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# Effectivity Study of "GAMA-AIMS" Application as Self-therapy in Overcoming Anxiety in Medical Students

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**Abstract**. The anxiety level in medical students is higher compared to other majors, thereby necessitating effective intervention. Gadjah Mada Anxiety Intervention for Medical Students (GAMA-AIMS) was developed to overcome anxiety using cognitive educational therapy. Therefore, this study aimed to determine the effectiveness of the GAMA-AIMS application by examining the differences in anxiety levels of health students before and after use. A quasi-experimental with pre-tests and post-tests was carried out on 86 students of Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada. Anxiety levels were measured using the Taylor Manifest Anxiety Scale (TMAS) questionnaire and statistical analysis was carried out through a paired T-test. Before the intervention, the prevalence of mild, moderate, and severe anxiety among participants was the same, at 33.3%. However, after the intervention, only 3.03% of participants experienced moderate anxiety, followed by severe and mild, with percentages of 12.12% and 84.84%, respectively. The results of the paired T-test showed a fairly strong relationship between anxiety levels before and after the intervention (Cohen's d coefficient = 1.04) which was statistically significant with a p-value of .000001 ($p < .05$). Therefore, the GAMA-AIMS mobile application was effective in reducing the anxiety levels of medical students.

**Keywords**: anxiety, cognitive therapy, GAMA-AIMS, medical students, mobile application

# Uji Efektivitas Aplikasi GAMA-AIMS Sebagai Terapi Diri dalam Mengatasi Kecemasan pada Mahasiswa Kesehatan

**Abstrak**. Tingkat kecemasan pada mahasiswa kedokteran lebih tinggi dibandingkan dengan jurusan lain, sehingga memerlukan intervensi yang efektif. Gadjah Mada Anxiety Intervention for Medical Students (GAMA-AIMS) dikembangkan untuk mengatasi kecemasan dengan menggunakan terapi edukasi kognitif. Penelitian ini bertujuan untuk mengetahui efektivitas aplikasi GAMA-AIMS dengan memeriksa perbedaan tingkat kecemasan mahasiswa kedokteran sebelum dan sesudah penggunaan. Penelitian eksperimen-kuasi dengan metode *pre-test* dan *post-test* ini melibatkan 86 mahasiswa Fakultas Kedokteran-Kesehatan Masyarakat, dan Keperawatan (FK-KMK), Universitas Gadjah Mada, yang telah menandatangani *informed consent*. Tingkat kecemasan diukur menggunakan kuesioner Taylor Manifest Anxiety Scale. Data yang diperoleh dianalisis menggunakan uji T berpasangan. Partisipan sebelum terapi mengalami kecemasan ringan, sedang, dan berat dengan persentase masing-masing sama (33.3%). Tingkat kecemasan partisipan sesudah terapi beragam, yaitu ringan (84.84%), sedang (3.03%), dan berat (12.12%). Hasil uji T berpasangan menunjukkan hubungan yang cukup kuat antara tingkat kecemasan sebelum dan sesudah terapi (koefisien Cohen's $d$ = 1.04) yang bermakna signifikan secara statistik dengan nilai p = .000001 ($p < .05$). Oleh karena itu, aplikasi seluler GAMA-AIMS efektif dalam mengurangi tingkat kecemasan mahasiswa kedokteran.

**Kata Kunci:** aplikasi, GAMA-AIMS, kecemasan, mahasiswa kedokteran, terapi kognitif.

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Anxiety disorders are the most common in the world (Stein et al., 2017) with a rate of 24.5% in the university environment. The anxiety level in the health field is higher than in other majors (Paula et al., 2020) with an above-normal percentage of 33.8% in medical students (Quek et al., 2019). A study at Hamadan University of Medical Sciences in 2017 showed that 28.7% of nursing students experienced above-normal anxiety (Shamsaei et al., 2018). The anxiety at the Faculty of Medicine, Public Health, and Nursing, Universitas Gadjah Mada (FK-KMK UGM) varies significantly. In the 2016 to 2021 cohort, the percentages of students who experienced minimal, mild, moderate, and severe anxiety were 42.9%, 31%, 15.9%, and 8.7%, respectively (Wijaya et al., 2022) Anxiety disorders have a high morbidity rate and can have a negative impact on students (Stein et al., 2017), such as decreased learning ability, professionalism, and work power (Macauley et al., 2018), thereby reducing the quality of life (Gan & Yuen Ling, 2019).

Some interventions that can be administered to overcome anxiety include psychotherapy, pharmacotherapy, or a combination of both (Bandelow et al., 2017). Medical students on average have mild to moderate levels of anxiety that do not require medication (Yusoff et al., 2013). Psychological therapy (psychotherapy), pharmacotherapy, or a combination of both are options that can be administered to individuals who experience severe anxiety (Chand & Marwaha, 2020). Therefore, the combination of these therapies is less than optimal for health students. A previous study reported that the behavior of seeking professional help for mental disorders experienced by health workers is only 13% to 36%. This reluctance can be caused by several factors, such as confidentiality, possible consequences for careers, busyness, and stigma, as well as the perception that symptoms can be overcome alone and health workers must be tough (Harvey et al., 2021). This result was supported by the limited number of psychologists compared to the population of Indonesia and the persistence of public stigma regarding mental disorders that are not good (Nugraha, 2021).

The Gadjah Mada Anxiety Intervention for Medical Students (GAMA-AIMS) application is a psychiatric intervention delivered through a mobile phone. This application enables patients to to independently engage with the material through a device, without the need for a therapist's presence (unguined and self-help). The GAMA-AIMS application is based on cognitive education and consists of anxiety psychoeducation, cognitive psychotherapy, relaxation exercises accompanied by a physical activity logbook, and spiritual therapy that can be used independently and flexibly at any time. There is also a module on anxiety equipped with questions using Generalized Anxiety Disorder-7 (GAD-7) as a form of self-assessment. This application contains 8 therapy sessions that are expected to be completed by participants for 1 session within 8 weeks, and a daily journal

containing 4 submenus, namely mood tracker, e-diary, physical activity and sports diary, and religious activity diary.

This application is designed to accommodate the specific stressors experienced by health students. The application can be assessed by students without having to spend excessive time scheduling consultations with therapists or visiting healthcare facilities. Some of the advantages include affordability, the ability to be used anytime and anywhere, as well as user privacy maintenance. The GAMA-AIMS application can be accessed via smartphones and the intervention using this method has been shown to overcome anxiety (Linardon et al., 2019). According to a previous study, the GAMA-AIMS application has been tested for validity and reliability (Nabila et al., 2024). To assess whether this application is effective in reducing anxiety levels, testing needs to be carried out. Therefore, this study aimed to determine the effectiveness of the GAMA-AIMS application by examining the differences in anxiety levels of health students before and after use. This therapy is expected to help reduce anxiety in health students from various generations and the wider community. Furthermore, this therapy helps realize a goal of the Sustainable Development Goals (SDGs), namely ensuring a healthy life and improving welfare for all people of all ages.

## Method

The study aimed to determine the effectiveness of the GAMA-AIMS application in overcoming anxiety in health students, using a quasi-experimental design. Independent sample T-test was carried out for normally distributed data and the Willcoxon test was used when the data is not normally distributed. Data were obtained from the GAD-7 questionnaire (anxiety screening) which was administered online to the population of health students of the Medicine, Public Health, and Nursing, Universitas Gadjah Mada (FK-KMK UGM), using the self-selection sampling method. GAD-7 is a questionnaire that measures the anxiety level of an individual, such as mild, moderate, and severe. According to Toussaint et al. (2020), completing this questionnaire requires less than 3 minutes. In self-selection sampling, the study determined the inclusion and exclusion criteria needed and individuals from the population who are willing to participate (Berndt, 2020). The Taylor Manifest Anxiety Scale (TMAS) was used to determine the anxiety level before and after using the GAMA-AIMS anxiety intervention application. The TMAS questionnaire has high validity and reliability, shown by sensitivity, specificity, positive predictive, negative predictive, and reliability values of 90%, 90.4%, 94.7%, 99.4%, and .86, respectively (Rohmawati et al., 2015).

The independent and dependent variables are the implementation of the GAMA-AIMS anxiety intervention and anxiety levels. The confounding variables include gender and year of admission. The sample will be recorded in the form of categories with inclusion criteria

of health students FK-KMK UGM who are willing to participate and sign an informed consent, experiencing mild, moderate, and severe anxiety based on the GAD-7 questionnaire and interviews with therapists. The exclusion criteria are not completing the intervention activities, suffering from cognitive disorders, such as dementia and mental retardation based on interviews with therapists, not experiencing anxiety based on the GAD-7 questionnaire and interviews with therapists, undergoing psychiatric treatment or taking sedatives, having a history of consuming Narcotics, Psychotropics, and Addictive Substances (NAPZA). This study obtained permission from the Ethics Committee of the Faculty of Medicine and Public Health UGM with the ethics permit number KE/FK/0115/EC/2023.

Participants were given socialization regarding the study, and then initial recruitment was carried out by asking students to fill out the GAD-7 questionnaire. Prospective participants who had a GAD score $\geq$ 5 would be contacted regarding informed consent for willingness to participate in the study. Furthermore, an online exam via Zoom will be continued by students in the 3rd semester or more. Participants who met the inclusion criteria were asked to fill out a demographic questionnaire and pre-test. The GAMA-AIMS application was then downloaded and therapy sessions were carried out independently for 1 session/week within 8 weeks. The subject coordinator will remind and follow up with participants every week via WhatsApp. The therapy sessions comprised the concept of Digital Cognitive Education psychotherapy, problem identification, identification of negative thoughts, reframing, behavioral activation, problem-solving exercises, relaxation, and evaluation. Participants filled out the post-test (containing the TMAS questionnaire) after completing the therapy session. Analysis of the results was carried out using a paired T-test or Willcoxon with the help of SPSS software to determine the relationship between the use of the GAMA-AIMS application and the anxiety level of health students.

## Results

The effectiveness of the GAMA-AIMS application in overcoming anxiety in health students was determined in this study by examining the significance of the differences in anxiety levels before and after using the GAMA-AIMS application for self-therapy. This was measured by the pre-test and post-test methods, and confounding factors were considered.

Health students of the FK-KMK UGM consist of medical, nursing, and health nutrition students. From a total population of 994 Health students in the class of 2017-2021, 568 filled out the GAD-7 questionnaire. A total of 179 students, accounting for 31.51%, experienced anxiety, as shown by GAD-7 $\geq$ 5. From a total of 179 students, 86 were willing to participate in the study and signed the informed consent. After the participant

recruitment was carried out, a diagnosis confirmation interview was conducted by a Psychiatry Resident doctor at the Madya and Mandiri levels. Using the GAMA-AIMS application, 44 students were intervened and 11 dropped out of the study due to being unreachable. The number of samples that completed the intervention to the final stage was 33 students.

**Description of study variables**

Female participants were more dominant than the male, with percentages of 78.78% and 21.21%, respectively. Based on the year of intake, the number of samples varied, namely 6.06%, 9.09%, 33.3%, 27.27%, and 24.24% for 2017, 2018, 2019, 27.27%, and 24.24%, respectively. Before the intervention, the student anxiety level had the same percentage, namely mild, moderate, and severe, at 33.3%, 33.3%, and 33.3%, respectively. After the intervention, the student anxiety level had various percentages, namely mild anxiety (84.84%), moderate anxiety (3.03%), and severe anxiety (12.12%).

**Normality test of anxiety levels before and after therapy**

**Table 1**

*Anxiety Normality Test Before and After Therapy (pre-test and post-test)*

| Shapiro-Wilk | | |
|---|---|---|
| Statistics | df | *p* |
| .972 | 33 | .543 |

The results of statistical analysis show significant ($p$) > .05. Therefore, the data was concluded to be normally distributed.

**The relationship between app use and anxiety levels before and after therapy**

**Table 2**

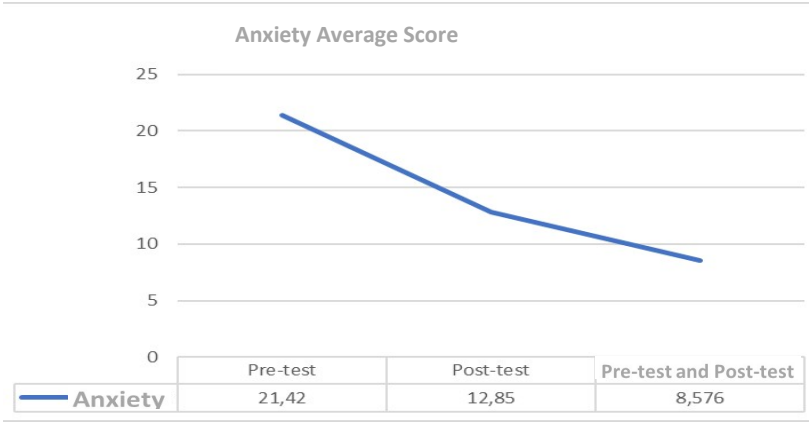
*Results of Paired T-Test Analysis*

| Variable | *Pre-test* | | *Post-test* | | *Pre-test and Post-test* | | df | T | *p* |
|---|---|---|---|---|---|---|---|---|---|
| | M | SD | M | SD | M | SD | | | |
| Anxiety | 21.42 | 6.81 | 12.85 | 8.004 | 8.576 | 8.212 | 32 | 5.999 | .000001 |

Based on the table, the p-value < .05 was obtained, showing a statistically significant relationship between the use of the GAMA-AIMS application and the anxiety level before and after therapy (pre-test and post-test). Cohen's D coefficient is the result of dividing the average pre-test and post-test by the standard deviation. The value obtained in this case was 1.04, showing a significant influence. The average anxiety level of health students before and after therapy was 21.42 and 12.85 for moderate and mild anxiety, respectively.

**Figure 1**

*Anxiety Average Score in Pre-test and Post-tes (TMAS)*




**Relationship between confounding variables and pre-therapy anxiety levels**

**Table 3**

*Relationship Between Confounding Variables and Anxiety Level Before Therapy*

| Cofounding Variables | | Anxiety Level Before Therapy (*Pre-test*) | | | *Cramer's* V | |
|---|---|---|---|---|---|---|
| | | Light | Medium | Heavy | Value | *p* |
| Gender | Males | 2 | 2 | 3 | .105 | .834 |
| | Females | 9 | 9 | 8 | | |
| Year of the Generation | 2017 | 0 | 1 | 1 | .409 | .200 |
| | 2018 | 2 | 1 | 0 | | |
| | 2019 | 6 | 3 | 2 | | |
| | 2020 | 1 | 2 | 6 | | |
| | 2021 | 2 | 4 | 2 | | |

*Note*. N = 11.

**Figure 2**

*Number of Students Experiencing Anxiety Before Therapy (Pre-test) by Gender*

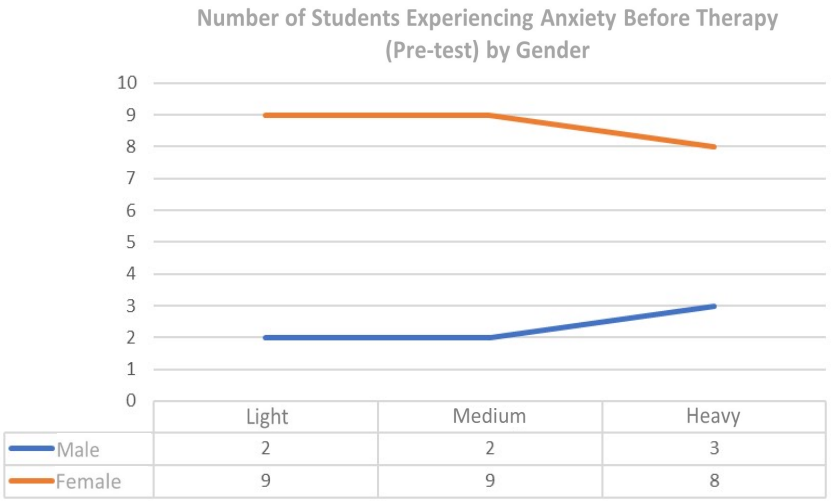
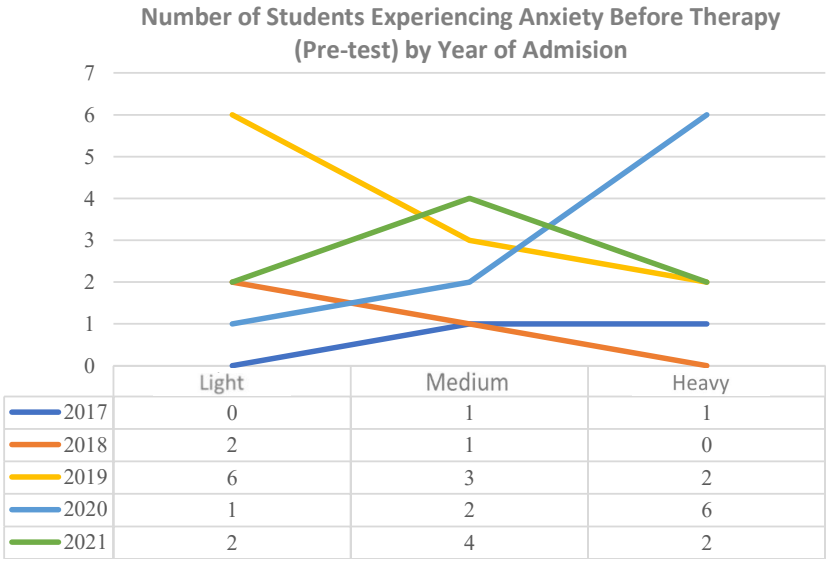



**Figure 3**

*Number of Students Experiencing Anxiety Before*




Based on the results of statistical analysis using Cramer's V, gender and year of admission did not have a significant effect on the anxiety level before therapy ($p > .05$). Cramer's V value of .105 showed a weak relationship while .409 suggested a fairly strong relationship.

**Relationship between confounding variables and anxiety levels after therapy**

**Table 4**

*Relationship Between Confounding Variables and Anxiety Levels After Therapy*

| Confounding Variables | | Anxiety Level After Therapy (*Post-test*) | | | Cramer's V | |
|---|---|---|---|---|---|---|
| | | Light | Medium | Heavy | Value | *p* |
| Gender | Males | 5 | 0 | 2 | .272 | .296 |
| | Females | 23 | 1 | 2 | | |
| Year of the Generation | 2017 | 0 | 1 | 1 | .572 | .006 |
| | 2018 | 3 | 0 | 0 | | |
| | 2019 | 9 | 0 | 2 | | |
| | 2020 | 8 | 0 | 1 | | |
| | 2021 | 8 | 0 | 0 | | |

*Note*. n Light = 28, n Medium = 1, n Heavy = 4.

**Figure 4**

*Number of Students Experiencing Anxiety After Therapy (Post-test) by Gender*

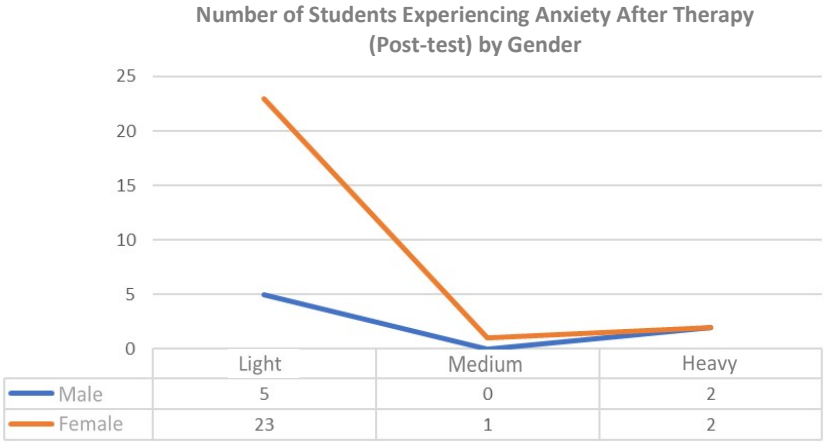
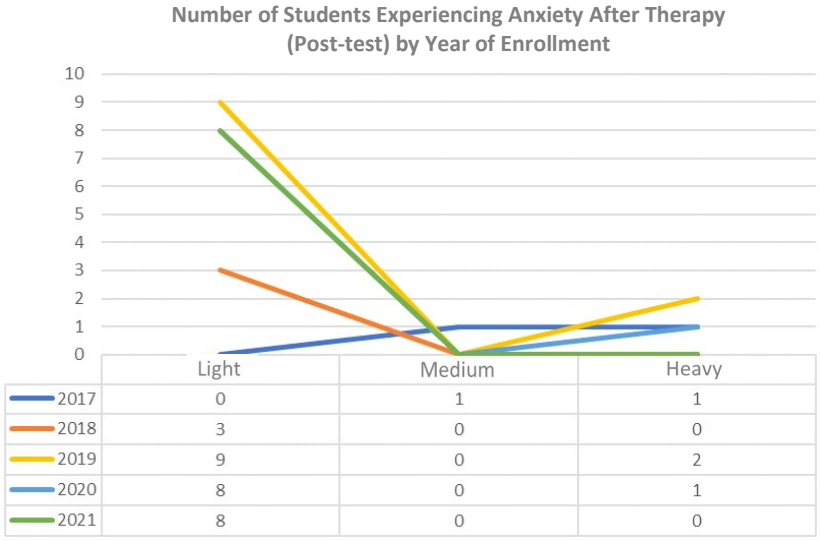


**Figure 5**

*Number of Students Experiencing Anxiety After Therapy (Post-test) by Year of Enrollment*




Based on the results of the statistical analysis, gender does not have a significant effect on the anxiety level after therapy ($p$ > .05). Cramer's V value of .272 shows a sufficient relationship. Based on the results of the statistical analysis, the year of admission has a significant effect on the anxiety level after therapy ($p$ < .05). Cramer's V value of .572 shows a fairly strong relationship.

***The relationship between confounding variables and anxiety levels before and after therapy***

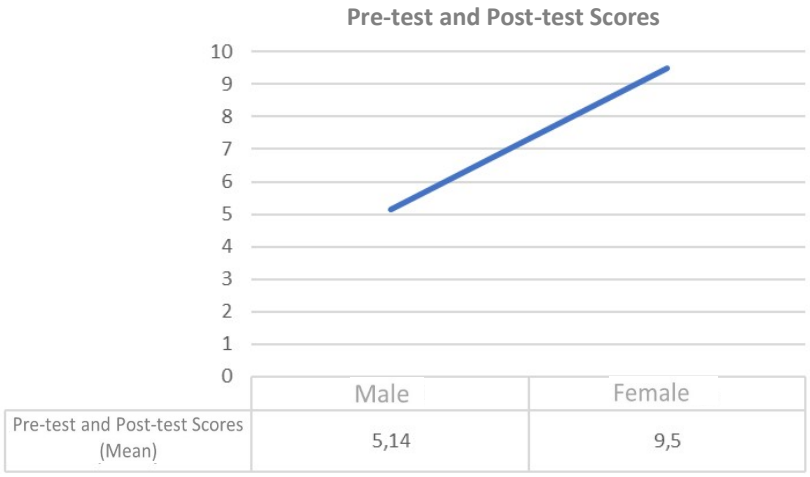
**Table 5**

*Relationship Between Confounding Variables and Anxiety Levels Before and After Therapy*

| Confounding Variables | | Pre-test and Post-test Scores | | t | *p* |
|---|---|---|---|---|---|
| | | M | SD | | |
| Gender | Males | 5.14 | 8.67 | -1.257 | -1.257 |
| | Females | 9.5 | 8.01 | | |
| Year of the Generation | 2017 | -2 | 4.24 | 2.507 | .037 (a<e) |
| | 2018 | 5.67 | 5.03 | 1.381 | .201 |
| | 2019 | 5.18 | 7.14 | 2.085 | .052 |
| | 2020 | 12.78 | 8.23 | -0.137 | .893 |
| | 2021 | 12.25 | 7.25 | - | reference |

**Figure 6**

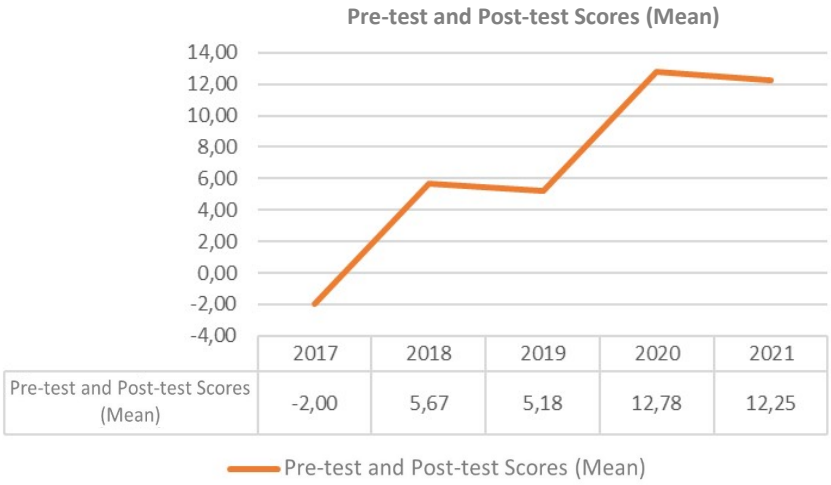
*Average Pre-test and Post-test Scores by Gender*




| | Male | Female |
|---|---|---|
| Pre-test and Post-test Scores (Mean) | 5,14 | 9,5 |

**Figure 7**

*Average Pre-test and Post-test Scores by Year of Enrollment*




| | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|
| Pre-test and Post-test Scores (Mean) | -2,00 | 5,67 | 5,18 | 12,78 | 12,25 |

The results in Table 5 show that gender and year of admission from 2018 to 2021 did not have a significant effect on anxiety levels before and after therapy ($p > .05$). Meanwhile, the year of admission from 2017 had a significant effect on anxiety levels before and after therapy ($p < .05$).

**Discussion**

Healthy students in academic life can manage (cope) psychological stress, ensuring that the experienced stress is at a normal level. In this case, students are directed to carry out mature self-defense mechanisms (Dunn et al., 2008), such as anticipation, sublimation, altruism, and others (Giuseppe & Perry, 2021).

Health studies are known to have strict achievements, where students are required to comply with procedural steps and require a lot of time to study. High educational demands make students more susceptible to psychological distress, one of which is anxiety (Yusoff et al., 2013). The prevalence of anxiety in this study was not much different from previous studies. A meta-analysis study proved that there were 33.8% of medical students experienced above-normal anxiety (Quek et al., 2019). Providing psychological services to students can affect the prevalence of student anxiety.

Before the intervention, the anxiety levels of students had the same percentage of 33% for each category. The prevalence of anxiety levels was not significantly different from studies in Asian countries, such as Pakistan and Bangladesh. In Pakistan, the percentage of medical students experiencing mild, moderate, and severe anxiety was 27.6%, 13.6%, and 6.5%, respectively (Mirza et al., 2021). In Bangladesh, the percentages of students who experienced minimal, mild, moderate, and severe anxiety during COVID-19 were 18.3%, 38.9%, 24.8%, and 18.1%, respectively (Islam et al., 2020). The subjects of this study were health students who experienced anxiety, as shown by the results of the GAD-7 questionnaire $\geq$ 5. The purpose of this intervention was to test the effectiveness of the GAMA-AIMS application.

After the intervention, the level of student anxiety had varying percentages of 84.84%, 3.03%, and 12.12% for mild, moderate, and severe, respectively. Mild anxiety was the most dominant level after the intervention.

In this study sample, females were more dominant than males, with percentages of 78.78% and 21.21%, respectively. In addition to the fact that UGM FK-KMK health students are dominated by females, hormonal changes, such as low estrogen levels during menstruation, can cause susceptibility to anxiety (Beck, 2012).

Based on the year of the class, the number of samples varied, namely 6.06%, 9.09%, 33.3%, 27.27%, and 24.24% from 2017, 2018, 2019, 2020, and 2021. Each class has its potential stressors that can contribute to the emergence of anxiety. The subjects of this study were mostly students from the class of 2019 who were in the third-year at that time. This is different

from another study conducted in Pakistan on medical students. The study showed that second-year medical students tend to show more symptoms of anxiety, with a percentage of 61.6% (Mirza et al., 2021). This difference in results may have occurred because second-year students were in the transition period from online to offline lectures. Meanwhile, students in 2019 have previously attended offline lectures. The transition to lectures is not an obstacle for students in the 2019 intake. The third-year is also the time for students to work on theses and maintain Cumulative Grade Point Average (GPA) according to target. These conditions and organizational activities can certainly trigger anxiety in third-year students. Therefore, the predominance of third-year students in this course is entirely natural.

The second largest batch was batch 2021, consisting of first-year students. This happened because students were still adapting to the lecture environment at FK-KMK UGM, had difficulty determining the right method to learn and socialize with classmates, and were living alone in a new environment for the first time. Students in the batch of 2021 have a different curriculum from those in 2017, 2018, 2019, and 2020. Adjusting to the environment accompanied by complex medical material can trigger anxiety in first-year students.

The relationship between the year of admission and anxiety levels before therapy has a Cramer's V value of .409, showing a fairly strong relationship (Table 3). However, based on the p-value, the year of admission did not have a significant effect on anxiety levels before therapy ($p > .05$). The results were different from the report of previous studies that the year of admission affected anxiety levels. Another study showed that the anxiety of medical students fluctuated with increasing years of study. The anxiety levels of first, second, third, fourth, and final-year students were 45.86%, 52.58%, 47.14%, 28.75%, and 45.10%, respectively (Mirza et al., 2021). The result showed that sophomore students had the highest anxiety levels. Ruz et al. (2018) reported that sophomore nursing students experience the highest anxiety levels. This difference in results may be due to the collection of anxiety level data before therapy was carried out when students were not attending lectures during the semester break. Therefore, the condition of no academic pressure can make the results of this study different from others.

Based on the Cramer's V value of .105, gender and anxiety levels before therapy showed a weak relationship (Table 3). However, based on the p-value, gender did not have a significant effect on anxiety levels before therapy ($p > .05$). These results were different from a study conducted in Brazil that conducted study on first and sixth-year medical students. The study showed that female medical students were more susceptible to anxiety. A cross-sectional study was conducted in Saudi Arabia on preclinical and clinical medical students and the result showed that female students in the

preclinical and first to third-year stages experienced more anxiety (89.7%) than males (60%) (Mirza et al., 2021). A prospective observational study of nursing students in Jordan also showed that the majority of students with persistent anxiety were female, accounting for 57.5% (Ruz et al., 2018). This difference in results may be due to the collection of anxiety level data before therapy when students were not attending lectures.

The relationship between the year of college entry and post-therapy anxiety has a Cramer's V value of .572, showing a fairly strong relationship (Table 4). Based on the p-value, the year of college entry has a significant effect on post-therapy anxiety levels, as evidenced by $p <$ .05. This can be influenced by students who are currently entering a new academic year. A study of 4th-year medical students was conducted at James Cook University's College of Medicine and Dentistry Australia. The 4th year was the first for clinical rotation at the university. Based on the results, students generally feel anxious when transitioning from the pre-clinical stage to the clinical rotation stage (Malau-Aduli et al., 2020). Another study was conducted on first-, third-, and fifth-year medical students at Airlangga University. The result showed that fifth-year students had the highest frequency of anxiety. This study also showed that third-year students had the lowest frequency of anxiety (Arisyna et al., 2020).

Based on the Cramer's V value of .272, gender and anxiety levels after therapy show a sufficient relationship (Table 4). However, gender does not have a significant effect on anxiety levels after therapy, as evidenced by $p >$ .05. This implies that the GAMA-AIMS application can overcome anxiety regardless of the gender of the application user. This is consistent with the study conducted on final-year PSKPS FK ULM students showing that there was no relationship between gender and anxiety levels in PSKPS FK ULM students (Assyifa et al., 2023).

Based on the results of statistical analysis in Table 5, gender and intake years 2018 to 2021 did not have a significant effect on anxiety levels before and after therapy ($p >$ .05). The intake year 2017 had a significant effect on anxiety levels before and after therapy, as shown by $p <$ .05. Students were experiencing a transition period from clinical rotation (coass) to internship. Furthermore, a cross-sectional study was conducted on students who had just completed internships at 3 medical college hospitals in Saudi Arabia. Based on this study, 73% of students who had just completed internships experienced stress at different levels, namely severe, mild, and moderate, with percentages of 34.9%, 19.3%, and 18.8%, respectively (Abdulghani et al., 2014).

A randomized controlled trial (RCT) was conducted to test the effectiveness of an anxiety-relieving app on students from 4 universities, namely University College London, School of Oriental and African Studies University of London, University of

Buckingham, and University of Roehampton. Anxiety levels were measured using the Hospital Anxiety and Depression Scale-Anxiety (HADS-A). In the study, the intervention group was given the Cognitive Behavioral Therapy (CBT)-based Feel Stress-Free app while the control was on a waiting list. The result showed that anxiety levels in both groups decreased evenly in the 4th week. In the intervention group, anxiety levels that were initially moderate (HADS-A score = 13.4) became mild (HADS-A score = 10.1) in the 4th week (McCloud et al., 2020).

Another randomized controlled study was conducted on participants aged >18 years with a diagnosis of moderate to severe Generalized Anxiety Disorder (GAD), recruited online through social media. In the study, the intervention group was given digital CBT (Daylight) and the control was on a waitlist. The study was conducted for 6 weeks with follow-up and measured the anxiety level of participants using the GAD-7. The results showed that there was a significant decrease in anxiety in the intervention group at week 6 and follow-up. Cohen's D values after week 6 and at follow-up in the intervention group were 1.08 and 1.43, respectively, showing a large effect size (Carl et al., 2020).

The results of the paired T-test in Table 5 showed that there is a relationship between anxiety levels before and after therapy, which is statistically significant. Cohen's D coefficient of 1.04 obtained in this study showed a significant influence. The average anxiety level of health students before therapy using the GAMA-AIMS application was 21.42 in the moderate category. After therapy, the average anxiety level of health students was 12.85 in the mild category. Therefore, there is a statistically significant difference in the anxiety level of health students before and after therapy using the GAMA-AIMS application. This application is a cognitive education-based psychotherapy intervention to overcome anxiety. Previous studies showed that CBT is effective for adults of all ages (Evans, 2007). The advantages of education provided digitally are the more attractive appearance, animation, and educational videos. Other studies also showed that CBT and digital education are effective in treating anxiety disorders (Donker et al., 2009; Kaczkurkin & Foa, 2015). In theory, CBT is shorter due to the highest evidence base for anxiety disorders, but the disadvantages are high dropout rates and lack of therapy compliance due to too many sessions and daily assignments.

The GAMA-AIMS application is a digital form of existing psychotherapy. This application is user-friendly, can be accessed via smartphone, and used anytime and anywhere. The GAMA-AIMS application comprises 8 CBT sessions, which fall under the category of short-term CBT, typically ranging from 4 to 8. A study by Cully et al. (2020) showed that standard CBT generally consists of 12 to 20 sessions. Therefore, this shorter duration enables health students to complete all therapy. Another study

was conducted in the UK that examined the relationship between application use and anxiety levels for 6 weeks. The study showed that the use of a mobile application intervention based on CBT was effective in overcoming anxiety symptoms in the fourth week (McCloud et al., 2020). Health students commonly use smartphones in daily life, which facilitates easy access to this application. Previous studies also showed that health students have a more packed learning schedule than non-health. Therefore, this practical application is suitable for use by health students. In the anxiety category, improvements in mood and physical symptoms can occur in the eighth week. Cognitive symptoms require a longer duration to improve, as the neuroadaptation theory of neuroplasticity suggests that structural changes in the prefrontal cortex and hippocampus occur over several months.

## Conclusions

This study aimed to determine the effectiveness of the GAMA-AIMS application by examining the differences in anxiety levels of health students before and after use. In conclusion, there was a significant difference in the anxiety level of health students before and after therapy using the GAMA-AIMS application at the FK-KMK UGM. The application was an effective intervention that could be carried out independently. This study showed that the GAMA-AIMS application was an intervention following the conditions of health students who generally had difficulty finding free time to carry out conventional therapy. The characteristics of self-help therapy supported a more private setting, which was expected to reduce limitations associated with stigma and concerns about confidentiality.

Certain emotional conditions could affect the results of filling out the anxiety level questionnaire after therapy. Emotional conditions due to various factors cannot be monitored because this application was filled out independently without supervision.

### Suggestion

The results of this study showed the importance of further development and using the GAMA-AIMS application to address anxiety in health students. The limitations of the current study arise from the uncertainty about the validity of responses, as participants completed the application independently without supervision. Furthermore, there was not sufficient information obtained regarding other factors underlying the occurrence of anxiety in each participant. At the end of the study process, participants filled out a post-test after completing all therapy sessions but no further follow-up was carried out to determine the long-term impact of therapy using the GAMA-AIMS application. Therefore, further studies can explore other factors that influence the development of anxiety in each participant by conducting an interview session after filling out the application. A follow-up was also needed

on the effectiveness of the GAMA-AIMS application for a certain period after the post-test was filled out by the participants to determine the long-term impact of using the GAMA-AIMS application in overcoming anxiety.

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