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Toward a Circular Society: The Role of Cognitive Intelligence in Promoting Circular Consumption Behaviour

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Abstract
The transition toward a circular economy requires greater consumer participation in sustainable consumption practices such as recycling, reusing, repairing, and sharing products. While prior research has primarily focused on environmental attitudes and sustainability values, limited attention has been given to the cognitive capabilities that drive circular consumption behavior. This study examines the influence of Cognitive Intelligence on Circular Consumption Behavior through the mediating roles of Resource Consciousness and Sustainable Value Perception, while also investigating the moderating effect of Environmental Literacy. Drawing upon Cognitive Information Processing Theory, Value-Belief-Norm Theory, and the Theory of Planned Behavior, a conceptual framework was developed and empirically tested using data collected from 422 consumers in Tunisia. The findings reveal that Cognitive Intelligence significantly enhances Resource Consciousness, Sustainable Value Perception, and Circular Consumption Behavior. Both Resource Consciousness and Sustainable Value Perception were found to significantly mediate the relationship between Cognitive Intelligence and Circular Consumption Behavior. Furthermore, Environmental Literacy significantly strengthens the relationship between Sustainable Value Perception and Circular Consumption Behavior, although its moderating effect on the Resource Consciousness–Circular Consumption Behavior relationship was not supported. The study contributes to sustainability and circular economy literature by identifying Cognitive Intelligence as a critical antecedent of sustainable consumption and by explaining the cognitive mechanisms through which consumers engage in circular economy practices. The findings provide valuable implications for policymakers, educators, and businesses seeking to promote sustainable consumer behavior and accelerate the transition toward a circular society.

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1. Introduction

The growing global concern over climate change, resource depletion, environmental degradation, and excessive waste generation has intensified interest in sustainable consumption and circular economy practices. Traditional linear economic systems, characterized by the "take-make-dispose" model, have contributed significantly to environmental pressures by encouraging excessive resource extraction and waste accumulation (Morais *et al*., 2021; Urbinati *et al*., 2017) [45, 65]. In response, the circular economy has emerged as a promising alternative that seeks to maximize resource efficiency through reducing, reusing, repairing, refurbishing, and recycling products and materials. While governments, businesses, and policymakers increasingly

promote circular economy initiatives, their ultimate success depends largely on consumer participation and behavioral transformation. Consequently, understanding the factors that motivate individuals to engage in Circular Consumption Behavior (CCB) has become an important research priority (Gomes *et al*., 2022; Keshavarz *et al*., 2025) [21, 33].

Circular Consumption Behavior refers to consumer actions that extend product life cycles and reduce resource consumption through activities such as product reuse, repair, sharing, recycling, and responsible disposal (Corsini *et al*., 2020; Gomes *et al*., 2023) [11, 22]. Unlike conventional consumption practices that emphasize ownership and replacement, circular consumption encourages resource preservation and sustainable utilization. Although considerable research has investigated environmental attitudes, ecological concern, green values, and sustainability awareness as predictors of sustainable consumption, the behavioral outcomes remain inconsistent. Many consumers express positive attitudes toward sustainability yet fail to translate these attitudes into actual circular consumption practices. This gap suggests that additional psychological and cognitive mechanisms may influence consumers' ability to engage in sustainable behavior (Hobson *et al*., 2021; Schill & Shaw, 2016) [28, 58].

One factor that has received limited attention within sustainability and circular economy research is Cognitive Intelligence (CI)(Musová *et al*., 2025) [46]. Cognitive Intelligence refers to an individual's ability to acquire, process, evaluate, and apply information in decision-making situations (Zhao *et al*., 2022) [71]. Individuals with higher cognitive intelligence are generally more capable of analyzing complex information, evaluating alternatives, understanding long-term consequences, and making rational decisions (Dellermann *et al*., 2019; Ganor *et al*., 2025; Wild *et al*., 2023) [13, 20, 69]. Circular consumption decisions frequently require consumers to consider future environmental consequences, assess resource scarcity issues, and balance short-term convenience against long-term sustainability benefits. Such decisions involve substantial cognitive processing, suggesting that cognitive intelligence may play a critical role in shaping sustainable consumption behavior (Korteling *et al*., 2023) [35].

The importance of cognitive intelligence becomes particularly evident when consumers encounter sustainability-related information. Modern consumers are increasingly exposed to messages concerning climate change, resource depletion, environmental responsibility, and circular economy practices (Si *et al*., 2026; White *et al*., 2019) [59, 68]. However, individuals differ significantly in their ability to understand and utilize this information. Consumers with higher cognitive intelligence may be more capable of interpreting sustainability information, recognizing resource constraints, and appreciating the long-term value associated with sustainable consumption practices. Consequently, cognitive intelligence may influence the development of cognitive evaluations that ultimately guide sustainable behavioral choices (Korteling *et al*., 2023; Zöldy *et al*., 2022) [35, 72].

Drawing upon Cognitive Information Processing Theory (CIPT), this study proposes that cognitive intelligence influences sustainable behavior through specific cognitive mechanisms (Aspara *et al*., 2017; Vuong & Nguyen, 2025) [4, 67]. CIPT suggests that individuals actively process information, interpret environmental stimuli, and generate behavioral responses based on their cognitive capabilities. According to the theory, individuals possessing stronger information-processing abilities are better able to evaluate complex issues and generate informed decisions. In the context of sustainability, cognitive intelligence may facilitate the development of Resource Consciousness (RC), which reflects awareness regarding resource scarcity and the importance of resource conservation (Zöldy *et al*., 2022) [72]. Simultaneously, cognitive intelligence may enhance Sustainable Value Perception (SVP), which represents consumers' evaluation of the environmental, social, and economic benefits associated with sustainable products and circular economy practices (Camilleri *et al*., 2023; Gonella *et al*., 2024) [7, 24].

Resource Consciousness and Sustainable Value Perception are particularly important because they represent the cognitive pathways through which sustainability information is translated into behavioral outcomes. Consumers who recognize the scarcity of natural resources are more likely to engage in behaviors that reduce waste and improve resource efficiency (Reppmann *et al*., 2024; Xin *et al*., 2025) [53, 70]. Similarly, consumers who perceive greater value from sustainable products and practices are more inclined to participate in circular economy activities. Drawing on Value-Belief-Norm Theory and the Theory of Planned Behavior, these cognitive evaluations are expected to encourage Circular Consumption Behavior by strengthening individuals' motivations to adopt environmentally responsible actions (Ozden, 2026) [47].

Another important factor influencing sustainable consumption is Environmental Literacy (EL). Environmental literacy refers to an individual's knowledge and understanding of environmental systems, ecological challenges, and sustainability principles. Although consumers may possess resource consciousness and perceive value in sustainable practices, the extent to which these evaluations translate into actual behavior may depend upon their level of environmental knowledge (Laheri *et al*., 2024; Longo *et al*., 2017) [37, 41]. Environmentally literate individuals are generally better able to understand the implications of their consumption choices and apply sustainability knowledge in practical contexts. Therefore, environmental literacy may strengthen the influence of Resource Consciousness and Sustainable Value Perception on Circular Consumption Behavior (Liu & Tobias, 2023) [40].

Despite growing interest in sustainable consumption and circular economy practices, several important gaps remain in the literature. First, existing research predominantly focuses on attitudinal and value-based determinants such as environmental concern, green attitudes, ecological awareness, and sustainability values, while largely overlooking the role of cognitive capabilities in shaping circular consumption behavior (Hobson *et al*., 2021; Keshavarz *et al*., 2025; Singh & Giacosa, 2018) [28, 33, 60]. Consequently, the cognitive foundations of sustainable consumption remain insufficiently understood. Second, although Resource Consciousness and Sustainable Value Perception have been identified as important antecedents of sustainable behavior, limited research has examined their mediating roles in explaining how cognitive characteristics influence circular consumption outcomes (Anwar *et al*., 2022; Hobson *et al*., 2021; Testa *et al*., 2020) [2, 28, 64]. Third, prior studies have largely concentrated on behavioral intentions rather than actual circular consumption behavior,

creating uncertainty regarding the factors that motivate real-world sustainability practices (Corsini *et al*., 2024; Hobson *et al*., 2021) [10, 28]. Finally, the moderating role of Environmental Literacy in strengthening the effects of cognitive evaluations on circular consumption behavior remains underexplored (Vadakkepatt *et al*., 2020) [66].

To address these gaps, this study develops and tests a comprehensive framework linking Cognitive Intelligence, Resource Consciousness, Sustainable Value Perception, Environmental Literacy, and Circular Consumption Behavior. By integrating Cognitive Information Processing Theory, Value-Belief-Norm Theory, and the Theory of Planned Behavior, the study seeks to provide a deeper understanding of how cognitive capabilities influence sustainable consumption decisions and circular economy participation.

1.1. The study aims to

1. To examine the influence of Cognitive Intelligence on Circular Consumption Behavior, Resource Consciousness, and Sustainable Value Perception.
2. To investigate the effects of Resource Consciousness and Sustainable Value Perception on Circular Consumption Behavior.
3. To assess the mediating roles of Resource Consciousness and Sustainable Value Perception in the relationship between Cognitive Intelligence and Circular Consumption Behavior.
4. To evaluate the moderating role of Environmental Literacy in strengthening the relationships between Resource Consciousness, Sustainable Value Perception, and Circular Consumption Behavior.

1.2. Research Questions

RQ1: What is the role of Cognitive Intelligence in promoting Circular Consumption Behavior?

RQ2: Through what cognitive mechanisms does Cognitive Intelligence influence Circular Consumption Behavior?

RQ3: Does Environmental Literacy strengthen the relationships between cognitive evaluations and Circular Consumption Behavior?

1.3. Significance of the Study

This study contributes theoretically by extending Cognitive Information Processing Theory into the circular economy domain and introducing Cognitive Intelligence as a novel antecedent of Circular Consumption Behavior. It further enriches sustainability literature by explaining the cognitive mechanisms through which intelligence influences sustainable behavior and by integrating Cognitive Information Processing Theory, Value-Belief-Norm Theory, and the Theory of Planned Behavior into a unified framework. Practically, the findings provide valuable guidance for policymakers, educators, and businesses seeking to encourage circular economy participation. Understanding the role of cognitive intelligence can assist in designing educational programs, sustainability campaigns, and communication strategies that enhance consumers' ability to process sustainability information and make informed decisions. By identifying Resource Consciousness, Sustainable Value Perception, and Environmental Literacy as important drivers of circular consumption, the study offers actionable insights for promoting sustainable lifestyles and supporting the transition toward a more resource-efficient and circular society.

2. Background of Study

2.1. Theoretical Foundation

2.1.1. Cognitive Information Processing Theory

Cognitive Information Processing Theory (CIPT) posits that individuals actively acquire, process, interpret, store, and utilize information to make decisions. The theory emphasizes that human behavior is influenced by cognitive processes through which individuals evaluate available information and generate responses to environmental stimuli. Individuals differ in their cognitive capabilities, which affects how effectively they process information and make decisions (Kowalczuk & Czubenko, 2022) [36]. Higher cognitive abilities enable individuals to analyze complex information, evaluate alternatives, and understand long-term consequences more effectively (Kowalczuk & Czubenko, 2022) [36]. In the context of sustainability and circular economy practices, consumers are frequently exposed to information regarding environmental degradation, resource scarcity, waste generation, and sustainable consumption alternatives (Keshavarz *et al*., 2025) [33]. Understanding these issues requires substantial cognitive effort because sustainability decisions often involve complex trade-offs between economic, environmental, and social outcomes. Individuals with higher levels of Cognitive Intelligence are better able to process such information and integrate sustainability considerations into their decision-making. Consequently, they are more likely to develop awareness regarding resource scarcity and perceive greater value in sustainable consumption practices (Šalčiuvienė *et al*., 2025) [57]. CIPT further suggests that cognitive outcomes serve as precursors to behavioral responses. In this study, Resource Consciousness and Sustainable Value Perception represent cognitive evaluations that emerge from information processing activities. These cognitive evaluations subsequently influence Circular Consumption Behavior (Gonella *et al*., 2024; Talukder *et al*., 2024) [24, 62]. Therefore, Cognitive Intelligence acts as an antecedent that initiates a sequence of cognitive processes leading to sustainable behavioral outcomes.

2.1.2. Value-Belief-Norm Theory

Value-Belief-Norm Theory explains environmentally responsible behavior through a sequence of values, beliefs, awareness, and personal norms. According to the theory, individuals who recognize environmental consequences and understand resource limitations are more likely to develop personal obligations toward sustainable actions (Mamun *et al*., 2022) [43]. Resource Consciousness reflects such awareness and serves as a motivational mechanism that encourages circular consumption practices. The theory therefore, supports the relationship between Resource Consciousness and Circular Consumption Behavior (Keshavarz *et al*., 2025) [33].

2.1.3. Theory of Planned Behavior

The Theory of Planned Behavior suggests that behavioral decisions are influenced by beliefs and evaluations regarding the outcomes of specific actions. Sustainable Value Perception reflects consumers' evaluation of the environmental, social, and economic benefits associated with sustainable practices. Consumers who perceive greater value from circular economy activities are more likely to engage in

behaviors such as recycling, repairing, sharing, and reusing products (Farooque *et al*., 2019) [18]. TPB therefore provides additional support for the relationship between Sustainable Value Perception and Circular Consumption Behavior (Corsini *et al*., 2020, 2024; Ozden, 2026) [11, 10, 47]. The integration of these three theories offers a comprehensive explanation of the proposed framework. Cognitive Information Processing Theory explains how Cognitive Intelligence shapes cognitive evaluations, while VBN and TPB explain how these evaluations are transformed into circular consumption behavior. Environmental Literacy further strengthens these relationships by enhancing consumers' ability to understand and apply sustainability knowledge in behavioral decisions as shown in Figure 1.

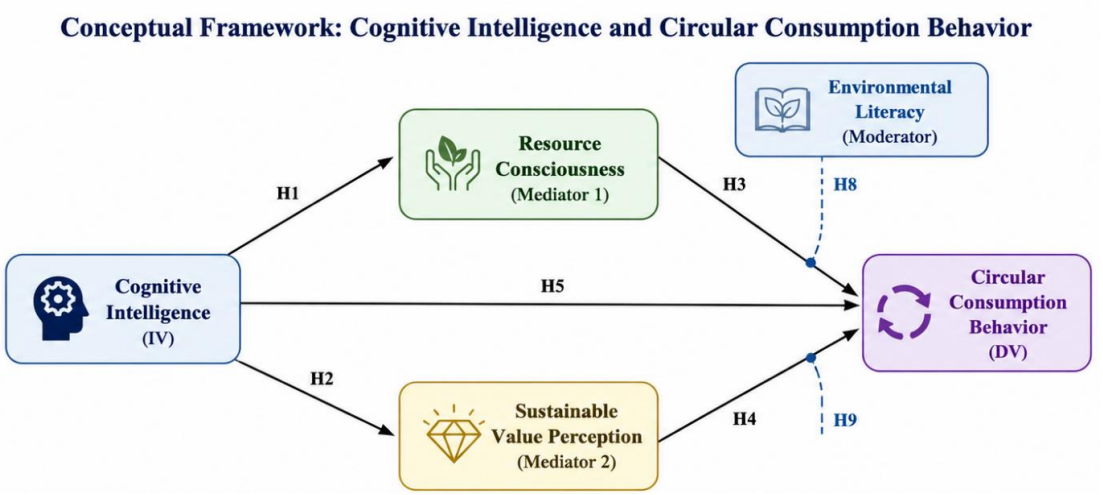

Fig 1: Framework of Study

2.2. Cognitive Intelligence and Circular Consumption Behavior

The transition toward a circular economy has emerged as a critical strategy for addressing resource depletion, environmental degradation, and unsustainable consumption patterns. Unlike the traditional linear economy characterized by the "take-make-dispose" model, the circular economy promotes resource efficiency through reducing, reusing, repairing, refurbishing, and recycling products and materials (Kanda *et al*., 2021) [31]. However, achieving circularity requires not only technological and institutional changes but also significant behavioral transformation among consumers. Circular Consumption Behavior (CCB) refers to consumer actions that support resource conservation and extend product lifespans through practices such as product sharing, repair, recycling, and responsible disposal. Understanding the cognitive mechanisms that drive such behavior has therefore become an important research priority (Islam *et al*., 2021; Rabiu & Jaeger-Erben, 2022) [30, 52].

One factor that may play a pivotal role in promoting circular consumption is Cognitive Intelligence (CI). Cognitive intelligence refers to an individual's ability to process information, evaluate alternatives, solve problems, and make reasoned decisions based on available evidence (Linde *et al*., 2025; Singh & Giacosa, 2018) [39, 60]. Individuals with higher cognitive intelligence are more capable of analyzing complex information, understanding long-term consequences, and integrating multiple dimensions of decision-making. Sustainability and circular economy decisions often involve trade-offs between immediate convenience and long-term environmental benefits, making cognitive capabilities particularly relevant (Korteling *et al*., 2023; Linde *et al*., 2025; Zöldy *et al*., 2022) [35, 39, 72].

The relationship between cognitive intelligence and sustainable behavior can be explained through Cognitive Information Processing Theory. The theory posits that individuals actively process information, interpret environmental cues, and use cognitive resources to make informed decisions. Consumers with higher cognitive intelligence are more likely to evaluate the environmental consequences of their actions and recognize the importance of resource conservation (Luo *et al*., 2023; Si *et al*., 2026) [42, 59]. Consequently, they are expected to exhibit stronger engagement in circular consumption practices. Unlike impulsive or habitual consumption, circular consumption often requires deliberate thinking, information evaluation, and future-oriented reasoning, all of which are facilitated by higher cognitive intelligence (Greene *et al*., 2023; Hobson *et al*., 2021; Keshavarz *et al*., 2025) [26, 28, 33].

Previous sustainability studies have largely focused on environmental concern, green attitudes, and ecological awareness as antecedents of sustainable behavior. However, these factors may not fully explain why some consumers translate sustainability knowledge into actual behavior while others do not (Gonzalez-Arcos *et al*., 2021) [25]. Cognitive intelligence provides a deeper explanation by emphasizing individuals' ability to process sustainability information and make rational consumption decisions. Therefore, cognitive intelligence may serve as a foundational capability influencing circular economy participation (Morais *et al*., 2021; Singh & Giacosa, 2018) [45, 60].

2.3. Cognitive Intelligence and Resource Consciousness

Resource Consciousness (RC) refers to an individual's awareness of resource scarcity and the importance of conserving natural resources through efficient consumption practices. It reflects consumers' recognition that resources such as energy, water, and raw materials are finite and should be utilized responsibly (Paço *et al*., 2018; Panda & Sharma, 2026) [48, 49]. Resource-conscious consumers are more likely to adopt behaviors that minimize waste and maximize resource efficiency.

The development of resource consciousness requires the ability to understand complex environmental problems and

evaluate the long-term implications of consumption decisions. Individuals with higher cognitive intelligence possess superior analytical and reasoning abilities, enabling them to comprehend resource scarcity issues and assess the environmental consequences of excessive consumption (Korteling *et al*., 2023; Salahodjaev, 2015) [35, 56]. Through effective information processing, cognitively intelligent individuals are more likely to recognize the interconnectedness between consumption behavior and environmental sustainability.

Cognitive Information Processing Theory suggests that individuals differ in their ability to process environmental information. Those with higher cognitive intelligence can better interpret sustainability-related messages and integrate such information into their decision-making processes (DeCaro *et al*., 2017; Korteling *et al*., 2023) [12, 35]. Consequently, cognitive intelligence may strengthen awareness of resource limitations and foster a greater sense of responsibility toward resource conservation.

As consumers become increasingly aware of environmental challenges, resource consciousness has emerged as an important determinant of sustainable behavior (Panda & Sharma, 2026; Ping & Liu, 2023) [49, 50]. However, the cognitive foundations underlying resource consciousness remain underexplored. Given that awareness and understanding are products of information processing, cognitive intelligence may serve as an important antecedent to resource consciousness (Dreyer *et al*., 2022) [14].

2.4. Cognitive Intelligence and Sustainable Value Perception

Sustainable Value Perception (SVP) refers to consumers' assessment of the environmental, social, and economic benefits associated with sustainable products and consumption practices. Consumers who perceive greater sustainable value are more likely to support environmentally responsible products and engage in sustainability-oriented behaviors (Burkert *et al*., 2023; Sun *et al*., 2022) [6, 61].

The formation of value perceptions involves cognitive evaluation processes. Consumers assess product attributes, compare alternatives, and determine the overall benefits derived from sustainable choices. Individuals with higher cognitive intelligence are better equipped to evaluate both tangible and intangible sustainability benefits, including environmental preservation, social responsibility, and long-term economic savings (Korteling *et al*., 2023) [35].

From a cognitive processing perspective, sustainable value perception results from consumers' ability to interpret and evaluate sustainability-related information. Cognitive intelligence enhances information comprehension, allowing individuals to recognize the broader benefits associated with sustainable products and circular consumption practices. Consequently, cognitively intelligent consumers are more likely to perceive sustainability as valuable and worthwhile (Alonso-Almeida *et al*., 2020; Saari *et al*., 2021) [1, 54].

Furthermore, sustainability often involves delayed or indirect benefits that may not be immediately observable. Recognizing such benefits requires future-oriented thinking and analytical reasoning, both of which are associated with cognitive intelligence. Therefore, cognitive intelligence is expected to positively influence sustainable value perception.

2.5. Resource Consciousness and Circular Consumption Behavior

Resource consciousness plays a central role in motivating circular consumption behavior. Consumers who understand resource scarcity and environmental limitations are more likely to adopt behaviors aimed at conserving resources and reducing waste. Such individuals recognize the importance of extending product lifecycles and minimizing environmental impact (Koch *et al*., 2023; Rabiu & Jaeger-Erben, 2022) [34, 52].

Value-Belief-Norm Theory provides a useful framework for understanding this relationship. According to the theory, awareness of environmental consequences leads to personal norms that encourage responsible behavior. Resource-conscious individuals are more likely to develop moral obligations toward sustainable consumption and circular economy participation (Hong *et al*., 2024) [29].

Empirical studies consistently show that awareness of environmental problems and resource scarcity influences recycling, reuse, and waste reduction behaviors. Resource-conscious consumers actively seek opportunities to reduce consumption and maximize resource efficiency. Therefore, resource consciousness is expected to positively influence circular consumption behavior (Keshavarz *et al*., 2025) [33].

2.6. Sustainable Value Perception and Circular Consumption Behavior

Sustainable value perception represents an important motivational mechanism underlying sustainable behavior. Consumers are more likely to engage in circular consumption when they perceive meaningful value from sustainable products and practices. Such value may include environmental benefits, social contributions, economic savings, and enhanced personal satisfaction (Cascavilla *et al*., 2025) [8].

According to consumer value theory, perceived value is a key determinant of behavioral decisions. When consumers perceive sustainable products as beneficial and worthwhile, they are more likely to support circular economy initiatives. Sustainable value perception strengthens consumers' willingness to repair, reuse, recycle, and share products, thereby promoting circular consumption behavior (Alonso-Almeida *et al*., 2020; Sairanen *et al*., 2024) [1, 55].

The relationship between sustainable value perception and circular consumption is particularly important because sustainable actions often involve additional effort or behavioral changes. Perceived value provides the justification necessary for consumers to adopt such behaviors. Consequently, sustainable value perception is expected to positively influence circular consumption behavior (Arias *et al*., 2024; Cascavilla *et al*., 2025) [3, 8].

2.7. Mediating Roles of Resource Consciousness and Sustainable Value Perception

The influence of cognitive intelligence on circular consumption behavior may not be entirely direct. Instead, cognitive intelligence may operate through intermediate psychological mechanisms. Resource consciousness and sustainable value perception provide two important pathways through which cognitive intelligence can shape sustainable behavior (Xin *et al*., 2025) [70]. Individuals with higher cognitive intelligence are better able to understand environmental challenges and recognize resource scarcity, leading to greater resource consciousness. This heightened awareness subsequently motivates circular consumption practices. Similarly, cognitive intelligence enables

consumers to evaluate the broader benefits of sustainability, enhancing sustainable value perception and encouraging sustainable behavior (Si *et al*., 2026; Xin *et al*., 2025) [59, 70]. These mediating mechanisms align with Cognitive Information Processing Theory, which suggests that information processing influences attitudes, perceptions, and ultimately behavior. Resource consciousness and sustainable value perception, therefore represent key cognitive outcomes that translate intelligence into circular consumption behavior (Alonso-Almeida *et al*., 2020; Keshavarz *et al*., 2025) [1, 33].

2.8. Moderating Role of Environmental Literacy

Environmental Literacy (EL) refers to an individual's knowledge and understanding of environmental systems, sustainability issues, and ecological consequences. Environmental literacy enables consumers to interpret environmental information and make informed decisions regarding sustainability (Fang *et al*., 2022) [17].

The effectiveness of resource consciousness and sustainable value perception may depend on consumers' environmental literacy. Individuals possessing high environmental literacy are better able to apply sustainability knowledge in practical contexts, strengthening the impact of resource consciousness and value perceptions on behavior (Liu & Tobias, 2023; Saari *et al*., 2021) [40, 54]. Conversely, consumers with limited environmental literacy may struggle to translate awareness and perceived value into actual circular consumption practices (Alonso-Almeida *et al*., 2020; Keramitsoglou *et al*., 2023) [1, 32].

Environmental literacy therefore functions as a boundary condition that determines the extent to which cognitive evaluations influence behavior. Higher levels of environmental literacy are expected to strengthen the relationships between resource consciousness, sustainable value perception, and circular consumption behavior (Liu & Tobias, 2023; Saari *et al*., 2021) [40, 54].

2.9. Research Gap

Despite growing interest in the circular economy and sustainable consumption, several important gaps remain in the literature (Eisenreich *et al*., 2022; Hobson *et al*., 2021) [16, 28]. First, existing studies predominantly focus on attitudinal factors such as environmental concern, ecological awareness, green values, and sustainability attitudes, while largely overlooking the role of cognitive capabilities in shaping circular consumption behavior (Keshavarz *et al*., 2025) [33]. Consequently, the cognitive foundations underlying sustainable decision-making remain insufficiently understood (Bourdin, 2025; Keshavarz *et al*., 2025) [5, 33].

Second, although resource consciousness and sustainable value perception have been identified as important drivers of sustainable behavior, limited research has examined their roles as mediating mechanisms linking cognitive characteristics to circular consumption outcomes. The processes through which cognitive intelligence translates into sustainable behavior therefore, remain underexplored (Bourdin, 2025; Luo *et al*., 2023) [5, 42].

Third, prior research has largely emphasized behavioral intentions rather than actual circular consumption behavior. This limitation restricts understanding of how cognitive and perceptual factors influence real-world sustainability practices such as reuse, repair, sharing, and recycling (Greene *et al*., 2023; Vadakkepatt *et al*., 2020) [26, 66].

Finally, while environmental literacy has been recognized as an important sustainability competency, its moderating role in strengthening the effects of resource consciousness and sustainable value perception on circular consumption behavior has received limited empirical attention (Conduit *et al*., 2023; Saari *et al*., 2021) [9, 54].

To address these gaps, the present study proposes a comprehensive framework that integrates Cognitive Intelligence, Resource Consciousness, Sustainable Value Perception, Environmental Literacy, and Circular Consumption Behavior. By extending Cognitive Information Processing Theory into the circular economy context, the study provides a novel explanation of how cognitive capabilities influence sustainable consumption and offers important theoretical and practical contributions to sustainability research.

2.10. Development of Hypothesis

2.10.1 Cognitive Intelligence and Resource Consciousness

Cognitive Intelligence refers to an individual's ability to process information, evaluate alternatives, solve problems, and make informed judgments. Individuals possessing higher cognitive intelligence are generally more capable of understanding complex sustainability challenges and evaluating the long-term consequences of consumption activities. Resource scarcity, environmental degradation, and waste management issues require substantial cognitive processing because their consequences are often indirect and long-term.

According to Cognitive Information Processing Theory, individuals with greater cognitive capabilities process information more effectively and generate more informed evaluations. Consumers with higher cognitive intelligence are therefore expected to develop greater awareness regarding resource limitations and environmental sustainability. Their ability to comprehend the implications of excessive consumption encourages responsible resource utilization and conservation-oriented thinking.

Consequently, cognitively intelligent consumers are likely to exhibit stronger resource consciousness than those with lower cognitive intelligence.

H1: Cognitive Intelligence positively influences Resource Consciousness.

2.9.2 Cognitive Intelligence and Sustainable Value Perception

Sustainable Value Perception refers to the extent to which consumers perceive environmental, social, and economic benefits from sustainable products and practices. The perception of value is largely influenced by an individual's ability to evaluate information and assess the consequences of alternative choices.

Cognitive Information Processing Theory suggests that cognitively intelligent individuals engage in deeper information processing and are more capable of recognizing long-term benefits. Such individuals are likely to appreciate the broader value associated with sustainability initiatives, including environmental protection, social responsibility, and resource efficiency.

As a result, consumers with higher cognitive intelligence are expected to perceive greater value in sustainable products and circular economy practices.

H2: Cognitive Intelligence positively influences Sustainable Value Perception.

2.10.3. Resource Consciousness and Circular Consumption Behavior

Resource Consciousness reflects awareness regarding the scarcity and importance of natural resources. Consumers who recognize the finite nature of resources are more likely to adopt behaviors that reduce waste and promote resource efficiency.

Value-Belief-Norm Theory suggests that awareness of environmental consequences creates personal obligations that motivate environmentally responsible behavior. Resource-conscious individuals are therefore expected to support circular economy activities such as product reuse, repair, recycling, and sharing.

Consequently, greater resource consciousness should encourage stronger circular consumption behavior.

H3: Resource Consciousness positively influences Circular Consumption Behavior.

2.10.4. Sustainable Value Perception and Circular Consumption Behavior

Consumers engage in sustainable behavior when they perceive meaningful value from such actions. Sustainable Value Perception represents consumers' evaluation of the benefits associated with circular consumption activities.

According to the Theory of Planned Behavior, positive evaluations of behavioral outcomes increase the likelihood of performing the behavior. Consumers who perceive environmental, social, and economic value from circular economy practices are therefore more inclined to participate in such activities.

Accordingly, Sustainable Value Perception is expected to positively influence Circular Consumption Behavior.

H4: Sustainable Value Perception positively influences Circular Consumption Behavior.

2.10.5. Cognitive Intelligence and Circular Consumption Behavior

Individuals with higher cognitive intelligence are more capable of understanding sustainability challenges, evaluating alternatives, and making future-oriented decisions. Circular consumption often requires consumers to sacrifice short-term convenience for long-term sustainability benefits.

Through effective information processing and rational decision-making, cognitively intelligent consumers are more likely to adopt environmentally responsible behaviors that support circular economy objectives.

Therefore, Cognitive Intelligence is expected to directly influence Circular Consumption Behavior.

H5: Cognitive Intelligence positively influences Circular Consumption Behavior.

2.10.6. Mediating Role of Resource Consciousness

Although cognitive intelligence may directly influence circular consumption behavior, its impact is likely to occur through greater awareness of resource scarcity and environmental consequences. Individuals with higher cognitive intelligence are better able to understand sustainability information, which increases resource consciousness and subsequently encourages circular consumption practices.

Resource Consciousness therefore serves as a mechanism through which cognitive intelligence is translated into sustainable behavioral outcomes.

H6: Resource Consciousness mediates the relationship between Cognitive Intelligence and Circular Consumption Behavior.

2.10.7. Mediating Role of Sustainable Value Perception

Cognitive intelligence also facilitates the recognition of environmental, social, and economic benefits associated with sustainable products and circular economy practices. These perceived benefits create favorable evaluations that motivate sustainable behavior.

Consequently, Sustainable Value Perception functions as an important mechanism linking Cognitive Intelligence to Circular Consumption Behavior.

H7: Sustainable Value Perception mediates the relationship between Cognitive Intelligence and Circular Consumption Behavior.

2.10.8. Moderating Role of Environmental Literacy

Environmental Literacy refers to an individual's knowledge and understanding of environmental issues and sustainability principles. Consumers possessing high environmental literacy are better able to interpret environmental information and apply sustainability knowledge in behavioral decisions.

Environmental Literacy strengthens the effectiveness of Resource Consciousness because knowledgeable consumers are more capable of translating awareness into action. Similarly, individuals with higher environmental literacy can better appreciate the benefits associated with sustainable consumption, enhancing the influence of Sustainable Value Perception on behavior.

Therefore, Environmental Literacy is expected to strengthen both relationships.

H8: Environmental Literacy positively moderates the relationship between Resource Consciousness and Circular Consumption Behavior, such that the relationship is stronger at higher levels of Environmental Literacy.

H9: Environmental Literacy positively moderates the relationship between Sustainable Value Perception and Circular Consumption Behavior, such that the relationship is stronger at higher levels of Environmental Literacy.

3. Methodology

3.1. Research Design

This study employed a quantitative, cross-sectional research design (Pratiwi *et al.*, 2023) [51] to investigate the influence of Cognitive Intelligence on Circular Consumption Behavior through the mediating roles of Resource Consciousness and Sustainable Value Perception, as well as the moderating role of Environmental Literacy. A quantitative approach was considered appropriate because the study seeks to examine causal relationships among multiple latent constructs and empirically test a theoretically grounded framework. Cross-sectional survey designs are widely used in sustainability and consumer behavior research because they facilitate the collection of standardized data from a large number of respondents within a relatively short period while enabling the examination of complex behavioral relationships. The study was conducted in Tunisia, a country that has increasingly prioritized sustainable development, resource efficiency, and environmental protection as part of its broader economic and social transformation agenda. Tunisia faces growing environmental challenges related to waste management, resource scarcity, and sustainable consumption, making it an appropriate context for examining consumer participation in circular economy practices. Understanding the cognitive and psychological factors that

encourage circular consumption behavior among Tunisian consumers can provide valuable insights for policymakers and businesses seeking to accelerate the transition toward a more sustainable and resource-efficient economy.

3.2. Target Population and Sampling Frame

The target population consisted of adult consumers residing in Tunisia who have experience purchasing consumer products and are capable of making independent consumption decisions. Since circular consumption behavior involves activities such as recycling, reusing, repairing, sharing, and responsible disposal of products, respondents were required to have prior purchasing experience and familiarity with sustainability-related consumption decisions. The sampling frame included consumers from major urban regions of Tunisia, including Tunis, Sfax, Sousse, Kairouan, Gabès, and Bizerte. These regions were selected because they represent diverse socioeconomic backgrounds and contain a substantial proportion of the country's consumer population. Data were collected through online and offline survey distribution methods to ensure broad demographic representation.

3.3. Sample Selection Criteria

To ensure the relevance and quality of the collected data, respondents were required to satisfy the following inclusion criteria:

1. Must be at least 18 years of age.
2. Must currently reside in Tunisia.
3. Must have independently purchased consumer products during the previous six months.
4. Must possess basic awareness of environmental or sustainability-related issues.
5. Must voluntarily agree to participate in the study.

The following exclusion criteria were applied:

1. Incomplete questionnaires with substantial missing data.
2. Duplicate responses.
3. Responses exhibiting straight-lining behavior or extremely short completion times.
4. Respondents younger than 18 years.
5. Respondents who indicated no involvement in purchasing decisions.

These criteria ensured that participants possessed sufficient experience and knowledge to provide meaningful responses regarding circular consumption practices.

3.4. Sample Size Determination

The minimum sample size was determined using Cochran's (1977) formula for large populations:

$$n_0 = \frac{Z^2 pq}{e^2}$$

Where:

- n_0= required sample size
- Z= Z-value corresponding to the desired confidence level
- p= estimated proportion of the population possessing the attribute
- $q = 1 - p$
- e= acceptable margin of error

Assuming a 95% confidence level ($Z = 1.96$), maximum variability ($p = 0.50, q = 0.50$), and a margin of error of 5% ($e = 0.05$), the sample size was calculated as:

$$n_0 = \frac{(1.96)^2(0.50)(0.50)}{(0.05)^2}$$

$$n_0 = \frac{3.8416 \times 0.25}{0.0025}$$

$$n_0 = \frac{0.9604}{0.0025}$$

$$n_0 = 384.16$$

$$n_0 \approx 385$$

Therefore, a minimum sample size of 385 respondents was required.

To account for potential non-response and incomplete questionnaires, additional surveys were distributed. After data screening and cleaning, 422 valid responses were retained for the final analysis, exceeding the minimum sample size requirement and ensuring adequate statistical power and representativeness.

3.5. Sampling Adequacy Verification

The adequacy of the sample was further confirmed using the respondent-to-parameter ratio:

$$R = \frac{N}{P}$$

Where:

1. R= respondent-to-parameter ratio
2. N= number of respondents
3. P= number of observed indicators

Assuming 20 measurement items:

$$R = \frac{422}{20}$$

$$R = 21.10$$

Since the obtained ratio exceeds the commonly recommended threshold of 10:1, the sample is considered sufficient for multivariate statistical analysis and hypothesis testing.

3.6. Data Collection Procedure

Data were collected between January and March 2026 using a structured questionnaire. The survey instrument was developed in English and translated into Arabic and French to accommodate Tunisia's multilingual population. A back-translation procedure was employed to ensure semantic consistency across language versions. The questionnaire was distributed through social media platforms, consumer forums, university networks, community organizations, and public locations such as shopping centers and community facilities. Participants were informed about the purpose of the study and assured that their participation was voluntary and anonymous. Prior to full-scale data collection, a pilot study involving 30 respondents was conducted to evaluate questionnaire clarity, wording, and reliability. Minor modifications were made based on participant feedback.

3.7. Measurement Instrument

All constructs were measured using previously validated scales adapted from the sustainability and consumer behavior literature. Responses were recorded using a five-point Likert scale ranging from:

1 = Strongly Disagree
2 = Disagree
3 = Neutral
4 = Agree
5 = Strongly Agree

The study measured five primary constructs:

- Cognitive Intelligence (CI)
- Resource Consciousness (RC)
- Sustainable Value Perception (SVP)
- Environmental Literacy (EL)
- Circular Consumption Behavior (CCB)

Each construct was operationalized using multiple reflective indicators to ensure comprehensive measurement of the underlying concept.

3.8. Data Analysis Technique

The collected data were analyzed using a two-stage analytical procedure. First, descriptive statistics were used to summarize respondents' demographic characteristics and identify potential data quality issues. Second, inferential analyses were conducted to evaluate the proposed theoretical relationships. The measurement model assessment examined reliability and validity using Cronbach's Alpha, Composite Reliability, Average Variance Extracted (AVE), and discriminant validity measures. Subsequently, hypothesis testing was performed by examining direct, indirect, and moderating effects among the constructs. The significance of the estimated relationships was assessed through path coefficients, t-values, and p-values.

4. Results

Measurement model assessment is conducted to evaluate the reliability and convergent validity of the latent constructs before testing the structural relationships. In PLS-SEM, this assessment ensures that the indicators consistently measure their intended constructs and that the constructs adequately capture the variance of their indicators. The analysis employs Cronbach's Alpha (α), Composite Reliability (ρA and ρC), and Average Variance Extracted (AVE). Cronbach's Alpha is derived from the ratio of item variances to total scale variance and is calculated as:

1. Cronbach's Alpha

$$\alpha = \frac{k}{k-1}\left(1 - \frac{\sum Var(X_i)}{Var(\sum X_i)}\right)$$

Where k = number of items, Var(Xi) = variance of each item, and Var(ΣXi) = variance of the total score.

2. Composite Reliability (ρc)

$$\rho_c = \frac{(\sum \lambda_i)^2}{(\sum \lambda_i)^2 + \sum(1-\lambda_i^2)}$$

Where λi represents standardized outer loadings and (1−λi²) represents error variance.

3. Composite Reliability (ρA)

$$\rho_A = \frac{(\mathbf{w}'\mathbf{S}\mathbf{w})^2}{(\mathbf{w}'\mathbf{S}\mathbf{w})^2 + \mathbf{w}'\Theta\mathbf{w}}$$

Where w is the indicator weight vector, S is the covariance/correlation matrix, and Θ is the measurement error matrix.

4. Average Variance Extracted (AVE)

$$AVE = \frac{\sum \lambda_i^2}{k}$$

Where λi² is the squared standardized loading and k is the number of indicators.

Table 1: Measurement Model Assessment: Reliability and Convergent Validity

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
Circular Consumption Behavior	0.772	0.774	0.854	0.595
Cognitive Intelligence	0.788	0.794	0.863	0.611
Environmental Literacy	0.786	0.820	0.856	0.600
Resource Consciousness	0.780	0.787	0.858	0.601
Sustainable Value Perception	0.780	0.781	0.858	0.602

The measurement model in Table 1 results demonstrate satisfactory reliability and convergent validity for all constructs. The Cronbach's Alpha values range from 0.772 to 0.788, exceeding the recommended threshold of 0.70 and indicating acceptable internal consistency among the measurement items. Similarly, the rho_A values (0.774–0.820) and Composite Reliability (ρC) values (0.854–0.863) are well above the minimum acceptable level of 0.70, confirming strong construct reliability. Furthermore, the Average Variance Extracted (AVE) values range from 0.595 to 0.611, surpassing the recommended threshold of 0.50 and indicating that each construct explains more than 50% of the variance in its indicators. Among the constructs, Cognitive Intelligence exhibits the highest convergent validity (AVE = 0.611) and composite reliability (ρC = 0.863), while Circular Consumption Behavior demonstrates the lowest yet acceptable reliability and validity values. Overall, these results confirm that all constructs possess adequate internal consistency reliability and convergent validity, supporting the suitability of the measurement model for subsequent structural model assessment and hypothesis testing.

Discriminant validity assessment is an essential step in evaluating the measurement model in PLS-SEM. It examines whether a construct is empirically distinct from other constructs within the model, ensuring that each latent variable measures a unique conceptual phenomenon. Among the available approaches, the Heterotrait–Monotrait Ratio (HTMT) has emerged as one of the most rigorous and reliable

methods for assessing discriminant validity. HTMT compares the correlations between indicators of different constructs (heterotrait correlations) with the correlations among indicators of the same construct (monotrait correlations). The method is used to identify potential overlaps between constructs that may not be detected through traditional approaches such as the Fornell–Larcker criterion or cross-loadings. According to established guidelines, HTMT values below 0.85 (strict criterion) or 0.90 (liberal criterion) indicate adequate discriminant validity. The use of HTMT is particularly important because it provides a more sensitive assessment of construct distinctiveness and helps ensure that the theoretical concepts represented in the model are empirically separate. Establishing discriminant validity confirms that the constructs capture unique aspects of the phenomenon under investigation and supports the validity of subsequent structural model analysis and hypothesis testing.

$$HTMT_{ab} = \frac{\frac{1}{mn}\sum_{i=1}^{m}\sum_{j=1}^{n}|r_{ij}|}{\sqrt{\left(\frac{1}{m(m-1)}\sum_{i=1}^{m}\sum_{k\neq i}^{m}|r_{ik}|\right)\left(\frac{1}{n(n-1)}\sum_{j=1}^{n}\sum_{l\neq j}^{n}|r_{jl}|\right)}}$$

Where:
r_ij = correlation between indicators belonging to different constructs (heterotrait correlations)
r_ik and r_jl = correlations between indicators within the same construct (monotrait correlations)
m and n = number of indicators in constructs a and b, respectively
Simplified Expression:
HTMT_ab = Mean of all heterotrait correlations / √(Mean monotrait correlations of construct a × Mean monotrait correlations of construct b)

Table 2: Discriminant Validity

	Circular Consumption Behavior	Cognitive Intelligence	Environmental Literacy	Resource Consciousness	Sustainable Value Perception	Environmental Literacy x Resource Consciousness	Environmental Literacy x Sustainable Value Perception
Circular Consumption Behavior							
Cognitive Intelligence	0.567						
Environmental Literacy	0.119	0.082					
Resource Consciousness	0.535	0.531	0.094				
Sustainable Value Perception	0.396	0.393	0.094	0.183			
Environmental Literacy x Resource Consciousness	0.094	0.030	0.054	0.048	0.025		
Environmental Literacy x Sustainable Value Perception	0.176	0.031	0.017	0.013	0.078	0.170	

The HTMT results in Table 2 provide strong evidence of discriminant validity among all constructs in the model. The highest HTMT value observed is between Cognitive Intelligence and Circular Consumption Behavior (HTMT = 0.567), followed by Resource Consciousness and Circular Consumption Behavior (HTMT = 0.535), and Cognitive Intelligence and Resource Consciousness (HTMT = 0.531). All HTMT values are substantially below the recommended threshold of 0.85, indicating that each construct is empirically distinct from the others. Furthermore, the interaction constructs, namely Environmental Literacy × Resource Consciousness and Environmental Literacy × Sustainable Value Perception, exhibit particularly low HTMT values ranging from 0.013 to 0.176, confirming minimal conceptual overlap with the primary constructs. Overall, the findings demonstrate that Circular Consumption Behavior, Cognitive Intelligence, Environmental Literacy, Resource Consciousness, Sustainable Value Perception, and the interaction terms represent unique theoretical concepts, thereby establishing satisfactory discriminant validity and supporting the suitability of the measurement model for structural model evaluation and hypothesis testing.

Hypothesis testing was conducted to examine the significance and direction of the proposed relationships among the study variables. The analysis was based on the estimated regression coefficients (β), standard errors, t-statistics, and p-values. The regression coefficient (β) indicates the magnitude and direction of the relationship between independent and dependent variables, whereas the t-statistic and p-value determine whether the observed relationship is statistically significant. A hypothesis is considered supported when the estimated coefficient is statistically significant at the 5% significance level ($p < 0.05$). The general regression model used to test the direct relationships can be expressed as:

$$CCB = \beta_0 + \beta_1 CI + \beta_2 RC + \beta_3 SVP + \beta_4 EL + \beta_5 (RC \times EL) + \beta_6 (SVP \times EL) + \varepsilon$$

CCB = Circular Consumption Behavior
CI = Cognitive Intelligence
RC = Resource Consciousness
SVP = Sustainable Value Perception
EL = Environmental Literacy
RC × EL = Moderating effect of Environmental Literacy on Resource Consciousness
SVP × EL = Moderating effect of Environmental Literacy on Sustainable Value Perception
β_0 = Intercept
β_1–β_6 = Regression coefficients
ε = Error term
For the mediation paths, the antecedent equations are:

$$RC = \alpha_0 + \alpha_1 CI + \varepsilon_1$$

$$SVP = \gamma_0 + \gamma_1 CI + \varepsilon_2$$

Thus, the complete model captures:
Direct effect: $CI \rightarrow CCB$
Indirect effect 1: $CI \rightarrow RC \rightarrow CCB$
Indirect effect 2: $CI \rightarrow SVP \rightarrow CCB$
Moderation: ELmoderates $RC \rightarrow CCB$and $SVP \rightarrow CCB$

Table 3: Hypothesis Testing

Hypothesis	Relationship	β	t-value	p-value	Decision
H1	Cognitive Intelligence → Resource Consciousness	0.423	10.584	< 0.001	Supported
H2	Cognitive Intelligence → Sustainable Value Perception	0.308	7.182	< 0.001	Supported
H3	Resource Consciousness → Circular Consumption Behavior	0.282	6.852	< 0.001	Supported
H4	Sustainable Value Perception → Circular Consumption Behavior	0.195	4.865	< 0.001	Supported
H5	Cognitive Intelligence → Circular Consumption Behavior	0.266	5.697	< 0.001	Supported
H6	Cognitive Intelligence → Resource Consciousness → Circular Consumption Behavior	0.119	5.436	< 0.001	Supported
H7	Cognitive Intelligence → Sustainable Value Perception → Circular Consumption Behavior	0.06	4.035	< 0.001	Supported
H8	Environmental Literacy × Resource Consciousness → Circular Consumption Behavior	0.048	1.276	0.202	Not Supported
H9	Environmental Literacy × Sustainable Value Perception → Circular Consumption Behavior	0.169	3.426	0.001	Supported

The hypothesis testing results provide strong support for the proposed theoretical framework linking Cognitive Intelligence to Circular Consumption Behavior through Resource Consciousness and Sustainable Value Perception. H1 reveals that Cognitive Intelligence has a significant positive effect on Resource Consciousness ($\beta = 0.423$, $t = 10.584$, $p < 0.001$), indicating that individuals with higher cognitive intelligence are more aware of resource scarcity and the importance of responsible resource utilization. Similarly, H2 demonstrates that Cognitive Intelligence significantly enhances Sustainable Value Perception ($\beta = 0.308$, $t = 7.182$, $p < 0.001$), suggesting that cognitively intelligent individuals are better able to recognize the environmental, social, and economic benefits associated with sustainable consumption practices. The results further show that Resource Consciousness significantly influences Circular Consumption Behavior (H3: $\beta = 0.282$, $t = 6.852$, $p < 0.001$), indicating that consumers who are more conscious of resource conservation are more likely to engage in circular economy practices such as reusing, repairing, and recycling products. Likewise, Sustainable Value Perception positively affects Circular Consumption Behavior (H4: $\beta = 0.195$, $t = 4.865$, $p < 0.001$), demonstrating that consumers who perceive greater value in sustainable products and practices are more inclined to adopt circular consumption behaviors. In addition, H5 confirms that Cognitive Intelligence exerts a direct positive influence on Circular Consumption Behavior ($\beta = 0.266$, $t = 5.697$, $p < 0.001$), suggesting that cognitive capability independently contributes to sustainable consumption decisions beyond the effects of the mediating variables. The mediation analysis provides further evidence regarding the mechanisms through which Cognitive Intelligence promotes circular consumption. H6 shows that Resource Consciousness significantly mediates the relationship between Cognitive Intelligence and Circular Consumption Behavior ($\beta = 0.119$, $t = 5.436$, $p < 0.001$). This finding indicates that cognitively intelligent individuals develop a stronger awareness of resource conservation, which subsequently encourages circular consumption practices. Similarly, H7 demonstrates that Sustainable Value Perception significantly mediates the relationship between Cognitive Intelligence and Circular Consumption Behavior ($\beta = 0.060$, $t = 4.035$, $p < 0.001$), suggesting that the ability to recognize sustainability-related benefits partially explains how cognitive intelligence translates into sustainable behavior. Regarding moderation effects, H8 proposed that Environmental Literacy would strengthen the relationship between Resource Consciousness and Circular Consumption Behavior. However, the interaction effect was not significant ($\beta = 0.048$, $t = 1.276$, $p = 0.202$), indicating that Environmental Literacy does not significantly alter the influence of Resource Consciousness on Circular Consumption Behavior. Therefore, H8 is not supported. In contrast, H9 is supported, as Environmental Literacy significantly strengthens the relationship between Sustainable Value Perception and Circular Consumption Behavior ($\beta = 0.169$, $t = 3.426$, $p = 0.001$). This result suggests that consumers possessing greater environmental knowledge are better able to translate perceived sustainability value into actual circular consumption practices. Overall, the findings highlight Cognitive Intelligence as a critical antecedent of Circular Consumption Behavior and demonstrate the important mediating roles of Resource Consciousness and Sustainable Value Perception, while Environmental Literacy serves as a significant boundary condition in the Sustainable Value Perception–Circular Consumption Behavior relationship.

4. Discussion

This study sought to explain how Cognitive Intelligence influences Circular Consumption Behavior through the mediating mechanisms of Resource Consciousness and Sustainable Value Perception, while also examining the moderating role of Environmental Literacy (G. M. Gomes *et al.*, 2022; S. Gomes & Lopes, 2023) [21, 23]. The findings provide substantial support for the proposed framework and offer important theoretical and practical insights into sustainable consumption and circular economy research. By integrating Cognitive Information Processing Theory (CIPT), Value-Belief-Norm (VBN) Theory, and the Theory of Planned Behavior (TPB), the study advances understanding of the cognitive foundations underlying circular consumption behavior.

The findings demonstrate that Cognitive Intelligence significantly enhances Resource Consciousness. This result supports Cognitive Information Processing Theory, which argues that individuals differ in their ability to acquire, process, and interpret information before making decisions (Hirschman, 1983) [27]. Consumers possessing higher cognitive intelligence are better able to understand complex sustainability challenges, evaluate the implications of resource scarcity, and appreciate the long-term environmental consequences of excessive consumption. Consequently, they develop stronger awareness regarding the importance of resource conservation. This finding extends previous sustainability research, which has predominantly emphasized environmental attitudes and ecological concern, by highlighting cognitive capability as a fundamental antecedent of resource-conscious behavior.

The results further reveal that Cognitive Intelligence positively influences Sustainable Value Perception. Consumers with greater cognitive intelligence appear more

capable of recognizing the environmental, social, and economic benefits associated with sustainable products and circular economy practices. This finding reinforces the argument that sustainability-related value perceptions are not formed solely through emotional or attitudinal processes but are also shaped by consumers' cognitive ability to evaluate information and assess future outcomes (Fu *et al*., 2026) [19]. The result supports Cognitive Information Processing Theory by demonstrating that deeper information processing facilitates more favorable evaluations of sustainable consumption alternatives.

Another important finding is the significant positive relationship between Resource Consciousness and Circular Consumption Behavior. This result aligns with Value-Belief-Norm Theory, which suggests that awareness of environmental consequences generates personal obligations that encourage environmentally responsible actions (Mamun *et al*., 2025; Saari *et al*., 2021) [44, 54]. Consumers who understand resource limitations and recognize the need for conservation are more likely to engage in circular practices such as recycling, repairing, sharing, and reusing products. The finding confirms that awareness of resource scarcity remains a critical driver of sustainable consumption and supports previous studies emphasizing the importance of environmental awareness in shaping pro-environmental behavior.

Similarly, Sustainable Value Perception was found to exert a significant positive influence on Circular Consumption Behavior. This finding is consistent with the Theory of Planned Behavior, which proposes that favorable evaluations of behavioral outcomes increase the likelihood of performing the behavior (Corsini *et al*., 2024; Lee, 2022; Ozden, 2026) [10, 38, 47]. Consumers who perceive meaningful environmental, economic, and social value from circular economy activities are more willing to adopt sustainable consumption practices. The result suggests that consumers engage in circular behavior not merely because they are environmentally concerned, but because they recognize tangible and intangible benefits associated with sustainability. Consequently, organizations seeking to promote circular consumption should clearly communicate the value generated through sustainable products and services.

The direct effect of Cognitive Intelligence on Circular Consumption Behavior was also found to be positive and significant. This finding indicates that cognitive intelligence influences sustainable behavior beyond the effects of Resource Consciousness and Sustainable Value Perception (Saari *et al*., 2021; Tan *et al*., 2021) [54, 63]. Individuals with higher cognitive capabilities are better able to evaluate consumption alternatives, consider future consequences, and make informed decisions that support sustainability objectives. The result contributes to the circular economy literature by demonstrating that cognitive intelligence functions as a direct behavioral determinant rather than merely an antecedent of cognitive evaluations. This finding is particularly important because most prior studies have focused on attitudes, values, and environmental concern while overlooking consumers' underlying cognitive abilities.

The mediation analysis provides further insights into the mechanisms through which Cognitive Intelligence promotes Circular Consumption Behavior. Resource Consciousness significantly mediates the relationship between Cognitive Intelligence and Circular Consumption Behavior (Saari *et al*., 2021; Singh & Giacosa, 2018) [54, 60]. This result suggests that cognitively intelligent individuals become more aware of resource scarcity and environmental challenges, which subsequently encourages participation in circular economy activities. The finding supports the central proposition of Cognitive Information Processing Theory that information processing shapes cognitive evaluations, which then influence behavioral outcomes. Resource Consciousness therefore serves as a critical psychological pathway translating cognitive capability into sustainable consumption practices.

Sustainable Value Perception was also found to mediate the relationship between Cognitive Intelligence and Circular Consumption Behavior. This finding indicates that cognitively intelligent consumers are more capable of recognizing the broader benefits of sustainability, and these favorable evaluations subsequently encourage circular consumption behavior (Gonella *et al*., 2024; Keshavarz *et al*., 2025) [24, 33]. Although the mediating effect of Sustainable Value Perception is smaller than that of Resource Consciousness, it remains statistically significant and theoretically meaningful. The result highlights the importance of perceived value as a motivational mechanism linking cognitive capability to sustainable behavioral outcomes.

The moderation analysis produced mixed findings. Environmental Literacy did not significantly moderate the relationship between Resource Consciousness and Circular Consumption Behavior. This finding suggests that awareness of resource scarcity may be sufficiently powerful to influence circular consumption regardless of consumers' level of environmental knowledge. Once individuals become conscious of resource limitations, they may naturally adopt resource-conserving behaviors without requiring additional environmental literacy (Duarte *et al*., 2024; Saari *et al*., 2021) [15, 54]. This result challenges the assumption that environmental knowledge always strengthens sustainability-related behavioral relationships and indicates that awareness alone may sometimes be adequate to drive action.

In contrast, Environmental Literacy significantly strengthened the relationship between Sustainable Value Perception and Circular Consumption Behavior. This finding suggests that environmentally literate consumers are better able to translate perceived sustainability benefits into actual behavior (Liu & Tobias, 2023) [40]. Individuals possessing greater environmental knowledge can more effectively understand how sustainable products contribute to environmental protection and resource conservation, thereby increasing the likelihood that perceived value will result in behavioral action. This result highlights Environmental Literacy as an important boundary condition in the sustainable consumption process and underscores the role of environmental education in promoting circular economy participation.

Overall, the findings make several important theoretical contributions. First, the study extends Cognitive Information

Processing Theory into the circular economy context by demonstrating how cognitive intelligence influences sustainable consumption behavior through cognitive evaluations. Second, it integrates Cognitive Information Processing Theory, Value-Belief-Norm Theory, and the Theory of Planned Behavior into a unified framework capable of explaining circular consumption behavior. Third, it introduces Cognitive Intelligence as a novel antecedent of sustainable consumption, addressing an important gap in the literature that has traditionally focused on attitudinal and value-based explanations. Finally, the study identifies Resource Consciousness and Sustainable Value Perception as key mechanisms linking cognitive capability to circular consumption outcomes.

From a practical perspective, the findings suggest that policymakers, educators, and businesses should focus not only on increasing environmental awareness but also on enhancing consumers' cognitive ability to understand sustainability issues. Educational campaigns should emphasize critical thinking, long-term consequences of consumption, and resource conservation principles. Organizations should communicate the environmental and economic value of sustainable products in a manner that facilitates consumer understanding and informed decision-making. Furthermore, investments in environmental literacy programs can strengthen consumers' ability to convert sustainability value perceptions into actual circular consumption behavior. Collectively, these efforts can contribute to the broader transition toward a more sustainable and circular society.

5. Conclusion

This study contributes to the growing circular economy literature by demonstrating how Cognitive Intelligence influences Circular Consumption Behavior through the mediating mechanisms of Resource Consciousness and Sustainable Value Perception. The findings reveal that cognitively intelligent consumers are more likely to recognize resource scarcity, appreciate the value of sustainable practices, and engage in circular consumption activities such as recycling, repairing, reusing, and sharing products. Both Resource Consciousness and Sustainable Value Perception significantly mediate the relationship between Cognitive Intelligence and Circular Consumption Behavior, highlighting the cognitive pathways through which sustainable behavior is developed. Furthermore, Environmental Literacy strengthens the effect of Sustainable Value Perception on Circular Consumption Behavior, although its moderating influence on the Resource Consciousness–Circular Consumption Behavior relationship was not supported. Overall, the study extends Cognitive Information Processing Theory into the circular economy context and establishes Cognitive Intelligence as an important antecedent of sustainable consumption behavior.

5.1. Theoretical and Practical Implications

The study offers several theoretical contributions. First, it extends Cognitive Information Processing Theory by demonstrating that cognitive capabilities play a fundamental role in shaping sustainable consumption decisions. Second, it integrates Cognitive Information Processing Theory, Value-Belief-Norm Theory, and the Theory of Planned Behavior into a unified framework explaining circular consumption behavior. Third, the study introduces Cognitive Intelligence as a novel predictor of circular consumption, thereby addressing a significant gap in sustainability research that has predominantly focused on attitudinal and value-based determinants. The identification of Resource Consciousness and Sustainable Value Perception as mediating mechanisms further enriches the understanding of how cognitive processes translate into sustainable behavior. From a practical perspective, the findings suggest that policymakers, educators, and businesses should focus on enhancing consumers' cognitive understanding of sustainability issues rather than relying solely on awareness campaigns. Educational initiatives that promote critical thinking, resource conservation, and sustainability literacy can encourage greater participation in circular economy activities. Organizations should communicate the environmental, social, and economic benefits of sustainable products more effectively to strengthen consumers' value perceptions and foster circular consumption practices. Furthermore, environmental literacy programs can improve consumers' ability to transform sustainability-related value perceptions into actual behavioral outcomes.

5.2. Future Direction of Research

Several opportunities exist for future research. First, future studies may examine additional cognitive and psychological variables, such as critical thinking ability, future orientation, ecological intelligence, and sustainability mindset, to provide a more comprehensive understanding of sustainable consumption behavior. Second, researchers may investigate other mediating mechanisms, including environmental self-efficacy, green trust, sustainable identity, and moral obligation, which may further explain the relationship between Cognitive Intelligence and Circular Consumption Behavior. Third, future studies could explore additional moderating factors such as cultural values, social influence, digital literacy, and environmental concern to identify boundary conditions influencing circular consumption decisions. Fourth, longitudinal research designs would provide stronger evidence regarding the causal relationships among the constructs and capture changes in consumer behavior over time. Finally, comparative studies across different countries, demographic groups, and cultural contexts would enhance the generalizability of the findings and provide deeper insights into the role of cognitive capabilities in promoting circular economy participation globally.

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