

## Statistical Analysis on the Emotion Effects of Academic Achievement

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### Abstract

The purpose of this study is to investigate the emotion effects on academic achievement for university students. The results are as follows. Resulting on the each emotions difference by the statistical variables, anxiety scores by gender showed a significant difference in the  $p < .01$  level ( $F = 7.685$ ). The males anxiety (2.478, standard deviation: 0.180) had significantly lower scores than females (3.076, standard deviation: 0.168). But fear, anger, activity, and sociability scores were not significantly different respectively between male and female students. To see the emotions effect of academic achievement, the analysis method of the linear regression line was used. As the result, anxiety, fear, anger, activity, and sociability did not significantly influence academic achievement. And so unlike previous methods, the analysis method of the quadratic regression curve was used. As the result, anxiety, fear, anger, activity, and sociability showed did significantly influence academic achievement respectively within 5% of statistical significance level, to more than  $F = 3.06$ . Therefore, the values on academic achievement of the each anxiety, fear, anger, activity, and sociability showed a quadratic regression curve. That is,  $[\text{Academic achievement}] = -0.9685 \times [\text{Anxiety}]^2 + 5.1342 \times [\text{Anxiety}] + 8.2679$ ,  $[\text{Academic achievement}] = -1.0638 \times [\text{Fear}]^2 + 5.5694 \times [\text{Fear}] + 7.5635$ ,  $[\text{Academic achievement}] = -1.3497 \times [\text{Anger}]^2 + 9.1284 \times [\text{Anger}] + 0.6720$ ,  $[\text{Academic achievement}] = -1.0589 \times [\text{Activity}]^2 + 7.4386 \times [\text{Activity}] + 1.8272$ ,  $[\text{Academic achievement}] = -1.6830 \times [\text{Sociability}]^2 + 11.2325 \times [\text{Sociability}] - 3.8258$ . Therefore, we were able to determine the following conclusions. First, we were able to predict the degree of academic achievement by the each emotions scale. Second, when the each emotion scores of students was a moderate, the academic achievement was most excellent. So, in order for the students to become higher academic achievement, the maintenance of medium degree of the each emotions scores is required.

**Keywords:** Emotion, Anxiety, Activity, Sociability, Academic Achievement

### 1. Introduction

Helping the emotional stability of the learners and keeping of their appropriate emotions are a very important concerns in academic achievement and education of students. Nevertheless, most workers have considered as dependent outcome variables of academic achievement than as independent variables of the cause about emotions characteristics. People who experience usually repeated success had positive emotions such as satisfaction and hope, but repeated failure had negative emotions such as frustration and inferiority etc<sup>[1]</sup>. When academic achievement was reached by the efforts,

learners had great pride. But when failed by the inability, they felt a sense of shame and depression<sup>[2]</sup>. The more the learner feels great difficulties adapting to the school, it was accompanied by anxiety and depression significantly<sup>[3]</sup>. Maladjusted students of the school had a lot of depression and anxiety<sup>[4]</sup>. Small group under 6 people of teaching showed a more positive effects on emotional development and social development than large group<sup>[5,6]</sup>. The more students with low academic achievement showed higher depressive symptoms<sup>[7]</sup>. The higher the academic achievements of students were, their activities were increased but their emotions of fear and depression were decreased<sup>[8]</sup>.

Each of the above studies have been treated as dependent variables affected such as academic achievement, rather than motivational causes variables to be considered to independent variables for the emotions. In other words, academic achievement has been studying the effects affecting the emotional characteristics variables. The following studies were presented variables of

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emotion are fundamentally independent those of academic achievement. The learners with the shyness and fear was inhibited in their actions. And they had higher risk of maladjustment in school<sup>[9]</sup>. The more depressed students showed a lower ability to learn about the challenges and learning achievement behavior<sup>[10]</sup>. In addition, the more depressed students showed low problem solving-ability about a given task<sup>[11]</sup>. The learning activities of students were able to improve by praise or reward by teachers<sup>[12]</sup>.

As above despite a lot of emotion characteristics by domestic and foreign workers have been studied, quantitative studies of academic achievement by the scale of emotion have been accomplished little until now<sup>[13]</sup>. Therefore, in this paper it is necessary to study between scale of each anxiety, fear, anger, activity, sociability and academic achievement. And this study will be able to provide the basic data for predicting academic achievement in accordance with the scale of emotion characteristics. So, this study sets the following research issues.

First, is there a difference in emotion by gender, grade, and family economic ability? Second, when it is analyzed by a linear regression line to see the effect of emotions on academic achievement, how does emotion affect academic achievement? Third, when it is analyzed by a quadratic regression curve to see the effect of emotions on academic achievement, how does emotion affect academic achievement? Fourth, is it possible to predict of academic achievement by the scale of emotion? Fifth, how much are scales for emotion that make the highest academic achievement?

## 2. Experimental Section

**Subjects.** The subjects in this study was 150 students have completed curriculum and educational evaluation in S university, located in Samho-eup Chonnam. The number of cases is shown in Table 1.

**Measures.** Emotion measurement tool used in this study was a questionnaire developed by Buss and Plomin(1984)<sup>[14]</sup>. Each anxiety, fear, anger, activity, and sociability in sub-variables of emotion inventory was consisted of 4 questions measured on a 5-point Likert scale. Each value of Cronbach's  $\alpha$  was 0.656 about anxiety, 0.688 fear, -0.726 anger, 0.713 activity, and 0.750 sociability. And the coefficient value for the entire reliability was 0.729. In this study to see the emotion characteristics, factors of gender, grade, and family economic ability were used as independent variables and the scales of each emotion as dependent variables, by three-way ANOVA.

## 3. Results and Discussion

### 3.1. Analysis of Emotion Characteristics by Gender, Grade, and Family Economic Ability of Learners

In this study to see the emotion characteristics, factors of gender, grade, and family economic power were used as independent variables and those of each anxiety, fear, anger, activity, sociability in sub-variables of emotion as dependent variables, by three-way ANOVA. The results are shown in Table 2.

The results of analysis by the ANOVA were showed that the scores of anxiety between male students and female had differences significantly in the  $p < .01$  level ( $F = 7.685$ ). And score of male students(2.478, standard deviation: 0.180) were significantly lower than female (3.076, standard deviations: 0.168) about anxiety. In other words, male students tended to worry less experienced than female. Except for score of anxiety, each that of fear, anger, activity, sociability, total emotion was not significantly different between male and female students. The score differences of each anxiety, fear, anger, activity, sociability, and total emotion caused by grade and family economic ability had not differences significantly in the  $p < .05$  level in all emotion variables.

**Table 1.** Ratio of the number of persons by gender, grade, and family economic ability

Classifi.	Grade				Family economic ability			Number	Ratio(%)
	1	2	3	4	Poor	Fair	Good		
Male	29	17	10	10	5	50	11	66	44
Female	14	53	8	9	5	60	19	84	56
Total	43	70	18	19	10	110	30	150	100

**Table 2.** Three-way ANOVA Analysis of Each Emotion by Gender, Grade, and Family Economic Ability of Learners

Emotion	Variable	Sum of squares	Degrees of freedom	Mean square	F
Anxiety	Gender	6.729	1	6.729	7.685**
	Grade	0.295	3	0.098	0.112
	Family economic ability	2.518	2	1.259	1.438
	Gender*Grade	2.896	3	0.965	1.103
	Gender*Family economic ability	2.638	2	1.319	1.507
	Grade*Family economic ability	2.570	5	0.514	0.587
	Gender*Grade*Family economic ability	5.128	3	1.709	1.952
	Error	113.820	127	0.876	
Fear	Gender	0.563	1	0.563	1.004
	Grade	1.701	3	0.567	1.011
	Family economic ability	0.885	2	0.442	0.788
	Gender*Grade	0.650	3	0.217	0.386
	Gender*Family economic ability	2.409	2	1.205	2.147
	Grade*Family economic ability	2.451	5	0.490	0.874
	Gender*Grade*Family economic ability	2.225	3	0.742	1.322
	Error	72.941	127	0.561	
Anger	Gender	0.018	1	0.018	0.051
	Grade	1.793	3	0.598	1.688
	Family economic ability	0.316	2	0.158	0.447
	Gender*Grade	1.059	3	0.353	0.997
	Gender*Family economic ability	0.439	2	0.219	0.620
	Grade*Family economic ability	2.867	5	0.573	1.620
	Gender*Grade*Family economic ability	1.190	3	0.397	1.120
	Error	46.018	127	0.354	
Activity	Gender	0.256	1	0.256	0.598
	Grade	1.985	3	0.662	1.544
	Family economic ability	0.588	2	0.294	0.686
	Gender*Grade	0.564	3	0.188	0.439
	Gender*Family economic ability	0.259	2	0.129	0.302
	Grade*Family economic ability	1.125	5	0.392	0.917
	Gender*Grade*Family economic ability	0.696	3	0.232	0.542
	Error	0.696	127	0.429	
Sociability	Gender	0.089	1	0.089	0.238
	Grade	0.272	3	0.091	0.243
	Family economic ability	1.035	2	0.518	1.390
	Gender*Grade	0.266	3	0.089	0.238
	Gender*Family economic ability	1.214	2	0.607	1.630
	Grade*Family economic ability	1.047	5	0.209	0.562
	Gender*Grade*Family economic ability	1.600	3	0.533	1.431
	Error	48.428	127	0.373	
Total	Gender	0.147	1	0.147	1.041
	Grade	0.354	3	0.118	0.835
	Family economic ability	0.380	2	0.190	1.346
	Gender*Grade	0.234	3	0.078	0.552
	Gender*Family economic ability	0.047	2	0.024	0.168
	Grade*Family economic ability	0.662	5	0.132	0.938
	Gender*Grade*Family economic ability	1.060	3	0.353	2.501
	Error	18.361	127	0.141	

3.2. Analysis of the Relations Between the Emotion and Academic Achievement

**Relationship between anxiety and academic achievement.** As in Table 3 analysing the relationship between anxiety and academic achievement, linear regression line was no significant difference ( $p > .05$ : equation(1)) but the quadratic regression curve was a significant difference ( $p \leq .05$ : equation (2)).

Observing Fig. 1 and Table 3, when the value of anxiety in quadratic regression curve was near a median of 3, scores of academic achievement were generally high. But when more than it is high or low, the academic achievement showed a lower trend. Looking strictly quantitative relationship between anxiety and academic achievement, it was able to get the following equation (2).

$$[\text{Academic achievement}] = -0.2022 \times [\text{Anxiety}] + 14.7427 \quad (1)$$

$$[\text{Academic achievement}] = -0.9685 \times [\text{Anxiety}]^2 + 5.1342 \times [\text{Anxiety}] + 8.2679 \quad (2)$$

Therefore as shown in quadratic regression curve of Fig. 1 and equation (2), when the value of anxiety have had that of the medium, it can be seen that academic achievement is good.

**Relationship between fear and academic achievement.** As in Table 4 analysing the relationship between fear and academic achievement, linear regression line was no significant difference ( $p > .05$ : equation(3)) but the quadratic regression curve was a significant difference ( $p \leq .05$ : equation (4)).

Observing Fig. 2 and Table 4, when the value of fear in quadratic regression curve was near a median of 3, scores of academic achievement were generally high. But when more than it is high or low, the academic achievement showed a lower trend. Looking strictly

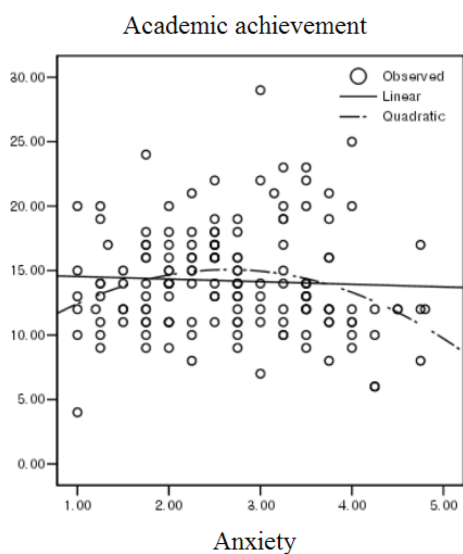


Fig. 1. Plot of anxiety for achievement.

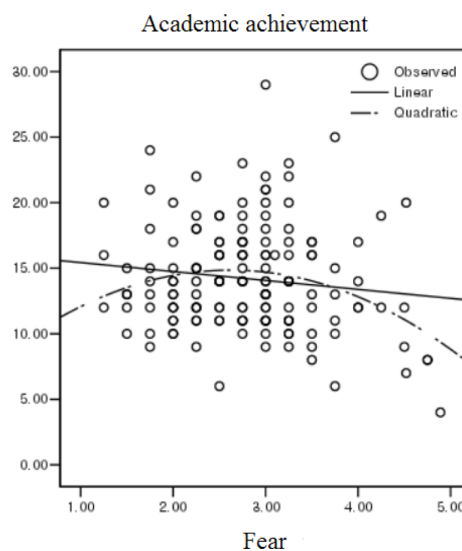


Fig. 2. Plot of fear for achievement.

Table 3. Test on goodness of fit for academic achievement by anxiety

Classification	R <sup>2</sup>	df.	F value	Sig. level
Linear regression line	.002	148	.34	.561
Quadratic regression curve	.058	147	4.66	.011

Table 4. Test on goodness of fit for academic achievement by fear

Classification	R <sup>2</sup>	df.	F value	Sig. level
Linear regression line	.016	148	2.53	.114
Quadratic regression curve	.061	147	4.88	.009

quantitative relationship between fear and academic achievement, it was able to get the following equation (4).

$$[\text{Academic achievement}] = -0.6825 \times [\text{Fear}] + 16.1121 \quad (3)$$

$$[\text{Academic achievement}] = -1.0638 \times [\text{Fear}]^2 + 5.5694 \times [\text{Fear}] + 7.5635 \quad (4)$$

Therefore as shown in quadratic regression curve of Fig. 2 and equation (4), when the value of fear have had that of the medium, it can be seen that academic achievement is good.

**Relationship between anger and academic achievement.** As in Table 5 analysing the relationship between anger and academic achievement, linear regression line was no significant difference ( $p > .05$ : equation(5)) but the quadratic regression curve was a significant difference ( $p \leq .05$ : equation (6)).

Observing Fig. 3 and Table 5, when the value of anger in quadratic regression curve was near a median of 3, scores of academic achievement were generally

high. But when more than it is high or low, the academic achievement showed a lower trend. Looking strictly quantitative relationship between anger and academic achievement, it was able to get the following equation (6).

$$[\text{Academic achievement}] = 0.7449 \times [\text{Anger}] + 11.8640 \quad (5)$$

$$[\text{Academic achievement}] = -1.3497 \times [\text{Anger}]^2 + 9.1284 \times [\text{Anger}] + 0.6720 \quad (6)$$

Therefore as shown in quadratic regression curve of Fig. 3 and equation (6), when the value of anger have had that of the medium, it can be seen that academic achievement is good.

**Relationship between activity and academic achievement.** As in Table 6 analysing the relationship between activity and academic achievement, linear regression line was no significant difference ( $p > .05$ : equation (7)) but the quadratic regression curve was a significant difference ( $p \leq .05$ : equation (8)).

Observing Fig. 4 and Table 6, when the value of

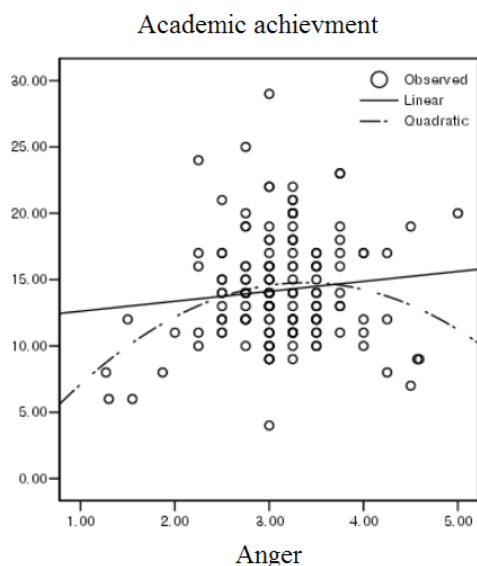


Fig. 3. Plot of anger for achievement.

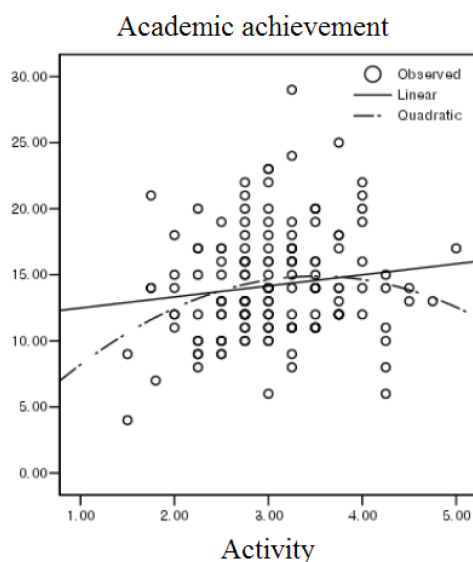


Fig. 4. Plot of activity for achievement.

Table 5. Test on goodness of fit for academic achievement by anger

Classification	R <sup>2</sup>	df.	F value	Sig. level
Linear regression line	.012	148	1.81	.180
Quadratic regression curve	.059	147	4.72	.010

**Table 6.** Test on goodness of fit for academic achievement by activity

Classification	R <sup>2</sup>	df.	F value	Sig. level
Linear regression line	.019	148	2.87	.092
Quadratic regression curve	.045	147	3.51	.032

activity in quadratic regression curve was near a median of 3, scores of academic achievement were generally high. But when more than it is high or low, the academic achievement showed a lower trend. Looking strictly quantitative relationship between activity and academic achievement, it was able to get the following equation (8).

$$[\text{Academic achievement}] = 0.8351 \times [\text{Activity}] + 11.6533 \quad (7)$$

$$[\text{Academic achievement}] = -1.0589 \times [\text{Activity}]^2 + 7.4386 \times [\text{Activity}] + 1.8272 \quad (8)$$

Therefore as shown in quadratic regression curve of Fig. 4 and equation (8), when the value of activity have had that of the medium, it can be seen that academic achievement is good.

**Relationship between sociability and academic achievement.** As in Table 7 analysing the relationship between sociability and academic achievement, linear regression line was no significant difference ( $p > .05$ : equation (9)) but the quadratic regression curve was a significant difference ( $p \leq .05$ : equation (10)).

Observing Fig. 5 and Table 7, when the value of sociability in quadratic regression curve was some larger than a median of 3, scores of academic achievement were generally high. But when more than it is high or low, the academic achievement showed a lower trend. Looking strictly quantitative relationship between activity and academic achievement, it was able to get the following equation (10).

$$[\text{Academic achievement}] = -0.5536 \times [\text{Sociability}] + 16.1802 \quad (9)$$

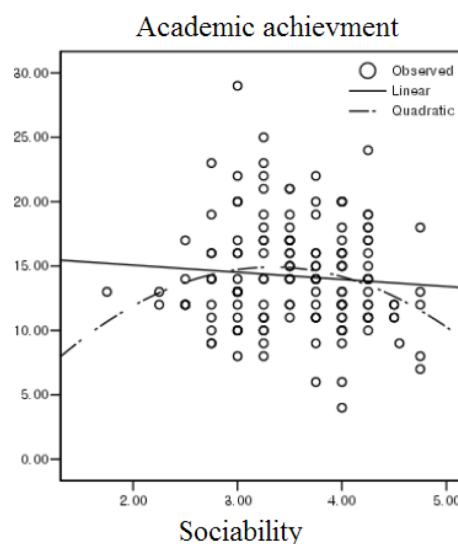
$$[\text{Academic achievement}] = -1.6830 \times [\text{Sociability}]^2 + 11.2325 \times [\text{Sociability}] - 3.8258 \quad (10)$$

Therefore as shown in quadratic regression curve of Fig. 5 and equation (10), when the value of sociability have had some larger than that of the medium, it can be seen that academic achievement is good.

**Relationship between total emotion and academic achievement.** As in Table 8 analysing the relationship between total emotion and academic achievement, both linear regression line and quadratic regression curve were no significant difference ( $p > .05$ : equations (11) and (12))

$$[\text{Academic achievement}] = -0.2146 \times [\text{Total emotion}] + 14.8556 \quad (11)$$

$$[\text{Academic achievement}] = -2.0279 \times [\text{Total emotion}]^2 + 12.2830 \times [\text{Total emotion}] - 4.1029 \quad (12)$$



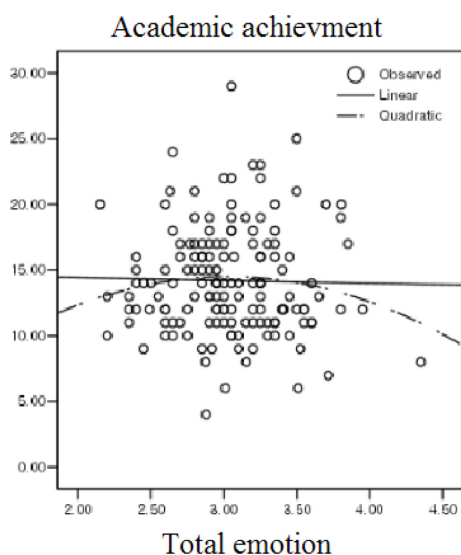
**Fig. 5.** Plot of sociability for achievement.

**Table 7.** Test on goodness of fit for academic achievement by sociability

Classification	R <sup>2</sup>	df.	F value	Sig. level
Linear regression line	.007	148	1.05	.307
Quadratic regression curve	.040	147	3.16	.045

**Table 8.** Test on goodness of fit for academic achievement by total emotion

Classification	R <sup>2</sup>	df.	F value	Sig. level
Linear regression line	.000	148	.06	.804
Quadratic regression curve	.040	147	.92	.400

**Fig. 6.** Plot of total emotion for achievement.

Reasoning on the absence ( $p > .05$ ) of a significant difference for academic achievement by total emotion, it will probably be because anxiety, fear, anger, activity, and sociability have each inherent characteristics of emotion.

Therefore as in Fig. 6 and Table 8 analysing the relationship between total emotion and academic achievement, both linear regression line and quadratic regression curve were no significant difference ( $p > .05$ : equations (11) and (12)).

#### 4. Conclusion

The results of this study are as follows.

First, the results of analysis by three-way ANOVA were showed that the scores of anxiety between male students and female had differences significantly in the  $p < .01$  level ( $F = 7.685$ ). And score of male students (2.478, standard deviation: 0.180) were significantly lower than that of female (3.076, standard deviations: 0.168) about anxiety. Second, the score differences of each anxiety, fear, anger, activity, sociability, and total

emotion caused by grade and family economic ability had not differences significantly in the  $p < .05$  level in all emotion variables. Third, the quantitative relationships between each anxiety, fear, anger, activity, sociability and academic achievement are as follows.

$$[\text{Academic achievement}] = -0.9685 \times [\text{Anxiety}]^2 + 5.1342 \times [\text{Anxiety}] + 8.2679$$

$$[\text{Academic achievement}] = -1.0638 \times [\text{Fear}]^2 + 5.5694 \times [\text{Fear}] + 7.5635$$

$$[\text{Academic achievement}] = -1.3497 \times [\text{Anger}]^2 + 9.1284 \times [\text{Anger}] + 0.6720$$

$$[\text{Academic achievement}] = -1.0589 \times [\text{Activity}]^2 + 7.4386 \times [\text{Activity}] + 1.8272$$

$$[\text{Academic achievement}] = -1.6830 \times [\text{Sociability}]^2 + 11.2325 \times [\text{Sociability}] - 3.8258$$

And so, the values on academic achievement of the each emotions showed a quadratic regression curve,

$$[\text{academic achievement}] = A \times [\text{emotions}]^2 + B \times [\text{emotions}] + C.$$

Therefore, we were able to determine the following conclusions. First, we were able to predict the degree of academic achievement by the each emotions scales. Second, when the each emotion scores of students was a moderate, the academic achievement was most excellent. So, in order for the students to become higher academic achievement, the maintenance of medium degree of the each emotions scores is required. Finally, the quantitative results of the model of quadratic regression curve rather than that of the linear regression line is expected could be obtained for study on the relationship between teachers' remuneration and job satisfaction, and on between teachers' praise frequency and academic achievement, in addition to on between emotion and academic achievement.

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