

# EVALUATION OF DEPRESSION CRITERIA USING ANALYTIC HIERARCHY PROCESS: A CASE STUDY ON UNIVERSITI MALAYSIA SABAH SCIENCES' SCHOOLS

ASDALIFAH TALIBE\*, ZATURRAWIAH ALI OMAR & TONG SIN BEI

School of Science and Technology, Universiti Malaysia Sabah, 88400 Kota Kinabalu, Sabah, Malaysia.

\*asdalifah@ums.edu.my

*Depression has been ranked by the World Health Organization (WHO) as the fourth most disabling disease in mental health problems. The aim of this study is therefore to determine the most common criteria of depression among students from five sciences' schools in Universiti Malaysia Sabah by using Analytic Hierarchy Process (AHP). The criterion was based on Beck Depression Inventory (BDI) I. There were three main criteria and were broken down into several sub-criteria in detail. The main criteria were negative attitudes towards self, performance impairment and somatic disturbances. Data were analysed using Statistical Package for Social Sciences (SPSS) Version 19. The results showed that the collected data were random (run test of median = 0.247, mean = 0.087) and normally distributed (Shapiro-Wilk test = 0.326). The Cronbach's alpha was 0.901 indicated that the questionnaire was reliable. The results of this study indicated somatic (bodily) disturbance and insomnia with the same relative weight of 0.4111 were the most common criteria and sub-criteria of depression for all school and also for different schools. Since all the consistency ratios were less than or greater than 0.1, the levels of consistency were acceptable.*

**KEYWORDS.** Depression, Analytic Hierarchy Process, selection criteria

## INTRODUCTION

Currently, mental illness is one of the hot issues in the psychology field. Malaysian Psychiatric Association reports that the number of people diagnosed with mental illness in Malaysia has increased. Even statistics from the 2011 National Health and Morbidity Survey shows that 12% of Malaysians aged between 18 and 60 years were diagnosed with mental illness (National Institute for Mental Health, 2011). One of the common mental illnesses is depression which is the fourth most disabling disease in the world according to the World Health Organization (WHO) and Ellen *et al.* (2007) identifies it as the first leading mental health disorder. In fact, there are about 400 million people worldwide suffering from depression and 3000 of them committed suicide every day (Malaysian Psychiatric Association, 2006).

Depression is normally diagnosed during adolescence period. University or college students fall under this category, thus concluding the suitability of respondents for this study. Ahmed *et al.* (2009) recognised the need and examined the prevalence of depression and anxiety among medical students and medical staff in Dubai, UAE. The researchers

concluded that, “crying” and “fear” of the worst happening” is the most common depressive and anxiety symptom respectively. There are also some researches done in identifying the relationship of depression with some related factors among students. Among them is Regestein *et al.* (2010), who reviewed the relationships between sleeping habits and depressive symptoms. They concluded that students who face trouble sleeping have higher depression scores. Melissa-Halikiopoulou *et al.* (2011) and Reyes-Rodríguez *et al.* (2012) reviewed the relationship between the suicidal ideation and depression. Both studies show a consistent result that higher level of depression increases the level of suicidal tendency. Based on these findings, we determine the objective of this study is, to find the most common criteria of depression using Analytic Hierarchy Process (AHP) method. AHP is multi-decision technique that structures a problem into a hierarchy. Due to its extensive used in psychology field, AHP had been chosen to evaluation depression among UMS students.

## MATERIALS AND METHODS

### AHP questionnaire

An AHP questionnaire was constructed based on pairwise comparison scale of the Beck Depression Inventory (BDI) I (Shafer, 2006). The respondents of this study were Universiti Malaysia Sabah students from five sciences’ schools, including School of Science and Technology (SST), School of Medicine (SPU), School of Engineering and Information Technology (SKTM), School of Food Science and Nutrition (SSMP) and the School of International Tropical Forestry (SPTA). There were three criteria, negative attitudes towards self, performance impairment and somatic (bodily) disturbance. Each of these criteria was broken down in details into several sub-criteria as in Table 1.

The “negative attitudes towards self” consisted of eleven sub-criteria, but three (sense of failure, guilty feeling and self-hate) was omitted from the questionnaire based on the study conducted by Ahmed *et al.* (2009). One of the sub-criteria in “performance impairment” which, was related to sex, was also excluded due to a particular culture in Malaysia. Similar approach also had been conducted by Simin and Zahra (2011). The sub-criteria “assesses work difficulty” was modified to assess the homework or examination difficulty and students’ attendance. This was to adapt the question to reflect students’ life. In this study, homework referred to assignments, tutorials and quizzes. The sub-criteria of the component “somatic disturbance” was maintained just like the original BDI-I. Table 1 shows the criteria and its sub-criteria together.

**Table 1:** Depression's Selection Sub-criteria.

Criteria	Sub-criteria
A: Negative attitudes towards self	A1: sadness A2: pessimism A3: crying A4: self-accusation A5: suicidal thoughts or wishes A6: punishment feelings A7: lack of satisfaction A8: body image
B: Performance impairment	B1: tiredness B2: irritability B3: indecisiveness. B4: somatic concern B5: social withdrawal B6: homework difficulty and attendance
C: Somatic (bodily) disturbance	C1: insomnia, C2: changing in appetite C3: loss in body weight

### Data Analysis

The reliability test of the questionnaire was analysed using SPSS Version 19. The results showed that the collected data were random (run test of median = 0.247, mean = 0.087) and normally distributed (Shapiro-Wilk test = 0.326). The Cronbach's alpha was 0.901 indicating that the questionnaire was reliable. Cronbach's alpha was used to measure the internal consistency of the data. Analysis of the demographic data was then carried out based on gender, race, religion, school and year. In AHP approach, a pairwise comparison matrix can be constructed by comparing each criterion in the row that corresponded to each criterion in the column. The diagonal elements were assigned to 1. The element of any columns that was greater than its row was the reciprocal of the element of row greater than column. Letting  $a_{ij}$  to define the element  $(i, j)$  of matrix  $A$ , a  $n \times n$  pairwise comparison matrix was constructed as in formula (1).

$$A = \begin{pmatrix} 1 & a_{12} & a_{13} & \dots & \dots \\ \frac{1}{a_{12}} & 1 & a_{23} & \dots & \dots \\ a_{13} & a_{23} & 1 & \dots & \dots \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ \frac{1}{a_{1n}} & \frac{1}{a_{2n}} & \frac{1}{a_{3n}} & \dots & \dots \\ a_{1n} & a_{2n} & a_{3n} & \dots & \dots \end{pmatrix} \quad (1)$$

The core of AHP was to determine the relative weights. By referring to Taha (2007), the relative weights of each criterion are determined from a pairwise comparison matrix **A** by normalizing it to become a new matrix. The steps to obtain the relative weights are:

- a) Divide the elements of each column by the sum of the elements of the same column to obtain a new matrix, *N* by using formula (2):

$$\frac{a_{ij}}{\sum_i^n a_{ij}} \quad (2)$$

where *i* is the row and *j* is the column of the matrix.

- b) The new matrix obtained (normalized matrix, *N*)

$$N = \begin{pmatrix} w_1 & w_1 & \dots & \dots \\ w_2 & w_2 & \dots & \dots \\ \vdots & \vdots & \vdots & \vdots \\ w_n & w_n & \dots & \dots \end{pmatrix} \quad (3)$$

- c) Then, compute the row average by sum the elements of each row, then divided with the total criterion of that particular row.
- d) Compute relative weight for each criterion, *w* by using formula (4):

$$w = \frac{1}{n} \sum_{j=1}^n \frac{a_{ij}}{\sum_i a_{ij}} \tag{4}$$

where  $n$  is the number of criteria and  $i = 1, 2, \dots, n$ .

The consistency of criteria and sub-criteria were calculated using the pairwise comparison matrix and relative weights. According to Taha (2007), the coherent judgment in decision making towards the pairwise comparisons was indicated by the consistency. Taha stated an upper limit of 10% on the consistency ratio (CR). If the CR value was less than or equal to 10%, the judgment of pairwise comparison matrix was acceptable. Otherwise, the judgment matrix needed to be improved (Saaty, 1990). Consistency ratio is calculated by using formula (5) in order to check the acceptability of the level of inconsistency.

$$CR = \frac{\frac{n_{max} - n}{n - 1}}{\frac{1.98(n - 2)}{n}} \tag{5}$$

## RESULTS AND DISCUSSION

There were 543 respondents participated in this study (male = 182, female = 362). Among the respondents, there were 198 Malays, 190 Chinese, 24 Indians and 131 other races (Rungus, Sino-Kadazan, Dusun, Kadazan, Suluk, Siamese, Bidayuh, Sino, Bajau, Bugis, Iban, Brunei, Eurasian and Melanau). Meanwhile, there were 231 Muslims, 145 Buddhists, 139 Christians, 24 Hindus and 4 other religions (Taoism and Atheism). The respondents consisted of 160 first, 172 second, 83 third, 93 fourth and 35 fifth year students. There were in total 88 SST, 126 SSMP, 91 SPTA, 136 SKTM and 102 SPU students. The result showed that the collected data was random (run test of median = 0.247, mean = 0.087) and normally distributed (Shapiro-Wilk test = 0.326). The Cronbach's alpha of 0.901 also indicated that the questionnaire was reliable (Cronbach, 1951). Since the questionnaire was reliable, the relative weights of each criteria and its rank were obtained as shown in Table 2.

**Table 2:** The relative weight of the main criteria.

Main Criteria	Somatic (bodily) disturbance	Performance impairment	Negative attitudes towards self	Weights	Ranking
Negative attitudes towards self	1	2	1/4	0.2611	3
Performance impairment	1/2	1	1/6	0.3278	2
Somatic (bodily) disturbance	4	6	1	0.4111	1

**Table 3:** Weights of sub-criteria A: Negative attitudes towards self

Sub-criteria	A1	A2	A3	A4	A5	A6	A7	A8	Weights
A1	1	2	1	0.5	2	0.5	1	1	0.1226
A2	0.5	1	1	0.5	0.5	0.5	0.5	0.5	0.0753
A3	1	1	1	2	2	0.5	0.5	1	0.1206
A4	2	2	0.5	1	0.5	0.5	0.5	0.5	0.0892
A5	0.5	2	0.5	2	1	0.5	1	0.5	0.1010
A6	2	2	2	2	2	1	2	0.5	0.1791
A7	1	2	2	2	1	0.5		0.5	0.1287
A8	1	2	1	2	2	2	2	1	0.1835

**Table 4:** Weights of sub-criteria B: Performance impairment

Sub-criteria	B1	B2	B3	B4	B5	B6	Weights
B1	1	2	2	2	1	1	0.2311
B2	0.5	1	1	1	1	1	0.1441
B3	0.5	1	1	1	1	1	0.1441
B4	0.5	1	1	1	1	0.5	0.1274
B5	1	1	1	1	1	0.5	0.1460
B6	1	1	1	2	2	1	0.2073

**Table 5:** Weights of sub-criteria C: Somatic (bodily) disturbance

Sub-criteria	C1	C2	C3	Weights
C1	1	1	2	0.4111
C2	1	1	1	0.3278
C3	1	0.5	1	0.2611

The consistency of each criteria and sub-criteria can be calculated from both of the pairwise comparison matrix and relative weights. Table 6 shows that the consistency ratio (CR) value for each criteria and sub-criteria was less than 10%. This means that all matrices of criteria and sub-criteria were acceptable.

**Table 6:** Consistency ratios of criteria and sub-criteria

Criteria	CR	Sub-criteria	CR
A	0.0421	A1, A2, A3, A4, A5, A6, A7, A8	0.058
B		B1, B2, B3, B4, B5, B6	0.0205
C		C1, C2, C3	0.0421

Table 2 shows that, the most common criteria of depression was somatic (bodily) disturbance with relative weight of 0.4111. This may be due to the higher contribution of insomnia where its relative weight was also 0.4111 (Table 5). Stress or worries happen in daily life caused by studies and relationship with family can lead to insomnia. In the long term, students cannot focus and may lead to depression. This was similar to the findings of Regestein *et al.* (2010) that indicate trouble in sleeping will increase Depression Tendency scores. Our result was consistent when the relative weights were obtained separately by different schools. However, this differs from the study done by Ahmed *et al.* (2009) that identify crying is the more common depressive symptoms among medical students. While the second rank of the relative weight is changing in appetite. Changing in appetite causes a person loss in appetite or overeating. Loss of appetite causes students loss energy and thus cannot pay attention in study. This is also associated with loss in body weight. Same goes as overeating, it can lead to depression. Thus, the respondents need pay attention of other depression symptoms to avoid having depression.

Performance impairment with the relative weight of 0.3278 was the second common criteria of depression. This may due to the respondents do not have motivation in performing daily activities. Tiredness with the relative weight of 0.2311 contributes the most under performance impairment. This follows with homework difficulty and attendance, social withdrawal, irritability and indecisiveness and finally somatic concern.

The criterion with the lowest relative weight is negative attitudes towards self with the weight of 0.2611. The main contributor was from the bodily image where concerns of bad appearance might be the cause. This was followed by punished feelings, then lack of satisfaction, sadness, crying, suicidal thoughts, self-accusation and lastly pessimism.

The obtained data is also used to find out the most common component of depression of each school. Table 7 shows the relative weight of main component for each school. The mean values and relative importance for each school can be obtained in in Table 8. The most common component for each school is somatic (bodily) disturbance with the relative weight of 0.4111. This followed by performance impairment and negative attitudes towards self. The result is consistent with the most common component of the overall five sciences schools. This is due to the highly contribution of the sub-criteria with the relative weight of 0.4111. The relative weight of sub-criteria for overall schools and each school are sharing the same relative weight.

**Table 7:** The relative weight of main criteria for five schools

<b>School</b> <b>Criteria</b>	<b>SST</b>	<b>SSMP</b>	<b>SKTM</b>	<b>SPTA</b>	<b>SPU</b>
Negative attitudes towards self	0.2611	0.2611	0.2611	0.2611	0.2611
Performance impairment	0.3278	0.3278	0.3278	0.3278	0.3278
Somatic (bodily) disturbance	0.4111	0.4111	0.4111	0.4111	0.4111

Table 8 summarizes the ranking of the relative weight of somatic (bodily) disturbances for each school. This shows that the most common sub-component of SSMP and SKTM which is changing in appetite are differently with the overall and three other schools. This may be because the students of SSMP and SKTM are taking four year course.

**Table 8:** The relative weight of Somatic (bodily) Disturbances for five schools

<b>School</b> <b>Ranking</b>	<b>SST</b>	<b>SSMP</b>	<b>SKTM</b>	<b>SPTA</b>	<b>SPU</b>
1	Insomnia (0.4095)	Changing in appetite (0.4111)	Changing in appetite (0.4111)	Insomnia (0.4095)	Insomnia (0.4111)
2	Changing in appetite (0.3119)	Insomnia (0.3278)	Insomnia (0.3278)	Changing in appetite (0.3119)	Changing in appetite (0.3278)
3	Loss in body weight (0.1976)	Loss in body weight (0.2611)	Loss in body weight (0.2611)	Loss in body weight (0.1976)	Loss in body weight (0.2611)

## CONCLUSION

AHP is a simple method that decomposes a problem into a hierarchical form so that a complex decision can be made. AHP is normally used when there is a need to solve multi-criteria decision problems. In this study, AHP was chosen to determine the most common criteria of depression among students from five sciences' schools in Universiti Malaysia Sabah. It can be concluded that the main criteria that affected students to be depressed comes from somatic disturbance. Lack of sleeps due to tasks and assignments might lead to insomniac disturbance to some students, hence contributing a disturbance to their normal body functions. This then will affect students' performance impairment (second highest



criteria) and eventually will lead to feeling negative about one self. When the data were analysed for five different schools, SKTM and SSMP did not show a consistent result in the most common sub-criteria. The results for both the schools indicated that changing in appetite was the most common component under the somatic (bodily) disturbance. This may due to the stress or frustration.

## REFERENCES

- Ahmed, I., Banu, H., Al-Fageer, R. & Al-Suwaidi, R. 2009. Cognitive emotions: depression and anxiety in medical students and staff. *Journal of Critical Care*, **24**: 1-18.
- Cronbach, L. J. 1951. Coefficient alpha and the internal structure of tests. *Psychometrika*, **16**(3): 297-334.
- Ellen, S., Selzer, R., Norman, T. & Blashki, G. 2007. Depression and anxiety: pharmacological treatment in general practice. *Australian Family Physician*: **36**(3): 222–227.
- Institute for Public Health. 2011. National Health and Morbidity Survey 2011. Malaysian Psychiatric Association, 2006. Depression. <http://www.psychiatry-malaysia.org/article.php?aid=56>.
- Melissa-Halikiopoulou, C., Tsigas, E., Khachatryan, R. & Papazisis, G. 2011. Suicidality and depressive symptoms among nursing students in northern Greece. *Health Science Journal*, **5**(2): 90-97.
- National Institute of Mental Health, 2011. Depression. <http://www.nimh.nih.gov/health/publications/depression/complete-index.shtml>.
- Regestein, Q., Natarajan, V., Pavlova, M., Kawasaki, S., Gleason, R. & Koff Elissa. 2010. Sleep debt and depression in female college students. *Psychiatry Research*, **176**: 34-39.
- Reyes-Rodríguez, M. L., Rivera-Medina, C. L., Cámara-Fuentes, L., Suárez-Torres, A. & Bernal, G. 2012. Depression symptoms and stressful life events among college students in Puerto Rico. *Journal of affective disorders* (In press).
- Saaty, T.L. 1990. How to make a decision: The Analytic Hierarchy Process. *European Journal of Operational Research*, **48**: 9-26.
- Shafer, A. B. 2006. Meta-analysis of the factor structures of four depression questionnaires: Beck, CES-D, Hamilton, and Zung. *Journal of Clinical Psychology*, **62**(1):123-46.
- Simin, H. & Zahra, G. 2011. A survey Beck test in university students & its relationship between some related risk factors. *Procedia Social and Behavioral Sciences*, **28**: 558-562.
- Taha, H. A. 2007. *Operations Research: An Introduction*. Singapore: Pearson Education International.