Received Date: 26 March 2025 I Accepted Date: 16 May 2025

RESEARCH ARTICLE

OPUS
Journal of Society Research

Effects of Working Memory Capacity and Cognitive Load on Decision Making and Rational-Experiential Information Processing*

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May 2025
Volume:22
Issue:3
DOI: 10.26466/opusjsr.1666411

Citation:
Coşkun, N. (2025). Effects of working memory capacity and cognitive load on decision making and rational-experiential information processing . *OPUS– Journal of Society Research, 22*(3), 417-431.

Abstract

Decision making is a situation that we encounter everyday. we come across theories supporting that we make decisions based on intuitions against the theories supporting that we make a decision by evaluating the possible results of the choices. Working memory has an important part in remembering the results of previous decisions and evaluating the consequences and studies are made to examine the relation between the two. Any load that limits working memory capacity effects decision making outcomes. The fact that there are two groups of theories that support rational or intuitive decision making has led to the investigation of relation between rational-experiential information processing and decision making. Yet studies investigate these relations separately. In the current study, the effect of cognitive load on information processing strategy and the way which it alters decision making is examined. Results show a significant relationship between working memory capacity and rational information processing, but no such relationship is found to be significant in relation to experiential processing as excepted. Cognitive load had a significant main effect on decision making and rationality but had no effect on experientiality. Results are discussed in accordance with relevant literature.

Keywords: *Decision making, Working memory capacity, Rational-experiential information processing, Cognivite load*

Öz

Karar verme günlük hayatta her gün karşılaştığımız bir durumdur. Tercihlerin olası sonuçlarını değerlendirerek bilişsel hesaplamalar yaparak karar verdiğimizi savunan teorilere karşı sezgilere dayanarak karar verdiğimizi savunan teoriler alanda karşımıza çıkmaktadır. Önceki tercihlerin sonuçlarını hatırlamak ve olası sonuçları değerlendirmek için çalışma belleğinin karar verme sürecinde rol oynadığı düşünülmüş ve ikisi arasındaki ilişkiyi inceleyen çalışmalar yapılmıştır. Çalışma belleğini kısıtlayan herhangi bir bilişsel yük karar verme performansını etkiler. Mantıksal ya da sezgisel karar verdiğimizi savunan iki farklı grupta teorilerin olması karar vermenin mantıksal-deneyimsel bilgi işlemlemeyle olan ilişkisinin incelenmesine neden olmuştur. Ancak çalışmalar genellikle bu ilişkileri ayrı ayrı inceler. Bu çalışmada, bilişsel yükün bilgi işleme stratejisi üzerindeki etkisi ve karar vermeyi değiştirme biçimi incelenmiştir. Sonuçlar, çalışma belleği kapasitesi ile rasyonel bilgi işleme arasında anlamlı ilişki olduğunu göstermektedir, ancak deneyimsel işlemeyle ilgili olarak anlamlı bir ilişki bulunamamıştır. Bilişsel yükün karar verme ve rasyonellik üzerinde anlamlı bir temel etkisi vardır ancak deneyimsellik üzerinde anlamlı bir etkisi bulunamamıştır. Sonuçlar, ilgili literatür kapsamında yorumlanmıştır.

Anahtar Kelimeler: *Karar verme, Çalışma belleği kapasitesi, Mantıksal-deneyimsel bilgi işlemleme, Bilişsel yük*

* *This article is based on the doctoral dissertation titled "The Effect of Working Memory Capacity and Cognitive Load on Analytical-Experiential Information Processing and Decision Making", completed at Bursa Uludağ University, Graduate School of Social Sciences (Thesis No: 649051).*

Introduction

In daily life, we often encounter situations where we make decisions. In such cases, we tend to focus on what decision we should make rather than how we make decisions. While it may be sufficient for us to simply make a choice and eliminate uncertainty, experimental psychology researchers have gone further, conducting studies on how we make decisions.

Working memory is defined as the short term memory system which is responsible for both temporary storage and manipulation of information necessary for high-level cognitive functions such as reasoning, comprehension, problem-solving, and decision-making (Bayındır et al., 2017). When individuals are faced with a situation that requires decision-making, working memory system stores the relevant information for a limited period of time and processes the information related to the situation.

The subject of decision-making has been examined not only in relation to working memory but also in terms of its connection to rational-experiential information processing. This relationship draws attention due to differing views that either argue whether decisions are based on rational reasoning or that they rely on intuition and cognitive shortcuts. When dual-process theories of information processing are examined, two distinct systems emerge: the rational and the experiential information processing systems (Epstein, 1994).

1. Decision Making

The term "decision making" transitioned from the field of public administration to the domain of business and economics research in the mid-20th century. With the adoption of the term "decision," the emphasis shifted to the conclusion of thought processes and the initiation of action (Buchanan & O'Connell, 2006). The Rational Decision-Making Model appears as a model primarily focused on how we should make decisions and behave. While it does not account for situations involving uncertainty, it remains centered on how individuals can make the most optimal decisions. In this model, rational thinking is at the forefront. Over time, assumptions in the field of decision-making have shifted from strict rationality toward bounded rationality (Simon, 1979).

One model based on the assumption that individuals make decisions on a rational basis is the expected utility theory, which assumes that humans are inherently rational and, therefore, when in possession of all relevant information, will make decisions that yield the greatest expected benefit. Utility refers to outcomes that align with a person's goals. Economists studying decision-making have traditionally interpreted utility in monetary terms—suggesting that the aim of good decision-making is to make choices that result in the greatest financial gain. It is believed that all individuals who think logically adhere to the propositions of this theory, and behavioral studies support this view (Kahneman & Tversky, 1979).

2. Working Memory

Approaches that explain decision-making using both cognitive processes and emotional/intuitive cues have investigated the relationship between decision-making and working memory. The first reason for these studies is that studies using brain imaging have shown that the cortical regions associated with decision-making overlap with those involved in working memory (Courtney et al., 1997). Another reason is that the decision-making function, which is considered one of the executive functions, is associated with the component of working memory, known as central executive. Central executive component is responsible for attention-related tasks. Attention control and inhibition functions are conducted by the central executive (Baddeley, 2003). Through this central executive component, working memory has a role in executive functions such as decision-making and reasoning (Czernatowicz-Kukuczka et al., 2014).

Working memory is not only a system for memorizing and retaining information about the current situation but also a system through which many complex cognitive activities are carried out, including problem-solving, reasoning, language processing, decision-making and visuospatial thinking (Miyake & Shah, 1999). The functions of working memory include retaining information over short periods, updating information, performing goal-directed computations related to active representations, and quickly controlling task-relevant thoughts and behaviors in line with these goals (Hassin, 2005).

3. The Relationship Between Working Memory and Decision-Making

The central executive, one of the components of working memory, is associated with attention. Decision-making is considered one of the executive functions. As executive functions are defined as the directed allocation of attention toward a specific goal, planning, and the encoding and processing of relevant information in working memory, the relationship between decision-making and working memory is examined. However, research in this area is a debated topic. While some researchers claim that working memory and decision-making are independent functions, others argue that there is an interaction between them (Toth & Lewis, 1992).

Researchers who argue that these two processes are not related often refer to evidence from neuroimaging studies. In cases of frontal lobe damage, it is frequently observed that working memory—especially the central executive component responsible for directing attention during information use—and attention-related functions are adversely affected. Other components of working memory different than the central executive, are considered relevant to decision-making. The phonological loop component is also considered to have a role in decision-making by enabling the verbal processing of past decisions and their outcomes. Researchers who support the idea that the central executive is involved in decision-making argue that damage to the frontal lobe limits working memory, thereby negatively impacting decision-making performance (Manes et al., 2002). Findings from imaging studies suggest that people with dorsolateral prefrontal cortex injuries who have impaired working memory exhibit normal decision-making performance (Bechara et al., 1997). In contrast, patients who suffer from ventromedial prefrontal cortex injuries may exhibit normal working capacity performance but they have poor performance in decision making tasks (Bechara et al., 1997).

In contrast to studies that consider working memory and decision-making to be independent subjects, there are also studies demonstrating that working memory has an effect on decision-making processes (Jameson et al., 2004). Damasio (1998) argues that in decision-making processes, it is essential for the prefrontal cortex to interact with somatic markers of other information. Considering that one of the primary functions of the frontal cortex is to support working memory, it can be concluded that working memory and decision-making may be mutually reinforcing processes. Working memory is a cognitive system capable of holding a limited amount of information in the focus of attention for a short period.

Pecchinenda and colleagues (2006) suggested that if it is accepted that retaining previous outcomes in memory leads to more advantageous results in subsequent steps, then tracking gains and losses would pose a challenge for people that have low working memory capacity. The concept that working memory is responsible for retrieving task-relevant information from long-term memory supports this theory. As a result, individuals with low working memory capacity may strive to retrieve information about the outcomes of previous choices, which would negatively affect their decision-making performance.

3.1. The Effect of Working Memory Capacity on Decision-Making

In the study by Bagneux and colleagues (2013), which aimed to examine the relationship between decision-making and working memory capacity, working memory capacity was obtained using three different tasks: reading span, symmetry span, and operation span. Instead of relying on a single task, the study employed multiple tasks to obtain an average working memory capacity. After each task presented in the study, a list to be remembered was also given. Decision-making performance was assessed using the Iowa Gambling Task. As expected, the results showed that participants with high working memory capacity had more advantageous decision-making performance. These findings support earlier research showing a link between working memory and decision-making patterns. It was proposed that working memory capacity can predict the ability to clearly identify the most advantageous choice. In other words, individuals with higher working memory capacity can more quickly and clearly comprehend the rules and content of assigned tasks. On the other hand, people with low working memory capacity struggle to grasp or take longer to understand the task content, resulting in lower performance.

In another study examining the relationship between working memory capacity and decision-making, it was found that limiting working memory capacity increased impulsive decision-making rather than random decision-making (Hatfield-Eldred et al., 2015). Some researchers define working memory as a capacity related to making decisions and planning among various options, and they argue that when this capacity is reduced, individuals experience difficulty retaining the information necessary to make better decisions (Hinson et al., 2003).

Furley and Memmert (2012) investigated athletes' decision-making performance in hypothetical sports scenarios based on their working memory capacity. Due to the fact that individual differences in working memory capacity can predict thought and behavior, it was hypothesized that individuals with low working memory capacity would be more susceptible to distractions and impulsive errors. As a result, it was found that working memory capacity served as a successful predictor of decision-making in basketball-related scenarios.

3.2. The Effect of Working Memory Load on Decision-Making

With the increasing recognition of the link between working memory and decision-making, interest has grown in how working memory load might affect this relationship. If there is a true link between working memory and decision-making, one would expect working memory load to negatively impact this interaction and reduce decision-making performance. However, results in this area are mixed. While some studies have reported no effect on decision-making performance, others have demonstrated a significant impact of working memory load (Bagneux et al., 2013).

Ester and colleagues (2014) imposed working memory load on participants by assigning tasks such as "detecting color changes" and "remembering movement," then asked them to make predictive decisions. Consistent with previous research, participants under working memory load made poorer decisions compared to the participants in the control group. The results suggest that individual differences in working memory influence decision-making ability. Individuals with high working memory capacity possess more cognitive resources, allowing them to use more strategies during decision-making.

In a study designed to closely investigate this relationship, researchers questioned whether disruptions in working memory would affect performance in decision-making tasks, and how working memory load might influence decision-making (Hinson et al., 2002). When participants were given an additional task to occupy their working memory—creating a working memory load condition—they made poorer decisions. Although the results were as expected, the interpretations varied. The adverse impact of working memory load on decision-making performance is a commonly observed finding, but researchers differ in how they explain the nature of this relationship. The researchers of this study stated that the findings could not be explained solely by the inability of working memory to retain and process necessary information under load. Instead, they proposed that working memory load hinders the formation of emotional signals necessary for decision-making, thereby impairing performance. In such a case, failure in decision-making tasks under working memory load is expected because participants either miss or are unable to form somatic markers due to the cognitive burden.

Working memory is a multi-component system, and additional research is required to clarify which components are specifically related to decision-making tasks. The decline in performance under working memory load may stem from the load consuming central executive resources, or from interference with the phonological loop, which handles short-term verbal storage. As working memory load hampers the recording of outcomes, a decline in performance may be observed. It has been predicted that articulatory suppression may interfere with control tasks but not affect the central executive function. Consequently, if verbal strategies are necessary for completing the decision task, then working memory load should impair performance by affecting the phonological loop.

4. Rational–Experiential Information Processing

We have examined the distinction between theories that argue decision-making involves logical computations using cognitive resources and those that claim decisions are based on intuitive methods driven by emotional cues. This distinction brings dual-process theories to the forefront. The categorization of decision-making approaches into two separate domains forced researchers to investigate the relationship between rational–experiential information processing and decision-making.

In cognitive psychology, a dualistic division is often observed across various topics. It is common for theorists to approach concepts through two dimensions or subcomponents. When discussing dual-system theories, a similar duality is evident in information processing. Dual-process theories suggest that there are two different modes of processing (Evans, 2008). A distinction is made between unconscious, fast, and automatic processes versus conscious, slow, and deliberate ones. Generally, we utilize two types of processing: experiential and rational. Experiential processing is continuous, automatic, and occurs without conscious control—it is associated with the activation of memories, emotions, and beliefs. Rational processing, on the other hand, involves deliberate, analytical thinking and is typically verbal in nature (Evans, 2008).

Individuals differ in terms of the type of processing they employ. Rational processing, which is assumed to be controlled, has been found to correlate with general intelligence and working memory capacity, whereas no such relationship has been established for experiential processing. This has been presented as evidence of a distinction in the nature of information processing (Evans, 2008).

4.1 Rational–Experiential Information Processing and Decision-Making

The relationship between dual-process theories of information processing and individual decision-making performance has attracted the attention of researchers. Kahneman and Frederick (2005) based their theory, developed in relation to probability judgments and decision-making, on dual-process theories. According to their theory, heuristic judgments lead to biases in decision-making, and these biases emerge from System 1. Analytical thinking, which corrects or overrides these judgments, is associated with System 2 and leads to higher accuracy. Representativeness and availability heuristics often do not align with accurate responses. According to this theory, individuals with higher cognitive capacity are more likely to use the analytical second system and, when confronted with a problem, provide more accurate answers. However, Kahneman and Frederick (2005) also noted that consciously applied heuristics may have an automatic component. For example, although the similarity heuristic may be consciously processed, its initial activation occurs automatically.

In a study examining individual differences in decision-making, the time and effort spent during the decision-making process was investigated (Czernatowicz-Kukuczka et al., 2014). Some individuals evaluate fewer options in a shorter period, whereas others engage in more extensive analysis and reach decisions only after prolonged deliberation. Researchers associated this with a form of cognitive closure—some individuals have a low need for closure, while others, driven by a high need for closure, make quicker decisions. This phenomenon is also explained by the relationship between decision-making and information processing. Given that individuals with a rational processing style tend to take more time and do not arrive at decisions quickly or automatically, the amount of time and effort spent becomes meaningful in the context of dual-process theories. Those who rely on experiential processing tend to review fewer details and make quicker decisions.

4.2 Rational–Experiential Information Processing and Working Memory

Research show that individuals with greater working memory span are more inclined toward logical processing, likely because they find analytical thinking more rewarding. Conversely, those with lower working memory spans face challenges in logical thinking and attention-related functions, leading to more errors and a lower tendency to engage in logical processing (Fletcher et al., 2011). In Fletcher and collegues' (2011) study, both operation span test and sentence–word span test were used to measure participants' working memory capacity. The Rational–Experiential Inventory was used to assess participants' information processing preferences. Logical reasoning and decision-making scores were derived from responses to four syllogistic reasoning questions and two decision-making problems. Ultimately, high working memory capacity was found to be associated with logical processing, while no significant relationship was observed with experiential processing. Individuals with limited working memory span tend to make rushed decisions without exerting much cognitive effort. While this may be suitable in some situations, it impairs one's capacity to take into account multiple perspectives and perform complex evaluations.

It is believed that high working memory capacity stimulates logical thinking to a greater extent and, consequently, leads to better outcomes in decision-making tasks. In line with this assumption, it is expected that people with low working memory capacity who rely more on experiential thinking would perform worse in decision-making tasks. These cognitive style differences have been shown to affect individuals' behaviors (Toplak et al., 2007).

In conclusion, individual differences in rational–experiential processing contribute to variations in decision-making and resulting behaviors. Low working memory span leads to impairments in reasoning, judgment, and decision-making abilities. Limitations in memory capacity cause individuals to rely on shortcuts and experiential or automatic processing styles during decision-making, increasing the likelihood of errors. Conversely, people with high working memory capacity also have well-developed attentional control, and thus exhibit stronger goal-oriented and flexible thinking skills.

5. Purpose and Significance of the Study

Just as there are distinct cognitive and emotional approaches to decision-making, it is also argued that there are two separate methods of information processing. Individuals are thought to utilize two types of information processing strategies: rational and experiential (Epstein et al., 1996). The relationship between decision-making performance and information processing strategies has been investigated, and it has been suggested that logical processing leads to better decision-making outcomes.

Working memory is a well-established concept in cognitive psychology and has been shown through various studies to be related to constructs such as intelligence and academic achievement. For this reason, it is assumed to also be associated with decision-making and information processing.

Working memory capacity affects decision-making performance, and any cognitive load placed on working memory may alter this performance. A commonly used method in research has been to apply tasks that impose cognitive load on working memory while simultaneously requiring participants to perform decision-making tasks. Although the findings are sometimes inconsistent—and decision-making performance has occasionally been explained by factors other than cognitive processes, such as somatic markers—working memory capacity has nevertheless been shown to influence decision-making performance.

When the relationship between working memory capacity and information processing is examined, it is shown that individuals with high working memory capacity usually adopt logical information processing strategies, while those with low working memory capacity are more inclined toward experiential processing.

People with high working memory capacity prefer logical information processing strategies and, as a result, exhibit better performance on decision-making tasks compared to those with lower capacity (Fletcher et al., 2011). On the other hand, individuals with low working memory capacity, tend to rely upon experiential information processing and consequently perform more poorly in decision-making tasks. Moreover, when cognitive load is introduced, impulsive and automatic processing appears to increase. However, a review of the literature reveals that studies tend to examine working memory capacity and working memory load separately, and there is a lack of research on how cognitive load affects the information processing styles of individuals with different levels of working memory capacity—and how this, in turn, influences their decision-making performance. The significance of this study lies in its contribution as one of the first steps toward addressing this gap.

That working memory capacity and cognitive load have typically been examined separately in relation to decision-making and information processing highlights the fact that the nature of their interaction remains unclear. While it is increasingly accepted that individuals' information processing styles are not fixed, there is a noticeable lack of research on the direction and nature of this variability. It is expected that the introduction of cognitive load will lead individuals to shift their processing strategies—for example, those with high working memory capacity who typically engage in logical processing may, under load, shift toward experiential processing.

The purpose of this study is to examine how imposed cognitive load affects individuals' information processing strategies and decision-making performance when their working memory capacity is constrained. It is expected that individuals with high working memory capacity, who typically prefer logical processing, will shift toward experiential processing under cognitive load, resulting in a significant decrease in their decision-making performance.

Based on the referenced studies and the overall aim of this research, the hypotheses targeted in this study are as follows:

- Individuals with high working memory capacity are expected to perform better in decision-making tasks compared to those with low capacity due to having greater cognitive resources.
- Individuals with high working memory capacity are expected to score higher in logical information processing due to finding it more rewarding and possessing sufficient cognitive resources. No significant difference is expected between the groups in terms of experiential processing scores.
- When cognitive load is introduced, individuals with high working memory capacity are expected to show a significant decline in decision-making performance as their access to sufficient cognitive resources becomes restricted. This interaction is expected to occur only in the high-capacity group, not in the low-capacity group.
- Under cognitive load, individuals with high working memory capacity are expected to show a significant decline in logical information processing scores. The interaction between cognitive load and working memory capacity is expected to be observed only in the high-capacity group, not in the low-capacity group. Cognitive load is not expected to have a significant effect on experiential processing scores in either group.

Method

1. Participants

Participants in this study were selected from undergraduate students enrolled in a Psychology Department in Türkiye. Participation was voluntary, and students received course credit in exchange for taking part in the research. A total of 92 students participated in the experiment, including 51 females and 41 males. The mean age of the participants was calculated as 21.54.

2. Materials and Instruments

2.1 Operation Span Task

In order to evaluate working memory span, automated version of the Operation Span Task which was developed by Turner and Engle (1989) has been used in this study. A significant positive correlation has been reported between the manual and automated versions of the task (Unsworth et al., 2005). This task was prepared in a computerized environment using the E-Prime 2.0 software. In this task, participants are first presented with a mathematical equation and a proposed answer. They were required to provide an answer whether the solution is true or false Following this judgment, a letter is displayed on the screen before moving on to the next equation. After all equations are presented, participants are shown a sequence of letters in random order and are asked to indicate the correct order in which they appeared. Participants must recall and select the letters in the exact order they were originally presented. An example of Operation Span Task is given in Figure 1.

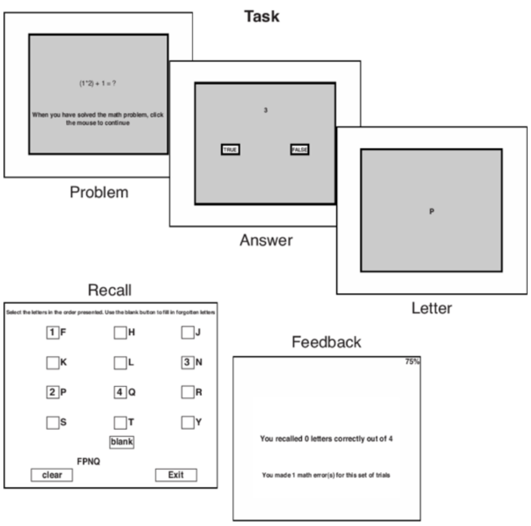

Figure 1. Operation span task example

2.2 Rational–Experiential Inventory

To determine the information processing styles of participants, the Rational–Experiential Inventory (REI) that was developed by Pacini and Epstein (1999) was used. The inventory consists of four subscales: rational ability, rational engagement, experiential ability, and experiential engagement. It includes 40 items in total, with 10 items per subscale. Pacini and Epstein (1999) demonstrated high reliability for both the rationality subscale ($\alpha = .90$) and the experientiality subscale ($\alpha = .87$). To demonstrate that rational and experiential processing styles are independent, the correlation between the two dimensions was examined and found to be non-significant (Pacini & Epstein, 1999). The Turkish adaptation of the scale was shown to have moderate reliability and validity (Türk & Artar, 2014). Upon completion of the scale, each participant receives four separate scores (rational ability, rational engagement, experiential ability, and experiential engagement), and general rationality and experientiality scores are calculated by averaging the relevant subscale scores.

2.3 Decision-Making Questions

In this study, participants were presented with decision-making problems commonly used in studies exploring dual-process theories. These problems were translated and adapted into Turkish from Toplak et al. (2007). A total of six problems were administered to each participant. Each problem has one true choice. The true choice is the one with maximizing process. Maximizing can be defined as increasing the probability of giving the correct answer by repeating the choice with the highest frequency each time. The correct answer is 1 points, whereas false answers get 0 points. Three problems were presented in no-load condition and the other three were presented in cognitive load condition.

2.4 Dot Memory Task

In this task, participants were obligated to observe and remember the positions of 10 dots displayed for 1000 ms on a 5x5 matrix. After completing the decision-making task, they were instructed to reproduce the positions of the dots on a blank matrix. Four different 5x5 matrices containing 10 dots each were used, and these were counterbalanced across participants. Although this is a spatial memory task, participants also engage the phonological loop to retain the dot locations. Additionally, studies have shown that the dot memory task imposes a cognitive load on executive functions (Miyake et al., 2001). In Miyake et al.'s (2001) study, visual–spatial memory tasks were found to overlap with tasks that engage executive functions. These findings were interpreted as suggesting that visual–spatial components, like verbal components, rely on executive function mechanisms.

3. Procedure

Each participant first completed the Operation Span Task, which was designed and administered via the E-Prime software to assess working memory capacity. In the following stage, half of the participants began the experiment in a no-load condition. These participants were presented with the first three decision-making problems to assess their performance in the absence of cognitive load. Subsequently, all participants completed the Rational–Experiential Inventory, responding based on their general self-perception without being under cognitive load.

After that, the Dot Memory Task was administered to impose a cognitive load. While participants were trying to remember places of dots (cognitive load condition) the other three decision making problems. After completing the problems, participants were given an empty matrix to place the dots. In the final stage participants completed the Rational–Experiential Inventory only for reviewing the time period of cognitive load task. This stage completed the no-load condition. This is called no-load condition because the participants started the experiment this situation. The cognitive load group had to complete the same procedure but they started the experiment with the cognitive load situation.

In both the load and no-load groups, the presentation order of the decision-making problems was counterbalanced among participants. As a result, participants were divided into four different groups based on the task sequence they followed. The procedure for four participant groups are shown in Table 1.

Tablo 1. Procedure

Group 1:	Operation Span Task
	Decision making problems (first three problems)
	Rational–Experiential Inventory (general, no-load)
	Dot Memory Task
	Decision making problems (last three problems)
	Rational–Experiential Inventory (load)
Group 2:	Operation Span Task
	Decision making problems (last three problems)
	Rational–Experiential Inventory (general, no-load)
	Dot Memory Task
	Decision making problems (first three problems)
	Rational–Experiential Inventory (load)
Group 3:	Operation Span Task
	Dot Memory Task
	Decision making problems (first three problems)
	Rational–Experiential Inventory (load)
	Decision making problems (last three problems)
	Rational–Experiential Inventory (general, no-load)
Group 4:	Operation Span Task
	Dot Memory Task
	Decision making problems (last three problems)
	Rational–Experiential Inventory (load)
	Decision making problems (first three problems)
	Rational–Experiential Inventory (general, no-load)

Results

As a result of the application, two types of decision-making performance scores were obtained for each participant: one under cognitive load and one without cognitive load, in addition to a measurement of working memory capacity. For the Rational–Experiential Inventory, six types of scores were calculated: overall rationality, rational ability, rational engagement, overall experientiality, experiential ability, and experiential engagement. The average of rational ability and rational engagement scores represents the overall rationality score, whereas the average of experiential ability and experiential engagement scores represents the overall experientiality score. A total of twelve scores were obtained for the Rational–Experiential Inventory, taking into account both cognitive load and no-load conditions. The data were transferred to SPSS 17.0 for statistical analysis. Descriptive statistics of the variables are given in Table 2.

Table 2. Descriptive statistics of variables

	No-load				Load			
	Min.	Max.	Mean	Sd.	Min.	Max.	Mean	Sd.
Age	18	27	21.54	1.75	-	-	-	-
WM Span	14	75	42.73	13.93	-	-	-	-
Decision Making	0	3	1.35	0.97	0	3	1.28	0.92
Rationality	2.25	4.70	3.63	0.52	2.20	4.70	3.53	0.63
Rational ability	1.80	4.90	3.55	0.63	1.80	4.80	3.44	0.07
Rational engagement	2.30	4.90	3.70	0.56	2.10	5.00	3.61	0.67
Experientiality	1.70	4.60	2.95	0.69	1.50	4.40	2.80	0.66
Experiential ability	1.70	4.80	2.94	0.68	1.30	4.50	2.79	0.69
Experiential enga-gement	1.50	4.80	2.95	0.76	1.30	4.40	2.81	0.71

First, it was hypothesized that participants with high working memory capacity would demonstrate significantly better decision-making performance than those with low capacity. To conduct variance analysis, the continuous variable of working memory capacity was split at the median into high and low-capacity groups. The analysis revealed that working memory capacity had no significant effect on decision-making performance ($F_{(1,90)}$ = .648, $p > .05$, η^2 = .007). There was no significant difference in decision-making scores between high and low working memory capacity groups. Results are given in Table 3.

Table 3. ANOVA results of working memory capacity and decision making

Source	Sum of Squares	Mean Square	df	f	p	η²
WM cap.	0.623	0.623	1	0.648	0.423	0.007
Error	86.540	0.962	90			
Total	257		92			

Secondly, it was hypothesized that individuals with high working memory capacity would have significantly higher rational information processing scores than those with low capacity. ANOVA was used to test this hypothesis. The effect of working memory capacity on rationality scores was examined in terms of overall rationality, rational ability, and rational engagement. No significant difference was expected between the groups in terms of overall experientiality, experiential ability, or experiential engagement scores. The results showed a significant effect of working memory capacity on overall rationality scores ($F_{(1,89)}$ = 5.362, $p < .05$, η^2 = .057). Participants with high working memory capacity scored significantly higher on rationality than the participants with low working memory capacity. Results are given in Table 4.

Table 4. ANOVA results of working memory capacity and rationality

Source	Sum of Squares	Mean Square	df	f	p	η²
WM cap.	1.389	1.389	1	5.362	.023*	.057
Error	20.049	0.259	89			
Total	1226.95		91			

A significant effect was also found on the rational ability subscale ($F_{(1,89)}$ = 5.465, $p < .05$, η^2 = .058). Participants in the high and low working memory capacity groups differed significantly in their rational ability scores. Results are given in Table 5.

Table 5. ANOVA results of working memory capacity and rational ability

Source	Sum of Squares	Mean Square	df	f	p	η²
WM cap.	2.108	2.108	1	5.465	.022*	.058
Error	34.338	0.386	89			
Total	1185.76		91			

However, no significant effect was found on the rational engagement subscale ($F_{(1,90)}$ = 3.515, $p > .05$, η^2 = .038). The high and low-capacity groups did not differ significantly in terms of rational engagement scores. Results are given in Table 6.

Table 6. ANOVA results of working memory capacity and rational engagement

Source	Sum of Squares	Mean Square	df	f	p	η²
WM cap.	1.110	1.110	1	3.515	.064	.038
Error	28.420	0.316	90			
Total	1289.75		92			

It was expected that working memory capacity would not significantly effect experientiality scores. This hypothesis was supported by the ANOVA results. No significant effect was found for overall experientiality ($F_{(1,90)}$ = .007, $p > .05$, η^2 = .000), experiential ability ($F_{(1,90)}$ = .000, $p > .05$, η^2 = .000), or experiential engagement ($F_{(1,90)}$ = .019, $p >$

.05, $\eta^2 = .000$). Results are shown in Tables 7, 8 and 9.

Table 7. ANOVA results of working memory capacity and experientiality

Source	Sum of Squares	Mean Square	df	f	p	η^2
WM cap.	0.003	0.003	1	0.007	.934	.000
Error	43.909	0.488	90			
Total	844.837		92			

Table 8. ANOVA results of working memory capacity and experiential ability

Source	Sum of Squares	Mean Square	df	f	p	η^2
WM cap.	6.670	6.670	1	0.000	.991	.000
Error	43.307	0.481	90			
Total	840.990		92			

Table 9. ANOVA results of working memory capacity and experiential engagement

Source	Sum of Squares	Mean Square	df	f	p	η^2
WM cap.	0.011	0.011	1	0.019	.889	.000
Error	52.975	0.589	90			
Total	857.160		92			

In the next stage of the analysis, the effect of cognitive load on participants' decision-making, rationality, and experientiality scores was examined. According to repeated measures ANOVA, there was no significant main effect of cognitive load on decision-making scores ($F_{(1,90)} = .379$, $p > .05$, $\eta^2 = .004$), and no significant interaction between working memory capacity and cognitive load ($F_{(1,90)} = .379$, $p > .05$, $\eta^2 = .004$) was found. Results are shown in Table 10.

Table 10. ANOVA results of cognitive load and working memory capacity on decision making

Source	Sum of Squares	Mean Square	df	f	p	η^2
Load	0.244	0.244	1	0.379	.540	0.004
WM cap. * Load	0.244	0.244	1	0.379	.540	0.004
Error	57.990	0.644	90			

Another hypothesis of the study was that rational processing scores of individuals with high working memory capacity would significantly decrease under cognitive load. To test this hypothesis, repeated measures ANOVA was conducted on overall rationality and its two subscales. The results showed no significant main effect of cognitive load on overall rationality scores ($F_{(1,87)} = 3.419$, $p > .05$, $\eta^2 = .038$), and no significant interaction between working memory capacity and cognitive load ($F_{(1,87)} = .048$, $p > .05$, $\eta^2 = .001$). Results are shown in Table 11.

Table 11. ANOVA results of cognitive load and working memory capacity on rationality

Source	Sum of Squares	Mean Square	df	f	p	η^2
Load	0.244	0.244	1	3.419	.068	0.038
WM cap. * Load	0.003	0.003	1	0.048	.828	0.001
Error	6.219	0.071	87			

No significant main effect of cognitive load was found on rational ability ($F_{(1,88)} = 3.825$, $p > .05$, $\eta^2 = .042$). Participants' rational ability scores did not differ significantly between the cognitive load and no-load conditions. Additionally, there was no significant interaction between working memory capacity and cognitive load on rational ability scores ($F_{(1,88)} = .499$, $p > .05$, $\eta^2 = .005$). Results are shown in Table 12.

Table 12. ANOVA results of cognitive load and working memory capacity on rational ability

Source	Sum of Squares	Mean Square	df	f	p	η^2
Load	0.338	0.338	1	3.825	.054	0.042
WM cap. * Load	0.040	0.040	1	0.449	.505	0.005
Error	7.785	0.088	88			

Regarding the rational engagement subscale, no significant main effect of cognitive load ($F_{(1,89)} = 2.604$, $p > .05$, $\eta^2 = .028$), and no significant interaction with working memory capacity ($F_{(1,89)} = .181$, $p > .05$, $\eta^2 = .002$) were found. Results are shown in Table 13.

Table 13. ANOVA results of cognitive load and working memory capacity on rational engagement

Source	Sum of Squares	Mean Square	df	f	p	η^2
Load	0.298	0.298	1	2.604	.110	0.028
WM cap * Load	0.021	0.021	1	0.181	.671	0.002
Error	10.171	0.114	89			

A significant main effect of cognitive load was found on overall experientiality scores ($F_{(1,89)} = 7.157$, $p < .05$, $\eta^2 = .074$). Participants in the cognitive load condition scored significantly different in experientiality compared to those in the no-load condition. However, there was no significant interaction between working memory capacity and cognitive load ($F_{(1,89)} = 3.073$, $p > .05$, $\eta^2 = .033$). Results are shown in Table 14.

Table 14. ANOVA results of cognitive load and working memory capacity on exprientiality

Source	Sum of Squares	Mean Square	df	f	p	η^2
Load	0.785	0.785	1	7.157	.009*	0.074
WM cap. * Load	0.337	0.337	1	3.037	.083	0.033
Error	9.758	0.110	89			

A significant effect of cognitive load was also found on experiential ability ($F_{(1,90)} = 8.679$, $p < .05$, $\eta^2 = .088$). Participants in the load and no-load conditions differed significantly in their experiential ability scores. No significant interaction was found with working memory capacity ($F_{(1,90)} = 1.031$, $p > .05$, $\eta^2 = .011$). Results are shown in Table 15.

Table 15. ANOVA results of cognitive load and working memory capacity on experiential ability

Source	Sum of Squares	Mean Square	df	f	p	η^2
Load	0.974	0.974	1	8.679	.004*	0.088
WM cap. * Load	0.116	0.116	1	1.031	.313	0.011
Error	10.099	0.112	90			

Finally, a significant effect of cognitive load was found on experiential engagement scores ($F_{(1,89)} = 4.370$, $p < .05$, $\eta^2 = .047$). Participants in the load and no-load conditions differed significantly. A significant interaction was also found between cognitive load and working memory capacity on experiential engagement ($F_{(1,89)} = 4.543$, $p < .05$, $\eta^2 = .049$). Results are shown in Table 16.

Table 16. ANOVA results of cognitive load and working memory capacity on experiential engagement

Source	Sum of Squares	Mean Square	df	f	p	η^2
Load	0.638	0.638	1	4.370	.039*	0.047
WM cap. * Load	0.664	0.664	1	4.543	.036*	0.049
Error	13.002	0.146	89			

Discussion

The primary aim of the current study was to examine the effect of cognitive load on individuals' information processing style and decision-making performance by limiting their working memory capacity.

At the outset of the study, it was hypothesized that working memory capacity would have a significant effect on decision-making performance. Specifically, individuals with high working memory capacity were expected to perform better than those with low capacity. However, the findings did not support this hypothesis. In the study conducted by Bagneux et al. (2013), high working memory capacity was found to positively influence decision-making performance, with individuals possessing higher capacity making more advantageous decisions. It was interpreted that individuals with low working memory capacity performed worse due to a slower comprehension of the task content. That study argued that individuals with high capacity were better able to clearly grasp the advantageous options.

In addition to studies suggesting a direct effect of working memory capacity on decision-making tasks, other research has proposed that working memory capacity acts as a mediating variable between cognitive closure needs and decision-making behavior (Czernatowicz-Kukuczka et al., 2014). Besides, other studies have claimed that concepts of working memory and decision-making are unrelated. One study suggested that participants could learn to choose the most rewarding options implicitly, rather than explicitly remembering the outcomes of their choices (Worthy et al., 2012). According to this view, reward tracking is managed by subcortical structures, and working memory is not directly associated with decision-making performance.

In a similar way, Damasio (1994) argued that executive functions are not crucial in decision-making processes, citing findings from studies with brain-damaged patients as evidence. In a study by Bechara et al. (1997), participants were found to perform well in decision-making tasks even before consciously using memory-based information, by learning which responses were more advantageous. The results of both Damasio (1994) and Bechara et al. (1997) suggest that decision-making is influenced more by intuitive and emotional processes than by working memory.

Another notable finding from the current study is that scores related to rationality—a dimension of the Rational–Experiential Inventory—were influenced by working memory capacity. It was assumed that individuals with high working memory capacity would score significantly higher on rational processing than those with low capacity, while no significant difference was expected in experiential processing scores. As anticipated, a significant difference was found in overall rationality and rational ability scores. Individuals with high working memory capacity perceived themselves as possessing stronger skills in rational and analytical thinking. However, no significant difference was found between groups in rational engagement scores, suggesting that both high and low capacity groups were equally confident in and enjoyed engaging in rational thinking. Also, consistent with expectations, no significant difference was found in experiential processing scores between high and low capacity groups.

Previous studies have shown that individuals with high working memory capacity tend to find rational thinking more rewarding (Fletcher et al., 2011), and that high capacity stimulates more rational information processing (Toplak et al., 2007). In contrast, individuals with low working memory capacity, who are weaker in executive functions such as attention, were found to make more errors in logical reasoning and to be less inclined to engage in rational processing (Fletcher et al., 2011). The findings of the present study are consistent with these previous studies. Participants' rational processing scores differed significantly between the low and high working memory capacity groups.

Another finding from this study is that cognitive load did not affect decision-making performance. It was initially hypothesized that cognitive load would significantly reduce the decision-making performance of individuals with high working memory capacity; however, this was not supported by the results. Similarly, in contrast to the majority of the literature, Whitney et al. (2008) found that cognitive load did not affect decision-making performance. In a different approach, Whitney and colleagues (2008) conducted a study focused on the framing effect to measure decision-making. They presented participants with decision-making scenarios framed in terms of gains and losses under two conditions—with and without cognitive load. Before the decision-making task, participants were presented with a string of letters and asked to recall a specific letter afterward. The results showed that decision-making performance was not affected by cognitive load.

It was initially predicted that the application of cognitive load would significantly reduce rationality scores, while having no meaningful effect on experientiality scores. However, the results revealed a significant main effect of cognitive load on all experientiality-related scores. Overall experientiality scores, experiential ability scores, and experiential engagement scores were all significantly lower under cognitive load. Furthermore, the interaction between cognitive load and working memory capacity showed a significant effect on experiential engagement scores. Specifically, individuals with high working memory capacity exhibited significantly lower experiential engagement scores when under cognitive load compared to the no-load condition.

This finding is inconsistent with those of prior studies related to dual-process theories. Such studies have generally focused on rationality scores and analyzed rational processing exclusively. In instances where experientiality scores were analyzed, the findings typically aligned with expectations—showing no significant differences.

Evans (2007) argued that although dual-process theories describe two parallel processing systems, they fail to sufficiently explain how these systems operate or what their core characteristics are. Kahneman et al. (2002) noted the difficulty of observing and explaining the functioning of the experiential system. Evans (2008) attributed this to the fact that the experiential system does not rely on attentional control and operates automatically. According to Epstein et al. (1996), experiential information processing is emotionally based. Researchers have asserted that the rational system is more stable and more clearly definable. Since the rational system is grounded in inference, calculation, and mechanisms such as working memory—closely tied to attentional control—it has garnered greater empirical support and acceptance within cognitive psychology. In contrast, due to its emotional basis, the experiential system is considered more subjective and has received comparatively less attention in experimental studies (Fletcher et al., 2011).

Jenkins (2019) attempted to introduce a novel perspective on the broader body of dual-process research. He identified the primary reason for using cognitive load as a means of separating automatic from controlled cognitive processes. He argued that in dual-process research, cognitive load is used to distinguish between the rational and experiential systems. However, Jenkins (2019) challenged the prevailing assumption that cognitive load exclusively burdens the rational system. He pointed to studies showing that cognitive load also impairs empathy and the ability to track others' beliefs, thereby suggesting that it may also limit social cognition. Generalizing these results, he proposed that cognitive load could restrict not only rational and social cognition but also other mental systems. In light of the present study's results, one interpretation is that cognitive load may also constrain the experiential system.

When the findings are considered as a whole, the results suggest that while there is no significant relationship between working memory capacity and decision-making performance, working memory capacity does influence individuals' information processing styles. Cognitive load, as expected, did not significantly affect decision-making performance or rationality scores among individuals with high working memory capacity. Unexpectedly, however, cognitive load led to significant changes in experientiality scores.

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