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THE HIDDEN FORCES OF INVESTMENT DECISION-MAKING: A PRISMA-BACKED SYSTEMATIC REVIEW OF BEHAVIORAL BIASES

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Abstract: Behavioral finance considers the irrational decisions of investors that differ from traditional and modern finance theories. This systematic review article examines the influence of behavioral biases on investment decisions and identifies specific biases and their effect on the investment choices of individual investors. The study included 29 peer-reviewed studies published in English between 2012 and May 2022 that objectively assessed behavioral biases and investment decisions in various contexts. Over 21 types of biases were identified, with overconfidence and herding bias being the most studied. The study population lacked diversity, highlighting a need for future research to include a more diverse group of investors and investigate the impact of behavioral biases in different contexts. Methodologically, the majority of previous studies were descriptive research that used quantitative methods and structured questionnaires to collect data. Correlation and regression analysis were used to analyze results, along with Structure Equation Modeling and various models for secondary data-based studies.

Keywords: behavioral finance, behavioral biases, irrational decisions, investment choices, overconfidence bias, herding bias, systematic review, quantitative methods, secondary data-based studies.

Introduction

Various research studies identified that investors do not behave always rationally while making investment decisions. With this idea, a new concept i.e. behavioral finance emerged in the area of finance and economics in the 1980s. Irrationality in human behavior can be found in the form of distinct behavioral biases and compares behavioral finance theories with traditional and modern finance theories. Nair and Antony (2015) viewed behavioral finance as not only a replacement for classical finance theories but also as a means to understand the irrational behavior of investors and the reasons for sudden growth and decline in the market. Behavioral finance proposes that the investment decision-making process is influenced by various behavioral biases that boost investors to deviate from rationality and take irrational investment decisions (Niehaus & Shrider, 2014). The present study is an extensive review of behavioral biases in individual investment decision-making (Taffler, Spence, & Eshraghi, 2017). After studying various pieces of literature, it was found that there is a need to conduct one study that carries a systematic review of behavioral biases (Kumar & Goyal, 2015). This made us curious to identify various biases studied in past. This systematic review article made an effort in identifying distinct behavioral biases and their influence on the investment decisions of investors.

The remaining study is structured as section 2 explains the method used in this systematic review, section 3 discussed the results of the study, section 4 deals with discussion, section 5 is about the limitations of this systematic review, and section 6 deals with the conclusion of the study.

MATERIALS AND METHODS Eligibility Criteria

All studies assessing the relationship between behavioral actors and investment decisions were eligible for this systematic review. The inclusion criteria were assessment of behavioral biases and investment decisions objectively (iv) Only open-access studies included (v) All types of documents, research papers, articles, etc. (vi) Subject included: Accounting, Business, Business Finance, Business Industry, Economics, Econometrics & Finance, and Finance & Management (vii) Database: Scopus, Taylor and Francis, and Web of Science.

Basis	Inclusion	Exclusion
Database	Scopus, Web of Science, and Taylor and Francis	All the databases except those mentioned in the inclusion
Study topic	Related to the association between biases and investment decisions.	Unfocused research topic
Study Language	Only English	Other than the English language
Time frame of the study	Published from 2012 to May 2022	Published before 2012.
Type of document	Research papers, articles, conference papers, working papers, etc.	Review article
Subject area	Accounting, Business, Business Finance, Business Industry, Economics, Econometrics & Finance, and Finance and Management	Other than mentioned in the inclusion

Previous studies were excluded from the systematic review if they were (i) assess the relationship between behavioral biases and investment decisions with some other factors (ii) review articles (iii) not published in peer-reviewed journals (iv) language other than English.

Information Source and Search

A literature search for the systematic review article was conducted in May 2022 including the databases viz., Scopus, Taylor and Francis, and Web of Science. Numerous searchers were conducted in the above-stated electronic databases and after performing various trials and errors the final search term for the study: “Behavioral Factors” OR “Behavioral Biases” OR
“Cognitive Biases” OR “Psychological Factors” AND “Invest* Decision”

Study Selection and Data Collection Processes

After performing the initial literature searches through various academic databases based on title, abstract, and keywords, the relevant studies were further assessed and screened considering the eligibility criteria for inclusion of the study in this systematic review. Detailed information about the selection of studies in this systematic review was presented in the PRISMA flow diagram (Figure 1).

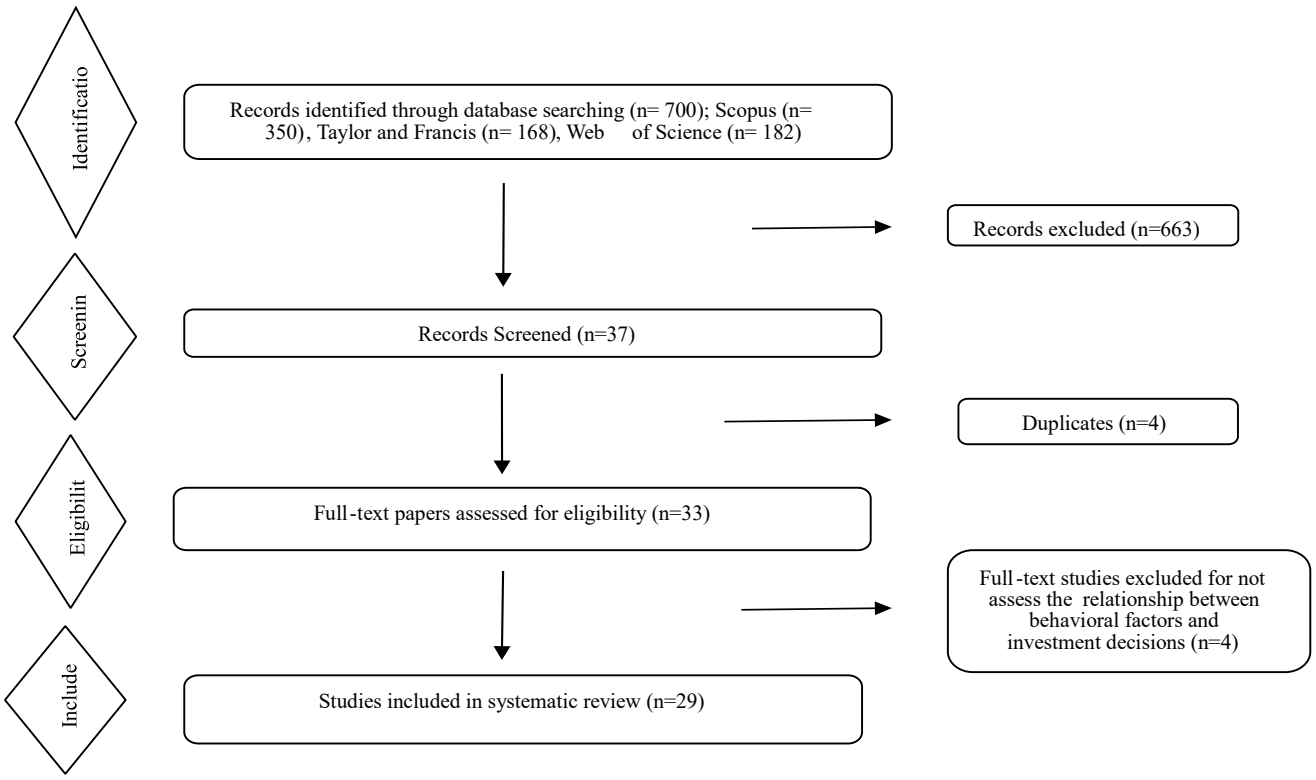

Figure 1. PRISMA flow diagram for the process of paper selection used in the systematic review study

RESULTS

Study Selection

A total number of 700 studies were identified in the process of initial search (Scopus, n= 350; Taylor and Francis, n= 168, and Web of Science, n= 182). After investigating the title, abstract, and keywords of all studies being searched through various databases (n=663) studies were excluded from the systematic review due to unsuitability for this study. Further, (n=4) studies were removed due to duplicates. As a result (n=33) studies were selected for the full-text eligibility phase of the study. Out of the studies selected for the eligibility of full text (n=4), studies were excluded due to not assessing the relationship between behavioral factors and investment decisions. Finally, (n=29) studies were selected for systematic review.

Study Characteristics

Information related to the general and specific properties of all included Studies (n=29) can be found in Tables 1, 2, and 3.

Table 1. Information regarding Country, context, and types of biases

Authors	Country	Context	Types of Biases deals
(Almansour, 2020)	UAE	Cryptocurrency market	Heuristic, herding, and prospect
(Abreu, 2019)	Portugal	Financial market (trade-in Warrants)	Overconfidence, gambling effect, and disposition effect
(Adil, Singh & Ansari, 2021)	India	Different financial products/ different investment avenues	Overconfidence, disposition effect, herding, and riskaversion
(Akgul & Cetin, 2021)	Turkey	Small-sized ship companies	Desirability bias, endowment effect, anchoring, overconfidence, status quo, bandwagon effect, and home bias

(Annamalah, Raman, Marthandan, & Logeswaran, 2019)	Malaysia	Mutual fund (Unit Trust)	Availability
(Bouteska & Regaieg, 2018)	Tunisia	Stock market	Disposition bias
(Gupta & Shrivastava, 2021)	India	Stock market	Herding and loss-aversion
(HALA, ABDULLAH, ANDAYANI, ILYAS, & AKOB, 2020)	Indonesia	Real assets and financial assets	Loss-aversion, herding, and overconfidence
(Hafez, 2021)	Egypt	Stock market	Overconfidence, disposition effect, loss, and regret aversion, representativeness, herding behavior, and gambler's fallacy
(Ullah & Elahi, 2014)	Pakistan	Stock market	Disposition effect, overconfidence, and herding
(KAMRAN, QAISAR, SULTANA, NAWAZ, & AHMAD, 2020)	Pakistan	Stock market	Representative, availability, and psychological bias
(KARTIKA, SAPUTRA, TJAHJANA, & MANURUNG, 2022)	Indonesia	Stock market	Overconfidence
(Khilar & Singh, 2019)	India	Capital Market	Overconfidence and disposition effect
(Kunjal & Peerbhai, 2021)	South Africa	Exchange-traded fund market	Overconfidence
(Madaan & Singh, 2019)	India	Stock market	overconfidence, anchoring, disposition effect, and herding behavior
(Mishra & Mishra, 2021)	India	Banking and Financial services	Herding
(Moueed & Hunjra, 2020)	Pakistan	Stock market	Herding
(Ng, Zhuang, Toh, Ong, & Teh, 2022)	China	Stock market	Herding
(Nurbarani & Soepriyanto, 2022)	Indonesia	Cryptocurrency market	Overconfidence and herd behavior
(Paisarn, Chancharat, & Chancharat, 2021)	Thailand	Stock market	Overconfidence
(Parveen, Satti, Subhan, & Jamil, 2020)	Pakistan	Stock market	Overconfidence and representative bias

(Prosad, Kapoor, & Sengupta, 2015)	India	Equity market	overconfidence, excessive optimism (pessimism), herd behavior, and the disposition effect
(Qasim, Hussain, Mehboob, & Arshad, 2019)	Pakistan	Stock market	Overconfidence and herding
(Rzeszutek, Szyszka, & Czerwonka, 2015)	Poland	Stock market	certainty effect, the sunk cost fallacy, and mental accounting
(Sharma & Firoz, 2020)	India	Capital market	Optimism, mental accounting, herding, and disposition effect
(Talwar, Talwar, Tarjanne, & Dhir, 2021)	Finland	Equity market	overconfidence and self-attribution, hindsight, herding, over-optimism, loss aversion, representativeness, mental accounting, and anchoring
(Winne, 2021)	Belgium	Stock market	Disposition effect
(Wu, Dutta, & Huang, 2018)	China	Mutual fund	Disposition Effect
(Zhdanov & Simonov, 2021)	Russia	Assets in portfolios	Familiarity Bias

Source: Author's compilation Table 2. Information regarding gender distribution, sample size, and target population

Authors	Gender Distribution	Sample size	Target Population
(Almansour, 2020)	12.50 percent female	112	Individual investors who invest in the cryptocurrency market in the United Arab Emirates (UAE)
(Abreau, 2019)	N/A	Database from the top three Portuguese, 52,768 investors in stocks, out of which 1,705 also trade warrants and the CAVM database identified 1,559 investors in securities.	Individual investors from the top three Portuguese banks, with a market share of 15% to 20%, a survey conducted by CMVM
(Adil, Singh & Ansari, 2021)	36.40 percent female	253	Individual investors of Delhi-NCR
(Akgul & Cetin, 2021)	N/A	31	Four consultants, three sale and purchase brokers, a secretary general, a director, and a research specialist from two different associations in Turkey, and 20 ship investors were interviewed

(Annamalah, Raman, Marthandan, & Logeswaran, 2019)	43.10 percent female	202	Unit Trust's investors in Malaysia
(Bouteska & Regaieg, 2018)	40 percent females	925	Tunisian investors
(Gupta & Shrivastava, 2021)	54 percent female	323	Retail investors in Gujarat, Maharashtra, Madhya Pradesh, and Chhattisgarh invested more in equity and mutual funds as compared to other avenues.
(HALA, ABDULLAH, ANDAYANI, ILYAS, & AKOB, 2020)	N/A	210	Real estate auction respondents at the State Assets and Auction Service Office Makassar, South Sulawesi, Indonesia.
(Hafez, 2021)	19 percent female	245	Individual investors in Egypt including small, medium, and professional investors of different brokerage firms in Egypt
(Ullah & Elahi, 2014)	3 percent female	348	Individual investors of the Karachi stock exchange
(KAMRAN, QAISAR, SULTANA, NAWAZ, & AHMAD, 2020)	15.33 percent female	300	Investors of Faisalabad in Pakistan
(KARTIKA, SAPUTRA, TJAHJANA, & MANURUNG, 2022)	34.72 percent female	386	Individual investors in Indonesia Stock Exchange
(Khilar & Singh, 2019)	46 percent female	91	Retail investors in the Bhubaneswar region
(Kunjal & Peerbhai, 2021)	N/A	55 South African ETFs including 49 listed and 6 delisted ETFs.	Samples were collected from ETFs that were registered on the Johannesburg Stock Exchange (JSE) and infront Analytics database.
(Madaan & Singh, 2019)	11.80 percent female	243	Investors of National Stock Exchange
(Mishra & Mishra, 2021)	N/A	54	The stock of constituent banks and financial services companies banking and financial sector listed in the National Stock Exchange
(Moueed & Hunjra, 2020)	N/A	470	Individual investors of the stock exchange from the Lahore, Karachi, Faisalabad, and Islamabad trading floors of PSX.

(Ng, Zhuang, Toh, Ong, & Teh, 2022)	N/A	N/A	China Stock Market Accounting Research (CSMAR) database and verified by the annual Shenzhen Stock Exchange Fact Book
(Nurbarani & Soepriyanto, 2022)	N/A	400	Individual Investors who have a cryptocurrency portfolio in the Greater Jakarta area (Jakarta, Bogor, Depok, Tangerang, and Bekasi)
(Paisarn, Chancharat, & Chancharat, 2021)	46.03 percent female	491	Individual investors who invest in various financial segments
(Parveen, Satti, Subhan, & Jamil, 2020)	N/A	446 retail investors and 301 companies	Individual investors of Karachi, Lahore, Islamabad, Rawalpindi, and Peshawar for primary data and secondary data collected through the business and industrial sector of Pakistan
(Prosad, Kapoor, & Sengupta, 2015)	35.40 percent females	401 individuals	Individual investors of Delhi/NCR
(Qasim, Hussain, Mehboob, & Arshad, 2019)	41 percent female	100	Bankers and individual investors in Pakistan
(Rzeszutek, Szyszka, & Czerwonka, 2015)	47.50 percent females	200 investors	100 retail investors of the Warsaw Stock Exchange and 100 students of the Warsaw School of Economics
(Sharma & Firoz, 2020)	26.90 percent female	400	Investors residing in Mumbai region
(Talwar, Talwar, Tarjanne, & Dhir, 2021)	0 percent female	351 for the quantitative study and 19 for the qualitative study	Millennial male investors of Finland who invest in the equity market for quantitative study and qualitative study millennial male investors through prolific academics.
(Winne, 2021)	8.87 percent female	17,364 individual investor	Belgian brokerage firm within the context of the MiFID regulation, daily lowest and highest prices coming from Eurofidai and Bloomberg
(Wu, Dutta, & Huang, 2018)	N/A	170 funds	143 domestic stock funds and 27 domestic balanced funds (period: 2008-2012)

(Zhdanov & Simonov, 2021)	N/A	255 respondents completed 510 online tests.	Russian speakers from Russia, Ukraine, and other post-Soviet countries around the world

Source: Author's compilation

Table 3. Information regarding data collection, tools and results, and conclusion

Authors	Data collection method	Tools used for Analysis	Results and Conclusion
(Almansour, 2020)	Structured Questionnaire; Snowball sampling technique	Descriptive statistic, multiple regression analysis	The result reflects that investors in the cryptocurrency market are prone to prospect factors and it plays an important role in making their investment decision. The study also found that herding and heuristic factors also impacted the investors' decisions in the cryptocurrency market.
(Abreu, 2019)	Secondary data	Probit model, count model, ordinal least square, and quantile regression model	The behavioral characteristics of investors investing in warrants are different from those who invest in stocks. Disposition effect, gambling effect, and overconfident investors are more likely to invest and trade in warrants.
(Adil, Singh & Ansari, 2021)	Structured Questionnaire; a mixture of judgment and snowball sampling	Pearson correlation and hierarchical regression analysis	The results of the study show that amongst male investors, the influence of herding and risk-aversion on investors' investment decisions was negative and statistically significant, whereas the influence of overconfidence on investment decisions was positive and significant. However, the effect of disposition was found statistically insignificant. Researchers also found that amongst female investors the effect of herding and risk-aversion on investment decisions was the same as that of males. However, the influence of the disposition effect and overconfidence was statistically insignificant on investment decisions. The moderation effect of financial literacy between overconfidence and investment decision amongst male investors was significantly significant. However, the moderation of financial literacy with the remaining three biases was found insignificant. The results of moderation of financial literacy with

			overconfidence, herding, disposition, and risk-aversion were found statistically significant amongst female investors.
(Akgul & Cetin, 2021)	Semi-structured interview; snowball sampling technique	The systematic approach of Wolcott (1994) and the action flows proposed by Miles and Huberman (1994)	Various behavioral factors affect ship investors while making their investment decisions. The study identifies the factors affecting the investment decisions of ship investors are ship finance, profile and business models of ship investors, market timing, and ship specifications. And all these factors of investment decisions are impacted by most behavioral biases.
(Annamalah, Raman, Marthandan, & Logeswaran, 2019)	Structured Questionnaire; Convenient sampling method	Descriptive statistic, Correlation, Regression analysis	The study found a strong association between availability and investment behavior of investors. As a strong relationship was found, Availability influences the investment decisions made by unit trust investors.
(Bouteska & Regaieg, 2018)	Secondary Data from January 2009 to September 2014	Weighted average cost method, Mann-Whitney U test, Regression analysis	The findings show that female and mature investors suffer weak disposition bias as compared to male and young investors. The result also shows that the disposition effect is more pronounced in a bull market than in a bear market.
(Gupta & Shrivastava, 2021)	Structured Questionnaire; Purposive sampling method	Factor analysis, partial least square structural equation modeling	The result reveals shows that the investment decisions of retail investors are significantly influenced by both herding and loss-aversion bias. The results also identify that the mediating role of Fear of missing out (FOMO) on the relationship of herding and loss-aversion with investment decisions amplified significantly.

(HALA, ABDULLAH, ANDAYANI, ILYAS, & AKOB, 2020)	Structured Questionnaire; Purposive sampling technique	PLS-SEM	Loss-aversion has a positive and significant effect on investment decisions. Negative and significant influence was found in the case of herding as an intervening variable between loss-aversion and investment decisions. No significant association was found between overconfidence and investment decisions. Researchers also concluded that investment in the real assets sector required more complicated decisions than financial assets.
(Hafez, 2021)	Structured questionnaire; a survey by distribution questionnaire and conducting the interview	Descriptive statistic, multiple regression analysis	The study found that before COVID-19, overconfidence, disposition effect, loss and regret aversion, representativeness, and herding have a significant and positive effect on Egyptian investors' decisions. However, the gambler's fallacy does not affect significantly. Egyptian investors are overconfident, slightly regret-averse, and moderately loss-averse. Loss and regret aversion negatively affected the investment decisions of Egyptian investors. After COVID-19, herding behavior and gambler's fallacy do not affect the investment decisions of Egyptian investors. Researchers also conclude that behavior finance theory is valid before the pandemic and not valid after the pandemic in the Egyptian stock market.
(Ullah & Elahi, 2014)	Structured Sampling questionnaire; Convenient technique	Descriptive analysis, t-test, correlation, multiple regression analysis, two stages least square method	Based on the types of investors the result reflects that active investor shows overconfidence bias whereas passive investors show herding bias while making investment decisions. The result found that overconfidence and herding exist in KSE whereas the disposition effect does not exist in KSE. Researchers also identify that all three biases have a positive and significant relationship with investment decision-making. All the biases significantly impacted the investment decisions made by investors. Investors' type shows no moderating contribution between

			disposition effect and investment decision, negative moderating contribution between herding and investment decisions, and positive moderating contribution between overconfidence and investment decisions.
(KAMRAN, QAISAR, SULTANA, NAWAZ, & AHMAD, 2020)	Structured Questionnaire	Structural equation modeling (SEM-PLS)	The study found a positive impact of representative and availability biases on investors' investment decisions. No significant impact of psychological bias was found on investment decisions. Researchers could not find any moderating role of locus of control between any biases and investment decisions.
(KARTIKA, SAPUTRA, TJAHJANA, & MANURUNG, 2022)	Structured Online Questionnaire; survey	SEM	Researchers found that there is a positive and significant effect of overconfidence on stock investment decisions. It is also found that there is no significant relationship between overconfidence and investment decisions by taking the year of investment as a moderating variable.
(Khilar & Singh, 2019)	Questionnaire; Judgment and snowball sampling method	Descriptive statistics, Correlation	The study found that overconfidence is the most pronounced bias found among retail investors in the Bhubaneswar region of Odisha. The study also found that investors use media reporting while making investment decisions and they are also influenced by the disposition effect.
(Kunjal & Peerbhai, 2021)	Secondary data from November 2000 to October 2005	Vector Auto Regression (VAR) models, impulse response functions	The findings of this study reveal that overconfidence is present in investors' investment decisions in both markets. Overconfidence bias also influences the trading activities of individual investors at ETFs.
(Madaan & Singh, 2019)	Structured questionnaire; convenient sampling technique	Correlation, Regression Analysis	The result shows that herding and overconfidence significantly influence the investment decisions of investors whereas the disposition effect and anchoring do not have a significant impact on investors' investment decisionmaking.

(Mishra & Mishra, 2021)	Secondary data	Quantile Regression Model, descriptive statistic, GARCH model	The researchers did not identify the presence of herding in extreme market conditions amid the pandemic when full market return data were used by investors. Herding was detected during the pandemic in banking and financial services during the bull market conditions.
(Moueed & Hunjra, 2020)	Structured Questionnaire; Purposive sampling technique	Confirmatory factor analysis, structural equation model	Researchers found that herding is negatively correlated to investment decisions as well as mediating variable risk perception of investors in the Pakistan Stock Exchange.
(Ng, Zhuang, Toh, Ong, & Teh, 2022)	Secondary data from January 2015 to December 2019	cross-sectional absolute deviation (CSAD) model, descriptive statistics, CSAD regression model, robustness test	The findings of the study indicate the presence of herding in the whole ChiNext market as well as during the up and down states of markets, respectively. Herding is more likely to be present among retail investors instead of institutional investors.
(Nurbarani & Soepriyanto, 2022)	Structured Questionnaire;	Partial least square (PLS)	Overconfidence has a significant positive effect on investment decisions in the cryptocurrency market. Social demography moderating variables in gender, education, occupation, age, and investment experience did not moderate the relationship between overconfidence and investors' investment decisions. Herd behavior has a positive but not significant effect on investment decisions made by investors in the cryptocurrency market. The same result has been found in the case of moderation as in the case of overconfidence.
(Paisarn, Chancharat, & Chancharat, 2021)	Structured Questionnaire; Survey-based technique	Descriptive statistics, various Logistic regression	The study found that individual characteristics and dimensions of psychological and behavioral patterns have strong impacts on investment decisions. Researchers also identify that biases are common among investors and that women are less overconfident than men.
(Parveen, Satti, Subhan, & Jamil, 2020)	Structured Questionnaire for primary data and secondary	Regression, F-square, mediation analysis, structural model assessment	The study found that all the biases prevail not only at the aggregate level of PSE but also in individual investors. The study also found that overconfidence is statistically significant as a mediator.

	data from PSE and the website of business reorder		
(Prosad, Kapoor, & Sengupta, 2015)	Structured Questionnaire; a combination of judgment and snowball sampling	Chi-square test, Independent sample t-test, discriminant analysis, and one sample ttest	There is a presence and impact of behavioral biases among investors. The result shows that the behavioral biases depend on investors' trading sophistication as well as the demographic of investors. Age, Profession, and trading frequency are the highest influencing factors among the demographic variables. Men are more confident and optimistic than females. Trading frequency and trading experience are prone to all behavioral biases.
(Qasim, Hussain, Mehboob, & Arshad, 2019)	Structured Questionnaire; Convenience Sampling method	Descriptive statistic, correlation, and linear regression analysis	There is a positive relationship between overconfidence and investment decisions and herding and investment decision. The result also shows a positive impact of overconfidence and herding on the investment decisions of investors in Pakistan.
(Rzeszutek, Szyszka, & Czerwonka, 2015)	Structured Questionnaire; Convenient sampling technique	Chi-square test	Experience does not help investors to make more rational investment decisions but it shows that they are susceptible to behavioral biases. Investors who casually invest also show a strong degree of susceptibility toward behavioral biases.
(Sharma & Firoz, 2020)	Structured Questionnaire; Snowball sampling technique	Factor Analysis, Descriptive statistic, correlation, and regression analysis	The study found that while making investment decisions, investors are prone to these behavioral biases. Only herding has a significant relationship with one of the components of investment decision-making which is demand identification, while information search shows a strong positive association with mental accounting and optimism. Additionally, researchers also found that only the disposition effect has a significant

			relationship with evaluating alternative components of the decision-making process.
(Talwar, Talwar, Tarjanne, & Dhir, 2021)	Structured Questionnaire; Online survey method used; for qualitative study open-ended essay was conducted	Covariance-based-SEM, variance-based-SEM, artificial neural networks, post hoc qualitative method	The result of both quantitative studies as well as qualitative studies indicates that all biases except over-optimism exist in investment decisions made by investors. As per order herding is the most influential, then hindsight, then overconfidence, then representativeness, then mental accounting, and the other two biases Viz., anchoring, and loss-aversion slightly influence the trading activity of investors. The same pattern follows in the case of recommendation intentions also. The study also reveals that the influence of biases is more in their trading activity decisions compared to recommendation intentions to others. A post hoc study indicates that mental accounting and lossaversion have a substantial influence on recommendation intention. The qualitative study also reveals that most of the biases observed at the beginning of the pandemic continue with its advancement in millennials' investment decisions.
(Winne, 2021)	Secondary data	Descriptive statistics, Weber and Camerer model, Odean model, Pearson and Spearman correlations, logit regression, Cox proportional hazards model	The results are aligned with previous results but are more robust than the disposition effect present in the financial market. Trading activity and financial literacy slightly mitigate the disposition effect.

(Wu, Dutta, & Huang, 2018)	Secondary Data used (Monthly data used for analysis)	Multiple Regression	Investors in the mutual fund markets exhibit the disposition effect. In the Bull market stock fund, investors show the disposition effect whereas, in the Bear market, neither stock fund investors nor balanced fund investors exhibit the disposition effect. Researchers also found that in the Neutral market overall all types of investors exhibit the disposition effect.
(Zhdanov & Simonov, 2021)	An experiment in the form of investment games	Kurtosis, two-Welch's sample t-test	A familiarity bias reinforces individual investors' decision hesitant to realize losses. Individual investors prefer to buy fallen assets, especially when the assets were familiar to them as compared to unfamiliar assets.

Source: Author's compilation

Country in which the Data were collected

Concerning the geographical characteristics of the studies included in this systematic review, seven studies from India (Adil, Singh &Ansari, 2021); (Gupta & Shrivastava, 2021); (Khilar & Singh, 2019); (Madaan & Singh, 2019); (Mishra & Mishra, 2021); (Prosad, Kapoor, & Sengupta, 2015) and (Sharma & Firoz, 2020), five from Pakistan (Ullah & Elahi, 2014); (KAMRAN, QAISAR, SULTANA, NAWAZ, & AHMAD, 2020); (Moueed & Hunjra, 2020); (Parveen, Satti, Subhan, & Jamil, 2020) and (Qasim, Hussain, Mehboob, & Arshad, 2019), three from Indonesia (HALA, ABDULLAH, ANDAYANI, ILYAS, & AKOB, 2020); (KARTIKA, SAPUTRA, TJAHJANA, & MANURUNG, 2022) and (Nurbarani & Soepriyanto, 2022), two from China (Ng, Zhuang, Toh, Ong, & Teh, 2022) and (Wu, Dutta, & Huang, 2018) rest of the studies from different countries viz., Belgium, Egypt, Finland, Malaysia, Poland, Portugal, Russia, South Africa, Thailand, Tunisia, Turkey, and UAE.

Context

This systematic review studies included the majority of the studies regarding the association between behavioral factors and investment decisions in the context of the stock market or equity market or capital market, except some of the studies. Two of the studies were in the context of Cryptocurrency (Almansour, 2020) and (Nurbarani & Soepriyanto, 2022). One of the studies was in the context of different investment avenues and options available for investors (Adil, Singh & Ansari, 2021). One of the studies was in the context of investment in small-sized ship companies (Akgul & Cetin, 2021). Two studies were in the context of mutual funds (Annamalah, Raman, Marthandan, & Logeswaran, 2019) and (Wu, Dutta, & Huang, 2018). One study was in the context of real assets and a comparison between investment in real assets and financial assets (HALA, ABDULLAH, ANDAYANI, ILYAS, & AKOB, 2020). All the remaining studies were in the context of the stock market or they were somehow related to the stock market.

Types of Biases

Regarding the types of biases, this systematic review identifies various types of biases the previous studies deal with or study about. There were approximately 21 types of biases that were previously studied by various researchers and academicians. Most of the previous studies dealt with overconfidence and herding bias.

Participants

This systematic review study included a total number of 6,802 participants from the primary source of data collection and the majority of the population included in the previous studies were male than female samples. All the studies included adult samples apart from a study that includes both adult as well as student samples for their study (Rzeszutek, Szyszka, & Czerwonka, 2015). One of the studies uses the composition of consultants, sales and purchase brokers, secretary general, director, and research specialist (Akgul & Cetin, 2021). One study also includes small, medium, and professional investors of different brokerage firms (Hafez, 2021). One study also comprises bankers with individual investors as a sample of their study (Qasim, Hussain, Mehboob, & Arshad, 2019). A study recruited only millennial male participants in their study (Talwar, Talwar, Tarjanne, & Dhir, 2021). The participants of one of the studies were Russian speakers around the world (Zhdanov & Simonov, 2021).

Methodological Features

Regarding methodological features being adapted from previous studies, this systematic review article identified that most of the previous studies were descriptive research and used quantitative methods. Some of the studies also used crosssectional data for the attainment of the objectives of the research. Structured questionnaires were used by researchers for collecting the data and measuring hypotheses objectively. Most of the studies used correlation and regression for the analysis of results. Previous studies also used Structure Equation Modeling (SEM). Secondary data-based studies used various models for the analysis of results.

Risk of Bias

Concerning the procedure of assessing the risk of sampling bias, approximately all the previous studies were found biased in the case of sampling, as they follow non-probability sampling techniques for collecting their samples. Most of the primary data-based studies use snowball, convenient, purposive sampling techniques for collecting data. One of the studies used experimental methods in form of investment games for collecting data (Zhdanov & Simonov, 2021). One study used only male samples and female respondents were completely ignored (Talwar, Talwar, Tarjanne, & Dhir, 2021).

DISCUSSIONS

The present systematic reviews article various peer-reviewed published research papers investigating the association between behavioral biases and investment decisions. All the studies included in this systematic review article reflects the presence of behavioral biases while making investment decision by investors and found more or less every investor are prone to various biases in the process of investment decision-making. This systematic review also extracted data from reviewed studies including (i) data collected from countries (ii) context (iii) types of biases deals (iv) characteristics of participants (v) information regarding sample (vi) risk of bias, and (vii) methodological features.

In respect of geographical dispersion, (n=21) studies were conducted in parts of Asia, and the rest of the studies were in different parts of the world. In terms of the context of the market, the previous studies deals (n=19) studies deal with the stock market/equity market/capital market and the rest of the studies deal with cryptocurrency, mutual funds, real assets, banking, and financial services, and different investment avenues available for investment. With regards to the types of biases in the previous studies, the majority of the studies (n=26) investigate the relationship between overconfidence, herding, and disposition effect with investment decisions as combined or individually or by combining with other biases. Other types of biases dealt with in the previous studies are gambling effect, risk-aversion, Desirability bias, endowment effect, anchoring, status quo, Bandwagon effect, home bias, Availability, loss-aversion, loss-aversion, psychological bias, excessive optimism (pessimism), certainty effect, the sunk cost fallacy, and mental accounting, hindsight and Familiarity

Bias. More specifically, the previous research comprised fewer female participants than males, individual investors of their respective markets rather than experts in the field. One of the studies used only male participants and ignore the female investors completely (Talwar, Talwar, Tarjanne, & Dhir, 2021). Regards of the sample size taken in the previous studies included in this systematic review range from 91 to 925. The average sample size comes to 235 after considering 6,802 participants in (n=29) studies.

With regards to the risk of bias in the studies, the systematic review found that more or less every study was prone to sampling bias as they used non-probability sampling techniques for collecting data. Most of the studies used snowball sampling, convenient sampling, and purposive sampling for the collection of data. In terms of methodological features, previous studies were based on primary data using structured questionnaires for data collection. The majority of the studies employed correlation and regression for investigating the relationship between behavioral biases and investment decisions. Previous studies also used SEM for the analysis of results. The previous studies based on secondary used various models and regression for the analysis of results.

The main objective of this systematic review article was to identify studies investigating the association between behavioral biases and investment decisions. The result of the systematic review article demonstrated that 21 distinct biases have been investigated with investment decisions are given below.

Table 4. Behavioral Biases and their association with Investment Decisions

Biases	Results (Association between Biases and Investment Decisions)	Related study
Overconfidence/ Self attribution	Positive and significant relation/ significant relation/ significant impact	(Almansour, 2020); (Abreu, 2019); (Adil, Singh & Ansari, 2021); (Akgul & Cetin, 2021); (Hafez, 2021); (Ullah & Elahi, 2014); (KARTIKA, SAPUTRA, TJAHJANA, & MANURUNG, 2022); (Khilar & Singh, 2019); (Kunjal & Peerbhai, 2021); (Madaan & Singh, 2019); (Nurbarani & Soepriyanto, 2022); (Paisarn, Chancharat, & Chancharat, 2021); (Parveen, Satti, Subhan, & Jamil, 2020); (Prosad, Kapoor, & Sengupta, 2015); (Qasim, Hussain, Mehboob, & Arshad, 2019); (Talwar, Talwar, Tarjanne, & Dhir, 2021)
	No significant relation/ No significant impact	(Adil, Singh & Ansari, 2021); (HALA, ABDULLAH, ANDAYANI, ILYAS, & AKOB, 2020)
	Males are more confident than females	(Paisarn, Chancharat, & Chancharat, 2021); (Prosad, Kapoor, & Sengupta, 2015)

	The significant moderating effect of Financial literacy in males and females	(Adil, Singh & Ansari, 2021)
	The positive moderating effect of Investor Type	(Ullah & Elahi, 2014)
	No moderating role of Year of Investment	(KARTIKA, SAPUTRA, TJAHJANA, & MANURUNG, 2022)
	No moderating effect of Social Demographic	(Nurbarani & Soepriyanto, 2022)
Herding	Significant relation/ Significant and positive relation/ significant impact	(Almansour, 2020); (Gupta & Shrivastava, 2021); (Hafez, 2021); (Ullah & Elahi, 2014); (Madaan & Singh, 2019); (Mishra & Mishra, 2021); (Ng, Zhuang, Toh, Ong, & Teh, 2022); (Prosad, Kapoor, & Sengupta, 2015); (Qasim, Hussain, Mehboob, & Arshad, 2019); (Talwar, Talwar, Tarjanne, & Dhir, 2021)
	Significant and negative	(Adil, Singh &Ansari, 2021); (Moueed & Hunjra, 2020)
	Positive but not significant effect	(Nurbarani & Soepriyanto, 2022)
	No significant relation/ Not significant impact	(Hafez, 2021); (Mishra & Mishra, 2021)
	Negative and significant as an intervening variable between loss-aversion and investment decision	(HALA, ABDULLAH, ANDAYANI, ILYAS, & AKOB, 2020)
	The moderating effect of Financial literacy is insignificant in the case of males and significant in the case of females	(Adil, Singh & Ansari, 2021)
	Negative moderation effect of Investor Type	(Ullah & Elahi, 2014)
	Negatively correlated with mediating variable risk perception	(Moueed & Hunjra, 2020)
	No moderating effect of Social Demographic	(Nurbarani & Soepriyanto, 2022)
	The significant mediating effect of FOMO	(Gupta & Shrivastava, 2021)
Disposition Effect	Positive and significant relation/ significant relation/ significant impact	(Almansour, 2020); (Abreu, 2019); (Bouteska & Regaieg, 2018); (Hafez, 2021); (Ullah & Elahi, 2014); (Khilar & Singh, 2019); (Prosad, Kapoor, & Sengupta, 2015); (Sharma & Firoz,

		2020); (Winne, 2021); (Wu, Dutta, & Huang, 2018)
	Insignificant relation/ No significant impact	(Adil, Singh & Ansari, 2021); (Madaan & Singh, 2019);
	The moderating effect of Financial literacy is insignificant in the case of males and significant in the case of females	(Adil, Singh & Ansari, 2021)
	Weak effect on female and mature investors than male and young investors	(Bouteska & Regaieg, 2018)
	No moderating effect of Investor Type	(Ullah & Elahi, 2014)
	Different types of mutual fund markets and different types of investors exhibit different results	(Wu, Dutta, & Huang, 2018)
Gambling Effect/ Gambler Fallacy	Significant relation/ significant impact	(Abreu, 2019)
	Insignificant relation/ no significant impact	(Hafez, 2021)
	The negative and significant relation	(Adil, Singh & Ansari, 2021)
	The moderating effect of Financial literacy is insignificant in the case of males and significant in the case of females	(Adil, Singh & Ansari, 2021)
Desirability Bias	Significant relation/ an impact/ affect	(Akgul & Cetin, 2021)
Endowment Effect	Significant relation/ an impact/ affect	(Akgul & Cetin, 2021)
Anchoring	Significant relation/ an impact/ affect	(Akgul & Cetin, 2021); (Talwar, Talwar, Tarjanne, & Dhir, 2021)
	Insignificant relation/ no significant impact	(Madaan & Singh, 2019)
Status quo	Significant relation/ an impact/ affect	(Akgul & Cetin, 2021)
Bandwagon Effect	Significant relation/ an impact/ affect	(Akgul & Cetin, 2021)
Home bias	Significant relation/ an impact/affect	(Akgul & Cetin, 2021)
Availability	Strong relationship/significant influence/ positive impact	(Annamalah, Raman, Marthandan, & Logeswaran, 2019); (KAMRAN, QAISAR, SULTANA, NAWAZ, & AHMAD,

		2020)
	No moderating effect of locus of control	(KAMRAN, QAISAR, SULTANA, NAWAZ, & AHMAD, 2020)
Loss-aversion	Positive and Significant effect/significant influence	(Gupta & Shrivastava, 2021); (HALA, ABDULLAH, ANDAYANI, ILYAS, & AKOB, 2020); (Hafez, 2021); (Talwar, Talwar, Tarjanne, & Dhir, 2021)
	Negative and significant in of herding as an intervening variable	(HALA, ABDULLAH, ANDAYANI, ILYAS, & AKOB, 2020)
Regret-aversion	The significant and positive effect	(Hafez, 2021)
Representativeness	Positive and significant effect/ significant relation/ positive impact	(Hafez, 2021); (KAMRAN, QAISAR, SULTANA, NAWAZ, & AHMAD, 2020); (Parveen, Satti, Subhan, & Jamil, 2020); (Talwar, Talwar, Tarjanne, & Dhir, 2021)
Psychological Bias	No significant impact	(KAMRAN, QAISAR, SULTANA, NAWAZ, & AHMAD, 2020)
Excessive optimism (Pessimism)/ overoptimism/ optimism	Significant relation/ significant impact	(Prosad, Kapoor, & Sengupta, 2015); (Sharma & Firoz, 2020); (Talwar, Talwar, Tarjanne, & Dhir, 2021)
	Males are more optimistic than females	(Prosad, Kapoor, & Sengupta, 2015)
Certainty Effect	Significant relation/significant affect	(Rzeszutek, Szyszka, & Czerwonka, 2015)
	The experience of investors does not help in rational decision-making	(Rzeszutek, Szyszka, & Czerwonka, 2015)
Sunk cost fallacy	Significant relation/significant affect	(Rzeszutek, Szyszka, & Czerwonka, 2015)
	The experience of investors does not help in rational decision-making	(Rzeszutek, Szyszka, & Czerwonka, 2015)
Mental accounting	Significant relation/significant affect	(Rzeszutek, Szyszka, & Czerwonka, 2015); (Sharma & Firoz, 2020); (Talwar, Talwar, Tarjanne, & Dhir, 2021)
Hindsight	Significant relation/significant affect	(Talwar, Talwar, Tarjanne, & Dhir, 2021)
Familiarity Bias	Significantly affect	(Zhdanov & Simonov, 2021)

Source: Author's compilation

From the above table, it can also be identified that some of the variables were used as a moderator between behavioral biases and investment decisions viz., financial literacy, investor type, year of investment, social demographic attributes, and Locus of control, and some variables were used as a mediator between behavioral

biases and investment decisions viz., risk perception and Fear Of Missing Out (FOMO). Some of the biases found a significant impact of moderation and mediation between behavioral biases and investment decisions where as some found no role of moderation and mediation between behavioral biases and investment decisions.

Finally, this systematic review identified various limitations in the previous studies and can be broadly grouped into two types: (i) sampling technique, and (ii) gender distribution. Attention should be dragged by researchers while considering the topic related to behavioral biases and investment decisions to improve the quality of the research published in the field of behavioral finance/ behavioral economics and its allied subjects.

Research Gap Identified

After performing such a thorough literature survey, it was found that most of the studies in the literature related to the topic are found in the area of the stock exchange and mutual funds. Some studies are also found in the field of real estate. Recently investment behavior of investors in the cryptocurrency market also became a hot topic for researchers. So, it is a need of the hour to include other areas also like Life Insurance, Pension funds, etc while understanding the behavior of investors. Very limited studies are found in these areas. It was also found that no cross-sectional studies are found in this field of research. Comparative study of investors investing in different avenues is also not given focus in this area of research. This systematic review also identified that most of the previous studies used non-probability sampling for the collection of data and very limited studies used probability sampling techniques in their study. Most of the studies used proportionate samples in regards to males and females and uses a larger number of male samples than female samples. Most of the previous studies used common biases like overconfidence bias, herding, disposition effect, etc., and neglect some other biases which also affect the decisions of investors. So, these gaps can be fulfilled by researchers in near future, and in this systematic review, we try to undertake these topics in their eyes to bridge the gaps found in the previous pieces of literature.

CONCLUSIONS

As a concluding remark, the findings obtained from this systematic review make evidence that the investment decisions of investors are affected by various types of biases. There are a lot of works mainly on three types of biases viz., overconfidence, herding, and the disposition effect. A lot of work has been done in the context of behavioral biases affecting the investment decisions of investors in the capital market/ stock market/ equity market. This systematic review found 21 types of biases affecting the investment decisions of investors. The study also found that there are few females included in the study who are unable to exhibit a true and fair picture of investors' behavior in the market. The studies identified that behavioral biases have a significant or insignificant effect on investment decisions depending upon the area of investment and population target. The cryptocurrency market is an emerging financial market, recent research is also found related to this context.

Future Research Directions

Further research can be carried out by researchers in various other contexts like Pension funds, life insurance, gold, bitcoins, etc. as there is a very less number of studies undertaken in these areas. It is also necessary to understand the investment behavior of investors investing in different avenues other than the stock market and mutual funds, researchers also need to carry out their research in the above-mentioned context. Future research can also be undertaken in comparing the investment behavior of investors investing in the same avenues but belonging to different countries of the same continent. Even researchers can also compare the investment behavior of investors residing in different continents but investing in the same avenues. This will help to understand the cultural differences, values, opinions, and knowledge of investors from different countries and

continents. Further moderation and mediation effect can also be assessed by including other variables in the study and assessing the effect of moderation and mediation of the same variable among different biases.

Limitations

Despite the ample search across various databases, some important studies might be missed due to including only selected databases searching for specific terms having open access studies published in the English language. Additionally, some related studies might also be missed due to including only peer-reviewed articles. Further studies should be undertaken by researchers by broadening the search term and including more databases and studies published in other languages.

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