ACADEMIC STRESS SCALE: A PSYCHOMETRIC STUDY FOR ACADEMIC STRESS IN SENIOR HIGH SCHOOL

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Abstract:

The purpose of this study was to test the construct validity and construct reliability on the academic stress scale and examined the components and indicators that could build academic stress variables. Academic stress was measured by four components, namely biological, cognitive psychosocial, psychosocial emotion, and psychosocial behavior. The populations in this study were 330 third grade students at one of the private high schools in Lampung. The samples in this study were 140 students. The sampling technique applied to cluster random sampling. The academic stress scale was employed as the data collection method. The research data were analyzed with Structural Equation Modeling (SEM) through the SmartPLS 3.2.8 program. Based on the results of data analysis, the components and indicators which built academic stress variables were declared as valid and reliable. The most dominant component reflecting academic stress was cognitive psychosocial by loading factor 0.631. Meanwhile, the weakest component reflecting academic stress was biological by the loading factor value of 0.525. These results indicated that all components and indicators were able to reflect and build academic stress variables. Thus, the measurement model could be accepted because the theory describing the academic stress variable fit with the empirical data obtained through the subject.

Keywords: academic stress, biological, psychosocial cognition, psychosocial emotion, psychosocial behavior

1. Introduction

Education is an important aspect of humans' life. Through the process of education, humans will develop and have progress in preparing for their future. One of the ways

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undertaken by the government in developing the role and the quality of education in today's era is the implementation of full-day schools (Iftayani & Nurhidayati, 2016). Full-day school systems perform dense learning activities, including the consistent application of punishment within certain limits. Hence, children tend to experience psychological pressure and stress inasmuch as one of the stresses caused in school is addressed as academic stress (Desmita, 2011 & Greenberg, 2002). Stress is a common problem that occurs in humans' life. Kupriyanov and Zhdanov (2014) stated that stress existing today is considered as an attribute of modern life. In other words, stress has become an inevitable part of life, either in school, work, family, or anywhere. Stress that occurs in an academic or school environment is known as academic stress.

Academic stress can endanger physical and mental conditions. Lin and Huang (2014) asserted high level stress could contribute problems to all individuals, including students. Several studies found that students with academic stress tend to show low academic performance ability (Rafidah, Azizah, Norzaidi, Chong, Salwani, & Noraini, 2009; Talib & Zia-ur-Rehman, 2012), deteriorating health (Chambel & Curral, 2005; Marshall, Allison, Nyakap & Lanke, 2008), depression (Das & Sahoo, 2012; Jayanthi, Thirunavukarasu & Rajkumar, 2015), and sleep disorders (Waqas, Khan, Sharif, Khalid & Ali, 2014). Another impact of academic stress is that individuals tend to experience addictions, one of which is smartphone addiction, this is in accordance with the research conducted by (Chiu, 2014; Hamrat, Hidayat, & Sumantri, 2019). Academic stress impacts smartphone addiction due to the fact that the higher level of academic stress they have, the more addicted to smartphones they show (Karuniawan & Cahyanti, 2013; Samaha & Hawi, 2016). This was influenced by a high academic pressure leading the student coping mechanism by diverting attention to the smartphone and creating addictive behavior. Academic stress also affects individuals addicted to the internet due to the intensive use of the internet. Furthermore, several studies presented that the use the internet by teens is as a way to relieve their stress (Hong, 2002; Lavoie & Pychyl, 2001; Suh & Yoo, 2001; Velezmoro, Lacefifield, & Roberti, 2010; Suh & Lee, 2007; Jun & Choi, 2015).

There are various factors that affect academic stress, according to Agolla and Onogiri (2009), namely positive temperament, self-efficacy, self-confidence, problem solving skills, good relationships with others, authoritative parenting, and social support. Individual self-efficacy factors can influence the academic stress conditions they undergo (Wisantyo, 2010; Utami, Sim & Moon, 2015; Watson and Watson, 2016; Jenaabadi, Nastiezaie, Safarzaie (2017)). The Factors of authoritative parenting can affect the conditions of academic stress due to the role and attitudes of parents towards their children's condition including the problems that the children encounter (Collins, Marccoby, Steinberg, Hetherington, & Bornstein, 2000; Asiamah, 2013; Masud, Ahmad, Jan and Jamil, 2015; Ondongo, Aloka, and Rabaru, 2016). Moreover, the factors from social support, Brand and Klein (2009) maintained that social support obtained through peers could impact individuals to deal with academic problems (Chambel & Curral, 2005; Glozah, 2013; Pan, Liao, Li, & Qin, 2016).

High school students vulnerably encounter academic stress as they are faced with higher academic expectations. Santrock (2007) argued that stress in adolescence tend to be higher for the demands they are attached, and one of which is to meet the academic expectation. The illustration that students incline to face academic stress, according to Sarafino and Smith (2014), rendering physiological reactions are headaches, increased heart rate, and trembling legs. Besides, academic stress also induces various psychological and social responses which endanger the memory and attention. Individuals will incline to use their emotions in evaluating stressful conditions, which can generate the feelings of sadness or depression, as well as change individuals' behavior towards other individuals.

The term stress has already existed at the beginning of the fourteenth century, but its understanding is still and often pronounced as "*hardship or severely suffer*" in which such term is based on the unsystematic emphasis (Lazarus, 1993). Form the eighteenth century to the early nineteenth century, the word "stress" was understood as strength, pressure, tension, or strong effort given to a material object or to someone "*organ or mental power*" (Hinkle, 1974). In the nineteenth century, the stress term had been gradually used in health and social sciences (Bartlett, 1998). However, the new term was firstly related to the human condition in the field of scientific studies in 1930 (Lyon, 2012). During the nineteenth to the twentieth centuries, the terms of stress and pressure began to be conceptualized as causing physical and psychological health problems (Hinkle, 1974). The theory of stress continued to evolve from time to time, but fundamentally it was only classified into three approaches, namely: (1) stress stimulus models (stimuli), (2) stress response models, and (3) transactional stress models (Bartlett, 1998; Lyon, 2012). The transactional stress model focuses on emotional responses and cognitive processes based on human interactions with the environment (Jovanovic, Lazaridis & Stefanovic, 2006). Therefore, it can be concluded that academic stress is one of the transactional stress models because academic stress is indicated by the inability of individuals to deal with demands arisen in the educational process (Weidner, Kohlmann, Dotzauer, & Burns, 1996). In the academic scope, academic stress is the situation which mostly faced by students either who are studying at the school level or at the college level. Likewise, according to Gupta and Khan (1987), academic stress is mental stress associated with some anticipation of frustration related to academic failure or even awareness of the possibility of failure. In addition, Baumel (2000) explained that academic stress could occur because individuals possess self-high expectations toward their academic achievement derived from parents, teachers, and peers. Academic stress is a pressure situation confronted by someone in which there are academic demands and being characterized by various reactions, including physical, emotional, cognitive, and behavioral reactions (Goliszek, 2005). Another understanding related to academic stress is a combination of stressful situations and academic-related demands which exceed beyond the adaptive resources available to an individual (Kadapatti & Vijayalaxmi, 2012). Furthermore, academic stress is a feeling of tension and discomfort caused by

individuals unbaling to handle demands in school environments (Sarafino & Smith, 2014).

Empirical studies of academic stress indicated that academic stress could predispose depressive symptoms moderated by gender and perceptions of school climates (Liu & Lu, 2012). The research related to academic stress, in addition, showed that there was a relationship between academic stress and suicidal thought, where coping styles and social support as mediators (Khan, Hamdan, Ahmad, & Mustaffa, 2015). Other research conducted by Ariani, Suryani, and Hernawaty (2018) presented the relationship between academic stress, family attachment, and friendship with internet addiction. Family attachment has the most significant influence with internet addiction to adolescents in secondary school.

Sarafino and Smith (2014) divided several components of academic stress into two: biology and psychosocial (cognitive, emotional, and social behavior). Firstly, it is as biological stress since the response of humans' body (sympathetic nervous system and endocrine, nervous system causing stress) emerging as a result of stress such as physiological reactions including headaches, increased heart rate, and trembling legs. Secondly, cognitive psychosocial, an individual's cognitive reaction when facing stress, is difficult to concentrate, forgetful, useless feeling, confused, desperate, negative thinking, decreased achievement, feel not enjoy life, and difficult to make decisions. Thirdly, emotional psychosocial is an emotional reaction that shows fear and discomfort psychologically or physically. Besides, stress can trigger sadness or depression. Eventually, the fourth psycho-social behavior indicating the behavioral change of individual in both with other individuals and with their social environment. For instance, they are more selective to choose people around them or the environment for their convenience. In addition, individuals become less sociable and hostile to their environment and are not empathy with others' circumstances

The aforementioned conceptual framework of the academic stress components consists of biological and psychosocial (cognitive, emotional, and social behavior) can be seen in Figure 1.
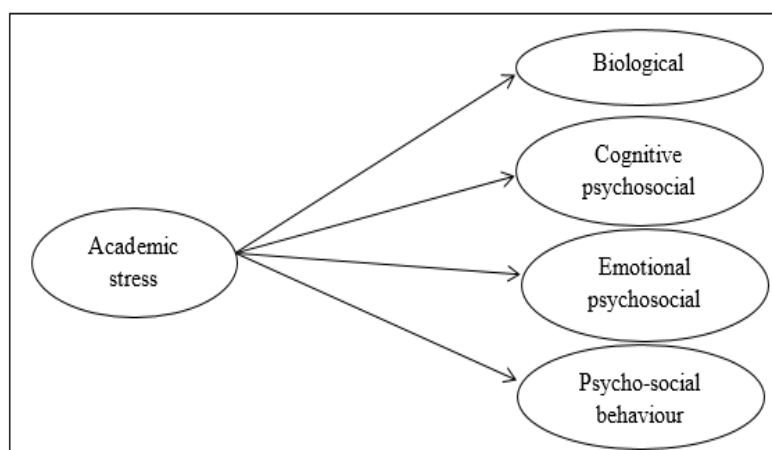

Figure 1: Conceptual Framework for Academic Stress

Based on Figure 1 above, the hypotheses in this study, biological components, cognitive psychosocial, emotional, psychosocial, psycho-social behavior, can simultaneously form academic stress construct.

One approach which can be adopted in testing the construction of a measuring instrument is Confirmatory Factor Analysis (CFA) as one of the main approaches in factor analysis. Confirmatory Factor Analysis (CFA) is able to test the components of a construct. This test is applied to measure the model so that it can describe the components and indicators of behavior in reflecting latent variables, namely academic stress, by looking at the loading factor of each component forming a construct. Likewise, Confirmatory Factor Analysis (CFA) was administered to test the construct validity and construct reliability of the indicators (items) generating latent constructs (Ghozali & Latan, 2012). Confirmatory Factor Analysis (CFA) used in this study was the second order of Confirmatory Factor Analysis (2nd Order CFA), a measurement model that consists of two levels. The first level of analysis was carried out from the components to the indicators, while the second analysis was revealed from the latent construct to the components (Ghozali & Latan, 2012).

Based on the aforesaid description, students with academic stress is an important psychological attribute to recognize both in the setting of the school environment and the wider social environment. Considering the importance of academic stress, we need a valid and reliable scale to measure it. Therefore, the problem formulations in this study are: 1) Is the academic stress scale valid and reliable? 2) Are biological, psychosocial cognitive, emotional, and social behavioral able to reflect the construct of academic stress? The purpose of this research is to analyze the construct validity and the construct reliability of the academic stress and to examine the component and indicators that represent the academic stress constructs.

2. Research Method

2.1. Population, Sample, and Sampling Techniques
The population in this research was all third-grade students at one of private high schools in Lampung. The samples in this study were to 100 students divided into two groups: one science class and two social classes. Cluster random sampling was applied as a sampling technique.

2.2. Data Collection Method
Academic stress in this research was measured by employing an academic stress scale with a semantic differential scaling model. The scale of the study was arranged by referring to the components of academic stress from Sarafino and Smith (2014) consisting of biological and psychosocial (cognitive, emotional, social behavior). An example of item on the academic stress scale was attached in Table 1.

Table 1: The example of academic stress variable item

When I face difficulty studying and doing many assignments, I will fee					
No headache	1	2	3	4	Headache
Normal sleep time	1	2	3	4	Insomnia
When it comes to working on difficult assignments, I will …					
Focus	1	2	3	4	Have difficulty to Concentrate
Remember the subjects learned	1	2	3	4	Be forgetful
When I am much loaded with schoolwork, I feel ...					
Patient	1	2	3	4	Easily angry
Ignorant	1	2	3	4	Easily offended
When I have a lot of difficult assignments, things that I often do ...					
Working alone	1	2	3	4	Copying a friend's assignment
Submitting assignments on time	1	2	3	4	Submitting assignments late

Moreover, the blueprint used as a reference in preparing the academic stress scale was presented in Table 2.

Table 2: Academic stress scale blueprint

No	Component	Item numbers	∑
1	Biological	1, 2, 3, 4, 5, 6	6
2	Cognitive psychosocial	7, 8, 9, 10, 11,12	6
3	Emotional psychosocial	13, 14, 15, 16, 17, 18,	6
4	Psycho-social behavior	19, 20, 21, 22, 23, 24,	6
Total		24	24

2.3. Construct validity and construct reliability

Testing the construct validity and construct reliability in this study used the outer model testing through the smartPLS 3.2.8 program. The construct validity test consisted of the convergent validity test and the discriminant validity test. Convergent validity can be seen from the loading factor value > 0.5 and the Average Variance Extracted (AVE) value > 0.5 (Jogiyanto, 2011). According to Hair, Black, Babin, and Anderson (2014), the higher the loading factor score, the more important the role of loading will be to interpret the factor matrix. The loading factor value > 0.5 and the value of Average Variance Extracted (AVE) > 0.5 are considered to have fulfilled the requirements (Jogiyanto, 2011). For the discriminant validity, it can be seen from comparing the roots of the Average Variance Extracted (AVE) between components in which should be higher than the correlation with other components (Jogiyanto, 2011).

The construct reliability test was undertaken to show the internal consistency of the measuring instrument by looking at the value of composite reliability and Cronbach alpha with a higher value. Hence, it would present the consistency value of each item in measuring latent variables. According to Hair, Black, Babin, and Anderson (2014), the expected composite reliability and Cronbach alpha values are > 0.7, and 0.6 values are still acceptable (Jogiyanto, 2011).

2.4. Data Analysis

The data in this study were analyzed using the outer model with the CFA 2nd Order approach through the SmartPLS 3.2.8 program. According to Abdillah and Hartono (2015), Partial Least Square (PLS) is a variance-based Structural Equation Model (SEM) that may simultaneously test measurement models to test the construct validity and the construct reliability.

3. Results and Discussion

Based on the academic stress scale outer model testing conducted using the smartPLS 3.2.8 program, the results were revealed in Figure 2 below.
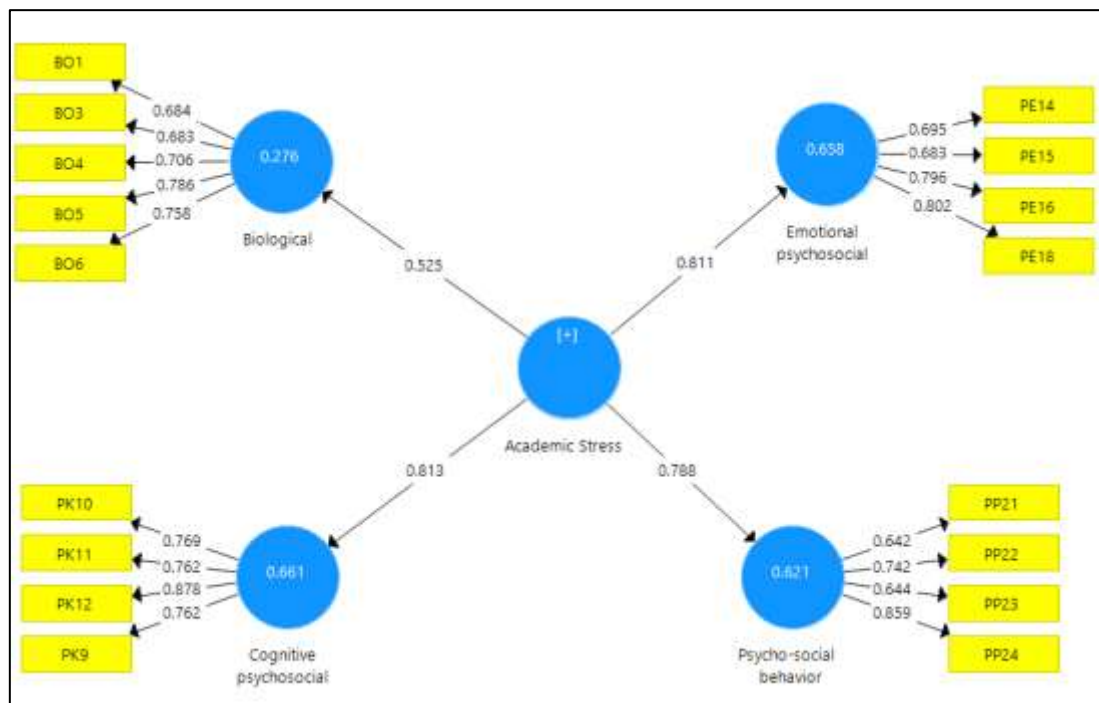
Figure 2: The output of academic stress scale outer model

3.1. Test Results of Construct Validity
3.1.1. Convergent Validity

Convergent validity test results were performed by testing the outer that was seen from the loading factor value and the value of the Average Variance Extracted (AVE). This test was done referring to the loading factor value > 0.5 and Average Variance Extracted (AVE) > 0.5. Based on data analysis, it was found that the loading factor value from variables to components and from components to indicators had a value > 0.5. A loading factor of 0.5 or more is considered to reach validity strong enough to explain latent constructs (Hair, Black, Babin, & Anderson, 2014). The results of convergent validity testing were provided in Table 3 and Table 4.

Table 3: Value of loading factor (variable to component)

Component	Loading factor	Explanation
Biological	0.525	Valid
Cognitive psychosocial	0.813	Valid
Emotional psychosocial	0.811	Valid
Psycho-social behavior	0.788	Valid

Table 4: Value of loading factor (component to indicator)

Item	Loading factor	Explanation
BO1	0.684	Valid
BO3	0.683	Valid
BO4	0.706	Valid
BO5	0.786	Valid
BO6	0.758	Valid
PK9	0.769	Valid
PK10	0.762	Valid
PK11	0.878	Valid
PK12	0.762	Valid
PE14	0.695	Valid
PE15	0.683	Valid
PE16	0.796	Valid
PE18	0.802	Valid
PK21	0.642	Valid
PK22	0.742	Valid
PK23	0.644	Valid
PK24	0.859	Valid

Furthermore, the results of the convergent validity test showed that the Average Variance Extracted (AVE) value was > 0.5. The Average Variance Extracted (AVE) value of the academic stress variable was 0.543, and the Average Variance Extracted (AVE) value of each academic stress component was submitted in Table 5.

Table 5: The value of Average Variance Extracted (AVE)

Component	AVE	Explanation
Biological	0.525	Valid
Cognitive psychosocial	0.631	Valid
Emotional psychosocial	0.557	Valid
Psycho-social behavior	0.529	Valid

3.1.2. Discriminant Validity

Based on the results of the discriminant validity test, it indicated that the value of the Average Variance Extracted (AVE) root correlation in each component of academic stress was higher than the correlation value with the Average Variance Extracted (AVE) root in the other component of academic stress. Thus, the discriminant validity criteria were met. The root value of the Average Variance Extracted (AVE) academic stress variable was in Table 6.

Table 6: The root value of Average Variance Extracted (AVE) academic stress

	Biological	Cognitive psychosocial	Emotional psychosocial	Psycho-social behavior
Biological	0.725	0.475	0.463	0.463
Cognitive psychosocial	0.475	0.794	0.465	0.465
Emotional psychosocial	0.463	0.465	0.746	0.746
Psycho-social behavior	0.527	0.633	0.600	0.600

3.2. Test Results of Construct Reliability Test

Construct reliability test was done by testing the outer model reflecting on the composite reliability and Cronbach alpha values. This test was done by considering the value of composite reliability and Cronbach alpha > 0.7, which meant that the scale in this study was reliable. The value of composite reliability and Cronbach alpha were mentioned in Table 7.

Table 7: The value of composite reliability and Cronbach alpha academic stress

Variable	Composite reliability	Cronbach alpha	Explanation
Academic stress	0.855	0.788	Reliable

Based on the results of the construct reliability test in table 6, it showed that the academic stress scale had expected reliability. This indicated that the component measuring the academic stress variable had met the unidimensional criteria (Hair, Hult, Ringle & Sarstedt, 2014). This was shown by the composite reliability value of 0.855 and Cronbach alpha 0.788. The construct validity and reliability test produced valid and reliable items / indicators that were able to reflect the component of academic stress, namely the items in numbers 1,3,4,5,6,9,10, 11,12,14,15,16,18,21,22,23, and 24. Based on the results of the study data analysis using the outer model test, it demonstrated that the measurement model was accepted because all components of academic stress were able to reflect the academic stress variable.

3.3. Discussion

Based on the analysis results of construct validity and construct reliability, the components and indicators that form the construct of academic stress were considered as valid and reliable. Thus, all existing components and indicators were able to reflect and form the academic stress construct. The most dominant component and able to reflect academic stress was cognition with a loading factor of 0.813. Cognition described the reactions of stress experienced by students, such as difficulty concentrating, forgetfulness, easily give up, always thinking negatively, decreasing achievement, and difficult have decision making make choices.

It was found that students encountered difficulty concentrating, were not interested in competing with classmates, and were difficult in decision makings, such as choosing majors for the intended college or university. This was supported by valid and reliable indicators showing that when students were on the school exam period, have a lot of school assignments, or a busy schedule of school activities, they found it difficult to concentrate, not confident, and be forgetful. The weakest component reflecting academic stress was biological with a loading factor value of 0.525. Biological describe the reactions of stress experienced by individuals/students such as headaches, increased heart rate. These was caused by the fact that stress is a condition that threatens in which the body will react as such. The actual conditions often undergone by students were headaches, nausea, fatigue due to academic burdens, hours of study, dense schoolwork, and difficulty in time management when dealing with assignments leading to not doing the assignment effectively or even left it at all. The valid and reliable indicators presenting that students were aware of their health by always paying attention to lifestyle and dietary habits so that students have a healthy body even though they still sometimes felt sick.

The results of previous studies that examined the constructs of academic stress that were relevant to this study explaining the validity and reliability are the Kadivar, Kavousian, Arabzadeh, and Nikdel (2011). The studies designed academic stress scales to assess academic stress on students. In this study, academic stress instruments were arranged by adapting from Gadzella (1991). This instrument was a self-report that included 51 questions and based on a theoretical model offered by Moris adapted by Gadzella (1991). This model evaluated five types of stressors (frustration, conflict, pressure, change, and self-coercion) and four classifications of responses to factors such as (physical, emotional, behavioral, and cognitive evaluation). It revealed that the scale met the reliability requirements with a Cronbach alpha of 0.72. Thomas (2016) adapted and modified 18 items on the instrument developed by Bedewy and Gabriel (2015). The study showed that the scale had met the reliability requirements with a Cronbach alpha of 0.70. Other studies reflecting the framework of academic stress instruments were undertaken by Stankovska, Dimitrovski, Angelkoska, Ibraimi, and Uka (2018). The academic stress instruments designed in this study were Student Academic Stress Tests (SAST) in the form of questionnaires consisting of 70 items with response formats such as scale Likert including 1-5 and consisted of two categories: Types of stressors / Pressure and Reaction to Stress Agents were adapted from (Bursary, 2011). Higher scores indicated high levels of academic stress and related reactions, and the study showed that the scale reached the reliability requirements with Cronbach alpha of 0.77. Furthermore, a study by Kiani, Latif, Bibi, Rashid, and Tariq (2011) compiled an academic stress instrument used to measure academic stress on students. To measure this instrument, participants were asked to rate the frequency of their attitudes and feelings towards academic stress. The results showed that the scale had met the reliability requirements with Cronbach alpha of 0.70. A subsequent study on the construct of academic stress conducted by You (2018) designed an academic stress scale to assess academic stress on students developed

by Yoo and Lee (2000). The academic stress scale was assessed using five items and showed that the scale had met the reliability requirements with a Cronbach alpha of 0.75. Some researchers modified the academic stress instrument from Gadzella (1991), namely Student-Life Stress Inventory (SSI) consisting of 23 items representing five subscales of academic stressors such as frustration, conflict, pressure, change, and coercion with the final results showing coefficients Cronbach alpha is 0.76 (Glozah, 2013). Lin, Su, and McElwin (2019) designed an academic stress instrument developed by Bedewy and Gabriel (2015), the Perception of Academic Stress Scale (PAS) consisting of 18 5-point Likert type points. These items assessed four students' perspectives: doing under pressure, perception of workload and examination, self-perception, and time limitation. The results revealed that the scale met the reliability requirements with a Cronbach alpha of 0.60.

Comparing the results in this study with previous studies. It indicated the scale of academic stress in this study performed better quality than the previous one. This can be proven from the Cronbach alpha value of the academic stress scale, namely 0.788. The study results are expected to provide an overview of the validity and reliability of the academic stress scale, especially in uncovering academic stress on students. Also, it can be useful as a reference for further research related to academic stress.

4. Conclusion

Based on the results of the analysis and discussion, it can be concluded that: 1) the construct of academic stress had fulfilled the expected validity and reliability, and 2) all components and indicators could significantly form academic stress. The most dominant component reflecting academic stress was cognitive, and the weakest one was biological. In this research, an academic stress scale measurement model was formed in accordance with empirical data obtained through the subjects at the research setting.

Acknowledgements

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