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A Critical Concept for Mental Health: Neuropsychology

Ruh Sağlığı İçin Önemli Bir Kavram: Nöropsikoloji

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ABSTRACT

As a field concerned with brain–behaviour links, neuropsychology is becoming more prominent in mental health research. How biological processes interact with the environment in the pursuit of better mental health has been a significant issue discussed from the past to the present. Researchers are currently examining where neuropsychology is positioned within this debate and what impact it has on mental health. Studies in neuropsychology have raised more questions than answers. The field of neuropsychology is vast and covers a wide range of topics. A review of the connection between neuropsychology and mental health is needed. Therefore, this study aims to examine the relationship between neuropsychology and mental health as an important field. Research has shown that neuropsychological disorders have a negative impact on mental health. However, there are also direct and indirect connections between neuropsychology and mental health through various related disciplines. This article discusses neuroscience and neuropsychology and explores their relationship with mental health, drawing on relevant literature.

ÖZ

Anahtar Kelimeler
Beyin,
Ruh sağlığı,
Nöropsikoloji,
Nörobilim.

Nöropsikoloji, beyin–davranış ilişkisini inceleyen disiplinlerarası bir alan olup, son yıllarda ruh sağlığı araştırmalarında giderek daha görünür hâle gelmiştir. Ruh sağlığına giden yolda biyolojik süreçlerin çevre ile etkileşimi geçmişten günümüze kadar tartışılagelen önemli bir konudur. Bu noktada, nöropsikolojinin nerede konumlandığı ve ruh sağlığını nasıl etkilediği araştırmacıların dikkatini çekmektedir. Nöropsikoloji çalışmalarının ortaya çıkardığı bulgular yanıttan daha fazla soru üretmektedir. Ruh sağlığı ile nöropsikoloji arasındaki bağlantıya odaklanan bir derleme çalışmasına ihtiyaç duyulmaktadır. Dolayısıyla bu çalışma önemli bir alan olarak nöropsikolojinin ruh sağlığı ile ilişkisini incelemeyi amaçlamaktadır. Yapılan çalışmalar, nöropsikolojik bozuklukların ruh sağlığı üzerindeki olumsuz etkilerini ortaya koymaktadır. Diğer taraftan, nöropsikolojinin ilişkili olduğu farklı disiplinler aracılığıyla doğrudan ve dolaylı şekillerde olmak üzere ruh sağlığı ile ilişkili olduğu bulunmuştur. Bu makalede sırasıyla nörobilim ve nöropsikolojiden bahsedilmiş, daha sonra nöropsikoloji ile ruh sağlığı arasındaki ilişki literatür bağlamında tartışılmıştır. Nöropsikolojinin bulguları saldırganlık ve antisosyal davranışları açıklama konusunda büyük bir yol kat etmiştir. İlerleyen süreçte çoğalacağı öngörülen nöropsikoloji çalışmaları ruh sağlığı alanı açısından umut vericidir.

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Introduction

The brain and nervous system are crucial components that contribute significantly to the survival and thriving of living organisms. In the class of mammals, which includes humans, these structures are relatively more massive, leading to a higher level of complexity in their anatomy and functionality. Compared with other species, the human brain shows exceptional enlargement relative to body size and underpins distinctive cognitive processes that evolved to support adaptive behaviour (DeCasien et al., 2022). The complex workings of the human brain are a subject of ongoing research and investigation, with numerous unanswered questions still to be explored (Uzbay, 2015). Nonetheless, the function of the brain in the emergence of cognitive abilities is obvious (Holyoak & Monti, 2021). Moreover, the brain plays a critical role in different contexts in completing a wide range of tasks by considering behavioural and cognitive demands (Vaidya & Badre, 2022). More importantly, the function of our body with all its organs depends on the brain's functionality, and this functionality also significantly shapes our thinking and emotions (Luebbers, 2021). Different sides of the brain are specialised for particular functions affecting human lives in all aspects (Lindell, 2019). That is why brain-focused studies are essential for understanding the link between the brain and behaviour.

It is imperative that a multitude of fields collaborate in the pursuit of understanding the brain rather than relying solely on one discipline. The investigation of the connection between social sciences and neurosciences is of utmost importance to effectively respond to today's conditions (Youmans, 2004). The main factors directly influencing mental health can be explained by discovering the human responses stemming from the brain. At this point, threats to humans are crucial to understanding how neuropsychology links to mental health. In this regard, "fight or flight" responses are the fundamental strategies for humans derived from their sympathetic nervous system, and these responses are significant to coping with environmental threats that have a high possibility of posing a risk to the mental health of individuals (Scott-Solomon et al., 2021). Importantly, the brain plays an important role in shaping the body–mind relationship through its dynamic coupling with the body by integrating interoceptive signals (Zhou et al., 2021), and the mental health of individuals requires a balance between mind and body (De Simoni, 1997; Laird et al., 2018). Thus, how neuropsychology is linked to mental health should be investigated when considering the considerable impact of the brain on the human mind and body.

This study aims to clarify how neuropsychology relates to mental health across mechanisms and disorders. The study's propositions are as follows:

P1. Neuropsychological dysfunctions are associated with adverse mental health outcomes.

P2. Neuropsychology elucidates how interactions between biological processes and environmental factors jointly shape mental health outcomes.

1. Methodology

This study carried out a narrative review using the selected databases: PsycINFO, Web of Science, Google Scholar, and PubMed/MEDLINE. The literature review was conducted between November and December 2024. The keywords were identified as neuropsychology and mental health outcomes (e.g., depression, anxiety, psychosis, neurodevelopmental conditions). Related empirical and theoretical articles that directly linked neuropsychology to mental health were included in this study to explore the relationship between neuropsychology and mental health. The authors assessed titles, abstracts, and full texts by resolving disagreements via discussion. Findings and

implications were discussed to make suggestions at the end of the study.

2. Results

2.1. Nervous System

Neuropsychology is a critical concept for various fields, but how neuropsychological research is applied to individuals' mental health is essential in order to decide how to direct future research. To comprehend this connection better, it is crucial first to have knowledge of the nervous system.

The nervous system is one of the most complex systems in the body (Klimovich & Bosch, 2018). Although adult central nervous system neurons are often considered to have limited regenerative capacity (Varadarajan et al., 2022), there is evidence for restricted regeneration and promising approaches to enhance repair (Iismaa et al., 2018). Furthermore, the nervous system can be damaged by different external influences, such as coronaviruses (Wu et al., 2020) and is open to different information coming from the environment (Brocklesby, 2004), so it is likely to change during the life course.

The nervous system plays a critical role in maintaining the harmonious functioning of all organs in the body. Additionally, it regulates the body's relationship with the internal and external environment (Jänig & McLachlan, 1992; Kalinkovich et al., 2009). The nervous system and brain function play a significant role in psychology, and ignoring their importance can be misleading. While it is known that behaviours are not independent of the body, the nervous system's contribution to directing both behaviour and bodily functions is often ignored. The nervous system can greatly impact human behaviour, especially in response to environmental factors, and can provide elements necessary for achieving mental health and harmony. Therefore, it is significant to recognise the brain's significant role in mental health and explore the relationship between neuropsychology and mental wellness. However, it would be beneficial to discuss neuroscience in detail to better understand the connection between neuropsychology and mental health.

2.2. Neuroscience

Neuroscience is crucial as it encompasses a wide range of diverse disciplines (Basu et al., 2021; De Raedt, 2020). It aims to gain a comprehensive understanding of the nervous system and its functioning within all living organisms (DeYoung et al., 2022; Münch et al., 2020). This complex science merges numerous areas of study, including molecular biology, anatomy, psychology, and physiology, to provide a holistic approach to understanding the intricacies of the nervous system (Admon & Pizzagalli, 2015; Gomez-Marin & Mainen, 2016; Scarlata et al., 2021). In this regard, neuroscience and neuropsychology are interrelated areas that concern detailing the mechanisms of the brain (Van Elk, 2021). These areas that examine driving factors for human behaviour, such as empathy, may be worthwhile for mental health (Fragkos et al., 2019). Despite the significant developments observed in these areas, there are chronic problems that clinicians have not been able to solve for a long time (Reber & Tranel, 2019). Thus, it is important to reveal the current state of neuroscience, especially neuropsychology, in terms of exploring the deficiencies in order to identify where future research should focus.

In the past, researchers primarily studied communication between neurons (Thompson & Sakiyama-Elbert, 2018), and they focused on its impact on human behaviours, such as adaptive behaviours (Chiel & Beer, 1997). However, in the 21st century, neuroscience has expanded the focus to include more complex brain-related matters (Berridge & Kringelbach, 2013; Carrier et al., 2022). On the other hand, there is growing recognition that deterministic approaches focused solely on neurons may not provide a complete understanding of the brain (Uzbay, 2015). Considering neuroscience and related fields in relation to important issues such as mental health can be helpful.

In 1983, Libet conducted an experimental study reporting that a readiness potential—an increase in brain electrical activity—can be detected before participants report conscious awareness of the intention to move. This timing has been interpreted as suggesting that some neural processes leading to action may begin prior to conscious intention. While this study sheds light on many behaviours that can be explained through neuroscience, it also raises a host of new questions (Libet, 1983). Similarly, Soon et al. (2013) found that neural activity can predict the outcome of complex voluntary choices as early as 4 seconds prior to reported conscious intention. At this point, brain-related studies are considered groundbreaking. Therefore, current findings should be reviewed to reach a better understanding of critical mental health issues through neuropsychology.

Neuropsychology is a significant branch of neuroscience (Margolin, 1991). A substantial number of new developments emerging in these fields may facilitate the spread of research into different areas (Wajman et al., 2015). These new developments require an evaluation of current findings. As a promising branch of neuroscience, neuropsychology has started to be prevalent in mental health research (Bailey et al., 2021; Markey et al., 2023; Singh & Germine, 2021; Zhou & Wang, 2021). Thus, this study aims to explain the relationship between neuropsychology and mental health.

2.3. Neuropsychology and Mental Health

Although neuropsychology has a long history, the field has expanded rapidly in recent decades (Dodrill,1997; Ponsford, 2017). It aims to understand the relationship between the brain and behaviour and uncover the effects of neurological disorders (Eglit, 2019; Gagnon & Bherer, 2023). Neuropsychology and neuroscience are often discussed together in literature as interconnected fields (Goss, 2016). With the advancement of technology, both neuropsychology and neuroscience have experienced significant developments (Haaland, 2006; Cisek & Green, 2024). The advanced possibilities of the age of technology are more likely to accelerate neuropsychology studies the most. Furthermore, neuropsychology is a promising field that is likely to play a significant role in future research due to the rapid advancement of technology. In today's conditions, neuropsychology provides a substantial amount of research explaining the brain and behaviour (Medaglia et al., 2017). At this point, new insights appear with neuropsychological research in the field of mental health (Fradkin et al., 2018). Considering that neuropsychology rapidly advances with increasing technological developments, innovative methods and techniques in mental health will mostly depend on the progression of neuropsychology. Thus, the relationship between neuropsychology and mental health is crucial when considering today's conditions and future expectations in these fields.

The brain is constantly engaged in various processes, with different parts working together to produce both simple and complex behaviours (Calimera et al., 2013). These behaviours are the result of interactions between neurons, which enable the brain to perceive, interpret, respond to stimuli, learn, and retain information. When neurons function properly, mental health is positively impacted, as the brain enables the individual to reach a healthy state (Gajbhiye et al., 2020; Üngüren, 2015). In this regard, it should not be forgotten that the body and mind affect each other (Maggio et al., 2022). At this point, the healthy functioning of the neurons that provide the balance of the mind is also an important step for the balance of the body. Moreover, the mind is the essential driving factor for all living beings, including humans (Pascal & Pross, 2023). More importantly, the brain's relationship with the body is direct and shapes the individual (Bayne et al., 2020). If the brain, which is the first condition for establishing the balance between mind and body, does not function properly, the individual's daily routine will be disrupted (Blacker et al., 2020). Neurological conditions can be associated with poorer mental health, as symptoms and functional limitations may disrupt daily routines and well-being. Thus, mental health mainly depends on the healthy functionality of the brain.

On the other hand, it is important to take into account the impact of environmental factors on mental health. The environment can play a significant role in the development of certain behaviours, as evidenced by numerous studies in the literature (Min et al., 2013; Plomin & Daniels, 2011). Seiden (1992) posits that the environment can have a profound impact on human behaviour and brain chemistry. In the same way, human behaviour can also influence both the environment and brain chemistry. However, it is significant to consider that the brain can directly affect human behaviour, even if the influence of the environment and behaviour is significant. Therefore, it is essential to consider all three factors when examining the complex relationship between human behaviour and brain chemistry.

When it comes to studying the brain's effect on behaviour, one of the most important areas to consider is the frontal lobe (Mubarik & Tohid, 2016). Assessing the frontal lobe in more detail can help improve the understanding of the brain's influence on mental health. The frontal lobe covers a large portion of the brain and is responsible for vital functions such as planning, decision-making, judgment, behavioural flexibility, and creativity (Moselhy et al., 2001; Semendeferi et al., 1997). Damage to the frontal lobes can lead to changes in mood and behaviour (Paradiso et al., 1999) and result in what is known as "frontal lobe syndrome," which can cause significant changes in an individual's behaviour and personality (Rommel et al., 1999). Possible causes of frontal lobe syndrome include head trauma, brain infections, and brain tumours (Mumoli et al., 2013). When an individual experiences brain damage, this can significantly change their behaviour and ultimately affect their mental health. Neurological disorders can make it difficult for individuals to adapt to adverse situations and obstacles, leaving them feeling helpless. Therefore, the proper functioning of the brain is essential for better mental health.

It is essential to evaluate how neuropsychological mechanisms interact. Various problems in reward processing can lower mood and depression (Keren et al., 2018; Wang et al., 2021). Weak executive control can increase anxiety and compulsive behaviour (Halse et al., 2022; Zainal & Newman, 2022). Changes in social cognition can alter developmental paths (De La Osa et al., 2021; Tsomokos & Flouri, 2023). These mechanisms also interact with various factors, which together influence symptom severity and treatment response (Beblo et al., 2011; Borsook et al., 2018; Laird et al., 2019; Millgate et al., 2021; Soares et al., 2023). Mapping these links across disorders clarifies what to assess and how to intervene (Braconnier & Siper, 2021).

Numerous studies have explored the connection between neuropsychology and criminal behaviour (Chen et al., 2015; Paul & Bennett, 2021; Witt et al., 2013). Research shows that neurological disorders, such as brain trauma, are linked to an increased likelihood of criminal behaviour (Aaronson et al., 2021; Pavlovic et al., 2019). Studies suggest that changes in the frontal lobe may contribute to increased aggression and antisocial behaviour (Jansen, 2022; Raine, 2019). These findings suggest that neuroscientific and neuropsychological research may be relevant in forensic contexts. Furthermore, studies highlight the changes in mental health that occur before criminal behaviour manifests (Almomen et al., 2022; Liang, 2019; Pontius, 2002; Reddy et al., 2018). Also, Philippi and Koenigs (2014) indicate that psychiatric disorders stem from the brain and establish a direct link between neuropsychology and mental health. The literature demonstrates that neuropsychological disorders have a negative impact on mental health. On the other hand, some studies show an indirect relationship between these two fields. For example, Cleary and Scott (2011) highlight the importance of neuropsychology in supporting children with attention-deficit hyperactivity disorder in schools. By providing this support, the mental health of these children can be positively maintained.

To maintain positive mental health, it is significant to consider the findings of neuropsychology. Neuropsychology research gives a substantial amount of evidence about how aggression and antisocial behaviour occur. Moreover, neuropsychology sheds light on the emergence of different kinds of criminal behaviour. Most importantly, neuropsychology proves that better mental health requires proper brain functioning. The significance of neuropsychology can be expected to increase for mental health when considering the findings proving the link between neuropsychology and mental health. Thus, if these limited studies show an increase in the near future, neuropsychology can expand its scope beyond certain issues, like the emergence of criminal behaviours.

3. Conclusions

From the past to the present, a considerable number of studies have been conducted in the field of neuropsychology. However, these studies have raised more questions than answers, and this has made it challenging to explain this complex field (Casaletto & Heaton, 2017). Nonetheless, the findings of studies have been promising for the development of neuropsychology. Moreover, neuropsychology has remained open to new approaches and advancements in technology, and this can be considered a strong aspect of this field. Furthermore, neuropsychology is linked to various disciplines. These connections enable neuropsychology to affect various aspects of mental health. Therefore, research in neuropsychology has become increasingly significant, and this field introduces groundbreaking innovations in fields such as medicine, education, and criminology (Cleary & Scott, 2011; Philippi & Koenigs, 2014; Reddy et al., 2018). Therefore, as a promising field, neuropsychology will continue to progress, and its impact on mental health is more likely to increase with groundbreaking innovations.

Neuropsychology plays a pivotal role in mental health as it gives an understanding of the interaction between biological processes and the environment. In this regard, Seiden (1992) highlights the relationship between brain chemistry, behaviour, and environment due to their significance on psychological outcomes. On the other hand, the impact of neuropsychological disorders on an individual's mental health is obvious, so this demonstrates the importance of the brain in the mental health of individuals. At this point, while the environment’s influence on individuals’ mental health should not be overlooked, brain-related factors are also important, and mental health is best understood as the product of their interaction. Furthermore, individuals can often modify aspects of their interaction with the environment more directly than underlying brain functions. Therefore, preventive mental health approaches may vary depending on whether the emphasis is placed on environmental supports, psychosocial resources, or biological factors. Although the brain and environment are closely interrelated, services may shift their focus across these areas as needed.

Over time, many studies have been done on aggression and antisocial behaviour, but clear explanations have not yet been found. At this point, neuropsychological research has shed light on the emergence of these traits, which are characterised by poor mental health. The literature linking neuropsychological disorders to criminal behaviour highlights the significance of neuropsychology on mental health. Compared to other fields, neuropsychology has revealed clear findings explaining criminal behaviour. It is expected that future research will prioritise neuropsychology in mental health. Moreover, advancements in technology are likely to facilitate the progression of neuropsychology. In today's conditions, reaching the brain is getting easier, so neuropsychology has a chance to appear more in mental health studies. Thus, neuropsychology is a promising field introducing new developments that effectively respond to today's conditions and explain the uncertainties of mental health.

Multidisciplinary research should be encouraged to better understand the effects of neuropsychology on mental health. The use of technological methods such as brain imaging and neuropsychological testing should be increased. Neuropsychological assessments should be systematically implemented in mental health services. Early diagnosis and intervention programs can be effective in reducing the risks posed by neuropsychological disorders. Neuropsychology-based approaches should be integrated into educational institutions to promote the mental health of children and adolescents. Furthermore, in judicial and forensic contexts, neuropsychological assessments may be considered when clinically indicated to inform rehabilitation and support planning. Supporting

neuropsychological research with artificial intelligence and other advanced technologies can facilitate monitoring individual mental health and developing intervention strategies. In conclusion, neuropsychology is critical for understanding and supporting mental health. Advances in this field will not only improve individuals' psychological well-being but will also significantly impact education, the judicial system, and health policies. Future studies can expand the scope of neuropsychology and further clarify the relationship between mental health and social cohesion.

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