



Exploring the Impact of AI Technology Addiction on Stress, Anxiety, and Depression in Adolescents

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Abstract. The rapid development of Artificial Intelligence (AI) has made it a part of the teens' routine, but the intensity of its use raises concerns about mental health. This study aims to analyze the pattern of AI utilization and its impact on stress, anxiety, and depression in students of St. Petrus Medan High School using the framework of Self-Determination Theory (SDT), namely competence, autonomy, and connectedness). The research was conducted with a quantitative approach through a survey of 64 students using a total sampling technique, equipped with focused group discussions (FGDs) and literature review. The results show that more than 70% of students use AI on a regular basis, mainly through chatbots (81%) and social media (73%). Some students (35.9%) also use AI as a means of venting. Although 85.9% of respondents found AI to be helpful, the majority (59.3%) reported feeling inferior as a result of comparing themselves to AI results. These findings reveal a psychological paradox, where AI is perceived as a solution as well as a source of pressure. This condition has the potential to trigger stress and anxiety, although depressive symptoms do not yet appear to be dominant. This research emphasizes the importance of healthy digital literacy as well as mentoring from schools and parents to reduce the risk of AI addiction and maintain adolescent mental well-being.

Keywords: Adolescents; AI Addiction; Artificial Intelligence (AI); Mental Health; Self-Determination Theory

1. INTRODUCTION

The development of Artificial Intelligence (AI) in the past decade has brought great transformations in various sectors of life, including education. This technology is no longer just a futuristic concept, but a reality that is integrated into daily activities. Since the emergence of generative AI platforms like ChatGPT in 2022, its use has increased rapidly and is widely adopted by the younger generation. For students, AI is an inevitable tool because it is able to offer efficiency in the learning process and provide unlimited access to academic information.

Behind these benefits, the increasingly intensive use of AI raises concerns about potential dependency (AI addiction) and its impact on mental health. Recent studies also highlight that excessive digital or AI use is strongly associated with stress, anxiety, and

depression among adolescents (Aziz et al., 2024; Kabadayı, 2024). Adolescents are a very vulnerable group because they are in a crucial phase of psychological development, where the formation of self-identity and emotional well-being is a priority. Excessive interaction with advanced technologies such as AI during this formative period has the potential to have a significant influence, both positive and negative, on their psychological state. This makes the study of the relationship between the use of AI and adolescent mental health even more relevant. The urgency of this research is also strengthened by empirical data. Nationally, it is reported that around 17.95 million adolescents in Indonesia experience mental health disorders,

with anxiety and depression as the most dominant symptoms. This phenomenon is exacerbated by the excessive use of digital technology. Ulfah (2024), for example, shows that 60% of college students feel that their social interaction has decreased due to their dependence on AI. This fact shows that there is a link that needs to be further researched between the use of AI and the appearance of symptoms of psychological distress.

To dissect this phenomenon, this study uses the framework of Self-Determination Theory (SDT). This theory emphasizes that the psychological well-being of individuals is influenced by the fulfillment of three basic needs, namely competence, connectedness, and autonomy. In the context of AI use, these needs can be threatened, for example when reliance on instant answers decreases autonomy in thinking or when overuse reduces social interaction, weakening a sense of connectedness. This research was conducted at SMA St. Petrus Medan with primary data sources in the form of questionnaires distributed to 64 students as research participants.

A number of previous studies have touched on related issues. Adelson (2023) found a correlation between the duration of social media use and depressive symptoms in adolescents, but has not isolated the variables of interaction with AI chatbots. Ulfah (2024) found that reliance on AI negatively impacts students' analytical and creative abilities, although it did not examine its implications on mental health. Fadhillah and Lestari (2024) explore the use of AI by psychology students and find the risk of self-diagnosing behavior that can trigger anxiety. Meanwhile, Sembiring (2024) through a literature review identified that the overuse of digital technology correlates with mental health disorders such as depression, anxiety, and sleep disorders, but did not focus specifically on generative AI.

Although they provide important insights, these studies still leave gaps. First, most studies focus on the student population or the younger generation in general, not high school teens. Second, previous research has looked more at cognitive and behavioral aspects, rather than directly on psychological symptoms such as stress, anxiety, and depression. Third, there has been no research that explicitly uses the SDT framework to analyze the impact of adolescents' interactions with AI. This gap is the basis of the novelty of this research.

Based on this, this research is focused on two main aspects. First, analyzing the pattern of AI utilization by students of St. Petrus Medan High School in personal and emotional activities. Second, explore whether there are significant psychological impacts in the form of stress, anxiety, and depression from these interactions.

In line with this focus, the purpose of this study is to analyze the pattern of AI use and explore its psychological impact on the fulfillment of basic needs according to the SDT framework in students of St. Petrus High School Medan. This research is expected to make a

theoretical contribution by expanding the literature on human interaction with AI in the context of adolescent psychological well-being, as well as a practical contribution in the form of recommendations for schools, counselors, and parents to build healthy digital literacy and support students' mental well-being.

2. METHOD

This study uses a quantitative approach with a survey method to explore the level of use and potential addiction of Artificial Intelligence (AI) in adolescents and its relationship with psychological symptoms in the form of stress, anxiety, and depression. A quantitative approach is commonly defined as a systematic investigation using numerical data to identify patterns and relationships, often applied in adolescent mental health and technology research (Creswell & Creswell, 2020). The research was carried out at SMA St. Petrus Medan involving 64 students as respondents, who were selected using purposive sampling techniques because a total of 64 students were selected from SMA St. Petrus Medan through purposive sampling techniques. The consideration of selecting this technique is based on time and resource limitations, so the respondents selected are those who are considered the most representative to provide data according to the needs of the research.

The main instrument of the research is a structured questionnaire compiled by the researcher and has gone through a validation process by a psychologist. This questionnaire contains questions about the patterns of use of AI, including the frequency, intensity, and purpose of its use, as well as items related to psychological symptoms felt by students, especially stress, anxiety, and depression. In addition to questionnaires, the data was also enriched through focused group discussions (FGDs) with a number of students to gain a collective perspective on the phenomenon of AI addiction, as well as a literature review from relevant journals that discuss digital technology, internet addiction, and adolescent mental health.

The research procedure is carried out through several stages, starting from preparation in the form of questionnaire preparation, then the implementation of a survey by distributing questionnaires to students at school, and continuing with data processing. Data analysis was carried out in a quantitative descriptive manner to describe the distribution of AI usage patterns and the tendency of psychological symptoms in respondents. Furthermore, respondents' open-ended answers and the results of group discussions were analyzed thematically to find patterns of meaning that emerged from students' experiences in interacting with AI.

The findings obtained were then interpreted using the framework of Self-Determination Theory (SDT), which emphasized the importance of fulfilling three basic psychological needs, namely competence, connectedness, and autonomy. With this framework, the study seeks to explain how intensive interaction with AI can affect the fulfillment of these psychological needs, as well as how it impacts adolescents' mental well-being.

3. RESEARCH RESULTS

From a total of 64 respondents from St. Petrus High School students in Medan, the quantitative and qualitative data collected provided a comprehensive picture of the patterns of Artificial Intelligence (AI) utilization, personal interactions, and psychological impacts felt. The following is the data that has been successfully collected.

Patterns and Frequency of AI Use

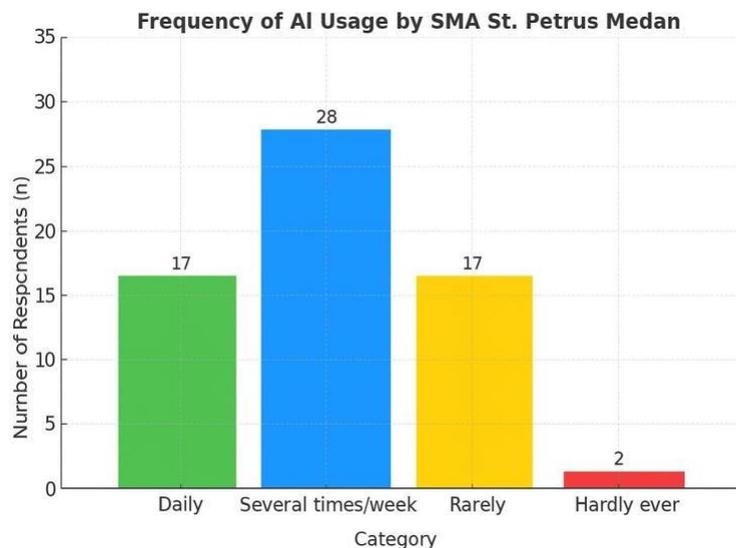


Diagram 1. Frequency of use of AI by students of St. Peter's High School Medan.

The diagram shows that more than 70% of students use AI regularly in a week, with the largest proportion being used multiple times a week (28 students), followed by daily use (17 students). In total, 45 of the 64 students (about 70.3%) use AI at least a few times a week. In contrast, few students are classified as rare (17 students) or almost never use AI (2 students). These findings confirm that AI has been integrated into students' daily routines.

In addition to frequency, AI usage patterns also vary in terms of platforms. Student interaction occurs most in AI Chatbots (81%) and social media with AI integration (73%), while the use of AI specifically for academic assignments (34.9%) is third. This fact indicates that the use of AI by adolescents is not solely limited to academic activities, but also includes the need for entertainment and digital social interaction.

Utilizing AI for Personal Interaction and Emotional Support

In addition to academic purposes, this study also explores the use of AI for more personalized interactions. Although students' main interactions with AI were dominated by academic topics (84.4%), the data showed a pattern of using AI as a means of emotional support. Overall, 35.9% of students admitted to having used AI as a friend to tell stories or confide. To understand the motivations behind this behavior, respondents who used AI to vent were asked to explain why. Here is the distribution of reasons given:

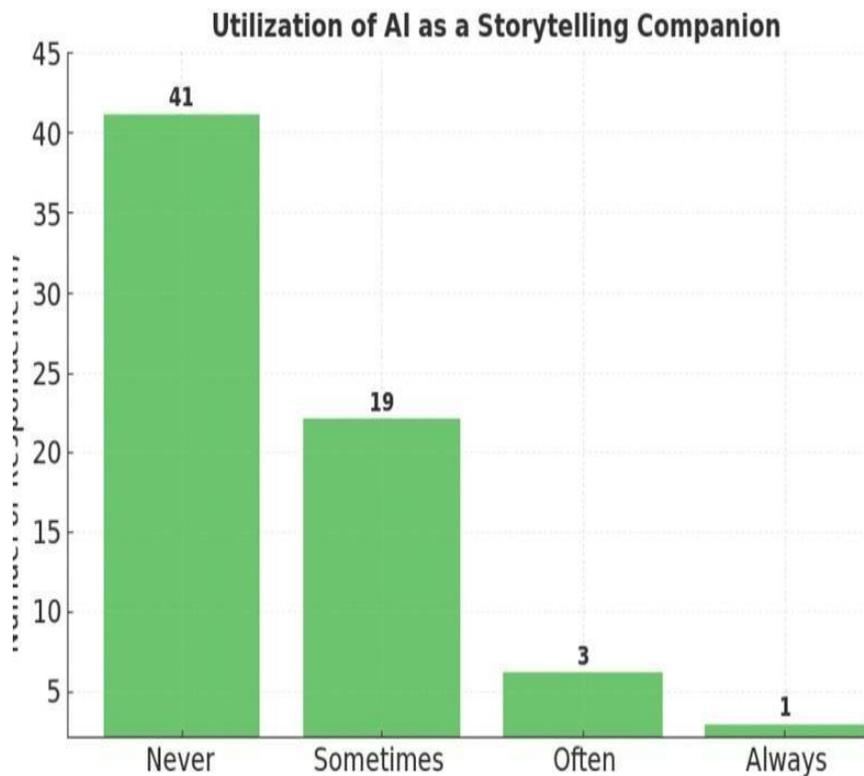


Diagram 2. The Utilization of AI as a Storytelling Companion.

The diagram above explains some of the driving factors. The main reason students use AI to vent is "just wanting to try AI technology" (73.2%), which shows a high level of curiosity about AI capabilities outside of their academic functions.

In addition, functional and emotional factors also play an important role. A total of 42.9% of students stated that AI is "always available at any time", indicating the need for instant and timeless support. Furthermore, 17.9% feel "more comfortable telling stories without being judged", highlighting that AI is considered a safe space for some students to express themselves without fear of stigma or social judgment.

These findings indicate that AI is not only serving as a productivity tool, but also starting to fill a niche as a source of emotional support that is easily accessible and considered safe by some students.

Psychological Impact on Mental Well-Being

This section outlines the psychological impact that students feel as a result of interaction with AI. The findings show a complex and dualistic influence, where AI is perceived as a very useful tool as well as a source of psychological pressure, especially related to social comparison and self-competence. Similar patterns were also reported by a 2024 latent profile and network analysis, which found that smartphone addiction among adolescents was strongly associated with depression, stress, disrupted sleep, and feelings of loneliness (Kabadayı, 2024). To map this impact, here is a comparison between the perception of AI's usability and the feeling of inferiority it causes:

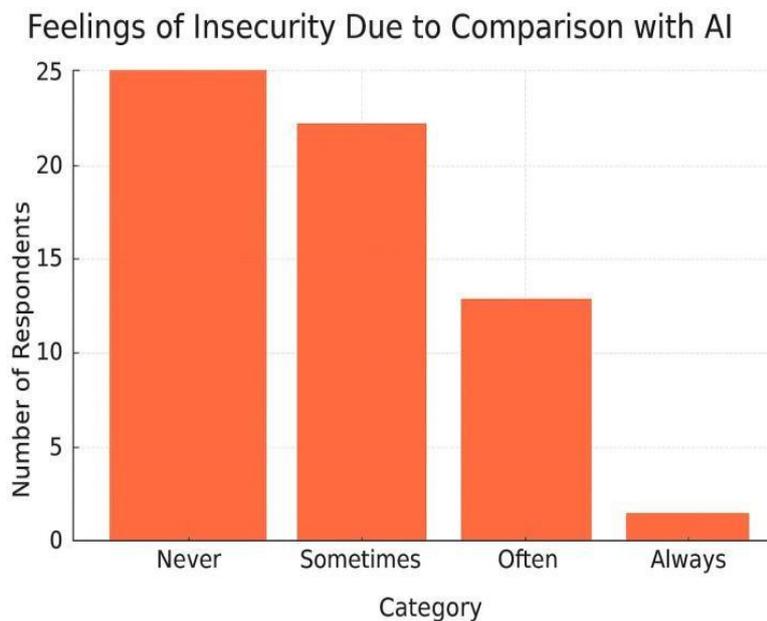


Diagram 3. Feelings of Lack of Confidence due to Comparison with AI.

The diagram highlights one of the most prominent findings, namely the pressure on student competence. The majority of respondents, 59.3% to be precise, reported feeling less confident or comparing themselves to the results of AI's work. These feelings are experienced periodically, with details of 35.9% feeling them sometimes, 20.3% often, and 3.1% often. This indicates that interaction with AI can trigger feelings of inferiority among adolescents.

In contrast to these negative impacts, the diagram also shows that AI is perceived to be very beneficial. A total of 86% of students feel AI can help solve their problems, with details 34.4% finding it very helpful and 51.6% quite helpful. This perception of high usability has the potential to be a reinforcing factor for the repeated use of AI.

These findings clearly point to a psychological paradox: a tool that is considered very useful by almost all students (86%) also turns out to be a source of stress and inferiority for the majority of them (59.3%).

Perception of the Benefits of AI in Providing Solutions

After exploring usage patterns and their psychological impacts, this section will detail how students view the benefits of AI directly in providing solutions, both for academic and personal problems. This perception is important to understand why students continue to use this technology despite the negative impact that it has felt. In general, the majority of students have a positive perception of AI's ability as a problem solver. Here is the distribution of students' answers regarding the benefits of AI.

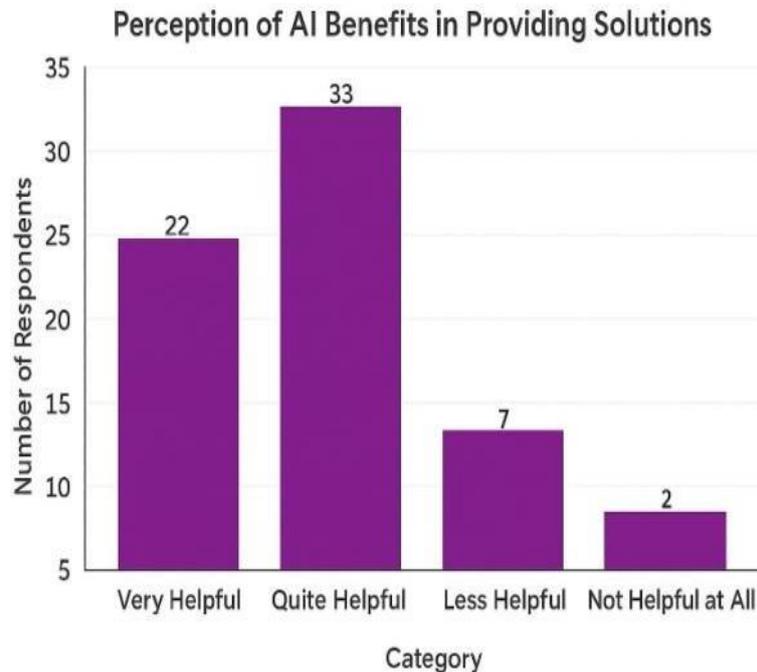


Diagram 4. Perception of the Benefits of AI in Providing Solutions.

The diagram above shows that the majority of students find AI useful. As many as 55 out of 64 respondents (85.9%) stated that AI is very helpful (22 students) or quite helpful (33 students) in providing solutions. These findings confirm the high perception of AI's usefulness among students, which is the main reason for its use in daily routines. Only a small percentage of students felt that AI was less helpful (7 students) or not at all (2 students). From the qualitative answers, two main categories were found. The first category is positive emotional responses, in which students feel "relieved," "happy," and "comfortable" because they feel listened to without being judged. This indicates that for some students, the "solution" provided by AI is emotional relief. The second category is neutral responses, where students express feelings of "normalcy" or affirm that they are not using AI for the purpose.

Thus, the data show that AI is not only considered functionally beneficial for assignments, but also capable of having a positive emotional impact on groups of students who use it for personal support.

4. DISCUSSION

The results of this study provide a comprehensive overview of the interaction of high school students with AI technology. The three main findings that stand out are: (1) the high frequency and integration of AI in students' daily routines, not only for academics but also for academics personal interaction; (2) the existence of a psychological paradox, in which AI is considered to be very useful but simultaneously triggers feelings of inferiority; and (3) the emergence of a new role of AI as a "confidant friend" or source of emotional support for some students. These findings suggest that the impact of AI on adolescents is multifaceted and requires deeper analysis to understand the psychological mechanisms behind it.

Application of Self-Determination Theory (SDT)

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Application of Self-Determination Theory (SDT)

To understand why these impacts occur, the findings of the study were analyzed using the framework of Self-Determination Theory (Deci & Ryan, 1985), the results of this study can be mapped into three basic psychological needs: competence, autonomy, and connectedness.

Competence

The SDT theory states that individuals have a need to feel capable and effective. The research findings point to a direct threat to this need. Although 85.9% of students found AI to be helpful (meeting the need for solutions), the majority (59.3%) also reported feeling less confident after comparing themselves to AI. This indicates that reliance on AI to achieve results can erode students' confidence in their own abilities. AI provides answers, but robs students of the opportunity to feel competent through personal effort.

Autonomy

The need for warm and authentic social relationships is the second pillar of SDT. The finding that 35.9% of students use AI as a "confidant buddy" because it is convenient and non-judgmental shows that there is an effort to meet this need through technology. However, these

interactions are artificial. AI provides a "pseudo-connectedness" that lacks genuine emotional reciprocity. Reliance on emotional support from AI risks hindering the development of the social skills necessary to build real, fulfilling relationships in the real world.

Relatedness

SDT defines autonomy as the ability to regulate one's own behavior and think independently. The high frequency of using AI (70.3% on a regular basis) to find quick solutions has the potential to erode cognitive autonomy. When "asking AI questions" becomes an automatic response to every challenge, students miss out on the opportunity to practice problem-solving independently, reasoning critically, and making decisions based on their own thinking. This dependency can reduce students' sense of control over their learning process.

Although a significant link with depression has not been found, this can be explained by several possibilities. First, stress and anxiety are faster responses arises against stress, while depression is often a condition that develops in the long term. The cross-sectional design of this study may not be able to capture such cumulative effects. Second, it's likely that AI serves as a temporary coping mechanism that provides "relief" and "comfort," which can temporarily mask deeper symptoms of depression.

The findings of this study show a link with a number of previous studies. In terms of competence, the results of the study are in line with the findings of Holmes et al. (2019) who show that AI-based systems are able to improve motivation and learning outcomes through adaptive learning. This reinforces the argument that AI can be an effective means of academic support. In the aspect of autonomy, this study expands Adelson's (2023) study on the use of digital technology by adolescents. While Adelson emphasizes the role of social media, games, and other digital platforms, the study adds a new perspective that AI also provides space for students to channel creativity and personal choice. Meanwhile, in terms of connectivity, the findings of this study are different from the results of Ulfah (2024) which emphasizes the negative side of the use of AI, especially the reduction of human social interaction. This research actually shows that for some adolescents, AI can be a safe alternative to expressing emotions, although it cannot completely replace relationships between humans.

Overall, the contribution of this research lies in shifting the focus of the study from the student population (as in Ulfah, 2024; Fadhillah & Lestari, 2024) to the population of high school students who are in the phase of psychological development are more vulnerable. In addition, the use of the Self-Determination Theory (SDT) framework, which is rarely used in similar studies, provides a sharper theoretical explanation of the relationship between the use of AI and the fulfillment of adolescents' basic psychological needs.

5. CONCLUSION

This study concludes that daily interactions with Artificial Intelligence (AI) have a significant and paradoxical psychological impact on adolescents, particularly in improving symptoms of stress and anxiety. Although AI is perceived to be very useful for supporting academic activities, these findings clearly answer the purpose of the study by showing that these "benefits" are accompanied by psychological costs in the form of feelings of inferiority and competency pressure in the majority of students. The main contribution of this article is to prove that such negative impacts can be explained through the frustration of the three basic psychological needs in Self-Determination Theory that is competence, relatedness, and autonomy. Based on these findings, it is recommended that educational institutions immediately develop digital literacy programs that focus on mental resilience. Strong evidence also shows that compulsive digital device use increases the risk of anxiety, depression, and stress (Brodersen et al., 2022; Amran et al., 2024). Because of this, clear screen time guidelines and strong support from families and schools are urgently needed. Overall, further research is recommended to use longitudinal designs to investigate the long-term impact of this phenomenon, especially in relation to depression.

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