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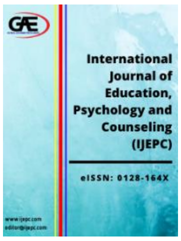

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DOPAMINE, SEROTONIN, AND THE PURSUIT OF BALANCE: NEUROBIOLOGICAL AND ISLAMIC PERSPECTIVES ON MOTIVATION – A NARRATIVE REVIEW

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Abstract:

In recent decades, research has emphasised the vital roles of serotonin and dopamine in regulating human motivation, cognition, and behaviour. This narrative review synthesises studies on how these neurotransmitters affect reward-based learning, decision-making, physical activity, and physiological factors, including sleep and appetite. Dopamine facilitates reward prediction,

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reinforcement, and task engagement, while serotonin contributes to mood regulation, impulse control, and stress management. When functioning harmoniously, they drive goal-directed behaviours; however, imbalances can lead to conditions such as binge eating, impulsive aggression, and fatigue. Additionally, Islamic perspectives on moderation, self-discipline, and spiritual well-being offer integrative frameworks that align with neurobiological insights, highlighting balanced sleep-wake cycles, regular physical activity, and mindful dietary habits. The review underscores the importance of further investigation into how dopamine and serotonin regulate motivational drive, particularly through multi-modal imaging, longitudinal studies, and objective behavioural metrics. Findings could inform preventive strategies and therapeutic interventions, especially for neuropsychiatric conditions, obesity, and age-related disorders such as Parkinson's disease. By incorporating religious, cultural, and scientific dimensions, an integrated approach to motivation-based activities may be realised, enhancing both individual health and societal well-being. Ultimately, the synergy between dopaminergic and serotonergic pathways emphasises the centrality of neurobiological mechanisms in human motivation and behavioural adaptation, paving the way for innovative research and clinical applications. The present work therefore calls for collaboration across neuroscience, psychology, public health, and theology to foster effective preventative and interventional strategies that enhance motivation, optimise behaviour, and support holistic human development. Such efforts will advance our understanding of how these systems cooperate.

Keywords:

Behaviour, Cognition, Dopamine, Islamic Perspective, Motivation, Serotonin

Introduction

In recent years, the neurobiology of motivation has become an area of significant scholarly interest, particularly concerning the roles that neurotransmitters play in influencing motivation-based activities. Among these neurotransmitters, serotonin and dopamine have garnered increasing attention from researchers aiming to understand how their functions and interactions underpin various motivational states and behaviours (Salamone & Correa, 2018; Cools, 2021). This interest stems from the critical impact these neurotransmitters have on emotional regulation, cognitive functions, and the brain's reward system—all essential components for maintaining motivation during prolonged effort and focused activities (Robinson et al., 2020).

Motivation is a fundamental driver of human behaviour, influencing actions from mundane daily tasks to the pursuit of long-term aspirations. According to Cook and Artino (2016), motivation is the process of initiating and maintaining goal-directed activities. For many years, researchers have been intrigued by the concept of motivation, seeking to unravel the complex interplay between cognitive processes and neurological mechanisms (Khalid et al., 2023). The cognitive approach has gained prominence in motivation studies, offering a comprehensive and integrative framework for understanding how mental processes influence the initiation and persistence of action (Murayama, 2022).

The prefrontal cortex and the striatum are critical brain regions involved in motivation. Dopamine-related neurotransmission in the prefrontal cortex facilitates complex motivational strategies, enabling individuals to plan and execute goal-directed behaviours (Ballard et al.,

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2011; Westbrook & Braver, 2016). The striatum contributes to motivation by registering rewards and actively supporting the drive to pursue them, integrating motivational and motor functions (Berridge & Robinson, 2016). Insufficient levels of dopamine can result in lethargy, difficulty initiating or completing tasks, impaired focus, diminished energy, and a lack of motivation (Volkow et al., 2021).

Serotonin, traditionally associated with mood regulation and emotional well-being, has also been implicated in motivational processes. Recent evidence suggests that serotonin plays a role in reward-related and motivational behaviours, influencing activities such as food consumption and social interaction (Lozano & Téllez, 2022). Galen et al. (2021) highlight that in both homeostatic and hedonic systems, serotonin and dopamine are vital neurotransmitters. Serotonin is essential for maintaining a positive mood and regulates emotions by preventing anxiety and depression (Li, 2023). An imbalance in serotonin is a common factor in mood disorders, which can significantly diminish motivation and productivity (Mosienko et al., 2020).

The interaction between dopamine and serotonin systems provides a comprehensive picture of motivational states. Rather than functioning antagonistically, these neurotransmitters have complementary roles in the reinforcement and control mechanisms underlying choice behaviours (Roberts et al., 2022). While dopamine drives the pursuit of rewards, serotonin helps maintain balance and prevent excessive stress, modulating the intensity and direction of motivated behaviour (Cools, 2021). Understanding this interplay is crucial for developing interventions targeting motivational deficits in various psychological conditions.

Acknowledging the importance of cultural and religious contexts, specifically in Malaysia, it is also pertinent to consider the Islamic perspective on motivation and behaviour. Islamic teachings emphasise the balance between material pursuits and spiritual well-being, aligning with the neurobiological mechanisms that regulate motivation and emotional regulation (Abbasi & Fazelian, 2021). Integrating scientific understanding with spiritual insights can provide a holistic approach to addressing motivational challenges.

Understanding the roles of serotonin and dopamine in motivation-based activities is crucial for several reasons. Firstly, motivation influences cognitive processes, emotional regulation, and the pursuit of goals (Hattie et al., 2020). Secondly, insights into how these neurotransmitters function can inform interventions for psychological and neurological disorders where motivation is impaired (Salamone et al., 2021). Therefore, this review aims to gain a deeper comprehension of how serotonin and dopamine function in motivation-based activities and to discuss the implications of these findings from an Islamic perspective.

Objectives
The objectives of this narrative review are twofold:

1. To examine the impact of neurotransmitter systems, particularly serotonin and dopamine, on motivation and cognition.
2. To discuss the implications of these findings from an Islamic point of view, integrating cultural and religious perspectives into the scientific discourse.

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Methods

This narrative review synthesized existing research on the role of serotonin and dopamine in motivation-based activities. To achieve this, a systematic literature search was conducted using various databases, including PubMed, Scopus, and Google Scholar. Keywords such as "serotonin," "dopamine," "motivation," "behaviour," and "neurotransmitters" were used in combination to identify relevant studies. The search was limited to peer-reviewed articles published in English within the past 10 years.

Once the relevant articles were identified, a careful screening process was conducted to select those that directly addressed the research question. The selected articles were then critically analysed to extract relevant information regarding the role of serotonin and dopamine in motivation-based activities. This analysis included examining the specific methodologies used in the studies, the findings, and the conclusions drawn by the authors.

The findings from the selected studies were then integrated and synthesized to develop a comprehensive understanding of the role of serotonin and dopamine in motivation-based activities. This synthesis involved identifying common themes, patterns, and contradictions across the studies, as well as highlighting any gaps in the existing research.

Literature Review

Sleep

According to Axelsson et al. (2020), lack of sleep and the related sleepiness affect people's motivation to perform or undertake different activities. In their study of 123 participants, who were screened for either maintaining normal sleep or total sleep deprivation, the researchers found that reported levels of sleepiness corresponded with a significant enhancement of engagement with sleep-motivating stimuli, such as resting and closing one's eyes. This increase in sleep-related motivation came at the expense of motivation for social and physical activities, which were reduced by sleepiness. However, the study found that sleepiness had no measurable effect on increasing hunger or changing food choices. This research acknowledges sleepiness as a variable motivating state that promotes sleep to the detriment of other activities and explains possible mechanisms for the health hazards related to sleep loss.

Learning and Memory

Yagishita (2019) examines the role of the dopaminergic system in motivation, with specific reference to learning and memory. He explains that dopamine and serotonin signalling have significant influence over motivation-related behaviours, operating on different synaptic and cellular frameworks in the brain to elicit both temporary and persistent effects. Yagishita (2019) highlights that various behaviours, including salience, reward and punishment learning, incentive processing, decision-making, goal-directed behaviour, and anxiety, are all influenced by these neurotransmitters. He suggests that impaired signalling in these systems may explain some aspects of depressive signs and symptoms. The study also utilises complex techniques like optogenetics and electrophysiology to demonstrate that dopamine release in the striatum is crucial in encouraging engagement in learning tasks and enhancing memory consolidation. Dopamine released during learning activities, in addition to enhancing synaptic plasticity, also positively influences individuals' willingness to perform more cognitive activities by providing a 'reward' or 'pleasure' signal.

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Neurotransmitters

Nobis et al. (2023) highlight the relationship between serotonin and motivation for decision-making among people diagnosed with Parkinson's Disease (PD). This study demonstrates that changes in serotonin concentration affect the motivational component of decision-making, including voluntary choice flexibility and risk-taking. The authors argue that because serotonin is thought to be involved in modulating the capacity to make sound decisions and control impulses, decreased serotonergic activity may be particularly disadvantageous in a world in which overindulgence is rampant. In PD patients, dysregulation of serotonergic neurotransmission can be expected to undermine motivational capacity, particularly in relation to moral reasoning and decision-making in risky and complex contexts.

Taken together, these studies emphasise the significance of neurotransmitter systems in the modulation of motivation and behaviour. Axelsson et al. (2020) showed that sleepiness elicited by sleep loss can be explained by its motivational pull, which prompts postponing other activities in favour of sleep. Yagishita (2019) explained how dopamine influences participation in learning and memory tasks through its function in reward signalling and neural connection changes. Finally, Nobis et al. (2023) revealed that serotonin influences motivational aspects of decision-making in PD and that its dysregulation is associated with cognitive-behavioural deficits. Combined, these papers remind readers that brain neurochemicals are intricately linked to the regulation of motivation and cognitive abilities.

Islam and Motivation

From an Islamic perspective, motivation is considered crucial for both fulfilling duties and maintaining balance in life. The Islamic emphasis on the importance of adequate sleep and rest aligns with the findings of Axelsson et al. (2020) regarding the motivational theory of sleepiness. The Prophet Muhammad (PBUH) encouraged sleep patterns that reflect the need for equal parts sleeping and work, which corresponds with the concept of sleepiness asserting the overruling value of sleep. The rewarding effect of dopamine in learning, as suggested by Yagishita (2019), is in line with the Islamic teaching of seeking knowledge and continuous learning as a form of worship. Similarly, the role of serotonin in decision-making, as mentioned by Nobis et al. (2023), connects with the Islamic emphasis on effective and wise decision-making. When these scientific findings are supplemented by Islamic views, a harmonised insight into motivation emerges, encompassing physical, mental, and spiritual dimensions.

Physical Activity

Despite its well-established health benefits, only a small percentage of adults are motivated to engage in regular physical activity (PA) (Ruiz-Tejada et al., 2022). Statistics estimate that only 5% of adults engage in physical activity (PA) daily, with the number of individuals meeting PA guidelines remaining constant over time. Little is known about how cardiovascular activity affects dopamine-related brain circuits in reward processing and mood regulation in humans, despite the well-established benefits to physical and mental health (Gorrell et al., 2022).

Previous research has suggested that the dopamine system may be responsible for increasing human motivation to engage in physical activity such as exercise. The central nervous system's dopaminergic pathways play a crucial role in regulating reward, motivation, and habit formation. These pathways are critical in the development of regular physical activity behaviour because they act across multiple neural pathways that regulate movement, motivation, and reward (Gorrell et al., 2022; Ruiz-Tejada et al., 2022; Gharakhanlou & Fasihi,

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2023). Dopamine levels in the nucleus accumbens influence motivation for physical activity (Gorrell et al., 2022; Ruiz-Tejada et al., 2022).

Dopamine (DA) is a neurotransmitter with a variety of functions in the brain, including reward and movement control (Ruiz-Tejada et al., 2022). DA in the nucleus accumbens (NAc) regulates both the motivation to take part in physical activity and to make an effort for some sort of reward. In addition to its primary function in motivation, DA is important in cognition, motor coordination, and motor pattern formation. Dopamine governs basal ganglia activities, allowing information to flow between the cortical, limbic, and motor areas of the brain. The interaction and exchange of information between these regions form the mesocorticolimbic pathway, a network of neurons that mediates the processing of rewards and regulates motivation for PA. This pathway is involved in targeted choice-making and adapting responses that reflect the value of a specific reward. Activation of this pathway lays the basis for behaviour initiation, reinforces behaviour once initiated, and produces conditioned responses (Gorrell et al., 2022).

According to Gorrell et al. (2022), taking part in regular physical activity, which includes aerobic exercise, alters neurological reward responses, which automatically reinforce this behaviour. This might explain why some people exercise excessively. Particular exercise may be useful in manipulating or modulating dopamine-related neuron stimulation, as the release of dopamine aids in understanding and promotes approach behaviour. The authors investigated whether there is a mutual relationship between dopamine-related reward responses and exercise conduct among healthy participants. They predicted an increase in salience response in the dopamine system as physical activity increased. The findings suggest that people who engage in more PA, such as aerobic activity, may be more responsive to significant stimuli, particularly stimulus receipt. Consistent aerobic exercise may influence neurological reward responses and regulate dopamine signalling, possibly reinforcing or strengthening PA behaviour naturally (Gorrell et al., 2022; Gharakhanlou & Fasihi, 2023).

Additionally, serotonin's association with dopamine is important in order to understand why central nervous system (CNS) fatigue takes place during physical activity, resulting in decreased motivation. Increased activity of serotonergic neurons during exercise can cause fatigue and reduced recruitment of motor neurons, which has been linked with greater serotonin-to-dopamine proportions (Ruiz-Tejada et al., 2022; Gharakhanlou & Fasihi, 2023).

Gharakhanlou and Fasihi (2023) studied changes in the functioning of neurotransmitters during exercise to further comprehend CNS fatigue following physical activity. A number of studies have looked into the underlying causes of fatigue, and this appears to be closely linked to the action of a few neurotransmitters, which includes serotonin (Ruiz-Tejada et al., 2022; Gharakhanlou & Fasihi, 2023). Serotonin (5-HT) regulates DA accessibility via various 5-HT receptors variants found on neurons that produce dopamine or by communicating with the GABAergic or the glutamatergic neurons. For instance, in rodents, preventing the 5-HT2C receptors increases DA production at the NAc. Consequently, 5-HT and its associated receptors influence DA availability within brain regions that control motivated actions, including physical activity. CNS fatigue is characterised by an adverse central impact that is present even when the subject is fully motivated. Serotonin (5-HT) is derived from the amino acid tryptophan (TRP), which is transported across the blood-brain membrane by a specific carrier. Increased exercise intensity leads to increased serotonergic activity, fatigue, decreased neural

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drive, and loss of motor nerve recruitment. Research has shown that moderate-intensity exercise increases TRP concentrations in blood plasma and brain regions, as well as higher serotonin levels concentrations in the brain of rodents when given a moderate intensity level of exercise, indicating that serotonin plays a role in fatigue management. The findings indicate that people with low aerobic capacity have a lower serotonergic response while exercising. On the other hand, serotonin's inhibitions are most likely responsible for the decrease in dopamine production during exercise. The dopamine system influences motor control, motivation and reward, all of which are associated with the emergence of fatigue. Furthermore, dopamine-related impairment may reduce performance.

These three studies provide an extensive overview regarding how serotonin and dopamine both affect motivational activities, particularly physical exercise. They highlighted the role of dopamine in processing rewards and motivation, the inhibitory consequences of serotonin on dopamine during exercise, and how physical activity can cause neural network adaptations that promote physical activity behaviours. This comprehensive understanding highlights the complex relationship between these neurotransmitters in governing motivation-based activities focusing on physical activity.

However, there are some limitations to the findings that must be addressed. The attempts to improve PA behaviour in our society are insufficient without a thorough understanding of the biological basis which influences motivation for PA. As pointed out by Ruiz-Tejada et al. (2022) in their paper, current research shows that dopaminergic pathways in the human brain serve a significant part when it comes to PA behaviour. The majority of research to date has been conducted in rodents, which is a significant limitation to the knowledge of the biological processes that govern voluntary PA behaviour in humans. Even though rodents provide a number of experimental benefits, it is unclear whether or not these findings could be directly linked to specific individual differences in PA between humans. Extending the basic understanding of the brain's dopaminergic pathways that regulate PA behaviour within humans is critical in improving PA in our modern world.

Additionally, data from Gorrell et al. (2022) was observed to be self-reported, which could reflect overall activity levels rather than the particular consequences of aerobic exercise. Some results on reported physical activity among healthy individuals indicate that extreme physical activity may be over-reported. Future research should involve unbiased assessments of activity to further comprehend the way these neurotransmitters contribute to motivation and physical activity behaviour in individuals. A greater awareness can aid in the development of more effective strategies for motivating regular physical activity participation. Addressing these drawbacks is also critical to understand the role of dopamine and serotonin in motivation-based activities.

Maintaining good health is also encouraged in Islam because it allows individuals to fulfil religious obligations and live a fulfilling life. Regular physical activity promotes disease prevention, good mental health, general well-being and satisfaction with life. Allah said in Surah Al-Mu'minun verse 51, "O messengers, eat good foods and work righteousness. Indeed, I know what you're doing." This verse not only encourages mindful eating, but it additionally highlights the value of preserving a healthy lifestyle, including physical activity as a form of righteous action.

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Binge Eating

An article by Yu et al. (2022) discussed how dopamine influences the desire to binge eat. They contend that impulsive personality characteristics, executive functioning, food cravings, and decision-making are all influenced by the neurotransmitter dopamine, which also plays a role in the development of binge eating. Eating a lot of food quickly and finding it difficult to stop eating are the hallmarks of binge eating. Numerous psychological risk factors for binge eating have been found in studies, such as a high need for food, deficits in cognitive function, and unique personality features. On the other hand, dopamine—a neurotransmitter connected to feeding behaviour, human motivation, cognitive capacity, and personality—is believed to have a significant role in binge eating, even if the physiological markers of the disorder are yet unclear.

They also state that the substantia nigra, ventral tegmental area, and retrorubral field are the three primary regions of the midbrain that contain dopamine neurons. These neurons are in charge of dopamine production and release. The mesolimbic circuits are formed when dopamine neurons in the ventral tegmental area send projections to the ventral striatum, a critical brain region linked to food cravings. The mesolimbic dopaminergic system has long been linked to motivation. The enhanced incentive salience, or desire for food-related rewards, brought on by the hyperactive mesolimbic dopaminergic system influences food intake in relation to eating behaviours (Yu et al., 2022). The increasing prevalence of obesity and the health effects it has is a pertinent contemporary topic in physiological psychology that might be investigated in light of the research on dopamine and binge eating (Razzoli et al., 2017). Numerous genetic, environmental, behavioural, and neurological variables can impact obesity, making it a complex and diverse disorder (WHO, 2024). One part of the neurobiological mechanisms behind overeating and weight gain can be clarified by understanding the function of dopamine in the drive to binge eat (Kessler et al., 2016). Several studies have suggested dysregulated dopamine signalling in the development and maintenance of obesity (Wu et al., 2017). An essential function of the mesolimbic dopaminergic system, which is involved in motivation and reward processing, is to regulate food intake and energy balance. Increased susceptibility to overeating and binge eating behaviours, decreased inhibitory control, and heightened food cravings may all be caused by malfunctions in this system, such as changes in dopamine receptor availability or sensitivity (Alcaro et al., 2007).

Furthermore, alterations in food reinforcement and reward sensitivity are frequently seen in obese people, and these effects may be mediated by problems in dopamine signalling pathways (Volkow et al., 2010). These neurological alterations may exacerbate poor eating patterns and a vicious cycle of obsessive eating, aggravating weight gain and the health problems associated with obesity (Kenny, 2011). It is crucial to comprehend the neurobiological causes of obesity, particularly how dopamine influences food cravings and the drive to overeat, in order to create focused treatments and treatment plans. In order to potentially reconcile the inconsistent findings, longitudinal studies are required to test two hypotheses: whether binge eating progresses from a hyperdopaminergic to a hypodopaminergic state, and whether genotypes individually influence the relationship between dopamine and binge eating.

Examining how Islamic beliefs relate to behaviour, self-control, and health is necessary to relate the function of dopamine in binge eating to Islamic viewpoints. In Islam, moderation (Wasatiyyah) is valued in all facets of life, including dietary practices (Helmy et al., 2021). The Prophet Muhammad (PBUH) advised against overeating, saying that one should fill their

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stomach with one-third food, one-third water, and leave the other third for air (Mateen et al., 2024). The Quran also supports a balanced lifestyle. This moderation concept is consistent with the need to control dopamine-driven cravings for overeating.

Impulsive Aggression

Cunha-Bang & Knudsen (2021) underlined that poor serotonin signalling has long been linked to impulsive aggressiveness caused by a compromised amygdala's prefrontal inhibition. For almost thirty years, the discipline has been impacted by the hypothesis that impulsive violence is caused by low brain serotonin levels. Conversely, the relationship between impulsive aggression and low serotonin levels has been demonstrated via indirect methods of studying serotonin activity. This work synthesises data from several domains, including imaging genetics, positron emission tomography (PET), functional magnetic resonance imaging (fMRI), multimodal, and pharmaco-neuroimaging, to understand serotonergic function in human impulsive aggressiveness. A large body of research on animals suggests that aggression is related to many serotonin system components. Early research showing lower levels of the serotonin metabolite 5-HIAA (5-hydroxyindoleacetic acid) in the cerebrospinal fluid of violent offenders behaving instrumentally than impulsive violent offenders gave rise to the "serotonin deficiency hypothesis" in humans.

The authors also suggested that the serotonin deficiency hypothesis suggests that low levels of serotonin or dysfunctional serotonin signalling are linked to increased impulsive aggression. This is supported by evidence showing reduced concentrations of the serotonin metabolite 5-HIAA in individuals exhibiting impulsive violence, the efficacy of selective serotonin reuptake inhibitors (SSRIs) in reducing aggression, and genetic studies associating variations in serotonin-related genes with aggression and impulsivity. Serotonin influences aggressive behaviour through its action on various brain regions, including the prefrontal cortex, which is critical for decision-making and impulse control; the amygdala, involved in emotional processing and threat response; and the anterior cingulate cortex, associated with conflict monitoring and emotional regulation. These regions are modulated by serotonin to regulate aggressive impulses (Cunha-Bang & Knudsen, 2021).

Research on serotonin's function in impulsive aggressiveness can be used to address current physiological psychology problems, especially those pertaining to the diagnosis, treatment, and mental health effects of violent behaviour disorders (Seo & Patrick, 2008). Comorbid problems including depression, anxiety, and drug addiction are common in people with aggressive behaviour disorders. Developing integrated treatment techniques can be aided by an understanding of the roles that serotonin plays in both mood control and aggressiveness. For example, treating serotonin dysregulation may improve overall mental health outcomes by concurrently reducing impulsive aggressiveness and alleviating feelings of sadness.

The knowledge gathered from this body of work can help shape public health initiatives that try to stop violence and aggression on a larger scale. Early intervention programmes that look for early indications of serotonin dysregulation or genetic markers linked to serotonin may be able to identify those who are more likely to exhibit violent behaviours. Campaigns for education and preventative care might be created to encourage good diet, stress reduction, regular exercise, and other behaviours that improve serotonin function. Lastly, advanced neuroimaging techniques to investigate changes in the structure and function of the brain, longitudinal studies to determine causal linkages, and genetic and epigenetic studies to

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comprehend individual variances in aggressiveness might all be beneficial for future study. By incorporating these viewpoints, better methods for controlling impulsive aggressiveness and enhancing mental health outcomes may be created.

Islamic teachings emphasise self-control, ethical conduct, and spiritual well-being to manage emotions, including anger and aggression. The Prophet Muhammad (PBUH) stressed the importance of controlling anger, stating that true strength lies in self-control (Hadith, Sahih Bukhari). Islamic practices such as daily prayers, fasting, and Quranic recitation promote mindfulness and emotional stability, potentially enhancing serotonin regulation and reducing impulsive behaviours (Rayhan, 2017). Furthermore, Islamic teachings advocate for holistic health, emphasizing good nutrition, regular physical activity, and stress management, all of which can positively influence serotonin levels and emotional regulation (Attum et al., 2023). Integrating these religious principles with the scientific understanding of serotonin's impact on aggression can lead to more effective and culturally sensitive approaches to managing impulsive aggression and improving mental health outcomes.

Circadian Rhythms and Sleep-Wake Cycle

Radwan et al. (2019) noted that abnormalities in sleep-wake cycles are frequently seen in illnesses involving impaired dopamine release, such as Parkinson's disease (PD), in which up to 90% of patients experience sleep disturbances. Among these are problems getting to sleep, staying asleep, and excessive daytime drowsiness. Dopaminergic pathways, particularly those involving the ventral tegmental area (VTA) and the substantia nigra, are essential for preserving proper sleep architecture, demonstrating the fundamental function that dopamine plays in controlling sleep. Dopamine levels are significantly reduced in Parkinson's disease, which is characterised by the destruction of dopaminergic neurons in the substantia nigra. This disruption affects several non-motor activities, including sleep.

They added that due to the disturbed sleep-wake cycle caused by dopamine depletion, patients with Parkinson's disease typically exhibit REM sleep behaviour disorder (RBD), insomnia, fragmented sleep, and daytime drowsiness. Neurodegenerative illnesses like Parkinson's disease are frequently accompanied by REM sleep behaviour disorder (RBD), a condition in which people act out their dreams because there is no muscular paralysis during REM sleep. Degeneration of brainstem nuclei, such as the pedunculopontine tegmental nucleus (PPT), which projects to dopaminergic neurons in the VTA and interferes with regular REM sleep processes, is associated with RBD (Radwan et al., 2019).

Molecular and circuit processes underlie the relationship between dopaminergic pathways and sleep regulation. Dopamine affects sleep by acting on brain areas such as the thalamus and hypothalamus. Dopaminergic neuron degeneration upsets the architecture of sleep, resulting in less REM sleep and disjointed sleep patterns. Treatments for sleep disturbances in Parkinson's disease (PD) can be guided by an understanding of the relationship between dopamine and sleep. These treatments can include pharmacological interventions such as dopaminergic agonists and non-pharmacological approaches like cognitive-behavioural therapy for insomnia, regular exercise, and consistent sleep schedules, all of which can enhance the quality of sleep and general well-being.

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It is crucial to apply this knowledge to current physiological psychology concerns, especially the rising incidence of sleep problems in ageing populations. Neurodegenerative illnesses such as Parkinson's disease (PD) are growing more prevalent as the world's population ages (Coleman & Martin, 2022). This emphasises the need to manage related non-motor symptoms, such as sleep difficulties, effectively. The development of novel pharmacological treatments that target particular dopaminergic pathways, longitudinal studies to examine the evolution of sleep disturbances in Parkinson's disease (PD), genetic and biomarker studies to predict susceptibility to sleep disturbances, and interdisciplinary approaches combining insights from neurobiology, psychology, and sleep medicine to develop comprehensive treatment plans that address both motor and non-motor symptoms of PD and similar disorders should be the main areas of future research (Radwan et al., 2019). By combining these viewpoints, we may improve our comprehension of the intricate relationship between dopamine and sleep regulation, which will help us manage and treat sleep disorders in neurodegenerative illnesses more effectively.

Connecting the research on dopamine's function in sleep-wake cycles and sleep disorders, especially in Parkinson's disease (PD), with Islamic viewpoints demonstrates a strong congruence with the all-encompassing perspective on health and wellness that is stressed in Islamic teachings. Islam promotes a balanced way of living, which includes taking care of one's physical and mental well-being and sleeping habits. Islam emphasises getting enough sleep and rejuvenation, and the five daily prayers (Salah), particularly the Fajr (dawn) and Isha (night) prayers, support a regular sleep-wake cycle that is in line with circadian rhythms (Bahammam & Gozal, 2012). Islamic teachings on compassion and caring for the sick support holistic treatment techniques that address both motor and non-motor symptoms in the context of Parkinson's disease (PD) and sleep difficulties. Promoting regular exercise, as Islam advises, can assist in controlling the symptoms of Parkinson's disease, including improving sleep quality.

Findings

This narrative review examined the interplay between dopamine and serotonin in motivating various activities, aligning these findings with Islamic perspectives. Firstly, sleep deprivation was found to increase sleepiness, motivating sleep-related behaviours at the expense of other activities, highlighting the potency of sleep as a primary drive (Axelsson et al., 2020). This aligns with the Islamic emphasis on adequate sleep and rest. Secondly, dopamine release in the striatum acts as a reward signal during learning, reinforcing cognitive engagement (Yagishita, 2019), which resonates with the Islamic view of seeking knowledge as a continuous act of worship. Thirdly, serotonin levels were found to influence decision-making, with optimal levels crucial for flexible choices and appropriate risk-taking (Nobis et al., 2023), echoing the Islamic emphasis on wise and ethical choices.

Furthermore, the review highlighted the role of dopamine in reinforcing physical activity, potentially explaining excessive exercise, while serotonin's interaction with dopamine influences fatigue during exercise (Gorrell et al., 2022; Ruiz-Tejada et al., 2022; Gharakhanlou & Fasihi, 2023). This complements the Islamic encouragement of maintaining good health through regular physical activity. Additionally, dopamine dysregulation was found to contribute to binge eating by increasing impulsivity and food cravings (Yu et al., 2022), contrasting with the Islamic promotion of moderation in eating habits. The review also linked low serotonin levels to impulsive aggression, underscoring its role in emotional regulation and

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impulse control (Cunha-Bang & Knudsen, 2021). This aligns with the Islamic emphasis on self-control and ethical conduct in managing anger. Finally, dopamine was found to be crucial for healthy sleep-wake cycles, with deficiencies leading to sleep disturbances (Radwan et al., 2019), complementing the Islamic promotion of a balanced lifestyle that includes healthy sleep habits and the practice of daily prayers, which support a regular sleep-wake cycle.

Table 1: Key Findings

Domain	Key Findings	Islamic Perspective
Sleep and Motivation	Sleep deprivation increases sleepiness, motivating sleep-related behaviours at the expense of other activities (Axelsson et al., 2020).	Islam emphasizes the importance of adequate sleep and rest, aligning with the motivational drive of sleepiness.
Learning and Memory	Dopamine release in the striatum acts as a reward signal, reinforcing learning and promoting further cognitive engagement (Yagishita, 2019).	The rewarding effect of dopamine in learning aligns with the Islamic emphasis on seeking knowledge as a form of worship.
Neurotransmitters and Decision-Making	Serotonin levels influence motivation in decision-making, with optimal levels crucial for flexible choices and appropriate risk-taking (Nobis et al., 2023).	The role of serotonin in sound decision-making resonates with the Islamic emphasis on wise and ethical choices.
Physical Activity	Dopamine reinforces physical activity, potentially explaining excessive exercise (Gorrell et al., 2022; Gharakhanlou & Fasihi, 2023; Ruiz-Tejada et al., 2022). Serotonin's interaction with dopamine influences fatigue during exercise.	Islam encourages maintaining good health through regular physical activity, aligning with the scientific understanding of its benefits.
Binge Eating	Dopamine dysregulation contributes to impulsive personality traits, heightened food cravings, and overeating (Yu et al., 2022).	Islam promotes moderation (Wasatiyyah) in all aspects of life, including eating habits, aligning with the need to manage dopamine-driven cravings.
Impulsive Aggression	Low serotonin levels are linked to impulsive aggression, highlighting serotonin's role in emotional regulation and impulse control (Cunha-Bang & Knudsen, 2021).	Islam emphasizes self-control and ethical conduct, particularly in managing anger and aggression, aligning with the role of serotonin in emotional regulation.
Circadian Rhythms and Sleep-Wake Cycle	Dopamine is crucial for maintaining healthy sleep-wake cycles, with	Islam promotes a balanced lifestyle that includes healthy sleep habits, with the practice

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	dopamine deficiency leading to sleep disturbances (Radwan et al., 2019).	of five daily prayers (Salah) supporting a regular sleep-wake cycle.

Conclusion

This narrative review set out with two primary objectives: firstly, to examine the impact of neurotransmitter systems, specifically dopamine and serotonin, on motivation and cognition; and secondly, to discuss the implications of these findings from an Islamic point of view. By synthesizing evidence from a range of studies, this review has successfully achieved both of these objectives.

The review has comprehensively demonstrated the intricate involvement of dopamine and serotonin in a variety of motivation-based activities, including sleep, learning, decision-making, physical activity, eating, aggression, and circadian rhythms. It has highlighted how these neurotransmitters contribute to both the initiation and maintenance of motivated behaviours, as well as their impact on cognitive processes such as learning and decision-making.

Furthermore, the review has successfully integrated these scientific findings with Islamic teachings, providing a unique and holistic perspective on motivation. This integration has revealed a strong congruence between scientific evidence and Islamic perspectives, emphasizing the importance of a balanced lifestyle that encompasses physical, mental, and spiritual well-being.

However, it is important to acknowledge the limitations of this review. Firstly, as a narrative review, it is inherently subjective and may be influenced by the author's perspectives and the selection of studies included. Secondly, the review primarily focused on dopamine and serotonin, while other neurochemicals and hormones may also play significant roles in motivation. Finally, the majority of the studies included were conducted in Western populations, which may limit the generalizability of the findings to other cultural contexts.

Despite these limitations, this review provides valuable insights into the neurochemical basis of motivation and its interaction with religious and cultural values. Future research should address these limitations by incorporating a wider range of neurochemicals and hormones, employing more rigorous methodologies, and including diverse populations. Longitudinal studies are needed to understand how these neurotransmitter systems adapt over time and in response to various interventions. Furthermore, exploring the individual differences in neurotransmitter function and their impact on motivation could pave the way for personalized interventions to promote healthy behaviours and improve mental health outcomes.

By continuing to explore the neurochemical basis of motivation and its interaction with religious and cultural values, we can develop more effective and culturally sensitive strategies for enhancing motivation and fostering overall well-being. This knowledge can empower individuals to make informed choices that promote a fulfilling and balanced life, in harmony with both scientific understanding and spiritual guidance.

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