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To cite this article: I Ariffudin *et al* 2019 *J. Phys.: Conf. Ser.* **1402** 077050

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Stress meter: Android-based assessment application for academic stress level of students

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Abstract. Academic stress is one of the negative emotional levels that can affect students' physical, psychological, and academic health. Thus, there needs to be an assessment media that utilizes technological developments but can still evaluate academic stress levels effectively and efficiently. The purpose of this study was to develop an android-based assessment media (Stress Meter) that is able to measure students' academic stress levels. This study used research and development methods. Data obtained were analyzed descriptively using Delphi technique for media acceptance test, and also Exploratory Factor Analysis test and Cronbach Alpha to test the validity and reliability of the instrument. The results of this study indicate that prototype of Stress Meter application has met the acceptability criteria and the instrument in it has passed the validity and reliability test. In conclusion, the prototype of Stress Meter application can be used by students as a media self-assessment and facilitate the performance of counselors in identifying the level of academic stress that students have.

1. Introduction

Challenges and pressures are very high in the world of education, especially for students [1]. The challenges and demands of learning involve two things, namely the development of abilities and displaying abilities. Students are expected to be able to continue develop their potential and prove it in various situations [2]. But in fact, fulfilling the demands of learning is certainly not easy, it requires a high persistent level, so the students are able to face the demands of learning. Students who fail to adapt to change, will have an impact on their physical and mental health, one of which is stress. Stress experienced by these students relates to academic aspects, so that it is called 'academic stress'. Academic stress is one type of negative emotion as a logical consequence of academic demands and pressures that are their responsibility at school [3-5]. The research show that the students' academic stress levels increase when academic demands and pressure increase [3]. In fact, academic stress has a good impact and is needed in the learning process of students. With stress, students can be stimulated and improve their performance in learning and doing assignments [3], but the collect of stress experienced occurs continuously and is not manipulated properly, it will have a negative impact on students' physical, mental and academic performance [6-8]. Therefore, it is important for students to keep up and know the stress level they have. By knowing this, students can take preventive measures, so that the stress level



can be maintaining within normal limits and immediately seek psychological help (curative), if the level of academic stress experienced is getting heavier.

The important knowing and maintaining this level of stress is apparently not accompanied by optimal efforts from psychological assistance personnel in schools, especially counselors. The lack of optimization of psychological service is caused by many factors, such as limited human resources, limited guidance counseling tools and media, and lack of school support. The reasons for this have turned out to have an impact on the lack of psychological services by the counselor, so counselors need media or tools as a wider range of service so that psychological services [9]. The media and tools are of course the latest technology based technology 4.0, so they are able to reach limitations and relevant with today's students [10]. Implementation of technology media in the practice of guidance and counseling is one of the factors that can influence the efficiency and efficacy of service delivery by counselors [11].

Thus, this study aims to develop a media that is consistent with the principles of the present and the principles of dynamism. As for media based on technology 4.0, one of them is an Android base. Why does it have chosen Android? Some of these considerations include, among others, students in today's modern technology [10], everyone in this period of the most has facilitated himself with a mobile smart phone [12], the most popular and most used mobile operating system is Android [13]. Considering these matters, development of media that is relatively relevant to problems and conditions in the field is an android-based assessment media called "Stress Meter". This Android-based "Stress Meter" measuring tool prioritizes preventive and self-serving services so that capable students in managing stress independently. In addition, the benefits obtained by the counselor through this tool are one of them is the counselor is able to offer psychological services accordance with the stress level of each students, so that the counselor is easier to check developmental of students.

2. Method

Based on figure 1 below, it could be seen that this study adopted 5 of the 10 stages of the research and development model [14]. The following steps were meant:

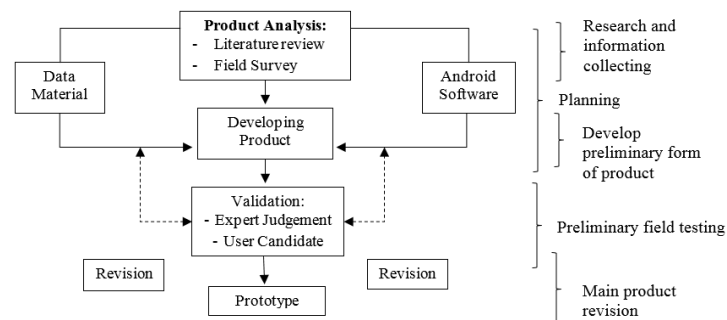


Figure 1. Stress meter development procedures.

The development of this Android-based Stress Meter application used the Adobe Flash program, which was a program that was used to create reliable and lightweight vector and 2-dimensional animation images. This program used the Action Script programming language with the file extension (.APK). In general, there were two features a given in this application, the first was a measuring instrument for the level of anxiety, stress, and depression. Second, interpretations and recommendations for each level of negative emotions possessed by students.

The scale of measuring academic stress levels contained in this application was developed based on the theoretical construct DASS 42 (Depression, Anxiety, & Stress Scale) [15]. This scale generally consists of three main variables: Depression, Anxiety and Stress, where each variable had its constituent indicators. Depression focused on low mood, motivation, and self-esteem; Anxiety focused on psychological arousal, perceived panic, and fear; Stress focused on tension and irritability [16]. The stress measurement scale developed consists of 42 statement items with four Likert scale answer choices (Never to Almost Often).

This study used three validity tests, namely the test of construct validity, content validity and appearance validity. The construct validity test was conducted to test the validity of the scale developed, which involved 3 expert judgment and 200 trial samples. The content validity test and appearance validity were carried out by 3 expert judgments and 7 prospective users (5 students and 2 counselors). All samples in this studies were chosen by purposive sampling technique. The media assessment process is based on 4 acceptability criteria (utility, feasibility, property and accuracy) [17]. Data obtained from the assessment of expert judgment and prospective users were analyzed using EFA (Exploratory Factor Analysis) to test the scale validity and the Delphi test for application acceptability tests.

3. Result and discussion

3.1. Development of academic stress scale

The results of the construct validity test of the measuring scale of student academic stress in general can be seen in table 1.

Table 1. The result of Exploratory Factor Analysis (EFA).

Variable	Sex		Σ of Sex		Indicator	KMO	Valid Item	Loading Factor	α
	M	F	M	F					
Stress	67	133	33.5	66.5	Tension	.85*	1, 6, 18, 27, 29, 32	.48 - .74	.86
					Irritability		8, 11, 12, 14, 22, 33, 35, 39	.40 - .79	
Anxiety	67	133	33.5	66.5	Psychological Arousal	.88*	19, 4, 41, 7, 6, 20	.59 - .78	.87
					Perceived panic		40, 36, 9, 28, 25, 30	.48 - .78	
					Fear validity		23, 15, 2	.47 - .76	
Depression	67	133	33.5	66.5	Low mood,	.84*	26, 24, 13, 34, 38, 17, 42,	.46 - .74	.86
					Motivation,		37, 10, 21	.59 - .72	
					Self-esteem		16, 5, 31, 3	.50 - .70	

Note: M= Male; F= Female; Σ Total = 200; * $p < .05$

The total respondents in this scale validity test amounted to 200 students (67 male students and 131 female students). Based on the test results in table 1, it can be seen that each item on this scale can be said to be valid. This is based on KMO and Bartlett's Test scores from each construct greater than .70 ($KMO_{Dep, Anx, Stress} = .84, .88$ and $.85, p < .05$, respectively) and score factor loading of each item has met the statistical test requirements [18]. KMO score is main requirement whether a construct can be analyzed by factor analysis method, while the size of the loading factor is a benchmark of how much the correlation of statement items in explaining the construct has been made [18]. Based on the results of table 1 it can be interpreted as well, that the constructs of depression, anxiety and stress have relatively high levels of internal consistency ($\alpha = .86; \alpha = .87$ and $\alpha = .86, p < .05$, respectively).

The statistical results in table 1 is a distinct advantage in developing this media, because a number of previous studies with the same model still have few validated stress measurement scales [19]. So, the results of this statistic can be used as the basis that the stress measurement scale in this application has been valid and reliable in measuring students' academic stress levels.

3.2. Prototype of Android-based assessment application "stress meter"

This study succeeded in developing an android-based application prototype to measure students' academic stress levels. The application in question, named Stress Meter. Referring to Figure 2, the use of this application is generally divided into 3 phases. The first phase is the symptom phase, where students will feel the symptoms of stress, such as tension and other psychological disorders caused by academic and non-academic demands in the learning environment [3-5,16]. The second phase is the assessment phase, where students who want to measure the level of stress can download and

install Stress Meter application first into their Android smartphone. After the Stress Meter application is installed, students can directly open and answer all statement items by selecting one of the four available answer choices (Figure 3). After finishing answering all statements, the score will automatically exit and interpret each level of stress (figure 4) and the level of anxiety, and depression if students press the “Next” button (Figure 5). The third phase is the follow-up phase. Students who experience academic stress in the normal and low categories can take precautions (simple coping) so that their stress levels remain controlled and are classified as a positive stress. While students who experience moderate to very high academic stress can seek psychological help from counselors or psychologists so that the stress experienced can be handled appropriately.

The development of this application is generally useful as a means of self-assessment which greatly helps the performance of school counselors in identifying the student academic stress levels massively [19]. The use of instruments, that can measures the level of Depression, Anxiety, and Stress is a separate force for this application because the actual academic or non-academic stressors experienced by students greatly contribute to the emergence of these three negative emotional levels [20,21]. With the existence of information about these three negative emotions, students can have a more comprehensive understanding and can find psychological help that is relevant to the level of stress they are experiencing.

The development of this prototype still has a number of limitations. The limitation in question is the nature of the prototype that has not been online and has not been integrated with the counselor yet. So, this prototype needs to be further developed regarding its complementary features.

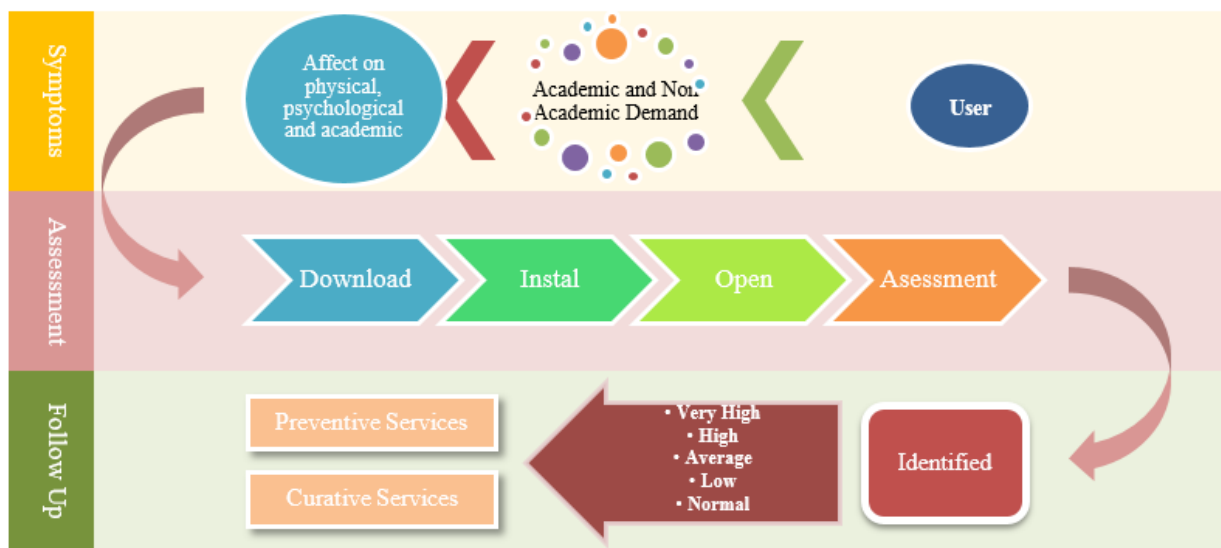


Figure 2. Flowchart of the uses of stress meter application.

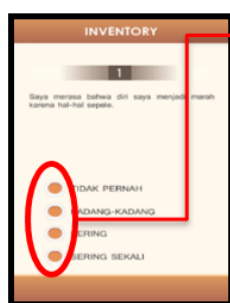


Figure 3. Example of the item



Figure 4. Result and Interpretation of Stress Level

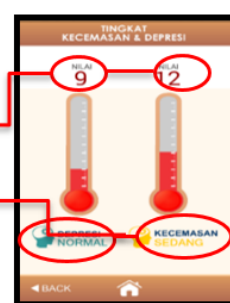


Figure 5. Level of Depression and Anxiety Level

- Note:
1. Option
 2. Score
 3. Category
 4. Interpretation

3.3. Acceptability test of stress meter application

The format for assessment of acceptability tests on the development of this application is based on four acceptability criteria (utility, feasibility, property and accuracy) [17]. The results of the acceptability test of the Stress Meter application can be seen in table 2.

Table 2. Result of acceptability test of stress meter application.

No	Component	Percentage	Criteria
1	Utility Standard	98%	High
2	Feasibility Standard	89%	High
3	property Standard	89%	High
4	Accuracy Standard	95%	High
Average		92%	High

Based on table 2, it can be seen that each acceptability criteria score is a 98% utility standard, 89% feasibility standard, 89% standard property, and 95% standard accuracy with an average of 92%. These results indicate that the Stress Meter application prototype meets acceptability criteria with very valid categories and can be used to measure students' academic stress levels.

Although quantitatively this prototype has a high acceptability score, this prototype is not yet fully ready to be disseminated. Based on the results of the second stage field trials conducted on subject of higher education, the acceptability level of the application of stress meters a fell in the medium validity category [22]. This indicates that this application cannot be fully used for all groups. The features, content, appearance and style of language contained in the application, need to be revised and re-adjusted so that it can be used not only for middle-level students, but also all users of various ages.

4. Conclusion

This study has succeeded in developing a prototype Stress Meter application that can identify academic stress levels and meet acceptability criteria. Later, through this application student can conduct a self-assessment of their academic stress level. In addition, the counselor is facilitated to identify the level of academic stress possessed by students. The prototype that has been developed is far from perfect. Synchronizing data with school servers and developing complementary features such as chatting need to be developed in future studies. Therefore, an upgrade to the prototype is very important to do, because the collected data can later be used as material for decision-making and making preventive and curative service programs in the future.

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