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Neural, Societal and Diagnostic Dynamics of Mental Health Disorders

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Abstract

The present paper comprehensively explores the multifaceted nature of mental health disorders, including their prevalence, societal impact (e.g., employment, social stigma), neurobiological underpinnings (e.g., brain chemistry, structure and function) and methods of diagnosis. In addition, the paper explores the cognitive costs associated with mental illness, specifically the decision-making deficits that often accompany mental health disorders. Finally, the paper discusses innovative approaches to mental health assessment, highlighting the potential of novel diagnostic tools to improve accuracy, efficiency, and accessibility.

Keywords

Mental Health Disorders, Prevalence, Neuroscience, Diagnosis

1. Introduction

Mental health disorders are impacting a rapidly growing segment of our population. According to the National Institute of Mental Health (NIMH), in 2022, approximately half of U.S. adults had sought some form of mental health treatment in the past year, and 59.3 million of them (23% of the U.S. population) were diagnosed with a mental health disorder [6% with a debilitating serious mental illness (SMI)], usually involving a psychotic disorder and a comorbid major mood disorder where every day functioning is severely impaired] (National Institute of Mental Health, 2024). Individuals with SMI are at greater risk of death, with a reported mortality gap of 25 years (i.e., they died an average of 25 years before those in the general population), usually due to cardiovascular factors (Viron & Stern, 2010).

While mental health disorders exist across the age spectrum, the diagnosis of

mental health disorders is greater in younger adults. For example, of the 23% of all U.S. adults who, in 2022, were diagnosed (in the past year) with a mental health disorder, the percentages were highest for younger adults (i.e., 36.2% in adults aged 18 - 25; 29.4% in adults ages 26 - 29; 13.9% in adults aged 50 and older) (National Institute of Mental Health, 2024). It is interesting to consider the impact of the pandemic on these numbers. Faced with disruptions in education and societal isolation, many in the GenZ population (roughly the 18 - 25 age group) reported that they were most impacted in terms of their lifestyles and social relationships (Vacchiano, 2023). In contrast, the older generations, who reported the lowest level of mental health issues in 2022, were more concerned about their health and the economy (Vacchiano, 2023).

Adults may be able to identify their mental challenges more readily, while younger individuals may struggle to understand their symptoms and accept that recovery is possible. Furthermore, in societies that believe in collectivism, many may struggle to share their conditions with others, due to conformity to norms and collective identity. Even in countries with stronger mental health support outlets, such as the United States, some individuals may not have sufficient access or consider their conditions taboo.

With these thoughts in mind, the purpose of the present paper is to explore the multifaceted nature of mental health disorders, including their prevalence, societal impact (e.g., employment, social stigma), neurological underpinnings (e.g., brain chemistry, structure and function) and methods of diagnosis. Where appropriate, specific information relevant to the following mental health disorders will be considered: major depressive disorder (MDD), bipolar disorder, anxiety disorders, schizophrenia, Alzheimer's disease (AD), and autism spectrum disorder (ASD).

2. Mental Health Disorders and Society

Statistics regarding societal harm to individuals with mental health disorders encompass various aspects, including physical violence, discrimination, and suicide rates. Below, statistics are presented to demonstrate the societal challenges faced by those dealing with mental illness.

Individuals with mental health disorders often receive poorer physical healthcare, resulting in healthcare disparities. Studies show they are less likely to receive standard levels of care for conditions such as diabetes, cardiovascular diseases, and cancer (Druss et al., 2011).

There are also severe gaps in access to mental health treatments for these individuals. Nearly 60% of adults with a mental illness didn't receive mental health services in the previous year (National Alliance on Mental Illness, 2017a). Additionally, many people with mental health conditions have limited access to mental health services due to insurance coverage limitations (Reinert et al., 2024). This lack of access results in higher mortality rates for those affected with mental health disorders. Indeed, a recent study showed that of the individuals who had

committed suicide between the years 2000 and 2013, 51% had a psychiatric diagnosis,a rate four times higher than individuals without a diagnosis. Mortality by suicide was highest for individuals with schizophrenia, then bipolar disorder, depressive disorders, anxiety disorders and attention-deficit hyperactivity disorder (ADHD) (Yeh et al., 2019).

Another societal issue for individuals with mental health disorders is the public stigma they face from others, leading to a situation where those suffering from mental illness are less likely to seek assistance. In India, for example, public stigma has produced a high prevalence of unreported mental health disorders, only 7.3% of young people report having mental illnesses and this leads to fewer people receiving treatment (Gaiha et al., 2020).

Individuals with mental health conditions face discrimination and stigma in their professional pursuits as well, which frequently results in employment challenges and homelessness. Those with mental illness have been found to have higher rates of unemployment, with rates ranging from 70% to 90% (National Alliance on Mental Illness, 2017b). Indeed, approximately 20% - 25% of the homeless population in the U.S. suffers from some form of severe mental illness (Eisenmann & Origanti, 2021).

Mental Illness and the Criminal Justice System

Individuals with mental illnesses are overrepresented in the criminal justice system. About 37% of people in state and federal prisons and 44% of those in local jails have a history of mental illness (Bureau of Justice Statistics, 2017). According to one study, 12% of adult psychiatric patients receiving treatment in the San Diego County health system had prior incarcerations, and 28 percent of Connecticut residents treated for schizophrenia and bipolar disorder have been arrested or detained. Moreover, people with untreated mental illness are 16 times more likely to be killed during a police encounter than other civilians approached or stopped by law enforcement (Treatment Advocacy Center, 2015).

The vast majority of people with mental illnesses are not violent. However, certain severe mental illnesses can increase the risk of violence if untreated.

Studies suggest that individuals with untreated SMI, such as schizophrenia or bipolar disorder, are somewhat more likely to exhibit violent behavior compared to the general population. One study found that people with SMI were 3-5 times more likely to be violent than those without mental illness, particularly when they also abuse substances (Swanson et al., 1990). A separate review found that individuals with schizophrenia are 4 to 6 times more likely to engage in violent behavior if untreated compared to those who receive treatment (Fazel et al., 2009). In addition, untreated bipolar disorder, particularly during manic episodes, can increase the likelihood of aggressive behavior. However, most individuals with bipolar disorder do not exhibit violent behavior (Goodwin & Jamison, 2007).

While untreated severe mental illnesses can increase the risk of violent behavior (Ghiasi et al., 2023), it is important to recognize that the majority of individuals

with these diagnoses are not violent and often lead non-violent lives. Statistics concerning individuals with untreated mental health disorders causing harm to others are often complex and sensitive, given the need to balance the public's right to safety with preventing stigma against those with mental health issues. Promoting effective treatment and support for individuals with mental health issues can mitigate risks and improve overall outcomes, ultimately fostering a safer environment. Educating the public about the realities of mental illness and reducing stigma is vital for encouraging those in need to seek help and for dispelling misconceptions surrounding mental health and violence.

Rather than being a source of threat, it is often the case that individuals with mental health disorder are more likely to be the victim of a crime, given their diminished capacity. For example, individuals with SMI are 2.5 times more likely to be victims of violent crime compared to the general population (Hiday et al., 2001). Approximately 25% - 50% of individuals with SMI experience physical abuse in their lifetime (Goodman et al., 2001).

3. Mental Health Disorders and Neurobiology

One critical misunderstanding that perpetuates stereotypes regarding mental illness is the notion that this is some sort of choice or weakness inherent in these individuals, as if individuals have the autonomy to choose whether to become afflicted by a mental health disorder. Researchers who study brain processing differences in mental health patients, such as neuroscientists and psychologists, understand a mental health disorder is a biological condition, not a weakness. The following section discusses some of these differences to contextualize the "low-level" phenotypic and biological differences that give rise to altered thought processes and behaviors.

3.1. Neurochemistry

There have been several links made between mental health disorders and significant changes in brain chemistry. Neurotransmitters are chemical messengers that facilitate communication between neurons in the brain. They play a crucial role in regulating mood, cognition, and behavior. Imbalances in neurotransmitter levels or receptor function have been implicated in various mental health conditions. This section will consider some key examples of neurotransmitter differences observed in individuals with varying mental health disorders, including depression, anxiety, schizophrenia, and bipolar disorder. By examining these neurochemical differences, researchers hope to gain insights into the pathophysiology of these conditions and develop more targeted and effective treatments.

Serotonin is a neurotransmitter that plays a crucial role in regulating mood, appetite, sleep, and memory. It is often referred to as the "happiness hormone" due to its association with positive mood and well-being (Puglisi-Allegra & Andolina, 2015). Low serotonin levels are correlated with chronic stress and patients with low levels of serotonin are at a higher risk of suicide attempts (Pourhamzeh

et al., 2022). **Figure 1** illustrates the decreased serotonin levels observed in those with depression compared to normal individuals. Patients diagnosed with depression are treated with antidepressants which, as seen in **Figure 1**, act to increase the rate of serotonin release at the synapse (Garcia-Arocena, 2015). These antidepressants, known as serotonin reuptake inhibitors (SSRIs), block the reuptake of serotonin (Andrews et al., 2015), leaving more available in the synapse to be utilized. Along with serotonin, low levels of dopamine may also contribute to depression. Dopamine is a "reward" neurotransmitter that is vital to the motivation and pleasure systems of the brain (Bressan & Crippa, 2005). Since those with depression can also have low dopamine levels, they feel unmotivated to do the things they used to like to do and are less likely to work toward achieving their goals (Garcia-Arocena, 2015).

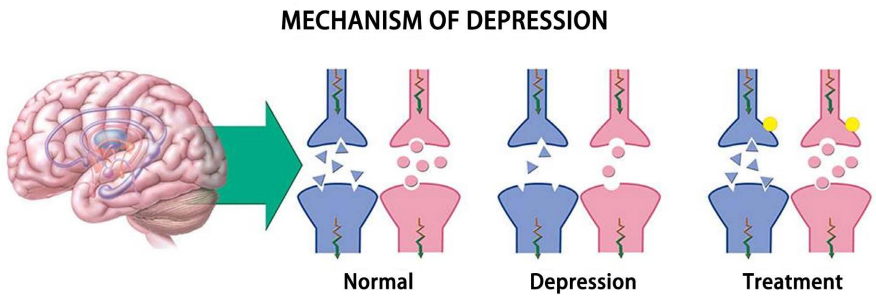

Figure 1. The image above represents decreased serotonin levels in those with depression compared to healthy individuals. With the help of medication, however, those with depression can show an increase in serotonin levels. Image from Garcia-Arocena (2015).

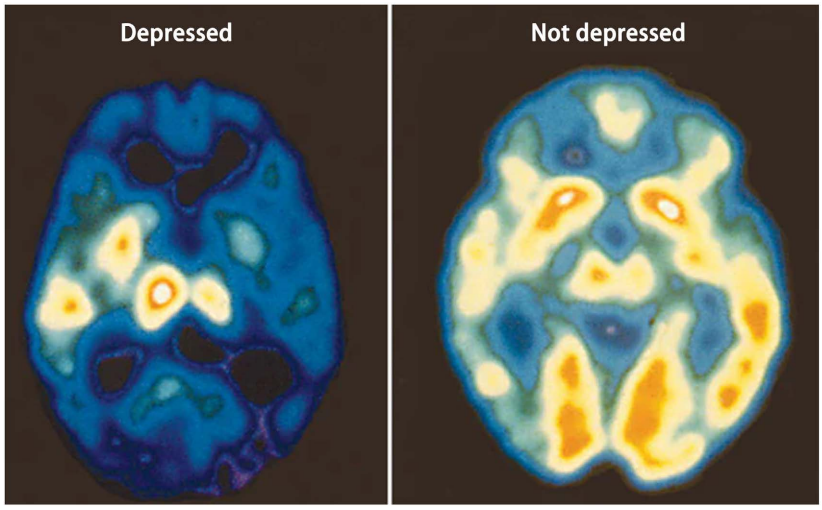

Figure 2. According to Mayo Clinic, those who are depressed have a different brain chemistry and metabolic processing compared to healthy individuals. Using Positron Emission Tomography (PET) to assess metabolic differences in brain processing can determine the probability of an individual having depression. Image from Mayo Clinic (2024).

Individuals with depression may also exhibit increased levels of monoamine oxidase A (MAO-A) (Meyer et al., 2006). MAO-A is an enzyme that breaks down

neurotransmitters, which leads to abnormally low levels of serotonin, dopamine, and norepinephrine. **Figure 2** illustrates differences in metabolic activity in those diagnosed with depression compared to healthy controls (Mayo Clinic, 2024).

Individuals diagnosed with schizophrenia present with an imbalance of dopamine, especially increased activity in the mesolimbic pathway and decreased activity in the prefrontal cortex. The mesolimbic pathway is an important brain circuit involved in reward, motivation, and learning. This pathway plays a significant role in one's ability to find pleasure and seek out rewarding experiences. Dysregulation of this pathway has been associated with schizophrenia (Weinstein et al., 2017).

Gamma-aminobutyric acid, or GABA, activity appears to be inversely related to dopamine activity in the brain. GABA is the primary inhibitory neurotransmitter in the brain. It helps to regulate neuronal activity by reducing excitability. GABA plays a critical role in anxiety reduction as GABAergic neurons help to calm the brain and reduce anxiety levels (Abdou et al., 2006).

Altered levels of serotonin, dopamine, and GABA have also been implicated in bipolar disorder. Dysregulation of neurotransmitters, including serotonin and dopamine occurs (Berk et al., 2007), along with altered signaling in the glutamate and GABA systems. Similarly, imbalances in serotonin, norepinephrine, and GABA occur in those diagnosed with anxiety disorders (Bandelow et al., 2016). Autism spectrum disorder (ASD) has also been linked to abnormal levels of serotonin and other neurotransmitters in the brain, along with imbalances in the glutamate-GABA system (Choudhury et al., 2012).

Alzheimer's disease (AD) has been linked to a significant decline in acetylcholine, a neurotransmitter important for learning and memory (Muir, 1997). These neurotransmitter deficits ultimately result in the formation of amyloid plaques and neurofibrillary tangles, which are hallmark features of AD. These abnormal structures disrupt brain communication, leading to progressive cognitive decline and symptoms such as memory loss, confusion, and difficulty with daily tasks.

It is clear that the relationship between neurotransmitter imbalances and mental health disorders is well documented. Neurotransmitters play a vital role in regulating mood, cognition, and behavior. Understanding the neurochemical underpinnings of mental health disorders is essential for developing more effective treatments. By examining neurotransmitter imbalances and their effects on brain function, researchers can gain insights into the pathophysiology of these conditions. This knowledge can lead to the development of targeted therapies that address specific neurotransmitter deficits, potentially improving the lives of individuals with mental health disorders.

3.2. Neuroanatomy

In addition to neurochemical differences found in mental health disorders, there exist several differences in the overall brain structure. Understanding the anatomical differences associated with mental health disorders is an ongoing area of

research. While psychological factors play a significant role, research suggests that structural differences in the brain may also contribute to the development and manifestation of these conditions. By examining the brain's anatomical differences, researchers gain insights into the pathophysiology of these conditions and develop more targeted and effective treatments.

3.2.1. Major Depressive Disorders (MDD) and Anxiety Disorders

Studies on MDD have shown a reduced volume of gray matter in the prefrontal cortex, hippocampus, and anterior cingulate cortex in individuals with depression compared to healthy individuals (Enneking et al., 2020; Pizzagalli & Roberts, 2022; Zheng et al., 2021). As an example, **Figure 3** illustrates a structural anatomic comparison of individuals with MDD compared to healthy individuals where the red areas represent areas where thinning of the cortex was greater in MDD compared to healthy controls (Schmaal et al., 2017).

Figure 3. Meta-analysis effect sizes for regions with a significant cortical thinning in adult patients with major depressive disorder (MDD) compared to healthy controls. Image from Schmaal et al. (2017).

The thalamus is a brain area that controls motor function, emotions, and thinking. Damage to the thalamus may cause issues such as sensory impairment, motor problems, and cognitive and emotional effects. Those with MDD have been shown to have significantly reduced gray matter volume in the right thalamus (Zheng et al., 2021).

The anterior cingulate cortex has a vital role in cognition and mood regulation. In one study, those with MDD thinning of the prefrontal cortex (Zheng et al., 2021). This is significant because thinning of the prefrontal cortex may be related to impulsivity (Lim et al., 2021).

The ventral striatum is involved in reward, motivation, and dopamine pathways. Decreased gray matter intensity in this area is common among MDD patients who have committed suicide (Kang et al., 2020). Such damage to the reward system and dopamine pathways may be related to the severity of depression. For

example, decreased gray matter in the ventral striatum is related to dampened feelings joy of in doing activities (Loonen & Ivanova, 2016).

Individuals with anxiety disorders exhibit hyperactivity in the amygdala, a brain area involved in fear processing and the monitoring of uncertain information cues (Whalen, 2007). These studies have shown reduced connectivity between the amygdala and prefrontal cortex in anxiety, affecting emotional regulation. In the non-anxious brain, the prefrontal lobes act like a judge, deciding whether the amygdala's signal should be inhibited or not. The disruption of this circuit in the anxious brain reduces the prefrontal lobe's ability to regulate amygdala activation, producing greater fear, or reactions to uncertainty.

3.2.2. Schizophrenia

Individuals with schizophrenia often have enlarged ventricles and reduced gray matter in the prefrontal cortex, hippocampus, and temporal lobe (Adamu et al., 2023; Wegrzyn et al., 2022). Lawrie & Abukmeil (1998) found that schizophrenic relatives had enlarged third ventricles and lower cerebral volume, higher lateral ventricle and caudate nucleus volumes, and a volume reduction of frontal lobe gray matter compared to healthy siblings (see also (Staal et al., 2000)). In fact, according to 40 studies, there was an overall 3% reduction in brain volume in schizophrenic patients. Left temporal lobe, which is involved in language and memory processing and facial recognition, also had a 6% reduction in volume and right temporal lobe, which functions in learning and auditory processing, was reduced by 9.5% (Lawrie & Abukmeil, 1998). Finally, Ingvar & Franzén (1974) showed that the size of the frontal lobe (compared to the whole brain volume) was reduced in patients with schizophrenia (see also Buchsbaum et al., 1992).

3.2.3. Alzheimer's Disease (AD)

Alzheimer's disease (AD) is a neurodegenerative disorder characterized by progressive cognitive decline, primarily affecting memory and thinking. Alzheimer's disease causes significant structural changes in the brain, including a loss of brain mass, primarily in the hippocampus, cerebral cortex, thereby enlarging the ventricles.

One of the most prominent brain volume changes associated with AD is atrophy of the hippocampus. The hippocampus is a brain region that is crucial for memory formation and retrieval. In individuals with AD, the hippocampus undergoes significant shrinkage when neurons and synapses atrophy and die. This atrophy is often observed in the early stages of the disease and is correlated with the severity of memory impairment (Rao et al., 2022).

The cerebral cortex comprises the outermost layers of the brain that are responsible for higher-order cognitive functions. Significant changes are observed here in AD. Studies have shown that individuals with AD exhibit cortical thinning, particularly in regions associated with memory, language, and decision-making (Jack et al., 1997). This thinning results from neuronal loss and reduced synaptic density, which leads to impaired cognitive abilities.

As brain tissue is lost in AD, the ventricles, fluid-filled cavities within the brain, often become enlarged. Ventricular enlargement is a common finding in individuals with AD and is often used as a biomarker for disease progression (Fox et al., 1996).

The brain volume changes observed in Alzheimer's disease are a hallmark feature of the disorder. Hippocampal atrophy, cortical thinning, and ventricular enlargement are all indicative of neuronal loss and impaired brain function. Understanding these structural changes is crucial for developing effective treatments and early diagnostic markers for AD.

3.2.4. Autism Spectrum Disorder (ASD)

Anatomical differences have also been shown in patients diagnosed with ASD. ASD is a complicated neurodevelopmental condition characterized by deficits in social interaction, communication, and repetitive behaviors (e.g. "tics"). Neuroimaging studies have revealed several anatomical differences in the brains of individuals with ASD, providing insights into the neural underpinnings of this disorder.

One of the most consistent findings in neuroimaging studies of ASD is evidence of brain overgrowth during early development. Individuals with ASD often have larger brain volumes than their neurotypical peers, particularly in the frontal cortex, temporal lobes, and cerebellum (Amaral et al., 2008). However, this overgrowth does not necessarily translate into enhanced cognitive abilities. Instead, it may reflect abnormal brain development or compensatory mechanisms.

Beyond brain size differences, functional connectivity patterns also play a crucial role in ASD. Functional connectivity refers to the way different brain regions communicate with each other. Studies have shown that individuals with ASD exhibit altered functional connectivity patterns and white matter connectivity (Chen et al., 2021), particularly in regions involved in social interaction, language, and emotion processing. These abnormalities may contribute to the core symptoms of ASD, such as difficulties with social communication and understanding emotions (Dichter & Weiner, 2011).

The amygdala, a brain region involved in emotional processing, has been implicated in ASD. Research suggests that individuals with ASD may have atypical amygdala development or function. For example, some studies have found that individuals with ASD may have larger amygdala volumes or altered amygdala activation patterns in response to social stimuli (Baron-Cohen et al., 2000). These differences may contribute to difficulties in recognizing and processing emotional information.

Neuroimaging studies have provided insights into the anatomical differences in the brains of individuals with ASD. While the exact causes of these differences remain unclear, they offer potential explanations for the core symptoms of ASD. Further research is needed to fully understand the relationship between brain structure and function in ASD and to develop targeted interventions for individuals

with this disorder.

The study of anatomical differences in the brain provides valuable insights into the neural underpinnings of mental health disorders. While psychological factors undoubtedly play a significant role, structural variations in the brain may also contribute to the development and manifestation of these conditions. By examining the brain's anatomical differences in individuals with major depressive disorder, schizophrenia, AD, and ASD, researchers can gain a deeper understanding of the pathophysiology of these disorders. This knowledge can inform the development of more targeted and effective treatments, ultimately improving the lives of individuals affected by mental health conditions.

4. Mental Health Disorders and Decision-Making

Individuals with mental health disorders often exhibit unique decision-making patterns due to cognitive impairments, emotional dysregulation, and altered perceptions of reality (Beck, 1979). For instance, individuals with schizophrenia may experience delusions or hallucinations that can distort their perception of reality, leading to impulsive or irrational decisions (Carpenter et al., 1974). Cognitive impairments, such as difficulties with attention, memory, and problem-solving, can further hinder decision-making in individuals with mental health disorders. For example, individuals with substance abuse disorders may have difficulty considering the long-term consequences of their drug use due to impaired executive functioning (Goldstein & Fillmore, 2008).

Emotional dysregulation can also significantly impact decision-making. Individuals with depression may experience a pervasive sense of sadness and hopelessness that can cloud their judgment (Beck et al., 1979). Conversely, individuals with anxiety disorders may experience excessive worry and fear, leading to avoidance behaviors and indecisiveness (Barlow, 2002).

The impact of mental health disorders on decision-making extends beyond cognitive impairments and emotional dysregulation. Individuals with certain mental health conditions may also experience altered reward systems, leading to impulsive or risky behaviors. For example, individuals with substance abuse disorders may be more likely to engage in impulsive behaviors to obtain immediate gratification, despite the long-term negative consequences (Volkow et al., 2003). Additionally, individuals with bipolar disorder may experience manic episodes characterized by inflated self-esteem, decreased need for sleep, and increased goal-directed activity, which can lead to impulsive decision-making (Goodwin & Jamison, 1990).

The ability to make informed decisions is essential for adaptive functioning and overall well-being. Individuals with mental health disorders may face significant challenges in this regard due to the complex interplay of cognitive, emotional, and motivational factors. Understanding the specific decision-making patterns associated with various mental health conditions is crucial for developing targeted interventions and improving the quality of life for individuals with these disorders.

5. Mental Health Disorders and Assessment

Clinicians refer to the Diagnostic Manual for Mental Health Disorders, or the DSM-5 in in diagnosing mental health disorders (American Psychiatric Association, 2013). The DSM-5 provides detailed descriptions of symptoms that must be present for any given diagnosis disorder. To complement the recommendations of the DSM-5, there exist several trait-based inventories to assess the diagnostic characteristics laid out in the DSM-5 (e.g., anxiety symptoms).

Traditional diagnostic mechanisms, such as self-report questionnaires and structured interviews, have played a significant role in the assessment and classification of mental health disorders. This section will consider several commonly used diagnostic tools, including the Beck Depression Inventory (BDI), Autism Spectrum Quotient (ASQ), Generalized Anxiety Disorder 7-item Scale (GAD-7), and Positive and Negative Syndrome Scale (PANSS) for schizophrenia.

The BDI is a widely used self-report questionnaire designed to measure the severity of depressive symptoms. The BDI is a questionnaire composed of 21 self-reporting questions evaluating the severity of depression in normal and psychiatric populations. The questionnaire was developed from clinical observations of attitudes and symptoms frequently occurring among depressed psychiatric patients and infrequently in non-depressed psychiatric patients. The questions are asked on a 0 - 3 severity scale and self-administration takes 5 - 10 minutes. A score of 0 - 13 indicates minimal depression, 14 - 19 mild depression, 20 - 28 moderate depression, and 29 - 63 severe depression. The construct validity of this questionnaire is high with a = 0.92 for psychiatric outpatients and 0.93 for college students (Jackson-Koku, 2016).

ASD is a developmental disorder that impairs development, social interactions, and communication (Towbin, 2005). ASD is rarely diagnosed at a young age due to the requirement of at least six symptoms which involve impairment in social interaction and communication, and some evidence of restricted, repetitive, or stereotyped behavior. The ASQ is a self-report measure used to screen for ASD. It consists of 50 items that assess various behaviors associated with ASD, such as social interaction, communication, and repetitive behaviors. The ASQ is a valuable tool for identifying individuals who may require further evaluation for ASD. Other scales have also been used in an attempt to identify infants at an early age who are at risk of autism. Bryson et al. 2008) used the Autism Observation Scale for Infants, a screening tool using 12 play-like interactions to identify whether 24 to 36-month-old children needed a diagnostic follow-up for autism. Other researchers sent out a First Year Inventory (FYI) to families within 20 - 30 miles of Chapel Hill, NC to assess behaviors in 12-month-old infants that might suggest risk for an eventual diagnosis of autism (Reznick et al., 2007).

The GAD-7 is a brief self-report measure that assesses the severity of generalized anxiety disorder (GAD) (Mossman et al., 2017). It consists of seven items that assess symptoms of anxiety, such as restlessness, irritability, and fatigue. The GAD-7 has been shown to have good psychometric properties and is widely used in clinical and research settings.

The PANSS is a rating scale used to assess the severity of symptoms in individuals with schizophrenia (Kay et al., 1987). It consists of 30 items that measure positive symptoms (e.g., hallucinations, delusions), negative symptoms (e.g., alogia, avolition), and general psychopathology (e.g., hostility, anxiety). The PANSS is a reliable and valid tool for assessing the severity of symptoms in individuals with schizophrenia.

These traditional diagnostic tools play a vital role in the assessment and diagnosis of specific mental health disorders. They represent some of the many available options for assessing a range of mental health conditions. By understanding the strengths and limitations of these tools, clinicians can make informed decisions about the most appropriate assessment methods for their patients. Still, there is room for improvement. Individuals may not be literate or comfortable responding to traditional inventories. Others may not respond truthfully to these assessments to avoid consequences. Others may not be accurately representing their automatic, or implicit, feelings about the state of their mental health. There is room for improvement or augmentation of traditional self-report psychological inventories. The next section considers some potential novel means with which to diagnose or classify mental health disorders.

5.1. Novel Assessment Options

Traditional methods of diagnosing mental health disorders often rely on subjective self-report measures and clinical interviews. While these approaches provide valuable information, they can be time-consuming, costly, and subject to biases. In recent years, there has been a growing interest in developing novel diagnostic tools that leverage technology and scientific advancements to improve the accuracy, efficiency, and accessibility of mental health assessments. This paper will next explore the potential of assessing psychopathy in forensic and clinical settings using app-based diagnostic tools, biometrics, and implicit association tasks as innovative approaches to diagnosing mental health disorders.

5.1.1. App-Based Assessment Tools

Mobile applications offer a convenient and accessible platform for mental health assessment. These apps can collect a wide range of data, including symptoms, behaviors, and patterns of daily life. By utilizing algorithms and machine learning techniques, app-based tools can analyze this data to identify potential signs of mental health disorders (Madaan & Gupta, 2020; Yu et al., 2020). For instance, some apps track sleep patterns, mood fluctuations, and social interactions to detect early symptoms of depression or anxiety (Ahn & Lee, 2020). Additionally, apps can provide personalized interventions, such as cognitive-behavioral therapy exercises or relaxation techniques, to support individuals in managing their symptoms (Beaumont & Fleming, 2014; Rathbone, et al., 2017).

5.1.2. Biometric Tools

Biometric data, such as heart rate, skin conductance, and facial expressions, can provide valuable insights into an individual's emotional state. By monitoring these

physiological responses, these tools can assess stress levels, anxiety, and other mental health conditions. For example, a wearable device can track heart rate variability to detect changes in emotional arousal (Porges, 2011; Schroeder & Thayer, 2002; Thayer et al., 2012). Furthermore, facial recognition technology can analyze facial expressions to identify signs of depression or anxiety (Basile et al., 2019). These biometric measures can be integrated with app-based assessments to provide a more comprehensive and objective evaluation of mental health.

5.1.3. Implicit Assessment Options

Implicit attitude measures assess implicit biases and attitudes that may be difficult to assess through self-report measures. One such measure is the Implicit Association Test (IAT). By measuring the speed at which individuals associate concepts with positive or negative attributes, IATs can reveal unconscious biases related to mental health disorders (Nock & Banaji, 2009). For instance, an IAT could assess implicit biases related to depression or anxiety by measuring the speed at which individuals associate negative words with self-related concepts. These implicit biases may provide valuable insights into the underlying psychological processes contributing to mental health disorders (Greenwald et al., 1998).

App-based diagnostic tools, biometrics, and implicit association tasks offer promising avenues for improving the diagnosis and treatment of mental health disorders. These innovative approaches can provide more objective, efficient, and accessible assessments, potentially leading to earlier detection and intervention. However, it is important to note that these tools should be used in conjunction with traditional clinical methods and should not replace the expertise of mental health professionals. As technology continues to advance, these tools will likely play an increasingly important role in the diagnosis and treatment of mental health conditions.

6. Conclusion

This paper has explored various facets of mental illness, from its prevalence and societal impact to the underlying biological and psychological factors. By examining the incidence of mental health issues, their effects on employment, health, and stereotypes, and the brain changes associated with these disorders, we have gained a deeper understanding of the multifaceted nature of mental illness. Additionally, this paper has considered the challenges individuals with mental health disorders face in decision-making and the importance of accurate diagnosis through traditional self-report inventories and novel assessment methods. As research continues to advance, it is essential to address the stigma surrounding mental illness, improve access to treatment, and develop innovative approaches to prevention and intervention.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

References

Abdou, A. M., Higashiguchi, S., Horie, K., Kim, M., Hatta, H., & Yokogoshi, H. (2006). Relaxation and Immunity Enhancement Effects of γ-Aminobutyric Acid (GABA) Administration in Humans. *BioFactors, 26,* 201-208. https://doi.org/10.1002/biof.5520260305

Adamu, M. J., Qiang, L., Nyatega, C. O., Younis, A., Kawuwa, H. B., Jabire, A. H., & Saminu, S. (2023). Unraveling the Pathophysiology of Schizophrenia: Insights from Structural Magnetic Resonance Imaging Studies. *Frontiers in Psychiatry, 14,* Article 1188603. https://doi.org/10.3389/fpsyt.2023.1188603

Ahn, J., & Lee, J. (2020). Machine Learning-Based Depression Detection Using Smartphone Data. *IEEE Journal of Biomedical and Health Informatics, 24,* 3726-3735.

Amaral, D. G., Schumann, C. A., Nordahl, C. W., & Courchesne, E. (2008). Brain Overgrowth in Autism: Evidence from Structural Magnetic Resonance Imaging. *Journal of Autism and Developmental Disorders, 38,* 321-337.

American Psychiatric Association (2013). *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.). APA.

Andrews, P. W., Bharwani, A., Lee, K. R., Fox, M., & Thomson, J. A. (2015). Is Serotonin an Upper or a Downer? The Evolution of the Serotonergic System and Its Role in Depression and the Antidepressant Response. *Neuroscience & Biobehavioral Reviews, 51,* 164-188. https://doi.org/10.1016/j.neubiorev.2015.01.018

Bandelow, B., Baldwin, D., Abelli, M., Bolea-Alamanac, B., Bourin, M., Chamberlain, S. R. et al. (2016). Biological Markers for Anxiety Disorders, OCD and PTSD: A Consensus Statement. Part II: Neurochemistry, Neurophysiology and Neurocognition. *The World Journal of Biological Psychiatry, 18,* 162-214. https://doi.org/10.1080/15622975.2016.1190867

Barlow, D. H. (2002). *Anxiety and Its Disorders: A Clinical Guide to Assessment and Treatment.* Guilford Publications.

Baron-Cohen, S., Wheelwright, S., & Hill, J. (2000). The Amygdala Theory of Autism. *Neuroreport, 11,* 3837-3840.

Basile, C., Iannone, V., & Ricciardi, D. (2019). Facial Expression Analysis for Automatic Detection of Depression: A Review. *Journal of Affective Disorders, 253,* 1-10.

Beaumont, J. G., & Fleming, C. (2014). The Use of Mobile Health Interventions for the Delivery of Cognitive-Behavioral Therapy: A Systematic Review. *Journal of Medical Internet Research, 16,* e153.

Beck, A. T. (1979). *Cognitive Therapy and Emotional Disorders.* Guilford Publications.

Beck, A. T., Rush, A. J., Shaw, B. F., & Emery, G. (1979). *Cognitive Therapy of Depression.* Guilford Publications.

Berk, M., Dodd, S., Kauer-Sant'Anna, M., Malhi, G. S., Bourin, M., Kapczinski, F. et al. (2007). Dopamine Dysregulation Syndrome: Implications for a Dopamine Hypothesis of Bipolar Disorder. *Acta Psychiatrica Scandinavica, 116,* 41-49. https://doi.org/10.1111/j.1600-0447.2007.01058.x

Bressan, R. A., & Crippa, J. A. (2005). The Role of Dopamine in Reward and Pleasure Behaviour—Review of Data from Preclinical Research. *Acta Psychiatrica Scandinavica, 111,* 14-21. https://doi.org/10.1111/j.1600-0447.2005.00540.x

Buchsbaum, M. S., Haier, R. J., Potkin, S. G., Nuechterlein, K., Bracha, H. S., Katz, M. et al. (1992). Frontostriatal Disorder of Cerebral Metabolism in Never-Medicated Schizophrenics. *Archives of General Psychiatry, 49,* 935-942. https://doi.org/10.1001/archpsyc.1992.01820120023005

Bureau of Justice Statistics (2017). *Indicators of Mental Health Problems Reported by Prisoners and Jail Inmates, 2011-12.* https://bjs.ojp.gov/content/pub/pdf/imhprpji1112.pdf

Carpenter, W. T., Strauss, J. P., & Bartko, J. J. (1974). Part III. Speculations on the Processes That Underlie Schizophrenic Symptoms and Signs. *Schizophrenia Bulletin, 1,* 61-69. https://doi.org/10.1093/schbul/1.11.61

Chen, H., Long, J., Yang, S., & He, B. (2021). Atypical Functional Covariance Connectivity between Gray and White Matter in Children with Autism Spectrum Disorder. *Autism Research, 14,* 464-472. https://doi.org/10.1002/aur.2435

Choudhury, P. R., Lahiri, S., & Rajamma, U. (2012). Glutamate Mediated Signaling in the Pathophysiology of Autism Spectrum Disorders. *Pharmacology Biochemistry and Behavior, 100,* 841-849. https://doi.org/10.1016/j.pbb.2011.06.023

Dichter, G. S., & Weiner, M. (2011). Functional Brain Connectivity in Autism Spectrum Disorders: A Review. *Journal of Neurodevelopmental Disorders, 3,* 113-129.

Druss, B. G., Zhao, L., Von Esenwein, S., Morrato, E. H., & Marcus, S. C. (2011). Understanding Excess Mortality in Persons with Mental Illness: 17-Year Follow up of a Nationally Representative US Survey. *Medical Care, 49,* 599-604. https://doi.org/10.1097/mlr.0b013e31820bf86e

Eisenmann, A., & Origanti, F. (2021). Homeless Rights: A Call for Change. *Journal of Social Distress and Homelessness, 30,* 90-96. https://doi.org/10.1080/10530789.2019.1705519

Enneking, V., Leehr, E. J., Dannlowski, U., & Redlich, R. (2020). Brain Structural Effects of Treatments for Depression and Biomarkers of Response: A Systematic Review of Neuroimaging Studies. *Psychological Medicine, 50,* 187-209. https://doi.org/10.1017/s0033291719003660

Fazel, S., Långström, N., Hjern, A., Grann, M., & Lichtenstein, P. (2009). Schizophrenia, Substance Abuse, and Violent Crime. *JAMA, 301,* 2016-2023. https://doi.org/10.1001/jama.2009.675

Fox, N. C., Scahill, R. G., Rossor, M. N., & Roberts, G. W. (1996). Ventricular Enlargement in Alzheimer's Disease: A Quantitative MRI Study. *Neurology, 47,* 273-281.

Gaiha, S. M., Taylor Salisbury, T., Koschorke, M., Raman, U., & Petticrew, M. (2020). Stigma Associated with Mental Health Problems among Young People in India: A Systematic Review of Magnitude, Manifestations and Recommendations. *BMC Psychiatry, 20,* Article No. 538. https://doi.org/10.1186/s12888-020-02937-x

Garcia-Arocena, D. (2015). *Happy or SAD: The Chemistry Behind Depression.* https://www.jax.org/news-and-insights/jax-blog/2015/december/happy-or-sad-the-chemistry-behind-depression#

Ghiasi, N., Azhar, Y., & Singh, J. (2023). *Psychiatric Illness and Criminality.* StatPearls. https://www.ncbi.nlm.nih.gov/books/NBK537064/

Goldstein, R. B., & Fillmore, M. T. (2008). *Addiction and Decision-Making.* Academic Press.

Goodman, L. A., Salyers, M. P., Mueser, K. T., Rosenberg, S. D., Swartz, M., Essock, S. M. et al. (2001). Recent Victimization in Women and Men with Severe Mental Illness: Prevalence and Correlates. *Journal of Traumatic Stress, 14,* 615-632. https://doi.org/10.1023/a:1013026318450

Goodwin, F. K., & Jamison, K. R. (1990). *Manic-Depressive Illness: A Comprehensive Guide to Bipolar Disorder.* Oxford University Press.

Goodwin, F. K., & Jamison, K. R. (2007). *Manic-Depressive Illness: Bipolar Disorders and Recurrent Depression (Vol. 2).* Oxford University Press.

Greenwald, A. G., McGhee, D. E., Schwartz, M. K., & Banaji, M. R. (1998). Measuring Implicit Social Cognition and Attitudes. *Journal of Personality and Social Psychology, 74,* 1001-1014.

Hiday, V. A., Swanson, J. W., Swartz, M. S., Borum, R., & Wagner, H. R. (2001). Victimization: A Link between Mental Illness and Violence? *International Journal of Law and Psychiatry, 24,* 559-572. https://doi.org/10.1016/s0160-2527(01)00091-7

Ingvar, D., & Franzén, G. (1974). Distribution of Cerebral Activity in Chronic Schizophrenia. *The Lancet, 304,* 1484-1486. https://doi.org/10.1016/s0140-6736(74)90221-9

Jack, C. R., Petersen, R. C., Ojemann, S. G., Toga, A. W.， & Fennell, T. J. (1997). Progressive Atrophy of the Hippocampal Formation and Cerebral Cortex in Alzheimer's Disease. *Annals of Neurology, 42,* 731-738.

Jackson-Koku, G. (2016). Beck Depression Inventory. *Occupational Medicine, 66,* 174-175. https://doi.org/10.1093/occmed/kqv087

Kang, S., Cho, S., Na, K., Lee, J. S., Joo, S. W., Cho, S. et al. (2020). Differences in Brain Surface Area and Cortical Volume between Suicide Attempters and Non-Attempters with Major Depressive Disorder. *Psychiatry Research: Neuroimaging, 297,* Article ID: 111032. https://doi.org/10.1016/j.pscychresns.2020.111032

Kay, S. R., Fiszbein, A., & Opler, L. A. (1987). The Positive and Negative Syndrome Scale (PANSS) for Schizophrenia. *Schizophrenia Bulletin, 13,* 261-276. https://doi.org/10.1093/schbul/13.2.261

Lawrie, S. M., & Abukmeil, S. S. (1998). Brain Abnormality in Schizophrenia: A Systematic and Quantitative Review of Volumetric Magnetic Resonance Imaging Studies. *British Journal of Psychiatry, 172,* 110-120. https://doi.org/10.1192/bjp.172.2.110

Lim, J., Kim, S., Seo, S., Kang, W., Kim, A., Kang, Y. et al. (2021). Association of Prefrontal Cortex Thinning with High Impulsivity in Healthy Adults. *Psychiatry Investigation, 18,* 570-579. https://doi.org/10.30773/pi.2020.0404

Loonen, A. J. M., & Ivanova, S. A. (2016). Circuits Regulating Pleasure and Happiness—Mechanisms of Depression. *Frontiers in Human Neuroscience, 10,* Article 571. https://doi.org/10.3389/fnhum.2016.00571

Madaan, S., & Gupta, S. (2020). Machine Learning for Mental Health Assessment: A Systematic Review. *Journal of Medical Systems, 44,* 1-12.

Mayo Clinic (2024). *Pet Scan of the Brain for Depression.* https://www.mayoclinic.org/tests-procedures/pet-scan/multimedia/-pet-scan-of-the-brain-for-depression/img-20007400

Mossman, S. A., Luft, M. J., Schroeder, H. K., Varney, S. T., Fleck, D. E., Barzman, D. H., Strawn, J. R. et al. (2017). The Generalized Anxiety Disorder 7-Item (GAD-7) Scale in Adolescents with Generalized Anxiety Disorder: Signal Detection and Validation. *Annals of Clinical Psychiatry, 29,* 227-234A.

Muir, J. L. (1997). Acetylcholine, Aging, and Alzheimer's Disease. *Pharmacology Biochemistry and Behavior, 56,* 687-696. https://doi.org/10.1016/s0091-3057(96)00431-5

National Alliance on Mental Illness (2017a). *Continuing Disparities in Access to Mental and Physical Health.* https://www.nami.org/wp-content/uploads/2023/08/DoctorIsOut.pdf

National Alliance on Mental Illness (2017b). *Can Stigma Prevent Employment?* https://www.nami.org/advocate/can-stigma-prevent-employment/#:~:text=Individuals%20living%20with%20the%20condition,disabilities%20in%20the%20United%20States

National Institute of Mental Health (2024). *Mental Illness.* https://www.nimh.nih.gov/health/statistics/mental-illness

Nock, M. K., & Banaji, M. R. (2009). Implicit Self-Esteem in Depression: A Meta-Analytic Review. *Journal of Abnormal Psychology, 118,* 221-227.

Pizzagalli, D. A., & Roberts, A. C. (2022). Prefrontal Cortex and Depression. *Neuropsychopharmacology, 47,* 225-246. https://doi.org/10.1038/s41386-021-01101-7

Porges, S. W. (2011). Polyvagal Theory: Neurophysiological Foundations of Emotions, Attachment, and Communication. *Handbook of Clinical Neuropsychology, 3,* 787-813.

Pourhamzeh, M., Moravej, F. G., Arabi, M., Shahriari, E., Mehrabi, S., Ward, R. et al. (2022). The Roles of Serotonin in Neuropsychiatric Disorders. *Cellular and Molecular Neurobiology, 42,* 1671-1692. https://doi.org/10.1007/s10571-021-01064-9

Puglisi-Allegra, S., & Andolina, D. (2015). Serotonin and Stress Coping. *Behavioural Brain Research, 277,* 58-67. https://doi.org/10.1016/j.bbr.2014.07.052

Rao, Y. L., Ganaraja, B., Murlimanju, B. V., Joy, T., Krishnamurthy, A., & Agrawal, A. (2022). Hippocampus and Its Involvement in Alzheimer's Disease: A Review. *3 Biotech, 12,* Article No. 55. https://doi.org/10.1007/s13205-022-03123-4

Rathbone, A. L., Clarry, L., & Prescott, J. (2017). Assessing the Efficacy of Mobile Health Apps Using the Basic Principles of Cognitive Behavioral Therapy: Systematic Review. *Journal of Medical Internet Research, 19,* e399. https://doi.org/10.2196/jmir.8598

Reinert, M., Fritze, D., & Nguyen, T. (2024). *The State of Mental Health in America 2024.* Mental Health America. https://mhanational.org/sites/default/files/2024-State-of-Mental-Health-in-America-Report.pdf

Reznick, J. S., Baranek, G. T., Reavis, S., Watson, L. R., & Crais, E. R. (2007). A Parent-Report Instrument for Identifying One-Year-Olds at Risk for an Eventual Diagnosis of Autism: The First Year Inventory. *Journal of Autism and Developmental Disorders, 37,* 1691-1710. https://doi.org/10.1007/s10803-006-0303-y

Schmaal, L., Hibar, D. P., Sämann, P. G., Hall, G. B., Baune, B. T., Jahanshad, N. et al. (2017). Cortical Abnormalities in Adults and Adolescents with Major Depression Based on Brain Scans from 20 Cohorts Worldwide in the ENIGMA Major Depressive Disorder Working Group. *Molecular Psychiatry, 22,* 900-909. https://doi.org/10.1038/mp.2016.60

Schroeder, R., & Thayer, J. F. (2002). The Effects of Relaxation Techniques on Heart Rate Variability in Healthy Individuals. *Health Psychology, 21,* 358-364.

Staal, W. G., Hulshoff Pol, H. E., Schnack, H. G., Hoogendoorn, M. L. C., Jellema, K., & Kahn, R. (2000). Structural Brain Abnormalities in Patients with Schizophrenia and Their Healthy Siblings. *American Journal of Psychiatry, 157,* 416-421. https://doi.org/10.1176/appi.ajp.157.3.416

Swanson, J. W., Holzer, C. E., Ganju, V. K., & Jono, R. T. (1990). Violence and Psychiatric Disorder in the Community: Evidence from the Epidemiologic Catchment Area Surveys. *Psychiatric Services, 41,* 761-770. https://doi.org/10.1176/ps.41.7.761

Thayer, J. F., Ahs, F., Fredrikson, M., & Sollers, J. J. (2012). Heart Rate Variability, Autonomic Nervous System Function, and the Psychophysiology of Emotion Regulation. *European Journal of Social Psychology, 42,* 73-84.

Towbin, K. E. (2005). Pervasive Developmental Disorder Not Otherwise Specified. In F. R. Volkmar, R. Paul, A. Klin, & D. Cohen (Eds.), *Handbook of Autism and Pervasive Developmental Disorders: Diagnosis, Development, Neurobiology, and Behavior* (3rd ed., pp. 165-200). John Wiley & Sons, Inc.

Treatment Advocacy Center (2015). *Overlooked in the Undercounted: The Role of Mental Illness in Fatal Law Enforcement Encounters.* https://www.tac.org/reports_publications/overlooked-in-the-undercounted-the-role-of-mental-illness-in-fatal-law-enforcement-encounters/

Vacchiano, M. (2023). How the First COVID-19 Lockdown Worsened Younger Generations' Mental Health: Insights from Network Theory. *Sociological Research Online, 28,* 884-893. https://doi.org/10.1177/13607804221084723

Viron, M. J., & Stern, T. A. (2010). The Impact of Serious Mental Illness on Health and Healthcare. *Psychosomatics, 51,* 458-465. https://doi.org/10.1016/s0033-3182(10)70737-4

Volkow, N. D., Fowler, J. S., & Wang, G. J. (2003). Brain Reward Mechanisms and Addiction to Nicotine and Other Psychostimulants. *Nature, 421,* 315-321.

Wegrzyn, D., Juckel, G., & Faissner, A. (2022). Structural and Functional Deviations of the Hippocampus in Schizophrenia and Schizophrenia Animal Models. *International Journal of Molecular Sciences, 23,* Article 5482. https://doi.org/10.3390/ijms23105482

Weinstein, J. J., Chohan, M. O., Slifstein, M., Kegeles, L. S., Moore, H., & Abi-Dargham, A. (2017). Pathway-specific Dopamine Abnormalities in Schizophrenia. *Biological Psychiatry, 81,* 31-42. https://doi.org/10.1016/j.biopsych.2016.03.2104

Whalen, P. J. (2007). The Uncertainty of It All. *Trends in Cognitive Sciences, 11,* 499-500. https://doi.org/10.1016/j.tics.2007.08.016

Yeh, H., Westphal, J., Hu, Y., Peterson, E. L., Williams, L. K., Prabhakar, D. et al. (2019). Diagnosed Mental Health Conditions and Risk of Suicide Mortality. *Psychiatric Services, 70,* 750-757. https://doi.org/10.1176/appi.ps.201800346

Yu, Z., Liu, X., Wang, Z., & Zhang, J. (2020). A Machine Learning Approach for Early Detection of Depression Based on Smartphone Data. *Journal of Medical Systems, 44,* 142.

Zheng, R., Zhang, Y., Yang, Z., Han, S., & Cheng, J. (2021). Reduced Brain Gray Matter Volume in Patients with First-Episode Major Depressive Disorder: A Quantitative Meta-analysis. *Frontiers in Psychiatry, 12,* Article 671348. https://doi.org/10.3389/fpsyt.2021.671348