

ROLE OF AI DEPENDENCY IN PSYCHOLOGICAL DISTRESS AND ACADEMIC PERFORMANCE AMONG UNIVERSITY STUDENTS

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ABSTRACT

The rapid integration of Artificial Intelligence (AI) into daily life has raised concerns about its potential psychological impacts, particularly among students. This study investigates the relationship between AI dependency and psychological distress, as well as its effects on academic adjustment among university students. The purpose of the study is to partial out the role of AI dependency in predicting psychological distress and academic adjustment of the participants and to investigate the relationship between artificial dependency and psychological distress among university students. There were 300 people in the sample, ranging in age from 18 to 37. Random sampling was used to choose the sample. Academic performance, anxiety, stress, and depression are the four main elements that are the subject of this study's investigation into the determinants of AI dependency. To find out how these factors affect university students' dependency on AI, a stepwise multiple regression analysis was used. The findings show that dependence on AI is significantly positively predicted by academic performance, with better academic achievement being associated with more reliance on AI. Significant positive predictors for stress, anxiety, and depression were also found, indicating that people who have greater levels of these psychological variables are more inclined to rely on AI technology. In particular, the greatest percentage of the variance in AI dependency was explained by academic performance, which was followed by stress, anxiety, and depression. This study adds to the expanding literature of research on AI's effects on mental health and sheds light on the psychological variables influencing young adults' and adolescents' AI usage habits.

Keywords: AI Dependency, Psychological distress, Academic performance.

INTRODUCTION

Artificial intelligence (AI) is a breakthrough technology that is rapidly emerging and changing every area of our lives (Ali et al., 2024). It has completely changed the way we engage with technology and could lead to important developments in a number of areas (Zhang et al., 2024). Artificial intelligence can be defined using the concept of intelligent systems as proposed by AI. The following list, in the authors' perspective, encapsulates the definitions of most of these

systems: (1) cognitively human-like technologies; (2) human-like technologies behaving in human-like ways; (3) reason-capable technologies; and (4) reason-capable technologies acting rationally.

There's no denying that artificial intelligence (AI) will become more and more integrated into people's daily lives and that this could have an effect on people's mental health. Artificial intelligence has had a significant impact on many areas of human effort, including the medical field,

the transportation industry, and the communication sector. However, there are a number of potential negative effects and threats to one's mental health associated with the use of AI. It is possible to reduce or completely eliminate these dangers. The notion that artificial intelligence can exacerbate emotions of loneliness, anxiety, and hopelessness in people is one of the main areas of concern regarding the effects that technology will have on mental health and welfare. The topic of treating mental illness is one area where the use of AI is spreading more quickly. Artificial intelligence (AI)-powered chatbots are becoming more and more common in the mental health field as a means of offering patients psychological support and counseling. These chatbots could help close the access gap to mental health care, which is particularly important in areas where mental health professionals are currently in short supply. However, it's probable that these chatbots won't be able to offer the same level of empathy and psychological support as a real-world therapist. This could potentially result in mistrust, which could then have a negative impact on one's individual's mental health. The use of social media is another area where artificial intelligence may have an impact on mental health. Content, including feeds on social media sites, can be curated and personalized with the use of AI algorithms. While this can offer users a more customized experience, it also has the potential to create echo chambers and filter bubbles, which can both contribute to emotions of pessimism, anxiety, and loneliness. Furthermore, social media users' emotions can be manipulated by AI algorithms, which has the potential to seriously damage people's psychological well-being (Gocen & Aydemir, 2020).

Over-reliance on AI technology has been linked to detrimental impacts on humans, including a decline in critical thinking and problem-solving skills, despite the absence of prior research in this area. There is a pressing need to address these challenges. As far as we are aware, no prior research has thoroughly examined the issue of AI dependency. Given the importance and urgency of this issue, empirical research is required to determine the traits of susceptible populations and the psychological variables influencing their behaviour (Krakauer, 2016).

Teenagers are adopting AI at an increasing rate. 49.3% of 12- to 17-year-olds use voice assistants

included in digital media (such as the Amazon Echo). Fifty-five percent of teenagers use voice assistants for searches more than once a day. AI, in contrast to more antiquated technology (TV, social media, cellphones, computers), not only makes interpersonal communication easier but also has the potential to serve as a social actor or agent and speak with teenagers directly. This will have a significant effect on the development of adolescents.

Adolescents are susceptible to digital technologies and emotional issues because they are going through a unique time of change in their brain structure and function and are still recuperating from the effects of COVID-19 (such as lockdown anxiety and a lack of mental health facilities). In contrast to the use of traditional technologies, generative AI technology is rapidly being employed in multiple settings for learning, entertainment, and tailored suggestions in the natural AI environment that surrounds adolescents. This is evident in the use of generative AI in comparison to traditional technologies. Students worry that generative AI, which creates phony content or videos, could influence their motivation, creativity, and critical thinking, perhaps leading to widespread cheating. For instance, they could utilize AI to finish assignments.

Therefore, it's critical to investigate how young people perceive the adult definition of "destructive" AI. While teenage technology dependence on traditional ICT (such as the internet, cell phones, computers, and social media) is a serious public health concern, it is unknown whether teenage AI dependence develops and how it connects to mental health issues. Additionally, AI is a tool that may help teenagers who are experiencing emotional or mental health issues; nevertheless, it is unknown how mental health issues affect the development of AI reliance (for example, through the mediating function of motivation to use AI) (Thakkar et al., 2024).

According to research, people who use AI frequently become reliant or addicted (e.g., emotionally dependent on chatbots, attached to social chatbots, dependent on conversational AI). AI dependence is defined as the excessive use of AI technologies that results in dependence and an addictive trend, which may have negative consequences (e.g., interpersonal problems and mental health distress) based on the framework of

technology dependence (e.g., problematic smartphone use, problematic internet use).

Dependency on technology is linked to a host of detrimental effects, such as disturbed relationships in real life, poor task performance, sleep issues, mental health issues, and physical pain. The detrimental effects of AI dependency, such as the risk to interpersonal relationships and mental health, have also been covered in recent studies. One of the most crucial considerations is whether, like technology reliance, AI dependence raises concerns about mental health. Technology determinism theory suggests that when a new technology appears, the public and society may experience technology panic, leading them to invest significant resources and materials in investigating the problem (Orben et al., 2022).

Technology panic is the worry that, when new technologies emerge, such as artificial intelligence (AI), teenagers will be encouraged to get hooked on them, like radio addiction did in the past. In the context of artificial intelligence, a common example is how teenage AI use can lead to reliance or addiction, endangering their mental health. The frequency of AI dependency in the general population is unknown, and empirical research on the connection between AI dependence and mental health suffering is lacking. Addressing AI technology fear and offering recommendations for future research on AI reliance will benefit from examining the prevalence of AI dependence and elucidating the connection between the two.

As the I-PACE model indicates, one of the key elements leading to technology dependency is motivation, which may also operate as a moderator in the interaction between mental health issues and technology dependence. Additionally, empirical research has demonstrated that the association between mental health issues and technology reliance is mediated by the urge to use technology. It's unclear, though, if the desire to use AI moderates the influence of mental health issues on AI reliance (Graham et al., 2019).

Concerns over an individual's right to privacy and the safety of their data have been raised in light of the growing reliance on technology driven by AI. According to Meyer et al.'s research from 2020, Algorithms frequently gather and evaluate massive volumes of personal data. This might cause an individual to experience increased anxiety and a lack of control over their information. Concerns such as informed consent, transparency, and the

possibility of bias in algorithmic decision-making are at the heart of the ethical application of artificial intelligence in the field of mental health. According to research by Montag et al. (2020) and Ungar et al. (2017), humans' mental well-being and faith in AI systems can be negatively impacted as a result of these issues. Platforms for social media and recommendation systems that are powered by artificial intelligence contribute to adverse psychological effects. According to research by Faelens et al. (2018) and Keles et al. (2020), these systems may encourage addictive behaviors, lead to an increase in social comparison, and have a negative influence on both self-esteem and body image. The quality of interactions mediated by artificial intelligence, such as chatbots or virtual companions, can have an effect on the outcomes regarding mental health. (Lucas et al., 2020; Zhou et al., 2019) Interactions with artificial intelligence that are inadequately planned or poorly conceived might lead to frustration, discontent, and possibly even harmful psychological impacts.

investigate the mediating role of AI dependency between psychological distress and academic adjustment among university students and also to find out the relationship between AI dependency and psychological distress. As, some people, especially teenagers who may be especially susceptible to new technologies, may experience technology anxiety in response to the introduction of new technologies like artificial intelligence (AI), as using AI can result in AI dependence, which poses a risk to mental health.

The literature also highlights the role of AI in mental health care. A study titled "Research on Artificial Intelligence Learning Systems Based on Psychological Knowledge to Adjust Anxiety and Depression" explores AI's potential in monitoring and treating mental health issues. The paper suggests that integrating psychological theories into AI systems can enhance mental health management by providing tailored guidance and support for individuals suffering from anxiety and depression.

Behavioral addictions, such as pathological gambling and internet addiction disorder, have also been affected by dependence in the AI era due to shared neurobiological and behavioral processes (Fu et al., 2010; Weinstein and Lejoyeux, 2010; Van Rooij et al., 2011; Sairitupa-Sanchez et al., 2023). When it comes to artificial intelligence

(AI), reliance can be defined as the tendency or requirement to excessively rely on automated systems for tasks, validation, or decision-making. Artificial intelligence (AI) and other advanced technologies have the ability to streamline operations and increase productivity, but they can also create anxiety in those who don't keep up with them or fear falling behind. Writing, research, and programming have all seen tremendous changes thanks to artificial intelligence (AI)-based technologies like ChatGPT, which have also greatly aided these industries (Paul et al., 2023). But there are worries about possible drawbacks, like losing one's ability to think critically and being overly reliant on these technologies (Kasneji et al., 2023).

The ability of the human brain to reason will naturally be limited when AI is used more and more. As a result, humans' ability to reason is gradually diminished. As a result humans lose their ability to reason and become more artificial. Furthermore, our constant engagement with technology has forced us to think blindly like algorithms (Sarwat, 2018). The reliance of people in practically every aspect of life on AI technology is another problem. It has unquestionably raised living conditions and made life easier, but it has also had a terrible effect on humankind, making people sluggish and impatient (Krakauer, 2016). Humans are producing vast amounts of data, and businesses are adopting AI and leveraging it to make the data more productive while preventing human use. When humans use AI to make judgments, they believe they are saving time and obtaining benefits. However, it is surpassing the biological processing abilities of humans by lowering cognition (Liu et al., 2023).

This suggests that AI technology has similarities to older technologies (eg, both can be treated as technologies for coping with emotional problems and unique features not present in traditional technologies (eg, AI is more competent and warm during interactions and gives human-like feedback). We propose that the similarities between them suggest that mental health problems may impact AI dependence, while the uniqueness of AI suggests that AI dependence has a "particular" impact on mental health problems. Self-medication theory suggests that when faced with depression or anxiety, individuals use drugs to self-medicate and eventually become addicted to them. Similarly, children and adolescents with

technology dependence use smartphones to "medicate" their stress and emotional problems. Compensatory internet theory suggests that people go online to escape from real-life problems or alleviate dysphoric moods. Eventually developing addictive use of the internet or technology. Due to the similarities between AI technologies and traditional technologies, AI can also be used to address emotional problems, which increases the risk of developing AI dependence. Attachment theory was first developed to explain the relationship between parents and children and suggests that because children are immature and ill-equipped to deal with threats, they develop behaviors to remain close to their caregivers (parents) to receive their protection, warmth, and care to help them survive. When faced with emotional problems, attachment mechanisms are activated, and adolescents may find attachment and belonging in other social agents (eg. AI as a social actor) (Huang et al., 2024).

AI Dependency can significantly affect the Mental Health of Students

AI dependency can significantly affect the mental health of students in various ways. Here's a detailed overview.

1. **Increased Anxiety and Stress:** As students rely more on AI tools for studying and completing assignments, they may experience heightened anxiety about their performance. The pressure to keep up with technology and the fear of falling behind can lead to stress and burnout.
2. **Isolation:** Heavy reliance on AI for learning can reduce face-to-face interactions with peers and teachers. This isolation can lead to feelings of loneliness and disconnection, which are detrimental to mental health.
3. **Reduced Critical Thinking Skills:** When students depend on AI for answers and solutions, they may not engage in critical thinking or problem-solving. This can hinder their cognitive development and lead to a lack of confidence in their abilities.
4. **Perfectionism:** AI tools often provide instant feedback, which can create a culture of perfectionism.

Students may feel pressured to achieve high standards set by AI, leading to self-doubt and anxiety if they don't meet those expectations.

5. **Impact on Self-Esteem:** Students may compare their performance with AI-generated benchmarks, which can negatively impact their self-esteem. If they perceive themselves as less capable than the AI, it can lead to feelings of inadequacy.

6. **Data Privacy Concerns:** The use of AI in education often involves the collection of personal data. Concerns about privacy and how this data is used can create additional stress for students, affecting their mental well-being.

7. **Dependency on Technology:** Over time, students may become overly reliant on AI, which can limit their ability to learn independently. This dependency can create anxiety when they face situations where AI is not available.

Transformative Role of AI in Education

The transformative impact of AI on education is further elaborated in literature discussing two perspectives: enhancing education and education in AI. The first perspective emphasizes AI's role in personalizing learning, leading to more effective outcomes as students engage with material tailored to their unique learning styles. The second perspective focuses on the necessity of educating future generations about AI technologies, underscoring the growing demand for a workforce skilled in AI (Zawacki-Richter et al., 2019).

AI in Decision-Making

The role of AI in decision-making in educational institutions is spreading daily. Universities are using AI in both academic and administrative activities. From students searching for program admission requirements to the issuance of degrees, they are now assisted by AI personalization, tutoring, and quick responses. 24/7 access to learning, answering questions, and task automation are the leading roles AI plays in the education sector. In all the above roles, AI collects data, analyzes it, and then responds. Le., makes decisions (Dwivedi et al., 2021).

AI among students is definitely rising, and it's causing a lot of anxiety for many. Here are some points to consider:

1. **Pressure to Perform:** With AI tools readily available, students might feel pressured to use them for everything, leading to anxiety about their own abilities. They might worry that if they don't use AI, they won't perform well.

2. **Fear of Failure:** Relying on AI can create a fear of failure. If students depend on technology to complete tasks, they might panic if something goes wrong or if they don't understand how to solve a problem without it.

3. **Comparison with Peers:** Students may compare their work with others who use AI differently, which can lead to feelings of inadequacy and anxiety. About not measuring up.

4. **Social Isolation:** As students turn to AI for help, they may spend less time collaborating or talking with classmates. This isolation can increase feelings of loneliness and anxiety.

5. **Overstimulation:** The constant availability of AI can lead to overstimulation. Students might feel the need to be "on" all the time, leading to burnout and increased anxiety levels.

Method

Participants & procedure

This study employs a quantitative research design utilizing a cross-sectional survey method to examine the relationship between psychological distress (anxiety, stress, depression) and academic performance with AI dependency among university students. Because it enables the collecting of data at a particular moment in time to determine correlations between the variables being studied, a cross-sectional approach is suitable. With a target sample size of 300 students, the study comprises a sample of university students from a range of academic fields. Participants received email invites or an online survey to complete. It should take 15 to 20 minutes to finish the survey. To guarantee a varied sample of students from different academic years and specialties, the data was gathered over the course of four weeks.

Measures

DASS-21 Scale

A popular self-report tool for evaluating the emotional states of stress, anxiety, and depression is the Depression, Anxiety, and Stress Scale

(DASS-21). It has three subscales, each with seven items, and a total of twenty-one items. Each item assesses the intensity of emotional states during the previous week and is scored on a 4-point Likert scale (0 = Did not apply to me at all, 3 = Applied to me very much or most of the time). In psychological research, the DASS-21 is frequently used to evaluate how people perceive certain emotional states.

Academic Performance Scale (APS)

The 8-item APS is evaluated using a 5-point Likert scale. With an internal consistency of .89 and a test-retest reliability of .85 over a two-week period, it showed high psychometric qualities. Ratings range from 1 (strongly disagree) to 5 (strongly agree) for each item on the scale. The APS is especially helpful for researchers who are interested in student accomplishment since it offers a robust and dependable instrument for assessing academic performance.

AI Dependency Scale

Five items on the AI Dependency Scale are scored on a 5-point Likert scale, with Strongly Agree (5) and Strongly Disagree (1) being the extremes. Emotional dependence, fear of falling behind in tasks, need for AI system validation, and worries about AI replacing human talents are some of the features of AI dependency that are measured by the scale. A higher score denotes a higher degree of AI dependence. The scale's validity and reliability for evaluating AI reliance are guaranteed by its good psychometric features, which include item-total correlations of 0.80.

Data Analysis:

The data was analyzed using the Statistical Package for the Social Sciences (SPSS) 27 version. Frequencies and Descriptive statistics were tabulated for socio-demographic characteristics of the respondents and liner regression analysis of the study variables.

Results

Table 1

Demographic characteristics of participants (N=250).

	frequency	percent
Male	137	47%
Female	164	54.7
Total	300	100.0

Note f= frequency, % = percentage

Table 2.

Mean and standard deviation of the participants for demographic characteristics.

Participants Characteristics	N=300			
	M	SD	Mini	Max
Age	1.93	.976	1	5

Note: M= mean, SD= Standard deviation, N= number of participants, Mini= minimum, Max=maximum

Stepwise Multiple Regression Analysis

Stepwise regression is the step-by-step iterative construction of a regression model that involves

the selection of independent variables to be used in a final model. It involves adding or removing potential explanatory variables in succession and testing for statistical significance after each iteration.

Table 4.1

Stepwise multiple regression analysis results related to the predication of AI dependency

Model	UC	SC					
B	Std.Error	Beta	t	R	R ²	F	df
				.	.		

AP	1.33	.057	.805	23.4**	805	648	549.2	298
					.217	.047	14.7	298
AN	.257	.067	.217	3.84**	2.08	.043	13.5	298
ST	.238	.065	.208	3.67**	.205	.42	13.0	298
DP	.259	.072	.205	3.61**				

** $p < .01$, * $p < .05$, UC= (unstandardized coefficients), SC= (Standardized coefficients). AP= (academic performance), AN = (Anxiety), ST= (Stress), DP= (Depression)

Academic performance was found to be strong positive predictor of AI dependency. In Step 1, academic performance demonstrated a strong standardized coefficient ($\beta = .805$, $p < .01$), accounting for a significant proportion of variance in AI dependency ($R^2 = .648$, $F = 549.2$, $df = 298$). This result supports the hypothesis that higher academic performance is associated with higher AI dependency.

Anxiety was also a strong positive predictor of AI dependency. In Step 2, anxiety showed a standardized coefficient ($\beta = .217$, $p < .01$), contributing to an additional proportion of variance explained in AI dependency ($R^2 = .047$, $F = 14.7$, $df = 298$). This finding indicates that higher levels of anxiety are linked to higher AI dependency.

Stress emerged as a significant positive predictor of AI dependency in Step 3. Stress demonstrated a standardized coefficient ($\beta = 2.08$, $p < .01$), explaining additional variance in AI dependency ($R^2 = .043$, $F = 13.5$, $df = 298$). These results suggest that individuals experiencing higher stress levels are more likely to depend on AI.

Finally, depression was found to strongly predict AI dependency. In Step 4, depression showed a standardized coefficient ($\beta = .205$, $p < .01$), further contributing to the explained variance in AI dependency ($R^2 = .42$, $F = 13.0$, $df = 298$). This finding supports the hypothesis that higher depression levels are associated with higher AI dependency.

Discussion

This study aimed to investigate the factors that contribute to AI dependency, focusing on academic performance, anxiety, stress, and depression. The results show that academic performance accounted for the biggest percentage of variance, but the other four predictors—stress,

anxiety, depression, and academic performance—were all substantial positive contributors to AI dependency. This implies that students who perform better academically and who have higher levels of stress, anxiety, and depression also have a tendency to rely more on AI technologies. It is remarkable that academic success and AI reliance have a strong positive association. The most significant predictor of AI dependency was found to be higher academic performance, which accounted for a significant amount of the variance. This result is consistent with earlier studies that show how AI is increasingly being used to improve student results and learning experiences. Artificial intelligence (AI) solutions, such as automated grading systems and personalized learning platforms, are made to help students with their assignments and boost their academic achievement (Zheng et al., 2023).

But this dependence on AI could also lead to over-reliance, where students start depending more and more on AI to do their schoolwork, which would reduce their capacity for critical thought and cognitive engagement. It is important to understand that although AI can provide useful assistance, an excessive dependence on it might impair pupils' capacity for autonomous information processing, critical thinking, and problem-solving. Teachers should think about methods that promote a balanced approach to AI use as it continues to be incorporated into educational systems to prevent students from becoming unhealthily dependent on these tools.

Although it explained a smaller percentage of the variance than academic performance, anxiety was found to be another major predictor of AI dependency. Given the positive correlation between anxiety and AI dependency, pupils who are more anxious might use AI as a coping strategy. Artificial intelligence (AI) tools, like chatbots and virtual assistants, can offer immediate assistance and lessen the uncertainty involved with personal or academic assignments, which may be especially alluring to people who are more anxious. This

highlights the importance of addressing mental health issues, especially anxiety, within educational and technological contexts. Teachers and mental health professionals should encourage students to seek appropriate support and develop strategies for managing anxiety in a way that does not lead to an over-reliance on technology. Constantly having access to AI-powered support may give anxious people a sense of security and control, but this can lead to a dependency where AI becomes a tool for emotional regulation. Additionally, stress was found to be a strong positive predictor of AI dependency. Stress is a typical reaction to demands in the classroom, difficulties managing one time, and other life circumstances. Artificial intelligence (AI) technologies, especially those that give individualized help, might seem like a way to alleviate the stress brought on by academic obligations. By lowering cognitive load and time pressure, artificial intelligence (AI) systems that automate repetitive work, give personalized learning routes, or provide real-time feedback can reduce stress. However, the use of AI as a stress-relieving tool may encourage dependency, comparable to the association between anxiety and AI dependency, which would cause students to rely more on AI instead of learning more adaptive, healthy coping mechanisms. Since stress is still a major problem for students, it is crucial to make sure AI tools are applied in ways that support resilience and well-being without making the propensity to rely on technology as the main stress-reduction strategy worse.

Lastly, it was discovered that depression was a significant predictor of AI dependency. People who are depressed, which is frequently characterized by emotions of worthlessness, hopelessness, and emotional numbness, may turn to AI for emotional support or companionship. Chatbots and virtual assistants driven by AI can provide instantaneous, albeit constrained, emotional exchanges, which could be appealing to those who are depressed. However, this emotional dependency on AI can prevent individuals from seeking more meaningful social interactions or professional help. It is vital to note that while AI can serve as a supporting tool for persons with mental health concerns, it cannot replace the emotional depth and therapeutic advantages that come from human interaction and expert care. With an emphasis on offering additional support

rather than replacing human relationships, the function of AI in mental health treatment should be carefully examined.

Limitations and Future Directions

There are several limitations even if this study offers insightful information on the factors that predict AI reliance. The study's cross-sectional design, which records data at a single moment in time, restricts the capacity to infer causal relationships. A longitudinal approach should be used in future studies to investigate the long-term impacts of AI dependence on academic achievement and mental health. Furthermore, the study's sample was restricted to students; future investigations may examine AI reliance in other demographics, such as older persons or professionals. Additionally, even though this study found that academic achievement, stress, anxiety, and depression were predictors of AI dependency, other factors like personality characteristics or social influence could also play a role.

Conclusion

This study concludes by highlighting the intricate connection between mental health and AI dependency. AI dependency was significantly predicted by academic performance, anxiety, stress, and depression, with academic performance accounting for the greatest percentage of the variation. Given the continued importance of AI in our lives, it is critical to keep an eye on how it affects mental health and to create policies that encourage constructive, balanced use of technology.

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