Validating an Academic Procrastination Scale Through Rasch Analysis

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Abstract. The aim of this study was to analyze the validity and reliability of an academic procrastination scale using the Rasch Model and Winstep software. A questionnaire was administered to 503 students at a public high school in Mojokerto, Indonesia. The results indicated that the scale has good validity and reliability for measuring academic procrastination. However, certain items require improvement, particularly the B9 items, which lack discriminatory power against different groups. Furthermore, some items tend to cluster at moderate levels of distribution. These findings have important implications for the construction of a more adequate instrument for measuring academic procrastination.

Keywords: academic procrastination · validity · reliability · Rasch Model · improvement

1 Introduction

Education is a form of developing human civilization so that it continues to exist as a quality individual [1]. Education is one of the means to be able to develop human civilization in the hope that humans can improve their quality of life and protect themselves from extinction on earth. Through individual education he is expected to develop, form a broader mindset, realistic and critical and responsible. Education policy in Indonesia requires education for the nation's children to be at least 9 to 12 years old, as the government's effort to realize the nation's ideals, namely, to educate the nation's life. This refers to the Minister of Education and Culture Regulation No. 19 of 2016 concerning the Smart Indonesia program. Article 2 states that the existence of the Smart Indonesia Program is to support the implementation of universal secondary education/pilots related to 12-year compulsory education. Students are one of the important factors in the continuity of education. A student is someone who is legally (officially) registered to take part in a series of learning processes in the world of education [2]. High school students have an average age of being in the adolescent phase, which is around the age of 12 to 18 years [3].

According to Rumberger, 50% of students experience dropping out of school at a young age which is based on factors students don't like school and lack commitment to

school [4]. In addition, Rumberger describes adolescents who have behavioral problems with learning difficulties in the classroom [4]. Adolescents have emotional problems if they have a psychiatric disorder that affects school attendance and performance. On the one hand students are required to be able to follow and do various tasks both academic and non-academic. According to [5] academic assignments are tasks related to formal learning activities at school, such as doing assignments given by teachers, and taking exams that have been set by the school, and so on. Meanwhile, non-academic assignments are tasks that are outside of school hours, such as extracurricular activities [5].

Students respond or complete academic assignments with various attitudes and ways. There are some students who can work on completing tasks well and precisely and pay attention to the difficulty of the task and the deadline for assignment collection. However, there are also some students who delay doing assignments, because they think the assignment is too difficult, or they are tempted by other activities that are more fun and end up with less than perfect assignment results and they don't even submit assignments. Ackerman & Gross (2005; in [1]) defines procrastination as an individual's need to carry out an activity or complete a task, but do not have the motivation to do so, so they choose to postpone and leave the task to be completed later. Furthermore, in psychological terms, delaying work or buying time to complete a task or job is procrastination [1]. Moreover, Akbay (2009) states that work procrastination behavior related to academic life is academic procrastination [1].

Ucar et al., (2021) stated that academic procrastination can pose a significant obstacle to student academic achievement [6]. This is because procrastination is a form of negative behavior that can affect students which has an impact on decreasing their effectiveness in the academic field. Serdar (2021) states that there are several factors that cause individuals to carry out academic procrastination, namely, individual inability to manage time properly, difficulty focusing on one task, low sense of responsibility for completing a task, anxiety, and fear with negative perceptions that individuals will continue to failure at work, unrealistic expectations, wrong cognitive attributes, and a tendency to be perfectionist about himself and his performance [7].

Some studies in Indonesia related to the phenomenon of academic procrastination. Students at SMA Negeri 1 Muara Sugihan have an average of 90.92% of students who practice academic procrastination [8]. In addition, Munawaroh et al. (2017) stated, there were 7.1% of students belonging to the high academic procrastination category, 79.8% belonging to medium, and 13.1% belonging to low [9]. It is undeniable that Covid-19 has also contributed to academic procrastination behavior. During the Covid 19 period students carried out distance learning activities (online). Students who originally came to school and carried out face-to-face learning activities, and teachers prepared material directly changed to online form. This situation requires students to be more independent from all aspects such as doing assignments independently, understanding the provided material, and managing time well. However, those behaviors are not easy for students to do precisely. There are several obstacles that students often face in the distance learning process at home, such as limitations of the tools used (mobile phones, computers, laptops, etc.), internet network, and so on. According to Graceltya & Harlina (2021), there were 102 students (63.35%) in class XI Martapura State High School who experienced moderate academic procrastination during the Covid-19 pandemic [10].

The tendency of academic procrastination is one of the phenomena that occurs in the field of education. In Indonesia, studies on academic procrastination are always reviewed from year to year. Based on a search using the Herzing's Publish or Perish application using Google Scholar Indonesia from 2020 to 2022, 26 studies were found in 2020, 22 studies in 2021, and 2 studies in 2022 (up to May). The search found that 95% used the Procrastination Assessment Scale-Student (PASS) as a measuring tool for academic procrastination, the remaining 5% used Tuckman's procrastination measurement tool.

The literature using the Procrastination Assessment Scale-Student also uses indicators based on the development of various theories. As many as 65% of the studies that developed PASS were based on the indicators disclosed by Ferrari et al. In addition, 10% of studies use indicators developed by McCloskey while 5% of PASS was developed by Combs J's theory. Then the remaining 5% was developed by the theory expressed by Dluha.

Considering the importance of the students' academic procrastination phenomenon, it is necessary to analyze the academic procrastination scale to develop an academic procrastination measurement that is relevant and appropriate to age and educational background.

1.1 Academic Procastination

Academic procrastination is a delay in the completion of a task or work related to the academic field that is carried out intentionally and repeatedly by carrying out other activities that are not useful, thus hindering performance [5]. The same thing was also expressed by Burka and Yuen (1983; in Khoirunnisa et al. (2021) that academic procrastination is a delay in doing a job until the next time or day [11]. Academic procrastination shows indiscipline in using time, because in this case the individual will spend spend a lot of time without producing anything useful. According to Garzon (2017), students with better academic report cards use effective time management and self-regulation strategies [12]. Academic procrastination is a behavior that exists at all levels of education which can be detrimental to students by delaying them in learning material or subjects as fulfillment of academic requirements, so that it can be said that academic procrastination is an important problem to reduce [12].

According to Muyana & Dahlan (2018) there are several things that make a person do academic procrastination, including: 1) a procrastinator has a possible point of view that a task must be completed perfectly, so that it raises the thought of not completing the task it immediately. 2) there is a fear of failure in doing the task. 3) difficulties in managing time and do not like the task. 4) implementation of reward and punishment systems. 5) lack of social support from the surrounding environment. 6) piling up too many tasks [13].

Ferrari et al. (1995) states that there are four aspects of academic procrastination behavior, namely: 1) delaying a job when starting or completing it, 2) delaying in completing assignments, 3) time imbalance between planning and carrying out tasks, and 4) the tendency to do activities that are considered more fun and not boring [11]. Meanwhile, Ghuhron & Risnawati (2010) suggests there are four aspects of academic procrastination behavior, namely, 1) delays in starting and completing tasks, 2) delays in doing tasks,

3) time gaps between plans and actual performance, 4) doing activities that are more enjoyable.

2 Methodology

This article is a result of descriptive quantitative research. Arikunto (2006) states, descriptive quantitative is a method that aims to create an objective description or description of a situation using numbers, starting from data collection, data interpretation, and the appearance of the results of the data [14]. In research conducted by Lenggono & Tentama (2020) using the procrastination academic scale student by Solomon & Rothibium with a sample of 60 students produced a reliability of 0.707 and a validity of 0.816. In this study, 26 items were used which were developed based on the evaluation, potential and activity dimensions introduced by Osgood & Association [15]. Research on academic procrastination was also carried out by Aydoğan & Akbarov (2018) using the academic procrastination questionnaire (APQ) constructed by Abu Ghazal. In this study, it has a reliability of 0.961 involving 213 respondents and 21 items [16].

This study adopted a procrastination scale developed by M. Tri Indarto S (2019) based on the development of aspects of academic procrastination put forward by Ghufron & Risnawati (2010) [17]. The scale consists of 34 items from four dimensions. The four aspects with the distribution of each number of items in the questionnaire are as follows: delays in assessing and completing tasks (8 items), delays in doing tasks (9 items), time gap between plans and actual performance (8 items), carrying out activities which is more fun (9 aitem). However, after trying out the remaining items there were 29 items, with each item in each aspect as follows: delaying in assessing and completing tasks (7 items), delaying in doing tasks (5 items), time gap between plan and actual performance (8 items), doing activities that are more fun (9 items).

The items in this study were given a code for each aspect used, there were codes A, B, C, and D. Code A was given for items that originate from the aspect of delay in starting and completing tasks. Code B was given for items that come from derivative aspects of delays in doing assignments. Code C was given to items derived from aspects of the time gap between the plan and actual performance. As well as the D code was given to items that come from the turn of aspects of doing activities that are more fun. The population of this study was 839 students of SMA Negeri 1 Ngoro, then the data collected for analysis was 503 students. So that based on these data then an analysis is carried out using the Rasch Model with the Winstep for Windows application.

2.1 The Measurement Scale

The measurement scale is an agreement used as a reference for determining the length or shortness of the interval in a measuring instrument, so that when the measuring instrument is used in measurement it can produce quantitative data [18]. Meanwhile, according to Muhammad (2005) the measurement scale is the determination of a variable based on the type of data inherent in a research variable [19]. By setting or determining a measurement scale, the variable values measured by certain instruments are in the form of numbers, so that they are more accurate, efficient, and communicative.

There are four types of measurement scales which are nominal scale, ordinal scale, interval scale, and ratio scale (Tashakkori & Teddie, 2010; Ridwan, 2015; in Hanafiah et al., 2020). When viewed based on the various types, Sugiyono (2012) states that there are 4 types of measurement scales, namely, Likert scale, Guttman scale, semantic differential, and rating scale [18]. In order to determine whether a person experiences academic procrastination, there are scales that can be used to measure it. There are several scales that are quite popular for measuring academic procrastination, namely the Tuckman procrastination scale, student procrastination assessment scale (PASS), irritational procrastination scale and pure procrastination scale [20].

This study used data from the academic procrastination scale developed by M. Tri Indarto (2019) based on aspects put forward by Ghufron & Risnawita (2010) [17]. The things that underlie the use of this scale, namely, on this scale has a standard assessment that is using a Likert scale, on this scale only reveals the condition of academic procrastination experienced by students, has a reliability of 0.942, and has a validity score that moves from 0.281 to 0.571. This refers to Saifuddin's statement (2020) regarding the requirements for a good psychological measuring instrument, namely the research scale must have a standard rating, on each psychological scale it only reveals one psychological variable, has a high level of reliability, and has high validity [21].

Rasch Modeling (Rasch Model) discovered by Dr. Georg Rasch on the results of tests conducted by Dr. Georg on two tests of elementary school students grades 4, 5 and 6. Dr. Georg is a mathematician from Denmark [24]. The Rasch Model is a model used to analyze data for both the quality of the instrument and the responses of people who answer the instrument [22]. Rasch modeling can explain the difficulty level of an item with the right measurement, so it can detect good items and identify the item's bias (differential item function). Further explained in Boon (2016) (in Scoulas et al., 2021) The Rasch model can be used by researchers to evaluate the strengths and weaknesses of the instrument, by identifying the level of difficulty of the item (difficulty level of the item varies) and the level of ability (varies from a high level to a low level) [23].

According to Sumintono & Widhiarso (2014) there are four advantages of using the Rasch model to analyze data [24]. First, being able to identify error responses, namely the wrong answer given by the respondent is not necessarily due to the respondent's incompetence, but due to the respondent's lack of accuracy in answering. Second, the missing data can be predicted with a score, namely by paying attention to the question with the highest level of difficulty, if the respondent is able to answer the question, then if the question that is not answered has a lower level of difficulty than the question, then it can be ascertained that the respondent is able to answer the question. Third, ability does not only depend on the number of correct answers, in other words, because there is a different level of difficulty in each item, the raw score obtained by adding up the correct answers of the respondents cannot be used to compare the abilities of the respondents. Fourth, being able to identify guesses, meaning that respondents with lower abilities do not have the opportunity to solve more difficult questions, in other words if the respondent is able to answer them, there is an indication of guesses when answering questions or statements. In addition, the use of the Rasch model can detect measurement problems such as item bias or item dependency which may be missed through classical validation methods such as factor analysis [23].

Sunjaya et al., (2021) suggest that using the Rasch model analysis (with data racking techniques) it can distinguish individual CHV abilities before training and after training, in addition to using this technique aspects of anthropometric measurements that are the most difficult to understand are able to identify and corrected, resulting in a good instrument [25]. Another study was also carried out by Timofte & Siminiciuc (2018) which resulted in the Rasch model being able to be used to show the level of difficulty on Marzano's taxonomy cognitive tests so that it shows the size of the test with normal range difficulties [26]. Another study was also carried out by Ramdani et al., (2020) that the Rasch model can be used to develop and validate an academic resilience scale that can measure the level of academic resilience of students at the junior high school level [27].

2.2   Rasch Model Analisis

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3 Results

The academic procrastination measurement scale data was tested based on the Rasch model approach by looking at data on realibility, item measures, person measures, variable maps, and the unidimensionality that appears. The output reliability can be used to see the reliability of both item and person. Meanwhile, the output item measure results can be used to see item suitability and item discrimination power. Then the data from the person measure can be used to analyze the extent of the capabilities possessed by the respondents. In the variable maps section, it is used to see the distribution of item difficulty. While the results of the unimenionality test are used to see whether the item has been able to measure the aspects that should be measured Fig. 1.

3.1 Items and Person Reliability

Based on the analysis through the Rasch model, the reliability of the test items is 0.99, meaning that the test items are very good. Meanwhile, personal reliability with a value of 0.90 shows the consistency of the subjects' answers, which also indicates very good reliability. This means that the items on the academic procrastination instrument were adequate to determine the level of student academic procrastination. In line with research [28] on Irrational Procrastination Scale (IPS) analysis using the Rasch model, it has an item reliability value of 0.95 and person reliability of 0.87. Moreover, J. Melgaard, R. et al. studying on procrastination working on thesis work on students of the psychology faculty at the State Islamic University of Maulana Malik Ibrahim Malang had a reliability value of the academic procrastination scale of 0.90. The results used analysis with the IBM SPSS program. Based on this data, it can be seen that by using IBM SPSS researchers can only find out the reliability of the scale, but if using the Rasch model researchers can see a picture of the reliability of the scale and person. Referring to

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--------------------------------------------------------------------------
| Person     503 INPUT    503 MEASURED            INFIT      OUTFIT    |
|           TOTAL    COUNT     MEASURE  REALSE    IMNSQ  ZSTD OMNSQ  ZSTD|
| MEAN       61.3     29.0      -.97     .38      1.02   -.3  1.02   -.4|
| P.SD       10.9      .1       1.26     .11       .76   2.6   .76   2.5|
| REAL RMSE   .39 TRUE SD    1.20 SEPARATION 3.05 Person RELIABILITY .90|
|------------------------------------------------------------------------|
| Item       29 INPUT     29 MEASURED            INFIT      OUTFIT    |
|           TOTAL    COUNT     MEASURE  REALSE    IMNSQ  ZSTD OMNSQ  ZSTD|
| MEAN     1062.4    502.9      .00      .08       .99   -.3  1.02    .0|
| P.SD      111.8      .3       .71      .01       .19   2.8   .23   3.2|
| REAL RMSE   .08 TRUE SD     .70 SEPARATION 8.58 Item   RELIABILITY .99|
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Fig. 1. Reliability of the academic scale

(Suminto & Widhiarso, 2014), it is stated that person reliability can be used to describe the consistency of the subject's answers [24].

3.2   Item Compatibility

The level of item suitability and item accuracy can be obtained by looking at the item fit obtained from the results of the analysis on the output item measure. Item fit can be used to see the normality of an item in making a measurement. In the results of the analysis, there are outfit mean-square (MNSQ), outfit z-standard (ZTSD), and point measure correlation values that can be used to see the suitability of item items. Point measure correlation can be used to reveal the discriminatory power of item. However, the outfit azstandard (ZSTD) value is not recommended for use if the sample size is relatively large [24]. Whereas in this study the authors used a research sample of 503 respondents, and this was relatively large, so the authors used the MNSQ outfit value and point measure correlation to analyze the level of suitability of the academic procrastination item in this study.

Suminto & Widhiarso (2014) state that the suitability criteria for item items can be seen by the MNSQ outfit received, namely $0.5 < MNSQ < 1.5$ [24]. The results of the MNSQ outfit show that if there are 2 items whose value is > 1.5, namely item 27 is 1.68 and item 9 is 1.55. This means that the two items are lacking in showing the existing model. Item D27 is an unfavorable item which says, "when I'm doing a task, I'm not easily influenced by friends who are playing my favorite game". This item is a derivative of the aspect of doing activities that are more fun. While item B9 is an unfavorable item which reads "I am able to prioritize tasks that are more important and closer to the specified deadline". The item is derived from the aspect of delay in doing the task. Both items are unfavorable items, meaning that these items are used to see the consistency of the subject's answers to other items from within that aspect.

Besides being able to be used to see the suitability of item items, the output item measure can also be used to see items that are the most difficult to agree with and the easiest for respondents to agree to by looking at the JMLE Measure section. Item A1 is the most difficult item to agree with in this study, it is known that item A1 has the highest logit item, which is 1.88. While item C12 is the easiest item to agree with, with the lowest item logit value, namely –1.55.

Meanwhile, to see the discriminatory power of item, the author uses the point measure correlation value that has been presented in the item measure image. In this case the authors refer to the classification guidelines proposed by Alagumalai et al. (2005) with the following details: Very good (>0.4); Good ($0.39 – 0.30$); Enough ($0.29 – 0.20$); Not able to discriminate ($0.19 – 0.00$); Requires checking (<0.00). The following is a picture of the results of the item measure analysis [24]. Then the results of the classification of the 29-item point measure correlation values are shown in the Table 1:

When viewed from the Table 1, it shows that as many as 24 items were classified as very good items, 2 items were classified as good, 2 items were classified as sufficient, and 1 item was classified as incapable of discriminating against groups. Items that are classified as incapable of discriminating against groups are item 9, so that item needs to be further examined, so that it could become a good item to be used as a measure in the used aspects. This result is in line with research conducted by [29] that in the personal

Table 1. Items Difficulty Classification

Criteria	Items
Difficult	A1, C20
Moderate	A6, D24, D28, A2, B7, C21, B9, C15, B10, D19, A17, A3, B8, C12, D22, C11, C13, D25, B18, C14, D26, D27, D29, C16, A5, D23
Easy	A4

fable measurement tool there are items that cannot discriminate and some items need to be corrected without eliminating these items.

The results of the item measure analysis show that the total count data for each item was 503 for all numbers, meaning that all items were answered as a whole by the respondents in this study.

3.3   Person Suitability

Suminto & Widhiarso (2014) state that the output person measure has information related to each respondent's logit [24]. Based on the analysis of the person measure value, it shows that respondent 177 has a logit person value of 1.71, which means that respondent 177 had the highest level of academic provocation compared to other respondents. It is known because respondent 177 had the highest logit person value among other respondents. Furthermore, there were 88 respondents who showed the number -7.68, meaning that 88 respondents had the lowest level of academic procrastination compared to the other responses. This can be seen from the logit person value developed by the respondent which is lower than the other respondents. The results of the person measure value analysis show a total count value of 29, meaning that all respondents answered each item completely on the academic procrastination instrument.

3.4   Variable Maps

Variable maps are measure that can be used to see the distribution of item difficulty based on the answers given by respondents [24]. The results of the variable maps consist of a measure (showing a logit scale), person showing the distribution of the difficulty levels of the questionnaire item items answered by the respondents. So, when seen from the variable maps image, it can be seen if the respondent has a low level of ability in answering the items given. It is known if the average logit person owned is –0.97. While the average logit item owned by the academic procrastination measurement scale was 0.00. In the variable maps image, it can be seen, the items were grouped at a moderate distribution level. The following table shows the distribution of item difficulty levels.

Based on the item variables, it is known that there are 2 items that are the most difficult for respondents to agree with, namely item A1 and C20. Item A1 was an item that reads "I feel anxious and restless if there are tasks that have not been done". Meanwhile, item C20 was an item that reads "if there is a task that I don't understand and don't know how to solve it, then I will ask someone who understands better". Item A1 is a favorable

item, while item C20 was an unfavorable item. Then, there was also 1 item that was the easiest to agree on, namely item A4 which reads "I like to do assignments little by little, even though the collection time is near. So, based on the description of the three items, it can be proven that the respondent's level of ability is quite low, apart from the logit person value he had. In the table it can also be seen if there were 26 items that were at a moderate level.

3.5 Instrument unidimensionality

Instrument unideminesionality is a measure that can be used to see that the instrument used is able to measure the aspects that should be measured, in this case it is a contract of nationalism [24]. In other words, unidimensionality can be used to measure the construct validity of the instrument. In this case the unidimensionality of the instrument is used to measure the diversity of measuring instruments to evaluate the constructs of academic procrastination measuring instruments. The following is a picture of the results of the unidimensionality test of the academic procrastination measuring instrument:

Sumintono & Widhiarso (2014) suggest that the unidimensionality requirement of at least 20% can be met [24]. Referring to this, the raw variance data on the academic procrastination instrument is 37.8%, meaning that the instrument can be classified as fulfilled. In addition, the data shows that other variances that cannot be explained by other instruments have a percentage below 15%, in the table the academic procrastination scale has a variance that cannot be explained by instruments ranging from 3–7%, meaning that it indicates the level of item independence in the instrument. Measure is good. These results are in line with research conducted by [30] that the resilience scale has a raw variance value of 38.2% and the variance that cannot be explained by instruments ranges from 4–8%, so this scale can be used because it shows consistency in uncovering constructs. Psychology based on the results of the dimensionality test. The academic procrastination scale can be used because it has reliable consistency to determine the condition of academic procrastination in students.

4   Conclusion

The results of the study show that overall, the academic procrastination scale was reliable and valid. Based on the results of the analysis using the Rasch Model, the academic procrastination instrument has fit items. In addition, the level of reliability shows a score of 0.99, meaning that the item has a very high level of reliability. The results of the item analysis indicate that there were a few items that need to be improved, especially the B9 item. This is because it had not been able to show discrimination against groups. In addition, there was a tendency for items to cluster at a moderate level of distribution, so item improvements can be made to reduce the case and to make it more varied. Finally, improvements to the items are necessary to construct an adequate scale of academic procrastination. In addition, further researchers could focus on academic procrastination considering some essential demographics aspects such as gender and age to result in more comprehensive findings.

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