NEURO-SEM UNVEILED: MAPPING BRAIN, BEHAVIOR, AND DECISION-MAKING

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ABSTRACT

The study aims to explore the intricate relationships between brain activity, behavioral processes, and decision-making using structural equation modeling (SEM) techniques. While existing research has advanced our understanding of these domains, gaps remain in synthesizing neurocognitive and behavioral factors in a unified framework. The primary objective of the study is to examine the neural mechanisms underlying decision-making and behavior, focusing on how brain function influences both cognitive and emotional decision processes. By integrating insights from neuroimaging, behavioral analysis, and decision theory, the study presents a novel approach to mapping these interconnected systems through SEM. The findings indicate significant associations between brain structures and behavioral outcomes, such as emotion regulation, impulsivity, and decision-making biases. Moreover, the study highlights contrasting evidence regarding the role of brain areas in cognitive flexibility and decision consistency, pointing to unresolved questions in neurocognitive models of decision-making. Key trends identified include the increasing use of neuroimaging and SEM to bridge the gap between neurological and behavioral research, alongside emerging methodologies to assess the dynamic interaction between cognitive processes and decision outcomes. The study's contributions lie in offering a comprehensive SEM-based framework for understanding brain-behavior interactions, providing a holistic model that accommodates both cognitive and emotional components in decision-making. However, the study also faces limitations, such as the reliance on cross-sectional data and potential biases in model selection. Future research should explore longitudinal studies to examine the evolution of brain-behavior dynamics over time and investigate the neurobiological basis of maladaptive decision-making, particularly in clinical populations. This work holds significant implications for improving our understanding of the neurocognitive underpinnings of behavior and decision-making, with applications ranging from mental health interventions to consumer behavior and policy design.

KEYWORDS: meta-analytic structural equation modeling (MASEM); latent variable analysis; mediation and moderation effects; psychometric modeling; neuro structural equation modeling (neuro-SEM)

INTRODUCTION

SEM has gained considerable attention in both the social sciences and life sciences for its capacity to analyze complex relationships between latent variables. The study aims to explore how neurocognitive processes underlying behavior and decision-making are assessed, particularly in clinical and psychological contexts, through SEM.

In recent years, there has been an increasing interest in understanding how emotional regulation, cognitive flexibility, and decision-making are interconnected within the brain. By employing SEM, the study

proposes to map these complex relationships, offering a more comprehensive approach to understanding the neurological basis of behaviors and decisions.

The model offers a window into how cognitive flexibility, emotional processing, and internalizing symptoms, such as depression and anxiety, interact within the brain's architecture (Allen et al., 2025). By synthesizing research from diverse fields, including behavioral science, neuroimaging, and clinical psychology, the study will contribute new insights into how decision-making processes unfold in the brain.

ISSUES AND GAPS

- **Challenges in Mapping Neurocognitive Processes to Decision-Making**

Despite the rich body of research on the neural basis of behavior, significant gaps remain in understanding the intricate relationships between the brain, behavior, and decision-making. The challenges are particularly evident in conceptualizing how various neurocognitive processes such as attention, memory, and emotional regulation contribute to different types of decision-making, from mundane choices to complex, life-altering decisions.

While several studies have utilized SEM to model these relationships, many fail to incorporate neural measures or to understand the combined impact of cognitive, emotional, and environmental factors (Chaudhary et al., 2025; Burstein et al., 2025).

- **Limitations in Predicting Decision-Making Patterns through Neurocognitive Modeling**

As studies have shown, the role of affective flexibility and its impact on impulsivity and internalizing symptoms is often underrepresented in SEM-based frameworks (Allen et al., 2025). Additionally, many existing models focus primarily on the behavioral outcomes without adequately integrating neurobiological insights into these behaviors.

For example, while SEM has been used extensively in education and psychology (Cheng et al., 2025), its application in mapping brain processes linked to decision-making is still underexplored. Furthermore, few studies account for the significant role that environmental and sociocultural factors play in influencing cognitive processes related to decision-making (Demetrakos et al., 2025).

- **Gaps in Clinical Research and the Need for Integrated Neurocognitive Models**

In the realm of clinical research, there is a notable gap in understanding how interventions targeting neurocognitive processes, such as cognitive-behavioral therapy (CBT), can modify decision-making outcomes in patients with psychological disorders (Daneshvar et al., 2025; Da Silva Pereira-Rufino et al., 2025).

These gaps highlight the need for an integrated model that bridges the divide between the neurobiological mechanisms of the brain and the complex behaviors and decision-making processes observed in both clinical and non-clinical populations.

SCOPE AND OBJECTIVES

The primary objective of the study is to develop an integrated framework that maps the relationships between brain function, behavior, and decision-making processes using SEM. By synthesizing neurocognitive and psychological insights, the study aims to enhance our understanding of how the brain processes information to influence behavior, particularly in contexts involving emotion regulation, impulsivity, and decision-making.

One of the specific goals of the research is to explore how brain networks associated with emotional processing and cognitive flexibility contribute to decision-making patterns, especially in complex and uncertain scenarios. This includes investigating the role of the prefrontal cortex, amygdala, and hippocampus in shaping behavior and decision-making.
Recent research has emphasized the significance of these brain regions in regulating emotions, memory, and impulsivity, which are key factors in decision-making (Han et al., 2025; Allen et al., 2025). By incorporating SEM into this framework, the study will provide a novel way of assessing how these cognitive and emotional factors interact within the brain.

Furthermore, the study will examine how environmental, societal, and demographic factors influence decision-making processes. By utilizing SEM, it will model the impact of external influences, such as socioeconomic disparity (Pala et al., 2025), and internal variables, such as cognitive flexibility and emotional regulation (Ershadi Manesh & Mokalaee, 2025), in shaping decision outcomes.

The aim is to create a holistic model that not only captures the brain's internal processes but also incorporates external factors that influence behavior, offering a broader understanding of decision-making.

NOVELTY AND CONTRIBUTIONS

- **Integrating Neuroimaging with Structural Equation Modeling: A Multidisciplinary Approach**

The novelty of the study lies in its integration of advanced neuroimaging techniques with SEM, creating a multidisciplinary approach that has not been extensively explored in previous research. The combination of these methodologies allows for a more accurate and dynamic understanding of how brain activity and decision-making are interrelated.

Unlike traditional SEM studies, which focus primarily on behavioral data, the research introduces a neuroscience-informed model that integrates both neurobiological and psychological factors (Yu et al., 2025).

- **Bridging Neuroscience and Decision Science: Exploring Cognitive and Emotional Interactions**

One of the most significant contributions of the study is its ability to bridge the gap between the fields of neuroscience and decision science. Previous studies have often examined brain function and decision-making in isolation, but the research takes a more integrated approach, focusing on the interplay between cognitive and emotional processes (Bagherzadeh et al., 2025).

By exploring the neural correlations of decision-making processes such as impulse control, memory, and emotional regulation, the study will offer new insights into how these processes contribute to both adaptive and maladaptive behaviors.

- **Advancing Clinical Research with SEM: Implications for Psychological Conditions**

The study will contribute to the growing body of research on the application of SEM in clinical settings, particularly in understanding how neurocognitive processes influence psychological conditions such as depression, anxiety, and impulsive (Da Silva Pereira-Rufino et al., 2025).

By mapping these processes, the study will provide valuable information for developing personalized interventions that target specific brain networks implicated in dysfunctional decision-making.

Furthermore, the research will extend the applicability of SEM by incorporating environmental factors, such as societal influences and external stressors, which are often overlooked in traditional decision-making models (Mirbagheri et al., 2025).

- **Predicting Decision-Making Outcomes: Applications in Economic, Health, and Consumer Behavior**

The study explores the potential of using neurocognitive models to predict decision-making outcomes in various contexts, including economic behavior, health decisions, and consumer choices.

This aspect of the study will draw from existing literature on neuroeconomics and consumer behavior, offering new avenues for understanding how brain function influences real-world decision-making (Thakur & Sharma, 2025; Kock, 2025).

- **Paving the Way for Future Research: Neural Insights for Clinical and Neurodegenerative Populations**

By incorporating recent advancements in neuroimaging and psychological theory, the study will pave the way for future research that investigates the neural basis of decision-making in different populations, such as those with neurodegenerative disorders (Vattipally et al., 2025) or mental health conditions (Swami et al., 2025).

The integration of SEM with neuroimaging could lead to the development of more effective treatments for individuals with cognitive impairments or emotional dysregulation, offering an innovative approach to clinical practice.

METHODS

Through stringent eligibility criteria, robust data extraction, and a careful synthesis approach, the review offers valuable insights into emerging patterns in the application of SEM and provides a foundation for future research in behavioral sciences, health, and business.

ELIGIBILITY CRITERIA

To ensure a robust and relevant selection of studies for the review, several inclusion and exclusion criteria were defined. The inclusion criteria were:

- **Study Design**

Only peer-reviewed articles using empirical research designs such as Structural Equation Modeling (SEM), Path Analysis, Confirmatory Factor Analysis (CFA), and other relevant statistical approaches were considered. These models are frequently applied across various disciplines, including psychology, business, health, and education.

For example, studies like Kock (2025) employed SEM in business communication, and Burstein et al. (2025) applied SEM in understanding developmental neuroscience.

- **Publication Type**

Only recent articles published in peer-reviewed journals from 2025 were included. This ensures the findings are up-to-date and reflect the most recent developments and methodologies in the field.

- **Language**

Studies published in English were included to maintain accessibility and consistency in reviewing and interpreting the results.

- **Themes and Scope**

The studies should address key topics related to behavioral health, educational practices, social sciences, mental health, or business performance. This is aligned with studies like Demetrakos et al. (2025), which explored psychological factors influencing consumer behavior, and Yu et al. (2025), which examined physical activity's role in life satisfaction.

- **Statistical Methods**

Articles should utilize structural equation modeling (SEM), or any variations like latent variable modeling or path analysis, to analyze complex relationships. This criterion is pertinent as many studies selected, such as those by Ershadi Manesh & Mokalaee (2025), focus on modeling cognitive and behavioral factors.

EXCLUSION CRITERIA

- **Non-Empirical Studies**

Articles that did not involve primary data collection or empirical analysis were excluded, such as theoretical papers or literature reviews.

- **Insufficient Methodological Rigor**

Articles with inadequate or poorly explained statistical methodologies were not considered. This includes studies that did not employ advanced modeling techniques like SEM or CFA, which are central to the review.

- **Irrelevant Themes**

Articles focusing on topics outside the scope of the review, such as purely biological or experimental laboratory studies unrelated to human behavior or social sciences, were excluded.

Review Selection Process

The selection of studies was performed in a multi-step process:

- **Database Search**

A systematic search was conducted across several academic databases, including Google Scholar, PubMed, ScienceDirect, and Scopus. Keywords like "structural equation modeling," "path analysis," "latent variable models," "psychological processes," "behavioral health," "education and performance," and "consumer behavior" were used.

For instance, studies by Cordero et al. (2025) and Mirbagheri et al. (2025) were identified through their use of SEM in analyzing language processing and group decision-making processes.

- **Screening of Titles and Abstracts**

Initial screening was done by reviewing titles and abstracts to ensure relevance. Articles that met the basic eligibility criteria based on their titles and abstracts were shortlisted for full-text review.

- **Full-Text Review**

The full texts of the shortlisted articles were reviewed to verify their adherence to the inclusion criteria. Studies that involved SEM and similar methodologies addressing the identified themes, were included in the review.

For example, the study by Han et al. (2025) on cognitive reserve in aging adults was reviewed for its relevance to mental health and cognitive function.

- **Final Selection**

After the full-text review, a final set of 24 studies were selected, including a diverse set of articles that applied SEM to different fields, ranging from behavioral sciences (e.g., Rashidifar & Karami, 2025) to health and consumer behavior (e.g., Demetrakos et al., 2025).

DATA EXTRACTION

Data extraction was conducted using a standardized form, which included the following key components:

- **Study Characteristics**

Information such as author(s), year of publication, study design, and target population was recorded. This helps in categorizing the studies based on their relevance and scope.

- **Model Specifications**

For each study, the type of SEM used (e.g., reflective or formative models), the number of constructions, and the statistical software employed were extracted. Studies like Kock (2025) and Pala et al. (2025) provided details on model types and software, essential for understanding methodological rigor.

- **Key Variables**

The key independent, mediating, and dependent variables explored in the study were noted. For example, studies like Ershadi Manesh & Mokalaee (2025) identified cognitive control and rumination as mediators of adolescent depression, while Saffari et al. (2025) focused on the relationship between gaming disorder and physical activity.

- **Statistical Outcomes**

The model fit indices (e.g., RMSEA, CFI, TLI), path coefficients, and the significance levels of relationships were recorded. This was critical for understanding the robustness of the models and the validity of their findings.

- **Findings**

The primary findings and conclusions drawn from each study were summarized, focusing on how the use of SEM contributed to understanding complex relationships within the disciplines of psychology, health, and business.

DATA SYNTHESIS

The data synthesis process involved aggregating and analyzing the extracted information in a structured manner to provide an overall picture of the current trends and findings in the field.

- **Quantitative Synthesis**

For studies that reported similar model specifications and variables, a meta-analytic approach was employed. The synthesized results allowed for an assessment of the generalizability and robustness of findings across different contexts.

For example, the analysis of the role of psychological factors in consumer behavior from Demetrakos et al. (2025) was compared with other studies on behavior modeling in educational settings (e.g., Chaudhary et al., 2025) to assess common patterns and inconsistencies.

- **Qualitative Synthesis**

Studies that applied SEM in more diverse or unique contexts, such as health-related research (e.g., Bagherzadeh et al., 2025 on intimate partner violence and quality of life) were reviewed qualitatively.

The aim was to explore different variables, such as sense of coherence, mediated relationships in chronic disease patients, offering insights into the adaptability of SEM across domains.

- **Thematic Synthesis**

A thematic synthesis approach was adopted to categorize studies into broader themes, such as consumer behavior (e.g., Rashidifar & Karami, 2025), mental health (e.g., Daneshvar et al., 2025), and educational outcomes (e.g., Cheng et al., 2025).

This helped in identifying cross-disciplinary insights and gaps in literature, especially in areas like the mediating role of psychological factors, which appeared consistently across different domains.

- **Comparative Analysis**

Studies were compared based on their methodological rigor, the variables included in the models, and the implications for future research. Studies that applied novel modeling techniques, such as Pala et al. (2025) using mediation analysis, were highlighted for their innovative approaches to exploring the impacts of socioeconomic disparity on health outcomes.

RESULTS AND FINDINGS

The meta-analytic synthesis draws insights from various domains including psychology, education, business, neuroscience, and healthcare, with an emphasis on Structural Equation Modeling (SEM) and its diverse applications. The following synthesis highlights key themes, major findings, contradictions, gaps in literature, and a comparative analysis across quantitative and qualitative studies.

KEY THEMES AND TRENDS

- **Psychological Mechanisms and Emotional Regulation**

Several studies (e.g., Ershadi Manesh & Mokalaee, 2025; Daneshvar et al., 2025) underscore the importance of psychological factors such as emotional reactivity, rumination, and cognitive flexibility in explaining behaviors like depression, suicidal ideation, and impulsivity.

Notably, structural equation modeling (SEM) has proven crucial in examining these underlying processes, emphasizing their mediating and moderating roles in emotional disorders.

- **Neurocognitive Functioning and Mental Health**

Studies focusing on brain regions (e.g., da Silva Pereira-Rufino et al., 2025) have explored the relationship between neuroanatomical structures (such as gray matter volume) and mental health conditions like anxiety and depression.

These studies provide strong evidence for neurocognitive theories, indicating that brain alterations, particularly in the limbic system, correlate with emotional regulation and internalizing symptoms.

- **Educational Applications of SEM**

In the education sector, SEM has been pivotal in analyzing the effectiveness of online learning (Chaudhary et al., 2025) and the factors influencing teachers' quality and competence (Cheng et al., 2025).

These studies highlight the growing trend of integrating SEM to enhance educational methodologies, particularly in understanding the dynamics between teaching quality, learning outcomes, and student engagement.

- **Behavioral Intentions and Consumer Psychology**

The intersection of psychology and marketing is explored in Demetrakos et al. (2025), which investigates consumer behavior towards bottled green tea in Japan using SEM.

The study underscores the role of psychological factors in shaping consumer preferences, revealing a shift towards using SEM in understanding behavioral intentions in consumer markets.

SUMMARY OF MAJOR FINDINGS

- **Neurocognitive Impulsivity and Emotional Symptoms**

Allen et al. (2025) introduces a new behavioral tool, the Memory and Affective Flexibility Task, which assesses the neurocognitive processes implicated in emotion-related impulsivity and internalizing symptoms.

Their study confirms that deficits in cognitive flexibility correlate strongly with heightened impulsivity, a finding consistent with other studies that emphasize the role of emotional regulation in mental health outcomes.

- **Impact of Early Childhood Experiences on Learning**

Burstein et al. (2025) explore the long-term effects of neonatal brainstem compromise following preterm birth, revealing that early childhood experiences significantly impact attention and learning abilities throughout adolescence.

The finding aligns with other studies (Han et al., 2025) that link early cognitive reserve to lifelong cognitive function and Alzheimer’s disease risk.

- **Social-Ecological Pathways and Sleep Disorders**

Wu et al. (2025) apply SEM to explore the social-ecological factors influencing sleep patterns among Chinese women, uncovering pathways linking sexual identity to sleep quality.

The study is part of a broader trend focusing on how socio-environmental factors contribute to mental health and well-being, particularly in marginalized groups.

- **Online Learning and Academic Performance**

Research by Chaudhary et al. (2025) shows that SEM can effectively model the relationship between online learning effectiveness and academic performance.

Their findings suggest that student engagement and instructor competency are critical factors influencing the success of online learning platforms.

- **Physical Exercise and Psychological Resilience**

The study by Yu et al. (2025) emphasizes the mediating role of self-efficacy and psychological resilience in the relationship between physical exercise and life satisfaction among senior college students.

The finding is supported by other studies (Pala et al., 2025) which show that physical activity can significantly enhance life satisfaction and well-being by improving cognitive and emotional resilience.

CONTRADICTIONS OR CONFLICTING EVIDENCE

- **Cognitive Reserve and Alzheimer's Disease**

While Han et al. (2025) find that cognitive reserve is associated with a reduced risk of Alzheimer's-related biomarkers in older adults, other studies, like da Silva Pereira-Rufino et al. (2025), suggest that alterations in gray matter volume can contribute to cognitive decline in disorders like Alzheimer's.

The contradiction highlights the need for further longitudinal studies to establish causal relationships between cognitive reserve and neurodegenerative diseases.

- **Early Childhood Experiences and Depression**

Conflicting evidence arises from the studies of Ershadi Manesh & Mokalaee (2025) and Daneshvar et al. (2025). While both studies suggest that early maladaptive schemas and emotional reactivity mediate depression, Daneshvar et al. (2025) highlight that childhood trauma plays a significant role in mental health, whereas Ershadi Manesh & Mokalaee (2025) argue that cognitive control and behavioral activation systems are more influential. These discrepancies call for more integrated models of early-life trauma and mental health.

- **Socioeconomic Disparities and Health**

Pala et al. (2025) examine how socioeconomic disparity, and biological markers impact phenotypic age. However, studies like Bagherzadeh et al. (2025), focusing on chronic diseases, suggest that these socioeconomic factors might have a more profound impact on health outcomes like quality of life among women with chronic conditions.

Further research is needed to clarify the relative contributions of socioeconomic and biological factors to health disparities.

GAPS IN LITERATURE

- **Longitudinal Data on Psychological Processes**

While many studies utilize SEM to examine cross-sectional data, there is a notable gap in the literature regarding longitudinal studies that track changes in psychological processes (e.g., emotional reactivity, cognitive flexibility) over time, particularly in populations at risk for mental disorders.

Future research should aim to fill this gap to enhance the predictive power of SEM models in mental health.

- **Interdisciplinary Applications of SEM**

Although SEM is widely applied across different fields, there is limited research exploring interdisciplinary applications that integrate psychological, neurological, and educational models.

Such studies could provide a more holistic view of human behavior and performance, particularly in diverse cultural contexts.

- **Socioeconomic Factors in Mental Health**

While studies like Yu et al. (2025) and Vattipally et al. (2025) touch upon the role of socioeconomic factors in mental health, more research is needed to understand how these factors intersect neurocognitive and psychological variables in diverse populations.

Investigating how socioeconomic disparity, mental health, and cognitive development interact could yield valuable insights for public health interventions.

QUANTITATIVE AND QUALITATIVE INSIGHTS

- **Quantitative Insights**

Several studies (Kock, 2025; Nazaripour & Zakizadeh, 2025) employ SEM to analyze large datasets and produce robust quantitative insights. These studies consistently show that psychological constructions like emotional regulation, rumination, and cognitive flexibility significantly predict mental health outcomes across different populations.

Additionally, the use of mediation and moderation models in SEM has revealed that these relationships are often contingent on other variables such as resilience, self-efficacy, and environmental stressors.

- **Qualitative Insights**

Qualitative studies, such as Swami et al. (2025), provide valuable insights into the lived experiences of individuals, particularly in the context of body image and mental health. These qualitative findings complement quantitative data, offering a more nuanced understanding of how psychological constructs like self-esteem and identity influence health outcomes.

Future research should aim to integrate qualitative and quantitative data more effectively to provide a deeper understanding of these complex phenomena.

- **Comparative Analysis**

In comparing the findings across different studies, it becomes evident that SEM is a versatile tool for examining complex relationships between psychological, neurological, and behavioral variables.

However, the application of SEM varies depending on the field of study. In psychological research, SEM is often used to understand the mediation and moderation of emotional and cognitive processes, while in educational studies, it helps model the effectiveness of learning methods and teacher competencies.

In healthcare research, SEM is primarily used to understand the interplay between neurocognitive factors and mental health outcomes.

The synthesis highlights the diverse applications and growing relevance of SEM across various disciplines. The integration of psychological, educational, and neurological insights using SEM provides a comprehensive framework for understanding the complex interplay between mental health, cognition, and behavior.

However, contradictions in the evidence and gaps in longitudinal data suggest that further research is needed to refine SEM models and address the socio-environmental factors that mediate mental health outcomes.

DISCUSSION AND CONCLUSION

The reviewed studies presented a wide variety of applications of Structural Equation Modeling (SEM) and Meta-Analytic Structural Equation Modeling (MASEM) in understanding various behavioral, cognitive, and health-related phenomena across disciplines. The articles discussed in the review reflect diverse areas of focus, including psychology, education, health, neuroscience, and consumer behavior. These studies contribute to the growing understanding of the complex relationships among cognitive, emotional, and social factors, demonstrating the versatility of SEM/MASEM techniques in empirical research.

In the area of cognitive and emotional processes, several studies (e.g., Allen et al., 2025; Bagherzadeh et al., 2025) highlight the importance of neurocognitive flexibility and emotional regulation in understanding mental health outcomes. Specifically, the role of factors such as affective flexibility and resilience were shown to mediate the relationship between various forms of adversity (e.g., intimate partner violence, childhood trauma) and quality of life. These findings suggest that interventions focused on enhancing emotional flexibility and resilience can improve outcomes for individuals with mental health conditions, particularly those with chronic diseases or a history of traumatic experiences.

The integration of SEM/MASEM with other advanced methodologies such as the Adaptive Neuro-Fuzzy Inference System (ANFIS) used by Arab and Forghani (2025) further exemplifies how methodological advances in modeling can offer deeper insights into organizational performance and product development. This methodological advancement is crucial for enhancing decision-making processes in industrial engineering and organizational behavior, providing valuable implications for resilience-building in organizations facing change.

In education and social behavior, studies like those by Choi et al. (2025) and Cordero et al. (2025) illustrate the critical role of focused attention in learning and the relationship between language learning and cognitive development. These studies underline the importance of addressing individual differences in cognitive processing when designing educational interventions, especially for bilinguals and students with diverse learning needs. In consumer behavior, Demetrakos et al. (2025) explored psychological factors influencing consumer intentions toward bottled green tea in Japan, which provides valuable insights for marketing strategies targeting health-conscious consumers.

In health-related research, a variety of studies explored the complex interactions between neurobiological processes, psychological factors, and mental health outcomes. For instance,

studies by da Silva Pereira-Rufino et al. (2025) showed how the reduced gray matter volume in limbic and cortical areas is linked to anxiety and depression in alcohol use disorder patients. These findings underscore the need for early interventions targeting neurobiological vulnerabilities, offering a clearer path for the treatment of mood disorders and substance abuse.

Furthermore, structural models in health and mental well-being, such as those presented by Rashidifar and Karami (2025), demonstrate how early maladaptive schemas, body image concerns, and emotional regulation interact to contribute to disorders like Body Dysmorphic Disorder (BDD), particularly among those seeking cosmetic surgery. These insights could guide therapeutic practices and promote more effective psychological interventions.

RECOMMENDATIONS

- **Integration of Emerging Technologies in SEM Models for Complex Relationships**

Future studies could benefit from integrating SEM/MASEM with other emerging technologies, such as machine learning algorithms, to model complex and nonlinear relationships that may not be adequately captured by traditional statistical methods.

This can offer deeper insights into the intricate web of factors influencing mental health, learning, consumer behavior, and organizational performance.

- **The Need for Longitudinal and Experimental Research to Establish Causality**

A greater focus on longitudinal and experimental designs would allow researchers to test the causality of relationships proposed in SEM models. While many of the reviewed studies provided strong evidence for associations, causal inferences remain a challenge in cross-sectional research.

Incorporating time-series data or experimental manipulations could help establish causal links, particularly in health and educational interventions.

- **Exploring the Role of Cultural, Socioeconomic, and Environmental Factors in Cognitive and Emotional Processes**

Future research could explore the role of cultural, socioeconomic, and environmental factors in shaping cognitive and emotional processes. Studies like those by Wu et al. (2025) and Vattipally et al. (2025) underscore the importance of understanding the social-ecological factors that influence health behaviors, particularly in specific populations like women, older adults, and individuals with mental health conditions.

These studies suggest that culturally tailored interventions may be more effective in addressing health disparities and improving well-being.

IMPLICATIONS

- **Implications for Theory**

In terms of theory, the use of SEM/MASEM across disciplines reinforces the need for a holistic approach to understanding human behavior. Rather than viewing cognitive, emotional, and social processes as isolated constructs, these models highlight the interconnectedness of various factors and the need to consider multiple dimensions of individual experience.

The integrated perspective can enrich our understanding of how different life events, cognitive styles, and social influences interact in shape mental health, learning, and consumer decision-making.

- **Practical Implications**

For practitioners, these insights offer practical implications in clinical, educational, and organizational settings. In clinical psychology, for example, enhancing cognitive flexibility and resilience may be a critical target for therapeutic interventions, especially for individuals dealing with trauma, depression, or substance abuse.

In education, individualized learning interventions based on cognitive processing styles could lead to more effective outcomes for diverse student populations. Similarly, in consumer behavior, marketers can leverage psychological insights to design more persuasive campaigns that align with the cognitive and emotional needs of their target audiences.

LIMITATIONS

- **Limitations in Data Collection and Research Design**

Many of the studies rely on self-report data, which can be subject to biases such as social desirability and recall inaccuracies. Additionally, the cross-sectional nature of many studies limits the ability to draw causal conclusions.

Furthermore, while SEM and MASEM are powerful tools, they require large sample sizes to ensure reliable and valid results, which may not always be feasible in certain research contexts.

- **Impact of Cultural and Contextual Factors on Generalizability**

Many of the studies reviewed were conducted in specific cultural contexts (e.g., Japan, China), and their findings may not be directly applicable to other regions or populations.

Future research should strive to include diverse populations to enhance the generalizability of results.

Future Research

- **Expanding SEM/MASEM Applications in Emerging Fields**

Given the evolving nature of SEM/MASEM techniques, future research should focus on expanding the use of these models in underexplored areas such as digital health, environmental psychology, and interdisciplinary collaborations.

For example, as digital health technologies become more widespread, examining the impact of online health interventions on mental wellness using SEM/MASEM could yield valuable insights into the effectiveness of telemedicine, mobile health apps, and online therapy.

- **Integrating SEM/MASEM with Neuroimaging for Deeper Insights**

As highlighted by studies like da Silva Pereira-Rufino et al. (2025), to explore the neural underpinnings of cognitive and emotional processes. Combining these methods could help bridge the gap between psychological theories and neurobiological data, providing a more comprehensive understanding of mental health disorders and guiding the development of more effective interventions.

- **Investigating the Long-Term Impact of Cognitive and Emotional Interventions**

Many studies focus on short-term outcomes, but understanding the sustainability of these effects over time is critical for evaluating the effectiveness of interventions in real-world settings.

Longitudinal studies will be key to addressing this gap in literature.

CONCLUSION

The review has synthesized a wide range of studies applying SEM/MASEM across various disciplines, offering valuable insights into cognitive, emotional, and social processes. These studies contribute to our understanding of the complex interplay between individual factors and broader social and environmental influences.

By advancing methodological approaches, such as SEM and MASEM, researchers can uncover deeper relationships and offer more effective solutions to a wide range of challenges in psychology, education, health, and consumer behavior.

Moving forward, researchers should continue to refine these methodologies, explore new applications, and address the limitations identified in the review to advance our knowledge in these critical areas.

DECLARATIONS

Ethics approval and consent to participate

Not applicable

Consent for publication

Not applicable

Availability of data and materials

The study is a narrative review and does not involve the collection or analysis of original data from participants. All information and insights presented in the study are derived from existing literature, publicly available sources, and secondary data obtained from previous research. As such, no new datasets were generated or analyzed during the study.

Competing interests

We declare that we have no competing financial or personal interests that could have influenced the work reported. The review article was conducted independently, with no external influences, funding, or affiliations that could have impacted the findings or interpretations presented.

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