Creating Academic Stress Scale And The Application For Students: Validity And Reliability Test In Psychometrics

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Abstract: The purpose of this study was to test the measurement model of the academic stress scale, to test the construct validity and construct reliability of the academic stress scale and to find aspects and indicators that form academic stress. Academic stress was measured by four aspects: emotional, physiological, cognitive, and behavioral. The subjects of this study were 60 high school students of the grade X in Yogyakarta. The data collection method used an academic stress scale. The data of the research were analyzed by using Structural Equation Modeling (SEM) SmartPLS 3.2.8 with reflective construct through CFA 2nd Order. Based on the results of the outer model analysis, the aspects and indicators that form academic stress were declared valid and reliable. The dominant aspect that reflected the construction of academic stress was the physiological aspect with a factor loading value of 0.877. The lowest aspect that reflects academic stress is the cognitive aspect with a factor loading value of 0.644. The results showed that all aspects and indicators were able to reflect and to form the academic stress scale. Therefore, the structural model could be accepted because theories that described academic stress were consistent with empirical data obtained from the subject.

Keywords: Academic Stress, CFA 2nd Order, Cognitive, Construct Reliability, Construct Validity, Physiological, Partial Least Square

1. INTRODUCTION

Assessment is one of the important aspects to understand the concept of stress overall [1]. The assessment which is conducted in this study is a psychometric measurement to test the validity and reliability of the academic stress scale. The stress phenomenon which is initiated by Selye's research focuses on systemic stress characterized by increased pituitary-adrenal cortical hormones in the body. Then, Lazarus develops the theory on the topic of psychological stress. Lazarus invited Cohen, Gruen, DeLongis, Folkman [2]. Lazarus and Cohen [3] states that stress affects satisfaction, problem solving, social competence, and individual health. When an individual is stressed the characteristics that can be recognized are looks of anxiety, fear, feeling guilty, angry, sad-depressed, and jealous. Lazarus was still not satisfied, he made further research in the following years: [4], [5], [6] with problems related to each other. In 1980, Lazarus and Folkman analyzed coping. Then, Lazarus, Folkman, and Gruen [2] reviewed with the topic of adaptational outcomes. Lazarus and Folkman [5] make their perspective back by connecting emotions and coping. Then, one year later Lazarus and Folkman [7] made publications on theories and cognitive patterns of stress as well as the implications of coping and emotions.

Then, developed again in [6] made specific measurements of stress. A few years later, in 1999, Sarafino and Ewing [8] made publications about the measurement of Hassles, which was adapted from the Selye scale. Further evaluation of the measurement of academic stress in various cultural contexts and countries is being carried out.

Academic stress scale has been found by several researchers including SAAS (Scale for Assessing Academic Stress) by Sinha, Sharma, and Mahendra [1]; PAS (Perception of Academic Stress Scale) by Bedewy and Gabriel [9]; PSS (Perceived Stress Scale) by Cohen, Kamarck, Mermelstei [10], SSI (Student-Life Stress Inventory) by Gadzella [11] and their revisions; LARS (Lakaev Academic Stress Response Scale) by Lakaev, [12]; DASS (Depression Anxiety Stress Scale) by Lovibond and Lovibond [13]. SAAS contains 30 items that are indicators of academic stress in individuals with a reliability of 0.88 [1] such as individuals experiencing high information load expectations, academic burdens or pressures, unrealistic ambitions, limited opportunities, high competitiveness are some important sources of stress that create tension, fear, and anxiety [1]. Some items that contain SAAS include being easily bored, feeling no one is helping, often being offended by others, like being alone, lack of sleep, decreased appetite, not wanting to talk to anyone, feeling depressed, feeling like a failure, and worrying about the expectations of parents. Researchers used PCA (Principal Component Analysis) for the analysis of five independent factors, namely cognitive, affective, psychological, social / interpersonal, and motivation. In addition to SAAS, PSS was initiated by Cohen, Kamarck, and Mermelstein [10] and then modified to be used in several countries including Brazil, Spain, Europe, and other countries. This is reasonable because PSS is more closely related to depressive or stressful events, and objective mental health so that PSS is widely applied in several countries. The purpose of PSS is to measure the construct of different stress symptoms that can be predicted independently [10]. This study completed the treatment with a life-event scale, and a physical-symptom checklist (CHIPS). Not only the treatment issue, but the PSS reliability coefficient is 0.84 for 332 samples of students who live in the University of Oregan dormitory; 0.85 for 114 samples of students who take psychology classes; and 0.86 for 60 samples of students who took a smoking-cessation program at the University of Oregon. The validity and reliability tests of these variables indicate that academic stress research has been available from previous studies and the researchers need to review and adjust to the current development of high school student population to find research renewal. This differences of scale variation stems from the culture, psychological conditions, and subjective conditions of people in Indonesia, especially in Yogyakarta. The state of Indonesia is illustrated by the amount of pressure experienced by students. It can be seen in the forms of (1) a student was

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shocked and committed suicide due to failure of the national exam. The second incident was a female student hanging herself in Bekasi due to embarrassment from her poor performance. The third incident in Medan was a woman committed suicide by jumping from the 4th floor of a mall because she did not go up in class. The fourth incident there was a madrasa student leaving home for fear of being scolded by his parents. In the fifth incident there were 10 madrasa students arrested in the hut because they ran away from school because they did not do homework [14]. Stress symptoms in the country of Brazil are measured by 10 statement items containing 6 negative items and 4 positive items. Cronbach's alpha coefficients are 0.83, 0.77 and 0.87 for the first factor, the second factor and for the overall value (Perceived Stress). The results show that the construct validity is significant. The analysis of the study uses CFA and with 2nd order confirmatory factor analysis. The study also compared the sample with independent t-test and chi-square tests of [15]. The application of the academic stress scale was also applied in Australia or better known as LASRS [12]. Aspects of academic stress include Physiological, Behavioral, Cognitive, and Affective with 27 items. Cognitive aspects describe how individuals coping with their environment. The affective aspect describes how individuals understand their feelings related to academic pressure. Physiological aspects describe how the body's reactions such as headaches, trembling hands, difficulty eating and others. Behavioral aspects describe how individuals feel disturbed so as to inhibit their activities such as procrastination, laziness, avoidance, and others. Affective aspect reliability is 0.82; behavioral aspects are 0.82; physiological aspects are 0.85; and the cognitive aspect is 0.89. Stress is defined as an expression of the body's response to each stimulus felt by an individual [16]. Stress is conceptualized as a condition that is evaluated by students as an undesirable event [17]. The scope of stress includes students experiencing anxiety, panic attacks, and depression [18]. Stress is a negative perception formed by students in managing environmental situations [19]. Stress has physical and psychological components [20],[21]. The physical component is directly related to the physiological challenges of the body when it involves individual concentration and perception [21]. Continuity of stress can continuously influence the body so that the body experiences immune, cardiovascular, pituitary hypothalamus, increases cortisol release and promotes unhealthy living behaviors [22]. The response of each individual will be different from one another, if stress is overcome negatively then the impact affects health, social relationships, and physical [23],[24]. Other impacts are mental, physical, and lower self-esteem and academic achievement of students [25]. If an individual is filled with negative impacts, positive impacts also play a role in shaping his personality [26]. The positive impact of academic stress is that individuals accept unacceptable grades and symptoms of depression experienced [27]. Academic stress has implications for strengthening academic performance and mental health [28]. Individuals become more critical and quick thinking so that it affects their performance. The strength of stress also influences the curiosity of individuals reading more literature or literacy [29]. Stress and socio-emotional feelings affect the scientific and language of individuals for the better. The birth of the validity and reliability research of the academic stress construct refers to the research of Gadzella [11] developing the SSI (Student-Life Stress Inventory). The scale reflects students' life experiences by looking at stressors and reactions to stressors such as frustration, conflict, pressure, change, and self-coercion while reactions to stressors include physiological, emotional, behavioral, and cognitive. Researchers take reactions to stressors as aspects of variables, namely emotional, physiological, cognitive, and behavioral. The academic stress construct compiled in this study supports previous data. Some phenomena found such as lack of intention to study, regret going to school at the school, piled up assignments, lack of rest, leave school longer, severe punishment received from school, difficulty concentrating, unclear and burdensome regulations, body aches, become more discipline, dizzy thinking about national exams, boring learning, wanting a new atmosphere, a lot of school dust, lack of learning facilities, a lot of empty hours, need refreshing, many complain about being in the school, and teachers are not able to condition the class. This shows that academic stress in schools is crucial to research.

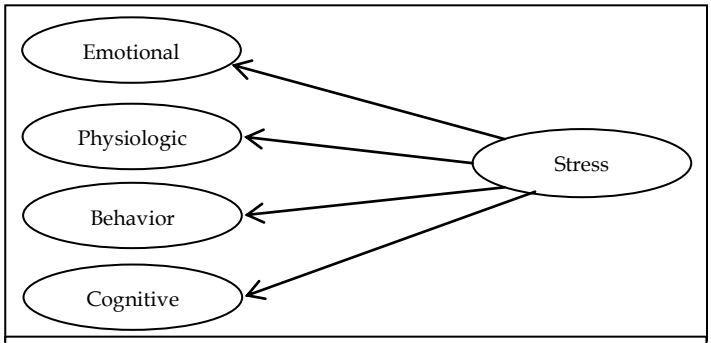

***Fig. 1**. Conceptual Framework for Confirmatory Factor Analysis in Academic Stress*

H: Emotional, Physiological, Behavioral, and Cognitive are able to form Academic Stress constructs.

One of the approaches to test the construct of a measuring instrument is the Confirmatory Factor Analysis (CFA). This approach involves testing the dimensionality of a construct that is primary in factor analysis. The output form of CFA is model measurement. The nature of dimensionality in this case is the depiction of aspects and each indicator of behavior in reflecting latent variables namely academic stress by looking at the loading factor of each aspect that forms the construct. CFA is a part of construct validity and reliability of each latent construct indicator [30]. This study uses a second order confirmatory factor analysis, a measurement model with two levels. The first level of analysis is carried out from the latent construct of the dimension to its indicators and the second analysis is carried out from the latent construct to its dimension construct [30]. The purpose of this study is to test the academic stress scale measurement model, to test the construct validity and construct reliability of the academic stress scale and to find aspects and indicators that form academic stress.

2 RESEARCH METHOD

2.1 Participant

Participants in this study were 60 students of Senior high School X in Yogyakarta that consisted of 14 students from class X science 1, 20 students from class XII social science 1, and 26 students from class XII science 2. The number of women was 28 students while the number of men was as

many as 32 students. Characteristics of the subjects were students of class XII majoring in Natural Sciences and Social Sciences, and the students of class X majoring in Natural Sciences that were willing to be the research respondents.

2.2 Research Design

The design in this study is semi-construction which is interpreted by doing scale design using theoretical collaborative studies with information on field data that researchers have worked on. The perceived benefits of this semi-construction design are strengthening existing theories and reproducing as many behavioral indicators as possible. Then, the next step is testing the psychometric properties including content validity analysis, discrimination power, confirmatory factor analysis, as well as concurrent validity testing and external validity [31].

2.3 Instrument

The instrument of this study was the Academic Stress (SA) scale which was constructed by the author based on the aspects of Gadzella [11] namely emotional, physiologic, cognitive, and behavior. The scale which was collected contained 4 alternative answers namely; Strongly agree (SS), Agree (S), Disagree (TS), and Strongly disagree (STS). The scale of the study was 24 items that consisted of 19 items favorable and 5 items unfavorable. The item examples on the emotional aspect are "There are so many demands in school so that I often get upset" and "I want a new atmosphere in this school". The item examples on the physiological aspect are "I feel tired getting up in the morning and having to go to school" and "The head is dizzy facing a lot of tasks". The examples of cognitive aspects are "I will ignore lessons in class if I find it difficult" and "I am afraid of getting bad grades". One of the example of the behavior aspect is "I find that it is difficult to concentrate while studying".

TABLE 1
SCORE OF ACADEMIC STRESS

Statement	Unfavorable Score	Unfavorable Score
SS	4	1
S	3	2
TS	2	3
STS	1	4

The scale arrangement on the research is based on blue print can be seen on table 2.

TABLE 2
BLUE PRINT ACADEMIC STRESS

Aspect	Indicator	Item		Total
		Favo	Unfavo	
Physiologic	a. Having fatigue b. Stuttering to communicate with the teacher c. Getting headache while studying	1,5, 12,23, 24	19	6
Cognitive	a. Think negatively about all the possibilities that will occur b. Think about others while studying	4,11, 16,18	8,21	6
Behaviour	a. Crying b. Less the ability to tell problems to friends c. Doing unnatural things in school d. Irregular sleep time	2,14, 17,20	3,6	6
Emotional	a. Feeling helpless at school b. Saving negative feelings while studying c. Do not like the challenges in learning at school	7,9, 10,13, 15,22		6
	Total	12	12	24

2.4 Construct Validity and Reliability

2.4.1 Construct Validity

The validity test of this research uses the validity of reflective constructs that are confirmatory in nature to show how well the results obtained from the use of measuring instruments with the theoretical reference used define a construct. There are 2 validity tests in construct validity, namely: Convergent validity, measuring the magnitude of the correlation between item scores and construct scores, is assessed based on loading factors. According to Hair, Hult, Ringle, and Sarstedt [32] the higher the loading factor score, the more important the loading role will be in interpreting the factor matrix with a loading value > 0.5. It considered significant, then the average variance extracted (AVE) value > 0.5 [33]. Discriminant validity, done because different construct measurements should not correlate with high scores. The amount of cross loading value between constructs and items is expected to be greater than the value of other constructs. The trick is to compare the AVE of a construct must be higher than the correlation between latent variables [33].

2.4.2 Construct Reliability

Reliability test is carried out to show the internal consistency of the measuring instrument by looking at the value of composite reliability and Cronbach's alpha with a higher value, it will show the consistency value of each item in measuring latent variables. According to Hair, Hult, Ringle, and Sarstedt [32], the expected composite reliability and cronbach's alpha value is > 0.7 and the value of 0.6 is still acceptable, then according to Cooper the internal consistency test has also been fulfilled if the validity of the extract has fulfilled the criteria so the average variance extracted value (AVE) has represented internal consistency, because the construct is valid then the construct is reliable but on the contrary a reliable construct is not necessarily a valid construct [33].

2.5 Data Analysis

Data collected in this study were analyzed using the Smart PLS 3.2.8 program with reflective constructs through the 2nd Order CFA. There were no many studies in Indonesia that have used SEM and than, the researchers want to do different testing apart from SPSS. According to Hartono and Abdillah [34] PLS is a structural equation analysis program based on simultaneous variants for testing measurement models by looking at the validity and reliability of this research measuring instrument.

3 RESULT

The results of this study can be seen from the outer model output on the academic stress scale in Figure 2 below.

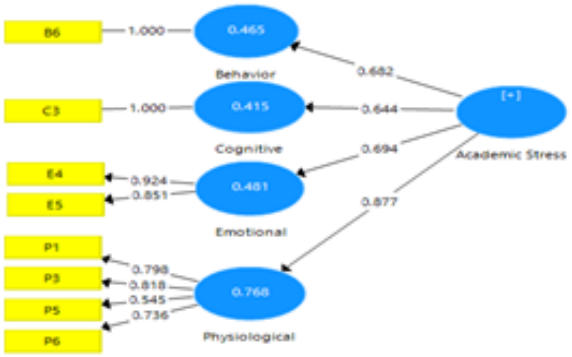

Fig 2. *Output of the academic stress construct model test*

Based on the test of convergent validity on the outer model, it was found that the loading factor value from the variable to its aspects has a value of > 0.5. It is shown in Table 3.

TABLE 3
LOADING FACTOR (VARIABLE-ASPECTS)

Aspects	Loading Factor	Information
Emotional	0.694	Valid
Physilogic	0.877	Valid
Behavior	0.682	Valid
Cognitive	0.644	Valid

Based on the convergent validity test the loading factor value seen from the Aspect-Indicator meets the requirements with a value > 0.5. Here is a table of loading factor values.

TABLE 4
LOADING FACTOR (ASPECT-ITEM)

Item	Loading Factor	Information
E4	0.924	Valid
E5	0.851	Valid
F1	0.798	Valid
F3	0.818	Valid
F.5	0.545	Valid
F.6	0.736	Valid
P.6	1.000	Valid
K.3	1.000	Valid

Based on table 5 below, it can be concluded that this scale fulfilled the valid requirements of > 0.5. The AVE value of academic stress variable is 0.520 > 0.5. AVE value in each aspect can be explained as follows:

TABLE 5
THE VALUE OF AVERAGE VARIANCE EXTRACTED (AVE) ACADEMIC STRESS

Aspect	AVE Value	Information
Emotional	0.788	Valid
Physiologic	0.536	Valid
Behavior	1.000	Valid
Cognitive	1.000	Valid

3.2 Discriminant Validity

Based on the discriminant validity test values, the root results of the Average Variance Extracted or AVE in each dimension are higher than the average variance extracted root or AVE in other dimensions, so that the discriminant validity criteria are met. Average Variance Extracted Root Value (AVE) construct of academic stress can be seen in the table 6.

TABLE 6
ROOT VALUE AVERAGE VARIANCE EXTRACTED (AVE) ACADEMIC STRESS

Aspect	PD	PT	F	EC
Emotional	0.888	0.517	0.393	0.214
Physiologic	0.517	0.732	0.499	0.519
Behavior	0.393	0.499	1.000	0.213
Cognitive	0.219	0.519	0.213	1.000

The results of construct reliability testing with confirmatory analysis have good reliability and give meaning that the aspects measuring the construct/latent variables of academic stress meet uni-dimensional criteria [32]. Based on table 7 below, it can be concluded that the composite reliability and Cronbach alpha values on the academic stress scale fulfilled the criteria of alpha value criteria >0.700.

3.3 Construction Reliability Test

Based on the results of the construct reliability test that has been done, the Composite Reliability and Cronbach's Alpha value s> 0.7 can be obtained so that the items used in this study are reliable.

TABLE 7
VALUE COMPOSITE RELIABILITY AND CRONBACH'S ALPHA CONSTRUCT ACADEMIC STRESS

Variable	Composite reliability	Cronbach's alpha	Information
Academic Stress	0.843	0.766	Reliable

The test of validity and reliability constructs produced valid and reliable items that were able to reflect aspects of academic stress, namely the items in numbers 2, 4, 7, 10, 11, 14, 15, 17, 22, and 24, while the items that are not able to reflect academic stress are items in numbers 1, 2, 3, 4, 5, 6, 8, 9, 12, 13, 16, 18, 19, 20, 21, and 23. Based on the analysis of research data using the Confirmatory Factor Analysis 2nd Order, the results show that this model can be accepted because aspects and indicators are able to reflect the variables / constructs that are formed.

4 DISCUSSION

Based on the results of the construct validity and reliability of the academic stress scale, these fulfill the valid requirements because the indicators have represented these aspects and reflect and shape the academic stress of students. Physiological aspects have the highest loading factor value of 0.877 compared to emotional, behavioral, and cognitive aspects. This indicates that physiological aspects are as constructors of academic stress. The most dominant aspect that reflects academic stress is physiological aspects such as experiencing obstacles that cannot be resolved immediately, therefore individuals feel difficult to concentrate on their study time and feel tired followed by a body which is feeling unwell. The validity of this study has a higher value especially the

physiological aspects that get the value of 0.844, while in the research of Arip, Kamaruzaman, Roslan, Ahmad, and Rahman [35], the value is 0.807. The findings of this study are supported by the study of Pandey and Chalise [36] which use aspects of academic stress that are cognitive aspects to reflect academic stress. In addition, cognitive aspects which are used to measure academic stress are supported by Dhakal's [37]. The obstacles which are faced by individuals include the desire or strength to take lessons in school that has not been well developed. Desire or power is related to something that is considered valuable [38], if it is increased continuously it also increases happiness. Conversely, unfavorable conditions such as getting severe physical punishment and getting unclear rules of intent and those purpose make these desires and strengths decline so that individuals feel that there is something that needs to be changed by reviving a new atmosphere at school. The new atmosphere in the school is closely related to the school climate. School climate is the heart and soul of a school. This is the essence of a school that guides a child, a teacher, an administrator, and a staff member to love the school and to hope to be there every school day [39]. Several studies have shown that students' sense of togetherness at school is related to greater happiness, success in overcoming problems, social skills, social support, tangible assistance, intrinsic motivation, self-esteem, self-efficacy in academics, interest in academic activities, adherence to democratic norms and values, lacking loneliness, not skipping, not doing violence, or doing other negative behavior [40]. In harmony with physiological aspects, emotional aspects do not adequately describe individual academic stress. The emotional aspect is in the second position which have a high loading factor value after physiological aspects. Emotional is a collection of feelings that can be expressed to others, but it depends on how other people catch the message. Emotional related to positive and negative affections that it can sometimes be raised simultaneously or differently within a certain period. The form of emotional feelings is like feeling annoyed with others or towards a system that is running and requires renewal of the school climate. Feelings of annoyance arise for many reasons such as feeling the place being inhabited is not safe, feeling worried about the tests going forward, and the environment is not supportive. Friends who are active and care for one another increase a sense of togetherness so individuals do not feel lonely and they feel valued. This support is not only the responsibility of one or two people, but all components both at school, home, and in the community. All components must work together so that the climate change occurs in schools specifically and outside school in general. This includes positive empowerment and positive autonomy [41], [42], [43]. The desire to have a new atmosphere in the school cannot be avoided from the influence of school leadership. Some individuals feel the positive impact of the order and policies of the new leader at this time, but not a few individuals also feel the negative impact of the policies and arrangements of the new leader at this time. The aspect that has a low loading factor is cognitive with a value of 0.644. Cognitive can be characterized by individual actions to think negatively of all possibilities that will occur such as excessive fear, smoking, and other things. The findings of Wen [44] reveal that academic stress can be reduced by reducing the academic burden on students, encouraging the development of individual abilities and intelligence, and teaching individuals to use the minds and hands of individuals to become the better people. Cognitive aspects are also influenced by the school environment such as increasing class hours, increasing the amount of homework, and reducing students' extracurricular activities time. This condition will increase academic stress. But instead, support for cognitive reinforcement by reducing class hours, reducing the amount of homework, and increasing the leraning time of extracurricular activities for students [45]. The results of this study are expected to provide an overview of the validity and reliability of academic stress on students so that it can be used as a reference for further research related to Academic Stress.

5 CONCLUSION

The conclusion in this study is that the aspects and indicators that create the academic stress are declared valid and reliable. The dominant aspect that reflects the construction of academic stress is the physiological aspect with a factor loading value of 0.877. The lowest aspect that reflects academic stress is the cognitive aspect with a factor loading value of 0.644. This results show that all aspects and indicators are able to reflect and form the academic stress scale. Therefore, the structural model can be accepted because the theories that describe the academic stress are appropriate to the empirical data which are obtained from the subjects.

ACKNOWLEDGMENT

The author would like to thank Ahmad Dahlan University and the Master of Psychology Programe University of Ahmad Dahlan for supporting the implementation of this research.

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