satisfactory and acceptable level of fit. Therefore, the next step involves examining the structural relationships and analyzing the path coefficients and regression coefficients among the latent variables.

Given the adequate fit of the measurement model, the research hypotheses were tested through examination of the structural model. In this regard, covariance-based structural equation modeling (SEM) was employed using AMOS. To test the hypotheses, standardized path coefficients, t-statistics, and significance levels were analyzed, and the results are presented in Table 6.

To test the hypotheses, both the P-value and the t-value were used. A relationship is considered statistically significant if the P-value is less than 0.05 or if the t-value exceeds ± 1.96 .

Table 6. Hypothesis Testing Based on the Structural Model

Hypothesis	Path	Path Coefficient	t-value	P-value	Result
H1	Verbal Intelligence → Financial Anxiety	-0.323	11.29	0.000	Supported
H2	Verbal Intelligence → Financial Literacy	0.659	6.23	0.000	Supported
H3	Financial Literacy → Financial Anxiety	-0.247	6.68	0.000	Supported
H4 (Mediating)	Verbal Intelligence → Financial Literacy → Financial Anxiety	0.335	7.39	0.000	Supported

Discussion and Conclusion

The findings of the present study provide a comprehensive understanding of the relationships among verbal intelligence, financial literacy, and financial anxiety among investors, and offer important theoretical and practical implications for financial behavior research. The results indicated that verbal intelligence has a significant negative effect on financial anxiety, suggesting that individuals with higher levels of verbal intelligence experience lower levels of anxiety in financial contexts. This finding aligns with prior research emphasizing the role of cognitive abilities in shaping individuals' emotional responses to complex decision-making environments. Specifically, individuals with stronger cognitive processing skills are better equipped to interpret financial information, assess risks, and make informed decisions, thereby reducing uncertainty and anxiety (3, 5). Moreover, this result is consistent with evidence showing that cognitive factors influence financial behaviors through their impact on individuals' confidence and perceived control over financial situations (2).

The negative relationship between verbal intelligence and financial anxiety can be further explained through the lens of information processing theory. Investors with higher verbal intelligence possess superior abilities in comprehension, reasoning, and analytical thinking, enabling them to decode complex financial information and avoid cognitive overload. This reduces ambiguity and enhances decision-making clarity, ultimately lowering anxiety levels. This finding is also in line with the work of (4), who demonstrated that cognitive abilities, particularly verbal intelligence, are inversely related to financial anxiety, highlighting the protective role of cognitive resources in financial decision-making contexts.

The results also revealed that verbal intelligence has a significant positive effect on financial literacy. This finding underscores the critical role of cognitive abilities in facilitating the acquisition and application of financial knowledge. Individuals with higher verbal intelligence are more capable of understanding financial concepts, interpreting financial data, and engaging with educational materials, which enhances their overall financial literacy. This result is consistent with previous studies that have established a strong link between cognitive functioning and financial literacy, indicating that individuals with higher cognitive abilities tend to exhibit higher levels of financial knowledge and competence (3, 6). Furthermore, this finding supports the argument that financial literacy is not solely a function of educational exposure but is also influenced by individuals' inherent cognitive capacities.

The positive relationship between verbal intelligence and financial literacy can also be interpreted in the context of the evolving financial landscape. As financial systems become increasingly complex due to technological advancements, individuals require advanced cognitive skills to navigate digital financial platforms and interpret sophisticated financial products. Studies have shown that the integration of artificial intelligence and big data in financial systems necessitates higher levels of financial literacy, which in turn depend on individuals' cognitive abilities (9, 17). Therefore, verbal intelligence plays a pivotal role in enabling individuals to adapt to the demands of modern financial environments.

In addition, the findings indicated that financial literacy has a significant negative effect on financial anxiety. This result highlights the importance of financial knowledge in reducing emotional distress associated with financial decision-making. Individuals with higher financial literacy are more confident in their ability to manage financial resources, assess risks, and make informed decisions, which reduces uncertainty and anxiety. This finding is consistent with prior research demonstrating that financial literacy enhances financial well-being and reduces financial stress by improving individuals' ability to cope with financial challenges (1, 7). Moreover, financial literacy has been shown to strengthen financial resilience and mitigate the adverse effects of economic shocks, further contributing to lower levels of financial anxiety (11).

The negative effect of financial literacy on financial anxiety can also be explained through behavioral finance theories, which emphasize the role of knowledge in reducing cognitive biases and emotional reactions. Financially literate individuals are less likely to rely on heuristics and more likely to engage in rational decision-making processes, which reduces the likelihood of anxiety-driven decisions. This finding is further supported by research indicating that financial literacy improves financial behaviors and promotes long-term planning, thereby reducing financial uncertainty and stress (8, 13).

One of the most significant contributions of this study is the confirmation of the mediating role of financial literacy in the relationship between verbal intelligence and financial anxiety. The results demonstrated that financial literacy significantly mediates this relationship, indicating that the effect of verbal intelligence on financial anxiety is partially transmitted through financial literacy. This finding provides empirical support for the theoretical framework suggesting that cognitive abilities influence financial outcomes indirectly through knowledge acquisition. In other words, individuals with higher verbal intelligence are more likely to develop higher levels of financial literacy, which in turn reduces their financial anxiety. This mediating mechanism is consistent with the findings of (4), who emphasized the intermediary role of financial literacy in linking cognitive abilities to financial outcomes.

The mediating role of financial literacy also highlights its strategic importance in financial education and policy interventions. While cognitive abilities such as verbal intelligence are relatively stable and difficult to modify, financial literacy can be enhanced through targeted educational programs and training initiatives. This suggests that

improving financial literacy can serve as an effective mechanism for reducing financial anxiety, even among individuals with lower cognitive abilities. Recent studies have emphasized the role of financial literacy in promoting financial inclusion and improving access to financial services, particularly in the context of digital financial systems (10, 16).

Furthermore, the findings of this study are consistent with broader empirical evidence highlighting the role of financial literacy in shaping financial behavior and outcomes. Financial literacy has been identified as a key determinant of investment decisions, asset allocation, and entrepreneurial performance, underscoring its importance in achieving financial stability and growth (12, 14). Additionally, research has shown that financial literacy contributes to the performance of small and medium-sized enterprises by enhancing financial management practices and decision-making capabilities (15).

The results of this study also contribute to the growing literature on the psychological dimensions of financial behavior by integrating cognitive and emotional perspectives. The interaction between verbal intelligence, financial literacy, and financial anxiety reflects a complex interplay of cognitive, educational, and psychological factors. This integrated approach provides a more comprehensive understanding of financial behavior and highlights the need for multidisciplinary research in this field. Moreover, the findings are consistent with studies examining the role of contextual factors, such as demographic characteristics and social influences, in shaping financial literacy and financial anxiety (18, 21).

In summary, the findings of this study confirm that verbal intelligence and financial literacy are critical determinants of financial anxiety among investors. Verbal intelligence reduces financial anxiety both directly and indirectly through its positive effect on financial literacy. Financial literacy, in turn, plays a central role in enhancing financial competence and reducing emotional distress in financial decision-making contexts. These results underscore the importance of integrating cognitive and educational interventions to improve financial outcomes and promote investor well-being.

One of the main limitations of this study is its cross-sectional design, which restricts the ability to infer causal relationships among the variables. Additionally, the reliance on self-reported data may introduce response bias, as participants may not accurately assess their levels of financial literacy or anxiety. The study is also limited to investors in a specific stock market context, which may affect the generalizability of the findings to other populations or financial environments. Furthermore, the measurement of verbal intelligence and financial literacy through questionnaire-based instruments may not fully capture the complexity of these constructs.

Future research should consider employing longitudinal designs to better examine causal relationships and changes in financial anxiety over time. It is also recommended to explore additional mediating and moderating variables, such as risk tolerance, personality traits, and technological literacy, to provide a more comprehensive understanding of financial behavior. Comparative studies across different cultural and economic contexts could offer valuable insights into the generalizability of the findings. Moreover, future studies may benefit from incorporating objective measures of cognitive ability and financial literacy to enhance the validity of the results.

From a practical perspective, the findings of this study highlight the importance of developing targeted financial education programs aimed at improving financial literacy among investors. Policymakers and financial institutions should prioritize initiatives that enhance individuals' understanding of financial concepts and decision-making skills. Educational interventions should also consider individual differences in cognitive abilities and provide tailored learning approaches to maximize effectiveness. Additionally, the integration of digital tools and technologies can

facilitate the delivery of financial education and improve accessibility. By addressing both cognitive and educational factors, stakeholders can contribute to reducing financial anxiety and promoting more informed and confident financial decision-making among investors.

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Authors' Contributions

All authors equally contributed to this study.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

All ethical principles were adhered in conducting and writing this article.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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