Pak. j. life soc. Sci. (2024), 22(2): 22810-22820 E-ISSN: 2221-7630;P-ISSN: 1727-4915

Pakistan Journal of Life and Social Sciences
www.pjlss.edu.pk

https://doi.org/10.57239/PJLSS-2024-22.2.001623

RESEARCH ARTICLE

Educational Big Data Mining: The Analysis of Academic Performance Impacts on Quality of Life

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ARTICLE INFO

Received: Sep 20, 2024

Accepted: Nov 5, 2024

Keywords

Academic Performance

Quality of Life

Human Health

Depression

Stress

Education

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ABSTRACT

Academic performance (AP) is one of the most important things for a student, as it can determine the future of the student, but AP also may have effects on quality of life. With the CGPA of students dropping in recent years, how much of a toll is taken on their quality of life? This study analyzed the relationship between academic performance and quality of life, together with having health insurance as a mediator variable using big dataset ICPSR (>90,000 sample size, 10237 variables, 42 datasets) using SPSS, PROCESS macro to perform correlation and mediation analysis. The result shows that most academic performance is negatively correlated with quality of life. Due to the results show that academic performance is negative correlates with general health, depression, and satisfaction with life, but positive correlates with having unpaid loan and having saving account and the mediator role as having health insurance. Next, there is a result also shows that the positive direct and indirect effect between academic performance and savings account and has unpaid loans, while there is a negative direct and indirect effect between academic performance and the last 7 days were depressed, general health, and satisfied with life. This study is crucial in alerting society in this digital age to the importance of good academic performance, as it affects quality of life. Health insurance also mediates relationships, and this provides information to society on the challenge of securing health in the digital age.

INTRODUCTION

In this modern digital era, academic performance plays an important role in securing your future, especially in this world of rapidly evolving digital technology. With an excellent academic result, many benefits are acquired in future quality of life. For example, it has greater potential to secure a financially stable job with a great result so that we can live in better surroundings [1]. Other than that, great results can also greatly increase our own reputation with others. Wider connections through social networks can be made which help to build a more sustainable friendship relationship, and this brings greater satisfaction in life. However, having bad academic performance could lead our life to a totally different path compared to having great results. Poor academic performance can lead to depression in the future [2]. It is because of them that they could not find a financially stable job

and must worry every day about their finances, families, and future. In addition to that, bad results can also lead to the withdrawal of government funding. In the worst case, students have to pay past loans after graduation if they are unable to pass their exams. Having unpaid loans only adds to the stress in our life.

The CGPA among students today is decreasing. According to the registrar office at the University of Wisconsin-Madison, the overall CGPA of undergraduates dropped from 3.477 in 2021 to 3.392 in 2022 with a total drop of 0.085 over 1 year [3]. With this drop in CGPA, student mental and physical health is also affected. Students may be stressed or fall into depression when their CGPA drops. With high levels of stress and depression, they will not be able to sleep well and their mind and body will be affected by this; hence their quality of life will be worse. They may also not have the will to do any physical activities with increased chances of binge eating, so their physical health may deteriorate [4]. With the support of this article, research indicates that students with a higher CGPA have higher levels of stress tolerance [5].

With the background and problem statements stated in the previous discussion, this study aims to use big educational data mining and data analytics in analyzing the potential impacts of academic performance on quality of life through large population responses (big data). The large population ensures generalization of the result worldwide.

LITERATURE REVIEW

Research conducted in 2018 stated that students with a higher CGPA are more depressed than students with a lower CGPA. The results show that 18% of students with CGPA lower than 3.5 are in severe depression, whereas there are 31% of students who have CGPA higher than 3.5 that are in severe depression. This is due to constant study and worrying about exams and results [6]. But not all research indicates that students with higher CGPA have higher levels of depression. A study conducted with pharmacy students in 2020 states that pharmacy students with CGPA between 2.00 and 2.99 had a higher mean depression compared to students with CGPA between 3.50 and 4.0 [7]. Students are much happier and less depressed when they achieve good results in their mathematical, language, and science subjects. In this article, they mention that happiness and education are properly and intimately connected [8]. Students with a lower CGPA may have a hard time finding a high-paying job when they grow up and may not have enough money to buy health insurance, as many people think health insurance is too expensive [9]. When the Covid 19 pandemic occurred, online learning was introduced. With this sudden change in the learning method, many students did not accept this method well. Some students are not used to using a computer and the internet, but were forced to learn it while also keeping up with their studies. This led to discomfort and agitation among the students. These students eventually saw their grades fall and their performance weaker compared to physical class. They would also be stressed when they submitted their homework or assignments online because they were afraid that their teachers would not receive their work on time. They would often call and send messages to the instructor to ensure that the teacher had received their assignment [10]. As for the other students that are used to using the computer, they received this method well and prefer this over the physical class. This is because they are in the comfort of their homes and do not have to leave the house to study [11].

Research conducted in 2021 stated that students who have a higher CGPA and study the latest year of study are more easily burnout, the CGPA between 3.5 and 4.0 has a 0.7% higher rate of burnout compared to the CGPA less than 3.49 and the third-year student has the highest rate of burnout, which is 66%. [12]. The research conducted in 2019 also stated that students with CGPA between 3.0 and 3.5 have greater stress compared to CGPA less than 3.0 because they may need a higher CGPA to maintain their scholarship [13]. But not all research states that the student in the latest study year and with a higher CGPA will have poor general health. In the article for 2020, it stated that the student in year one has a higher mental health problem compared to the other year because they were not

yet familiar with the study style in the colleges [14]. In 2021 research also stated that the student with a CGPA between 2.0 and 2.5 has a higher stress level compared to the student who has a higher CGPA [15]. There is also an article in which the student who has a low CGPA is stated to have more stress on the exam. Stress cause of heart rate, blood pressure, depression, and aryl esterase [16].

Grade point average (GPA), which represented the quality performance of a student for a certain or all academic action in studying, was a grading system recognized by the world. Failure and success are important in the calculation of GPA [17]. Academic performance is closely related to saving accounts and was a point of inspiration for future research [18]. To receive scholarships while studying, a higher GPA is required to be eligible [19]. These types of scholarships often provide money for students who are used to paying college or university study fees or are kept in a savings account, which is also another type of investment [20]. The scholarship can also be used to buy health insurance, as there are 20.3% of Americans who do not have health insurance, that is, about 45 million people [21]. They will think that buying a health insurance plan is a way to add stress to their finances as it is an extra charge and it is too expensive to cover your health [22]. The purpose of having health insurance is to provide access to medical care, protection against high unexpected costs, and economic stability for a person [23]. Extra money may be kept in a savings account for future use.

The overall failure index in all years has been affecting students who have unpaid loans. The reason behind it was that the students did not manage to pass all the subjects in their own course. Due to failing any of the subjects, the student's scholarship and tuition aid fee will be removed from their courses. This will cause students to be unable to pay their university / tuition fees in the upcoming semester. However, most students choose to drop out of their studies after realizing the huge debt that has accumulated. Research has shown that students with average academic performance will increase tuition subsidies and mitigate the risk of dropping out and increase the completion of their degree [24]. In addition to that, studies have shown that student debt is affected by academic performance [25]. Next, nonperforming loans, aka NPL, showed a significant positive relationship with graduate employees. It is due to poor performance; therefore, even the bank denied aiding students [26].

In addition, stress is also one of the reasons students have unpaid loans. The higher the level of education, the more stress students will have in their mind with the slowly increasing debt. Students with poor overall examination performance tend to worry about their finances and have higher debt due to high stress fatigue. Students with stress could not even concentrate on studying, they have their mind concentrated on the exam [27]. Lastly, students who have a lower attendance rate can be banned from the exam and will not be able to score on the exam and must resit the exam [28].

There is research that has examined the relationship between academic performance and life satisfaction. Although some studies suggest that greater happiness in life is associated with better academic performance, others do not report no significant association. In recent years, researchers have begun to explore the relationship between satisfaction with life as a whole and academic achievement throughout all years of education, including college and university. This review of the literature aims to examine existing research on the relationship between satisfied with life as a whole and GPA in all years of education and to give a clear picture of what we currently understand about this topic.

Few studies have examined the relationship between CGPA and satisfaction with life as a whole. According to a study, students with a higher CGPA reported having better life satisfaction than those with a lower CGPA [29]. Another study conducted in 2019 stated that the student will have a high level of happiness if they receive higher academic achievements through their CGPA. This is because the student may hit the target they want [30].

Other factors have also been found to influence the relationship between CGPA and satisfaction with life as a whole. For example, violence in the family, such as intra- and extrafamily violence, has been found to affect school performance [31]. Research has also shown that there is no significant relationship between academic success and overall satisfaction with life. This is because happiness in life is not only affected by academic achievement and is affected by the environment, personality characteristics, and family relationship [32]. There were some effects when the student has low life satisfaction, which is depression and anxiety; the research stated that the relationship between life satisfaction and depression is negative, which means that the lower life satisfaction, the higher depression and anxiety [33].

Based on the literature review conducted in the previous sections, this study aims to test the following hypotheses that are constructed based on the conceptual framework of Figure 1.

H1: Academic performance is negatively with past 7 days of depression.

H2: Academic performance is negatively with General Health

H3: Academic performance is positively correlated with Has Saving Account.

H4: Academic performance correlates positively with having unpaid loans.

H5: Academic performance is negatively with satisfied with life as a whole

H6: Have health insurance mediated the relationship between academic performance and past 7 days were depressed

H7: Months of health insurance mediates the relationship between Academic Performance and general health

H8: Have health insurance mediated the relationship between academic performance and Has Saving Account.

H9: Having health insurance mediates the relationship between academic performance and having unpaid loans.

H10: Having health insurance mediates the relationship between academic performance and satisfied with life.

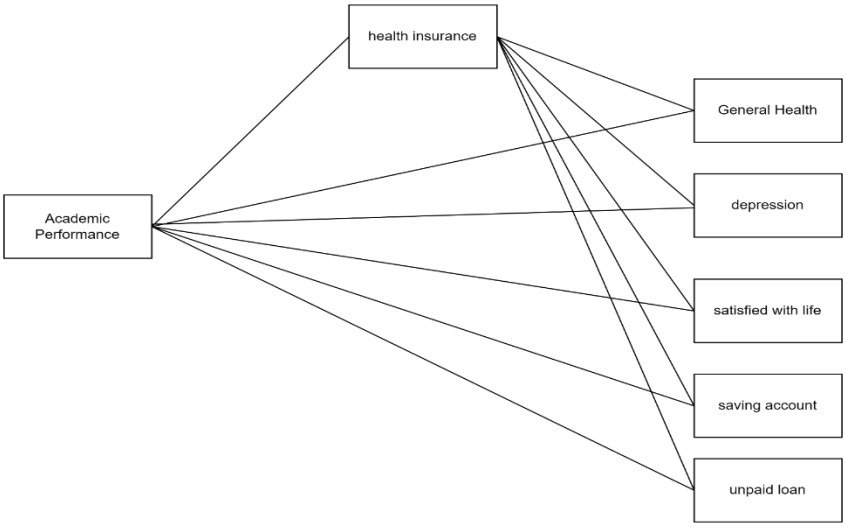

Figure 1. Conceptual framework of the study.

RESEARCH METHODOLOGY

In this research, two of the most relevant datasets are selected from ICPSR datasets - DS8 demographic and DS16- education. SPSS is used to merge both data sets and clean them up. A total of 177 variables are shown in the final data set table. In the demographic category, there are 134 variables and 42 variables in education. Due to the Demographic data set having 3517 variables, which is too many variables for this study,200 variables will be analyzed and cleansed. In cases with more than 10 variables, the missing data will be removed. The variable will be removed if the variable has more than 30% missing (Figure II). The number of cases after analysis and cleaning is 3517. A different value will be replaced if the variable has a missing value. For example, the CGPA with the missing values 9995 is replaced by the mean value. The next step is to filter related variables from the merged data sets to test hypotheses (Table I).

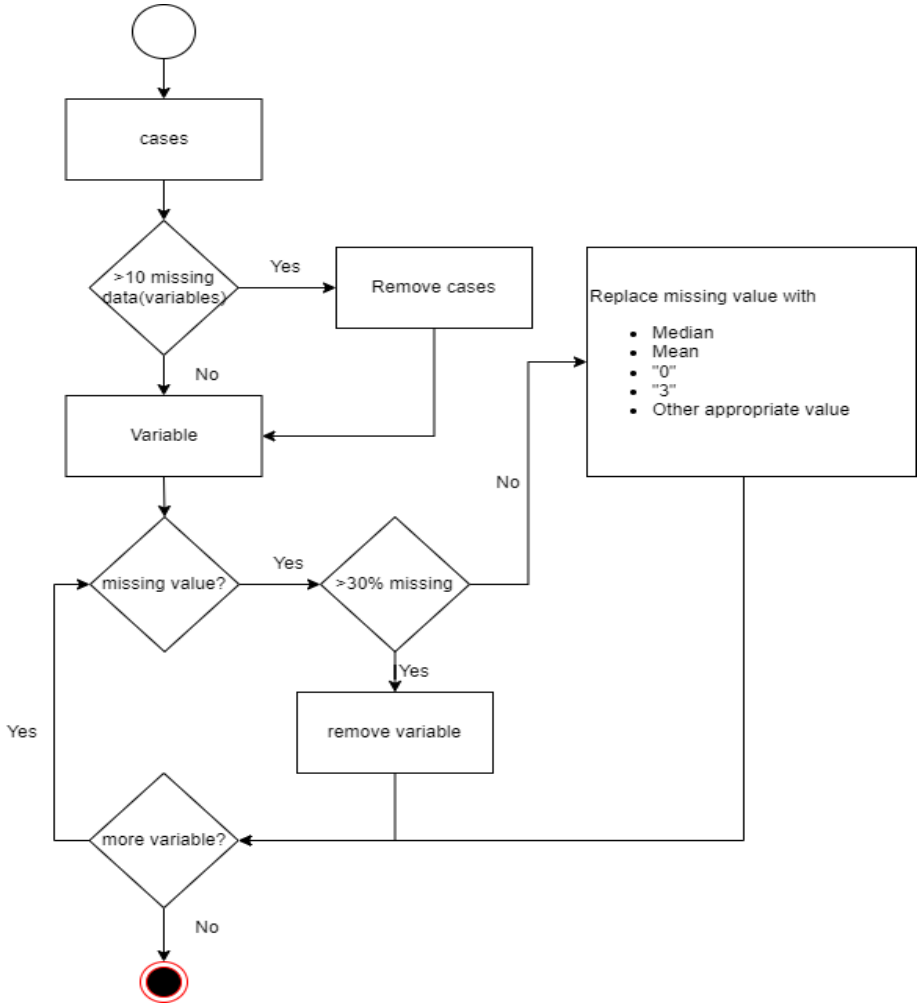

Figure 2. Data cleansing and transformation process.

Table 1. Related variables in this study.

AID	Variable	Questionnaire
DS8 – Demographic	Past 7 Days were depressed	You were depressed, during the past seven days. 0 (0) Never/rarely 1 (1) Sometimes 2 (2) A lot of the time 3 (3) Most of the time/all of the time

	General Health	In general, how is your health? 1 (1) Excellent 2 (2) Very good 3 (3) Good 4 (4) Fair 5 (5) Poor
	Has Savings Account	Do you have a savings account? 0 (0) No 1 (1) Yes
	Has unpaid loans	Do you [if the respondent is married, add: or your {HUSBAND/WIFE}] have any student loans or other educational loans that have not yet been paid? 0 (0) No 1 (1) Yes
	Satisfied with life as a whole	How satisfied are you with your life as a whole? 1 (1) Very satisfied 2 (2) Satisfied 3 (3) Neither satisfied nor dissatisfied 4 (4) Dissatisfied 5 (5) Very dissatisfied

IBM SPSS 23.0 is used to perform descriptive statistics and correlation analysis. The mediation analysis is performed with macro-PROCESS v4.3. Examination of indirect effects is performed under bootstrapping 5000 bootstrap resamples in mediation models. The value of non-zero values in the confidence intervals implies a significant indirect effect.

RESULT

Demographic

There are a total of 3517 respondents that are valid after cleansing and transformation in this analysis. There are 46% men and 54% women in this analysis, and most of the respondents are 22 years old, which is 18.2% of the total respondents. There are 0.3% of the respondents who state that they have poor general health, while 75.7% of the respondents who have never been in depression (Table 2).

Table 2. Demographics of the respondents

		Frequency	Percent (%)
Gender	Male	1618	46.0
	Female	1899	54.0
Age	18	27	0.8
	19	390	11.1
	20	556	15.8
	21	561	16
	22	639	18.2
	23	611	17.4
	24	527	15
	25	167	4.7
	26	30	0.9
	27	9	0.3
Total respondents		3517	100

Based on Table 3, the result of the correlations, academic performance has a negative correlation with general health (-0.116, p < 0.000), past 7 days were depressed (-0.012, p < 0.000), and satisfied with life (-0.171, p < 0.000). However, the remaining results that correlate with positive correlation are unpaid loans (0.095, p < 0.000) and having a savings account (0.202, p < 0.000). Then, the result also shows that academic performance is positive in relation to the mediator role of having health insurance (0.255, p<0.000).

Table 3. Pearson correlation analysis of IV and DV

Variable	M	SD	1.	2.	3.	4.	5.	6.
1. General Health	1.94	0.84	-	-	-	-	-	-
2. Past 7 days were depressed	0.31	0.604	-	-	-	-	-	-
3. Has Unpaid Loans	0.35	0.478	-	-	-	-	-	-
4. Satisfied with life	1.78	0.783	-	-	-	-	-	-
5. Has saving account	0.67	0.470	-	-	-	-	-	-
6. Have Health Insurance	9.14	4.608	-0.094 **	-.012 **	0.095 **	-0.171 **	0.202 **	-
7. Academic Performance	13.17	3.67	-0.116**	-0.126 **	0.28 **	-0.128 **	0.137 **	0.255 **

NOTE: M = MEAN; SD = STANDARD DEVIATION, P<0.01**

Mediation Analyses

Based on Table 4, the direct effect of academic performance and the last 7 days were depressed is -0.0168 and the significance value is -0.126; therefore, the first hypothesis (H1) is supported. Based on Tables III and IV, the indirect effect of academic performance and the last 7 days was depressed is -0.004, 95% CI -0.0057, -0.0023 and the significance value is -0.126. The second hypothesis (H2) is supported. Based on Tables III and IV, the direct effect of academic performance and general health is -0.0224 and the significance value is -0.116. The third hypothesis (H3) is also supported. Based on Table 4, the indirect effect of academic performance and general health is -0.004, 95% CI is -0.0062, -0.002, and the significance value is -0.126. The fourth hypothesis (H4) is supported. Based on Tables III and IV, the direct effect of academic performance and having savings account is 0.0547 and the indirect effect is 0.0252, 95% CI 0.0197, 0.0313 and the significance value is 0.255. The fifth hypotheses (H5) and the sixth (H6) are also supported. Based on Table III and IV, the direct effect of academic performance and having unpaid loans is 0.1762, the indirect effect is 0.0041, 95% CI at -0.0012, 0.0096 and the significance value is 0.28. The seventh hypotheses (H7) and the eight hypotheses (H8) are supported. Based on Table III and IV, the direct effect of academic performance and satisfaction with life is -0.0193 and the indirect effect is -0.0081, 95% CI 0.0104, -0.0059, and the significance value is -0.128. The ninth hypotheses (H9) and the tenth (H10) are supported.

Table 4. Mediation Analysis Results.

IV	M	DV	Direct effect	Indirect Effect (95%)
AP	HI	GH	-0.0224	-0.004(-0.0062, -0.002)
AP	HI	PD	-0.0168	-0.004(-0.0057, -0.0023)
AP	HI	UL	0.1762	0.0041(-0.0012, 0.0096)
AP	HI	SL	-0.0193	-0.0081(0.0104, -0.0059)
AP	HI	SA	0.0547	0.0252(0.0197, 0.0313)

Note: AP-Academic Performance; HI-Health Insurance; M-Mediator; GH-General Health; PD-Past 7 days were depressed; UL-Has unpaid loans; SL-satisfied with life as a whole; SA-Has savings account

DISCUSSION

Based on the research conducted by Yusof, the first hypothesis (H1) is the same as their research. In their research, they stated that students with a lower CGPA have a higher mean depression compared to students with a higher CGPA, which is the same as the first hypothesis (H1) that states that academic performance has a negative correlation with the past 7 days of being depressed. Meanwhile, according to Adnan Hashim, the second hypothesis (H2) is also the same as their research. In their research, they stated that students with a lower CGPA have a higher stress level compared to students who have a higher CGPA, which is the same as the second hypothesis (H2), which states that academic performance correlates negatively with general health.

Based on the research conducted by Elliott, the third hypothesis (H3) is the same as their research. In their research, they stated that students with a high CGPA will most likely have a scholarship and therefore can save their scholarship money in their savings account, which is the same as the third hypothesis (H3), which states that academic performance correlates positively with having a savings account. As there is no previous research or result to support the fourth hypothesis (H4), this hypothesis is a new result in this research. According to this study, academic performance was positively correlated with having unpaid loans because if the student has a higher overall failure rate, they may need to retake more and more subjects, resulting in their student loans increasing as the more subjects the student must retake. The same applies to H5, which has no similar previous research or results. Based on this study, academic performance correlates negatively with life satisfaction because if they have a higher CGPA, they may need to work harder to achieve their desired CGPA; therefore, they will have a higher stress level and may not be satisfied with their life as they may be dealing with stress and depression.

CONCLUSION

The study conducted highlighted both the existence of a conditionality in obtaining a high quality of life due to lack of academic performance and the mediating role of having health insurance. Based on the recorded results of the analysis, students should not be too stressed about their academic performance to reduce the chances that they have health insurance, which will consequently increase their quality of life. Stressing to achieve better academic performance can negatively impact student lives. Therefore, students must find a middle ground to achieve good academic performance and maintain a good and healthy quality of life. The study focuses on the interdependence between achieving good academic performance and quality of life through health insurance. The results obtained from this research showed that having health insurance is negatively related to quality of life. For example, students will need to focus on their academic performance to determine whether they can have health insurance, and it will affect their quality of life. To achieve a better quality of life, such as having less stress and enjoying your life, control of whether a student needs health insurance is necessary [34].

The limitation of this study is that quality of life is too broad of a concept for us to cover all together in this study. There are many more aspects of quality of life that are affected by academic performance that can be included in future studies. There is also a time constraint as there was little time to conduct this research; thus, this research only covers a few aspects of quality of life that are affected by academic performance. We may need to conduct more interviews with students from different backgrounds and educational levels so that more studies and research can be done to fully understand the effects of academic performance on student quality of life.

ACKNOWLEDGEMENT:

The authors acknowledge researcher Mr. Francis Lim Jia Hong for his efforts in carrying out data analysis for this research.

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