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Artificial intelligence and mental disorders: chicken-or-the egg issue

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Abstract: Mental illnesses are common worldwide and have negative impact on many aspects of human life. Mental disorders are caused by a variety of genetic and environmental factors. Recently it has been shown that the psychological problems, including mental disorders, are closely related to the pervasive use of information and communication technologies including artificial intelligence (AI) in modern society. Although the successful integration of AI into human life dramatically improved the quality of life, leading to decreased stress in some aspects of human life, there is great potential, numerous risks and challenges regarding AI application in human life. While revolution in AI generally increases productivity, it may diminish some of today's valuable employment opportunities, which in turn, may cause distress and psychological problems in the society. On the one hand, due to negative outcomes of AI integration into human life, AI has been reported to cause distress and mental disorders in many societies, on the other hand, increased rate of psychological problems including mental disorders forced health professionals to increase the use of AI in the mental health care to help psychologists and psychiatrists to control and treat mental disorders, making this paradoxical issue as a chicken-or-the egg issue. This mini-review aims to present the association of AI with mental disorders in the trend of human life.

Keywords: Mental disorder, Artificial intelligence, Chicken-or-the egg issue

1 Mental disorder

1. 1. Mental disorder

A mental disorder (illness) is characterized by a clinically significant disturbance in an individual's cognition, emotional regulation, or behavior, which causes significant distress or

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impairment of personal functioning. Such features may be persistent, relapsing and remitting, or occur as single episodes. There are many different categories of mental disorder including anxiety, mood (depression), psychotic (schizophrenia, and delusional), personality (paranoid, schizoid and schizotypal), eating (anorexia nervosa, bulimia nervosa, exercise bulimia), sleeping (insomnia, narcolepsy, …), sexuality related, impulse control, dissociative, and developmental (autism spectrum, …) disorders (Blackmore et al., 2020; Martínez-Martínez et al., 2020; Zumstein and Riese, 2020).

1. 2. Mental disorders epidemiology

Roughly half of all lifetime mental disorders in most studies start by the mid-teens and three quarters by the mid-20s (Kessler et al., 2007). Impulse-control disorders and a few anxiety disorders tend to appear in childhood. Some other anxiety disorders, substance disorders, and mood disorders emerge later in the mid-teens (Paus et al., 2008). In 2019, 1 in every 8 people, or 970 million people around the world were living with a mental disorder, 301 million people were living with an anxiety disorder including 58 million children and adolescents, 280 million people were living with depression, including 23 million children and adolescents, 40 million people experienced bipolar disorder, 14 million people experienced eating disorders including almost 3 million children and adolescents, and 40 million people, including children and adolescents, were living with conduct-dissocial disorder. In addition, schizophrenia affects approximately 24 million people or 1 in 300 people worldwide (Institute of Health Metrics and Evaluation, 2022).

1. 3. Mental disorders complications

Mental disorders are associated with serious signs and symptoms including dramatic sleep and appetite changes or decline in personal care, rapid or dramatic shifts in emotions or depressed feelings, greater irritability, social withdrawal and loss of interest in activities previously enjoyed, unusual drop in functioning, at school, work or social activities, such as quitting sports, failing in school or difficulty performing familiar tasks, problems with concentration, memory or logical thought and speech that are hard to explain, heightened sensitivity to sights, sounds, smells or touch; avoidance of over-stimulating situations, loss of initiative or desire to participate in any activity, a vague feeling of being disconnected from oneself or one's surroundings; a sense of unreality, unusual or exaggerated beliefs about personal powers to understand meanings or influence events; illogical or "magical" thinking typical of childhood in an adult, and changes in school or work, which may result in other clinical impairments in human body (Reading Turchioe et al., 2021; Spoorthy et al., 2020; Angehrn et al., 2020; Werlen et al., 2020). Mental disorders have been reported to remain among the top ten leading causes of burden worldwide, with no evidence of global reduction in the burden since 1990 (GBD 2019 Mental Disorders Collaborators, 2022). It has been estimated that 418 million disability-adjusted life years could be attributable to mental disorders in 2019. The economic value associated with this burden is estimated at about USD 5 trillion (Arias et al., 2022). Mortality rate can be increased in patients suffering from mental disorders. Excess mortality has been reported in people with psychotic disorders and bipolar disorder (Ali et al., 2022).

1. 4. Mental disorders risk factors

Mental disorders, in general, are thought to be caused by a variety of genetic and environmental factors including having blood relatives with mental illness, exposure to environmental stressors, inflammatory conditions, toxins, alcohol or drugs. Neurotransmitters in brain also play important role in mental illness development. The risk factors for mental health issues are widely known and include sexual and physical abuse during childhood; family, school and community violence: poverty, social exclusion and educational disadvantage (Daghagh Yazd et al., 2019; Giacco et al., 2018; Goodell et al., 2011). Recently it has been shown that the psychological problems are closely related to the pervasive use of information and communication technologies including artificial intelligence in modern society, which affects both professional and private life and can lead to a reduction in job and life satisfaction and in productivity, and is often associated to the occurrence of psychological disorders (La Torre et al., 2019).

2 Artificial intelligence

2. 1. Artificial intelligence

Computer and information communication technologies have over the years continued to evolve, leading to the development of artificial intelligence (AI). AI is intelligence—perceiving, synthesizing, and inferring information—demonstrated by machines. It is the theory and development of computer systems able to perform tasks that normally require human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages (Chen et al., 2020). AI in its broadest sense indicates the ability of a machine or artifact to perform the same kind of functions that characterize human thought. The term AI has also been applied to computer systems and programs capable of performing tasks more complex than straightforward programming, although still far from the realm of actual thought (Mellit and Kalogirou, 2008). AI is indeed a general term that implies the use of a computer to model intelligent behavior with minimal human intervention and is generally accepted as having started with the invention of robots. Today, AI is considered a branch of engineering that implements novel concepts and novel solutions to resolve complex challenges. With continued progress in electronic speed, capacity, and software programming, computers might someday be as intelligent as humans. One cannot neglect the important contribution of contemporary cybernetics to the development of AI (Mellit and Kalogirou, 2008).

2. 2. Impact of artificial intelligence on human life

In recent years, AI applications were at the heart of the most commercially successful areas of computing, and have become a ubiquitous feature of human daily life. AI is used in search engines, targeting online advertisements, recommendation systems, driving internet traffic, targeted advertising, virtual assistants, autonomous vehicles, automatic language translation, facial recognition, image labeling and spam filtering. AI applications are growing significantly and influencing all aspects of human life. Today, AI is widely used in an enormous fields of human life including medicine (Malik et al., 2019), industry (Peres et al., 2020), business

(Loureiro et al., 2021), education (Knox, 2020), health care (Davenport and Kalakota, 2019), marketing (Vlačić et al., 2021), agriculture (Eli-Chukwu, 2019), accounting (Luo et al., 2018), manufacturing (Chien et al., 2020), finance (Tadapaneni, 2019), and games (Fan et al., 2020).

Although many positive impacts of AI have reported on human life, the negative effects of AI on human life also has been argued. It is argued that AI improves the quality of everyday life by doing routine and even complicated tasks better than humans can, making life simpler, safer, and more efficient, which can improve many aspects of human concerns about the life and reduce psychological problems, but at the same time, it poses dangerous privacy risks, exacerbates racism by standardizing people, and costs workers their jobs, leading to greater unemployment, which is followed by emergence of psychological disorders in human (Khanzode and Sarode, 2020; Chowdhury and Sadek, 2012).

Many positive impacts of AI on humans have been reported on human life. AI can provide various ways of treatment for physicians to consider. Therapeutic robots and the socially assistive robot technology help improve the quality of life for seniors and physically challenged. AI application in daily life reduces errors related to human fatigue. AI-based surgical procedures can complete the work with less damage to the body. Indeed, we can overcome many risky limitations of humans by developing an AI Robot which in turn can do the risky things for us. Using AI alongside other technologies we can make machines take decisions faster than a human and carry out actions quicker. AI is also powering many inventions in almost every domain which will help humans solve the majority of complex problems. AI also helps health care professionals to use computer based software in controlling and treatment of diseases such as mental disorders (Sotala, 2012; Bhbosale et al., 2020).

Despite positive effects of AI in human daily life, it has been shown that it may bring disadvantages to human life. Machines cannot develop a bond with humans which is an essential attribute when comes to Team Management. Machines can perform only those tasks which they are designed or programmed to do, anything out of that they tend to crash or give irrelevant outputs which could be a major backdrop. As AI is replacing the majority of the repetitive tasks and other works with robots, human interference is becoming less which will cause a major problem in the employment standards (Khanzode and Sarode, 2020; Chowdhury and Sadek, 2012). Application of AI in human daily life can reduce face to face human connections, which in turn, leads to human loneliness and developing of psychological disorders.

3 Artificial intelligence and mental disorders

3. 1. Positive impact of artificial intelligence on mental disorders

With the advent of digital approaches to mental health, modern artificial intelligence (AI), and machine learning in particular, is being used in the development of prediction, detection and treatment solutions for mental health care. In terms of treatment, AI is being incorporated into digital interventions, particularly web and smartphone apps, to enhance user experience and optimise personalised mental health care. In terms of prediction and detection, modern streams of abundant data mean that data-driven AI methods can be employed to develop

prediction/detection models for mental health conditions (D'Alfonso, 2020). AI has been successfully exploited in diagnosing many mental disorders. A positive link has been found between using AI and mental disorders prevention. The health care professionals successfully have taken the advantages of AI in controlling and prevention of psychological disorders including mental disorders. In recent years, AI-based applications have rapidly been developed for psychiatric research and diagnosis (Esteva et al., 2019). The studies revealed high accuracies and provided excellent examples of AI's potential in mental healthcare (Graham et al., 2019). It has been shown that AI technologies and techniques have useful purposes in just about every domain of behavioral and mental health care including clinical decision-making, treatments, assessment, self-care, healthcare management, research and more (Luxton, 2016). Applying AI techniques to MRI data has the potential to provide an objective and evidence-based approach for identification and management of some psychological disorders (Kalmady et al., 2019). With the help of advanced AI techniques and machine learning algorithms, a personalized care that focuses on providing emotional support catered to a specific individual has been facilitated (Mody and Mody, 2019). Due to the general enthusiasm of young people for new technologies, with more than 97% of youth connecting to the Internet daily, internet-based interventions may be especially effective for, and attractive to, patients with different mental health disorders (D'alfonso et al., 2017). AI has been reported to have a potential in predicting and recommending the type of therapy for patients with personality disorders (Sulistiani et al., 2021). In addition, AI approaches have been developed to support mental health professionals, primarily psychiatrists and clinicians, with decision-making based on patients' historical data (e.g., clinical history, behavioural data, social media use, etc.) (Zhang et al., 2021). Computer Aided Diagnosis systems assist radiologists and doctors in the early diagnosis of mental disorders such as Alzheimer's, bipolar disorder, depression, autism, dementia, and schizophrenia using neuroimaging. Advancements in AI have leveraged neuroimaging research to unfold numerous techniques for analyzing and interpreting thousands of scans in order to detect and classify various mental illnesses (Tyagi et al., 2022). Growing demand for mental health services, coupled with funding and resource limitations, creates an opportunity for novel technological solutions including AI (Dawoodbhoy et al., 2021). Overall, the application of AI to mental health has demonstrated a range of benefits across the areas of diagnosis, treatment and support, research, and clinical administration (Shatte et al., 2019).

3. 2. Negative impact of artificial intelligence on mental disorders

Despite many advantages of AI, some scientists believe that AI represents a danger to the human life and health of hundreds of millions of working people and their families leading to psychological problems including mental disorders. While revolution in AI generally increases productivity, it may diminish some of today's valuable employment opportunities, which in turn may cause distress and psychological problems in the society. Despite being a major source of innovation, AI also threatens human service jobs. Many psychologists are thinking of AI as an origin of a wide variety of worries in human life. They think that AI will not only cheapen the cost of producing goods and services, it will cheapen our way of life threatening human mental health and causing an increased rate of mental disorders. Computer users have shown varying degrees of stress that may lead to mental disorders in long period of time (Bauer and

Lizotte, 2021; Hudiburg and Necessary, 1996). These results suggest that increased computer use may leadsto increased computer-related stress (Hudiburg, 1989). There have been a variety of research approaches that have examined the stress issues related to AI application in human life (Smith et al., 1999). Higher levels of stress have been observed in people who use computer games (Andreetta et al., 2020). Ethical issues have been risen regarding AI application in behavioral and mental health care (Luxton et al., 2016).

3. 3. Artificial intelligence and mental disorders: chicken-or-the egg issue

Although the successful integration of AI into human life dramatically improved the quality of life, leading to decreased stress in some aspects of human life, there is great potential, numerous risks and challenges regarding AI application in human life. Rapid technological change and development has led to an era of complex AI technology and applications. In addition to the positive effects of AI, such as increased production and indirectly lowered costs in factories and production lines, reduced potential of errors and increased efficiency, replacement of human labor in dangerous situations, etc.; but along with progress in technology come negative outcomes such as increased unemployment rate, human laziness, decreased face to face jobs, etc., which may lead to psychological problems (Lovejoy, 2019; Čerka et al., 2015). On the one hand, due to negative outcomes of AI integration into human life, AI has been reported to cause distress and mental disorders in societies, on the other hand, increased rate of psychological problems including mental disorders forced health professionals to increase the use of AI in the mental health care to help psychologists and psychiatrists to control and treat mental disorders! This is a chicken-or-the egg issue making a paradox. It is a pivotal issue and the human decision to plan how to apply AI in human life will be a critical decision, shaping our future life and mental health.

4 Conclusion

Although the use of AI in many areas of human life has many advantages, it represents a danger to the human life and health. Despite being a major source of innovation, AI is an origin of a wide variety of worries in human life. AI has been reported in the literature that may cause mental disorders occurrence due to changing the natural human life style, but at the same time, many studies suggest the positive impact of AI in mental disorder controlling and prevention, making the link between AI and mental disorders a paradoxical link and a chicken-or-the egg issue. Further research and scrutiny are required to investigate the association of AI with mental disorders.

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Conflict of interests

The author has no conflict of interests to declare.

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