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ORIGINAL RESEARCH

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GPA as A Stronger Determinant of Medical Doctor Computer-Based National Competence Test

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ABSTRACT

Background: The government implements a high-quality assurance system in the health sector to strengthen the national education system. One of the steps is the Indonesian Medical Doctor National Competency Examination (known as UKMPPD in Indonesia), which follows regulations on higher education and health workers. The entrance exam for medical students at the Faculty of Medicine, Maranatha Christian University, consists of a biology test and an academic potential test.
Aims: The purpose of this study was to determine the relationship between the biology entrance exam, academic potential test, and grade point average with the final score of UKMPPD CBT at the Faculty of Medicine, Maranatha Christian University.
Methods: The samples collected consisted of students from the Faculty of Medicine at Maranatha Christian University, from the 2010 to 2016 classes, who took the UKMPPD from 2016 to 2022. Data were analyzed using the Spearman test and examined for both bivariate and multivariate relationships.
Results: This study showed that the biology entrance examination, medical undergraduate GPA, and medical professional GPA influenced the UKMPPD CBT final score of Maranatha Christian University Faculty of Medicine students. Nevertheless, there is no relationship between students' TPA score and UKMPPD CBT.
Conclusion: Medical undergraduate GPA had the strongest relationship with CBT scores, compared to medical professional GPA. This study also highlighted the importance of non-cognitive aspects of input selection tests besides the improvement of the quality of the clinical education evaluation process.

Keywords: Entrance exam, CBT, GPA, UKMPPD

ABSTRAK

Latar belakang: Pemerintah menerapkan sistem mutu penjaminan tinggi bidang kesehatan sebagai bagian dari penguatan sistem pendidikan nasional. Salah satu langkahnya adalah uji kompetensi nasional, UKMPPD, sesuai dengan peraturan tentang Pendidikan Tinggi dan Tenaga Kesehatan. Tes masuk untuk menjadi mahasiswa di Fakultas Kedokteran, Universitas Kristen Maranatha, terdiri dari tes biologi dan tes potensi akademik.
Tujuan: Tujuan dari penelitian ini adalah untuk mengetahui hubungan ujian saringan masuk biologi, tes potensi akademik, dan indeks prestasi kumulatif mahasiswa kedokteran dengan nilai akhir CBT di Fakultas Kedokteran Universitas Kristen Maranatha.

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Metode: Sampel yang dikumpulkan adalah mahasiswa Fakultas Kedokteran Universitas Kristen Maranatha Angkatan 2010 sampai 2016 yang mengikuti CBT UKMPPD pada tahun 2016 sampai tahun 2022. Analisis data dilakukan dengan menggunakan uji Spearman dan di analisis secara bivariat dan multivariat.
Hasil: Studi menunjukkan bahwa ujian saringan masuk biologi, IPK sarjana kedokteran dan IPK profesi dokter memiliki pengaruh terhadap nilai akhir CBT UKMPPD mahasiswa Fakultas Kedokteran Universitas Kristen Maranatha. Hasil penilitian juga menunjukkan tidak terdapat adanya hubungan antara TPA dan CBT UKMPPD.
Kesimpulan: IPK sarjana kedokteran memiliki hubungan yang paling kuat dengan nilai CBT, dibandingkan dengan IPK profesi dokter. Penelitian ini menemukan bahwa proses seleksi calon mahasiswa kedokteran membutuhkan uji aspek non-kognitif dan kualitas evaluasi pendidikan klinik perlu ditingkatkan untuk menaikkan kelulusan CBT UKMPPD.

Kata kunci: Ujian masuk, CBT UKMPPD, IPK

PRACTICE POINTS

- The results of the study can be used to design or adapt the health education curriculum to emphasize certain factors associated with successful UKMPPD CBT, such as effective study strategies, time management skills, clinical reasoning abilities, and psychological preparedness.
- This study provides new insights into the relationship between the Biology Entrance Screening Exam, undergraduate GPA, professional GPA, and UKMPPD CBT that may influence health education policy.
- Implementing the recommendations of this study will increase the admission rate of CBT students and improve the quality of health education.
- Implement special preparation programs for students with low GPAs to help them prepare for the UKMPPD CBT exam.
- Evaluate student pass rates and performance after implementation of recommendations to ensure effectiveness and adjust as needed.

INTRODUCTION

The consistent demand for medical education underscores its important role in preparing future physicians to navigate the ever-expanding landscape of medical knowledge.[1] This large number of enthusiasts makes the competition to enter medical education very tight.[2] Various types of entrance exams must be faced before registering for this major.[3] The choice to become a doctor is influenced by many variables.[4] According to a study, students choose this field of study because they are attracted to humanity, willing to try new things, feel they are suitable for the field of medicine, and want to help others and be recognized for their contributions.[5] High levels of motivation are required for learning, academic performance, and the desire to pursue medical education.[4] Furthermore, academic success has the potential to impact and influence motivation for medical education.[6,7] In 2023, public universities are competing to open medical faculties to replenish the lack of doctors in Indonesia and produce qualified doctor graduates for the country.[8] It is hoped that in the coming years, the distribution of doctors in Indonesia will be evenly distributed with sufficient numbers.

The parameter usually used to improve academic performance, or the level of knowledge gained by students after starting the learning process, is usually represented as the cumulative grade point average (GPA).[9] For university students, academic success has always been an important part of life.[10] One of the most widely used parameters in studies on academic achievement is grade point average (GPA), which is generally considered one of the most significant indicators of student success in college and may have an impact on long-term career prospects.[9] GPA can be used as a measure of the effectiveness of a learner's educational process, as it is a means of assessing knowledge gained from practical experience, theoretical knowledge, and the development of a particular skill or area of expertise. It also helps to assess knowledge gained from skills.[11]

As part of efforts to strengthen the national education system, the government implemented a quality assurance system in the health sector. One of the main initiatives implemented is the national competency test, following Law Number 12 of 2012 concerning higher education and Law Number 36 of 2014 concerning health workers.[12] This national competency test is known as the Indonesian Medical Doctor National Competency Examination (UKMPPD).[13] The National Competency Standards are part of the registration standardization procedures and practical guidelines for health care providers in Indonesia. The National Competency Test is expected to identify health care providers in Indonesia who can provide professional health care services to the public, with a primary focus on patient safety.[14] On the other hand, from the education side, the National Competency Test is expected to support the improvement of curriculum and teaching methods in each educational institution and become the foundation for the health education sector, which is under the direct control of the Ministry of Education.[14]

Many individual factors possessed by each student can affect their performance in competency examinations for medical students in professional programs, especially in learning behaviour.[15] Among these individual factors are motivation, self-awareness, goal-focused learning, time management, positive thinking, and material acquisition. Firmansyah et al. (2022) identified several key internal factors influencing students' learning behaviour before the UKMPPD, such as task value, goal orientation, self-efficacy, beliefs, and test anxiety.[17] External influences, like peer pressure and institutional policies, also play a significant role. Students with strong motivation, both intrinsic and extrinsic (e.g., desire to be a doctor, to succeed, or spiritually driven), tend to regulate their study time better and adopt more effective strategies. These factors not only drive knowledge acquisition but also shape how students manage stress and learning consistency. Thus, the distinction between those who succeed and those who do not often lies in the interplay of motivation and behavioral regulation shaped by these factors.[4,6,7] Motivation consists of a strong desire to become a doctor as soon as possible and a strong desire to be respected as a doctor, making students more eager to learn.[6] Furthermore, students who participated in the UKMPPD are those who have completed their professional and undergraduate education programs, as a highly qualified to take the exam effectively.[14] Thus, the difference between students who have completed UKMPPD and those who have not is in terms of motivation and willingness to learn.[17] This motivation is directly related to a person's desire to achieve something.[6]

Any selection system for new students who will enter the university can determine the performance of students in the learning process and affect the results (output).[18–20] Almost every university conducts a selection process for its student candidates.[18] The selection process of new students in universities is influenced by various factors such as policies, regulations, capacity, facilities, administrative and teaching staff, costs required, and selection objectives.[21] Guidance in determining how to conduct the selection process to assess students' skills in the learning process can inadvertently impact learning outcomes.[18,21]

As one of the first steps to improve educational standards, the Faculty of Medicine of Maranatha Christian University sets criteria for high school students who will become prospective medical

students with the Academic Potential Test (TPA) as an admission test for the Maranatha Christian University Faculty of Medicine. There is an additional selection in the form of a human biology test, which is a special test for prospective new students of the Faculty of Medicine of Maranatha Christian University. The selection process used can determine the readiness and ability of participants to follow the study. If the selection process is inappropriate or ineffective, then the CBT results obtained may not reflect the true potential of prospective students. On the other hand, a well-designed selection process can help ensure that the successful participants have sufficient abilities to cope with the educational program, strengthening the CBT results as an accurate representation of their abilities.[14] Therefore, it is important to understand whether the new student candidate selection process applied can affect the final results of the Computer-Based Test (CBT) on the UKMPPD. Academic achievement parameters, in the form of GPA, both undergraduate medical and professional programs' GPA, also need to be ascertained for their influence on the final CBT score in UKMPPD.

Thus, the purpose of this study is to see the relationship between the biology entrance screening exam and the Academic Potential Test (TPA) with CBT scores or the relationship between the Bachelor of Medicine and the Doctor Professional Program GPA with the results of the CBT score at the Faculty of Medicine, Maranatha Christian University. This is done by examining the data results of medical students admitted with the type of screening performed, the medical undergraduate GPA value, and the Doctor Professional Program GPA at the Faculty of Medicine, Maranatha Christian University.

METHODS

Using observational cross-sectional analysis techniques, this study was conducted. The study was conducted at the Faculty of Medicine, Maranatha Christian University, from July 2023 until February 2024. The participants of this study were students of the Faculty of Medicine, Maranatha Christian University, from class 2010 until 2016, and participated in the UKMPPD for the period 2016 until 2022. This study employed a consecutive sampling method, including all students who met the inclusion criteria: they had taken the entrance test, completed both the undergraduate (S.Ked) and professional (dr.) medical education programs, and had passed the UKMPPD CBT. Students admitted through the academic report track were excluded, as they did not take the entrance exams and thus did not meet the inclusion criteria.

This study employed a document analysis approach using existing academic records obtained from the Faculty of Medicine, Maranatha Christian University. The data included entrance exam scores (Biology and Academic Potential Test/TPA), cumulative GPAs for both undergraduate and professional medical programs, and UKMPPD CBT scores. The authors received formal authorization from the institution to access and use these documents for the study. All data were anonymized before analysis to ensure confidentiality and comply with institutional ethical standards. Data analysis was conducted using the Spearman test. Data segmentation was presented in the form of frequency distribution tables using bivariate and multivariate analysis.

RESULTS AND DISCUSSION

The respondents in this study comprised a total of 876 medical students, with a higher proportion of females (578 respondents) compared to males (298 respondents). The participants were drawn from various admission years, ranging from 2010 to 2016, with the largest respondents originating from the 2012 class. The range of age was between 16-23 years old when admitting to the Faculty of Medicine, Maranatha Christian University. The detailed respondent characteristic is shown in Table 1.

On average, the respondents achieved a TPA (Academic Potential Test) score of 72.62 ± 10.22 and a biology entrance exam score of 67.02 ± 12.02. Their academic performance was reflected in a mean GPA of 3.14 ± 0.33 during the preclinical stage and 3.41 ± 0.14 during the clinical professional phase. The average score for the CBT of the UKMPPD exam was 77.36 ± 5.52, indicating overall satisfactory performance among the cohort. The descriptive analysis of the variables is shown in Table 2.

Table 1. Characteristics of Respondents Included in This Study

Characteristic	n	%
Sex		
Male	298	34.0%
Female	578	66.0%
Year of Admission		
2010	105	12.0%
2011	153	17.5%
2012	157	17.9%
2013	117	13.4%
2014	79	9.0%
2015	143	16.3%
2016	122	13.9%
Total	**876**	**100%**

Table 2. Descriptive Analysis of The Variables

Variable	Mean	Standard Deviation
TPA	72.62	10.22
Biology	67.02	12.02
Undergraduate GPA	3.14	0.33
Professional GPA	3.41	0.14
UKMPPD CBT	77.36	5.52

Bivariate Analysis

The correlation between TPA and CBT scores showed no correlation (r = -0.029). Statistical results showed no significance between TPA results and CBT scores (P = 0.389). The correlation between the biology entrance exam and CBT scores showed a low correlation (r = 0.115). The higher the biology exam score, the higher the CBT score. Statistical results showed significance between biology exam results and CBT scores (P = 0.001), as shown in Table 2.

The correlation between undergraduate GPA and CBT scores showed the strongest correlation of all variables tested (r = 0.513) and a positive result, meaning that the higher the undergraduate GPA, the higher the CBT scores. Statistical results showed significance between undergraduate GPA and CBT scores (P = 0.000). While the correlation between professional GPA and CBT scores shows a moderate correlation (r = 0.321), and positive results. Statistical results showed significance between professional GPA and CBT scores (P = 0.000), as shown in Table 3.

Multivariate Analysis

The requirement for variables to enter the analysis of the relationship between biology tests and undergraduate and professional GPA is a p-value of 0.05. The variables included in the multivariate analysis are biology test (p value = 0.011), medical undergraduate GPA (p value = < 0.001), and professional GPA (p value = 0.002). All three variables were significant because the p-value was 0.05. After the three variables were pooled, a better R correlation was obtained (R = 0.531). Each one-point increase in the biology test resulted in a 0.035-point increase in CBT. Each one-point increase in medical undergraduate GPA resulted in a 7.926-point increase in CBT, and each one-point increase in professional GPA resulted in a 4.204-point increase in CBT. It can be seen from these results that the medical undergraduate GPA is more influential than the professional GPA and the biology test, as shown in Table 4.

Table 3. Bivariate Analysis: Relationship of TPA, Biology Test, GPA of Medical Undergraduate & Professional to CBT

VARIABLE	TEST	TPA	Biology	Under GPA	Prof GPA
CBT	Spearman's Rho	-0.029	0.115**	0.513**	0.321**
	p-value	0.389	0.001	0.000	0.000

CBT = computer-based test
TPA = academic potential test
Under GPA = undergraduate grade point average
Prof GPA = professional grade point average

Table 4. Multivariate Analysis: Relationship between Biology Test, Medical Undergraduate GPA, and Professional GPA on CBT

Variable	Coefficient B	Standard Error	P-value	R	R Square	P-value Model
Constanta	35.757	3.978	p < 0.001	0.531	0.282	p < 0.001
Biology Test	0.035	0.014	0.011			
Undergraduate GPA	7.926	0.542	p < 0.001			
Professional GPA	4.204	1.334	0.002			

Based on the research findings, there is a correlation between the biology test, undergraduate GPA, professional GPA, and UKMPPD CBT passing results. The results highlight significant relationships among these academic indicators, providing insight into how early academic performance can predict success in professional medical exams.

Relationship between Biology Entrance Screening Test and Academic Potential Test (APT) with UKMPPD CBT

Based on Spearman's rho test, this study showed no relationship between TPA and UKMPPD CBT, with a p-value of 0.389. Meanwhile, the biology test showed a statistically significant relationship with the CBT, with a p-value of 0.001 ($p<0.05$). This research premise is consistent with the previous research findings. The biology test had a correlation coefficient of approximately 0.035. Although the correlation coefficient is low, its statistical significance suggests that performance on the biology test may reflect certain cognitive or knowledge-based skills relevant to the CBT. This implies that subject-specific tests, like biology, might be more predictive of CBT outcomes than general aptitude tests such as the TPA. These findings support the idea that curriculum-aligned assessments could play a more influential role in predicting licensing exam performance and should be considered when designing preparatory strategies for the UKMPPD.

At the end of the doctor's professional education stage, they must pass the UKMPPD, or a nationally standardized doctor competency achievement test, one of which is the CBT. It is a computer-based theoretical exam conducted at the final stage of medical professional education.[14] This test consistently tests cognitive abilities. According to the results of the research, there is no relationship between the TPA and the final results of the UKMPPD CBT. Although TPA and CBT have similarities in assessing students' cognitive abilities, the type of CBT exam is specific clinical knowledge and skills acquired during medical education, and TPA measures general academic potential, such as verbal, numerical, and logical abilities, acquired since high school.[14,22] The lack of correlation between the TPA and UKMPPD CBT scores may be explained by recent research showing that cognitive ability tests are not as predictive as once believed. As Woods and Patterson (2023) argue, these tests often reflect socio-economic background and access to test preparation more than true academic potential. While TPA may assess reasoning skills, it does not fully capture the long-term knowledge, clinical judgment, and academic consistency needed to succeed in the UKMPPD CBT.[22]

The biology entrance exam, which is a selection process for new students, showed a relationship with the UKMPPD CBT. This exam assesses the competence of prospective new students in the science of human biology, which is similar to that tested on the UKMPPD CBT.

The medical school admission selection process tests both cognitive and non-cognitive components to assess prospective students' abilities. Non-cognitive aspects such as personality, attitudes, interests, values, and personal characteristics are assessed, including communication, empathy, leadership, and teamwork skills.[23,24] Cognitive tests are also required to assess problem-solving ability, basic knowledge, and reasoning skills.[24] This selection process is important to ensure success during medical education.[23]

In the United States, prospective medical students must pass entrance exams such as the Medical College Admission Test (MCAT) and Multiple Mini Interviews (MMI). The MCAT is a computerized standardized test that assesses knowledge of biology, chemistry, physics, and reasoning skills aimed at assessing the cognitive abilities of freshmen.[23] Meanwhile, the MMI assesses non-academic abilities through non-medical scenarios to assess conflict resolution, critical thinking, and communication skills.[25]

The selection process at the Faculty of Medicine of Maranatha Christian University uses the Academic Potential Test (TPA) and the biology test. The TPA tests basic knowledge from high school education, such as general knowledge, arithmetic, reasoning, natural science, number series, verbal analogies, shape observation, word groups, and English. TPA assesses the potential for student success based on analytical and logical reasoning power. This potential test is used to select prospective new students based on cognitive abilities that are expected to be positively correlated with student success in higher education.[22] The purpose of TPA is to assess the cognitive abilities of prospective students, especially problem-solving abilities.[22] It helps students evaluate their own learning needs and make wise clinical decisions when they do clinical practice in the future.[26] The biology entrance screening test is used to assess prospective students' competency in human biological sciences, which is essential for study in medical school. In general, the biology entrance selection test serves not only as an academic assessment tool but also as an indicator of a prospective student's readiness to face the challenges of a complex medical curriculum.[27–29]

Relationship between Bachelor of Medicine GPA and UKMPPD CBT

Based on this study, there is a significant relationship between Bachelor of Medicine GPA and UKMPPD CBT, with a p-value of 0.000 ($p < 0.05$). The Bachelor of Medicine GPA has a correlation coefficient of around 7.926. There is a stronger interpretation with a positive direction for the correlation of Bachelor of Medicine GPA with UKMPPD CBT of Maranatha Christian University Faculty of Medicine students who took the UKMPPD Period from 2016 until 2022.

From the research obtained, there is a strong relationship between medical undergraduate GPA and UKMPPD CBT. The magnitude of this relationship is due to the similarity between the undergraduate program and the CBT assessment, which consists of multiple-choice questions that theoretically focus on the cognitive domain. Thus, a medical undergraduate's GPA can be used as a good predictor of UKMPPD results. According to Rezki et al.'s research, medical undergraduate GPA has a strong interpretation and positive direction.[30] The higher the two pre-clinical GPA scores, the higher the UKMPPD CBT score. Other studies, such as Febrianti et al., also mentioned that the GPA and CBT scores of students have a significant relationship.[31] The magnitude of this relationship is because CBT and GPA tend to focus on the cognitive domain.[11,14]

Relationship between Professional GPA with UKMPPD CBT

Based on this study, there is a significant difference between the professional GPA and UKMPPD CBT, with a p-value of 0.000 ($p < 0.05$). Professional GPA has a correlation coefficient of around 4.204. The relationship between the Professional GPA and the UKMPPD CBT at the Faculty of Medicine, Maranatha Christian University, who participated in the UKMPPD period from 2016 to 2022, was found to be significant and positive.

The research shows that there is a relationship between GPA and UKMPPD CBT. The existence of this significant relationship may be due to the fact that students in the professional period are more emphasized on clinical skills, but students still have to understand the theoretical aspects of clinical skills obtained in each phase. In addition, consuls and residents at the doctor's professional stage also teach material that has been obtained previously during academic education. At this clinical stage of the medical profession, students are exposed to actual situations that they will face every day as doctors. In

the previous medical education or pre-clinical process, students have gained a lot of theory, knowledge, and skills. However, the knowledge gained in class during the pre-clinical period cannot be understood properly until they experience actual situations that require analysis, evaluation, modification, and application of known knowledge.[26] Research conducted by Febrianti et al. showed a significant correlation between GPA and CBT scores.[31] However, the strength of the relationship obtained in this study was lower than the strength of the relationship between undergraduate medical GPA and CBT scores.

Based on the research conducted, it can be concluded that the biology entrance examination, undergraduate GPA, and professional GPA have an influence on the UKMPPD CBT. The strongest relationship among the three is the undergraduate GPA. This study shows that undergraduate GPA has a stronger correlation with CBT scores than professional GPA. Success in facing the UKMPPD is also influenced by various factors, such as internal and external factors.[15,17] Internal factors include academic skills and abilities, health, and self-confidence, while external factors include the quality of education received, practice experience, supportive practice environment, and appropriate teaching process.[15,17] Factors such as cognitive academic skills, pre-entry skills, learning style, undergraduate academic performance, and understanding of biomedical basic sciences also influence UKMPPD success.[7,9,10,15]

GPA remains important as an indicator of academic achievement or as a predictor of the success of the UKMPPD CBT final score.[30] The higher the GPA of medical graduates, the higher the success and value of the UKMPPD CBT.[31] For this reason, it is necessary to pay attention to student performance during the medical undergraduate education period to create a good GPA. To create a good GPA value, it is important for every student to know their learning abilities, self-characteristics, learning environment, learning attitudes, and strong motivation can show a relationship with academic success.[30]

From the research that has been done, the biology entrance exam can determine the success of the UKMPPD CBT, but it does not play a strong role like the undergraduate medical GPA. The test is given in the form of human biology, which is the basic knowledge to understand medical science. Therefore, the biology entrance exam can be used to select new students who are also likely to succeed in the UKMPPD CBT. In addition, the TPA is needed because it aims to select prospective students who can solve problems well. This plays an important role in the learning process, namely facilitating the learning of basic medical material, and appropriate academic achievement also reduces misunderstanding of material concepts in the learning process.[22,24,32]

This study has several limitations. It was conducted at a single institution, which may limit the generalizability of the findings. As a retrospective analysis using secondary data, it relied on the accuracy and completeness of existing records. The study did not include non-cognitive factors such as motivation or stress, which may also influence UKMPPD performance. Additionally, the correlational design prevents any conclusions about causality, and potential confounding variables were not controlled.

CONCLUSION

From this study, it can be concluded that there is a significant relationship between medical undergraduate GPA and UKMPPD CBT, with a strong positive correlation compared to the relationship between GPA and biology entrance examination with UKMPPD CBT. In addition, the results also show that there is no relationship between TPA and UKMPPD CBT.

RECOMMENDATIONS

- The selection process for new Faculty of Medicine students requires testing of non-cognitive aspects to improve success during medical education.
- The quality of evaluation during pre-clinical and clinical education needs to be improved as GPA becomes a predictive indicator of UKMPPD CBT pass.

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COMPETING INTEREST

The authors declare that there are no competing interests related to the study.

LIST OF ABBREVIATIONS

UKMPPD : *Indonesia Medical Doctor National Competency Examination*
CBT : *Computer-Based Test*
GPA : *Grade Point Average*
TPA : *Test Potential Academic*

KONTRIBUSI PENULIS

Fen Tih – conceptualization and designing the research.

Wenny Waty – design and develop the research proposal.

Melya Ikbar Rizamena – data collection and paper drafting.

Ardo Sanjaya – data analysis and interpretation.

Julia Windi Gunadi – data collection and paper drafting.

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