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VALIDATION OF THE MINDSET SCALE IN THE INDONESIAN CONTEXT: A RASCH MODEL ANALYSIS

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Abstract

Research on growth mindset shows a positive trend in the recent years. The importance of the growth mindset for students is growing to be a center in education, but the valid scale to assess the variable in Indonesia is still limited. The study aims to measure the validity and reliability of the adaptation mindset scale in the Indonesian context. The scale was developed by Carol Dweck in 2008. The study recruited 554 students from universities consisting of students in diploma, bachelor, master, and doctoral programs in Indonesia. The research used the Rasch model to test the validity and reliability of the mindset scale instrument considering the five Fisher's criteria. The results indicated good results based on the internal consistency of the instrument with a reliability value of 0.99 and Cronbach's alpha value of 0.88. The construction validation of the scale still did not meet the fair criteria on the Fisher standard (Fisher, 2007), but the number was found acceptable according to some studies. Meanwhile, the results of the misfit test showed that each item had met the standard of a good instrument in which the MNSQ value was between 0.71-1.4 in the good category. The recommendation for further study was discussed.

Keywords: mindset scale, growth mindset, fixed mindset, instrument validation, reliability, Rasch model

1. Introduction

Each individual is a unique person with all the advantages and disadvantages. Therefore, each individual will produce a different response to the results of intelligence tests, aptitude tests, and psychological tests. Individuals who believe that they do not have sufficient talent and intelligence from birth will make these individuals limit themselves. On the other hand, individuals who believe that they are born with various talents and high intelligence will make them feel in a safe position. Individuals who realize that talent and intelligence are uncertain abilities will try to develop their potential with effort. This thinking is what we know as the mindset.

Mindset is a collection of thoughts in various places, times, and reinforced by projections so that they become a reality that can be ascertained in each of the same places and times (Wijaya, 2015). Mindset is an individual's belief about human attributes such as intelligence and personality (Bernecker & Job, 2019). Dweck (2006) defines mindset as an individual's perspective to understand the world. Mindset affects the individual's beliefs about his capacity and ability. Even so, the mindset is in the realm of consciousness so that individuals can change

it (C. Dweck, 2006). Every individual has a fixed mindset or growth mindset tendency (Zeng et al., 2016).

Mindset has an important role in all lines of human life. In social life, mindset has a role in forming individual social connections (Heslin & VandeWalle, 2011). In education, mindset affects the learning process and the formation of students' character. The formation of a growth mindset has proven to be effective in improving the academic achievement of adolescent girls in rural African-American areas (Burnette et al., 2018). Research conducted by (Blackwell et al., 2007) found that students who have a growth mindset after experiencing challenges and adversity actually get high math scores compared to other students. This is in line with research on high school students in America which shows that growth mindset interventions affect changes in students' beliefs about academic tasks, as an activity that is useful for learning and developing (Paunesku et al., 2015). Another study discussed the effectiveness of growth mindset training for high school students (Wahidah et al., 2021). The results showed that there was a positive change after students participated in growth mindset training with two meeting sessions. Students feel motivated to plan and achieve life goals in the future because they believe that processes and efforts matter rather than just looking at talent and intelligence. This is in line with the opinion of (Heslin et al., 2021) which states that individual talents can be developed from time to time.

Research by (Wahidah & Royanto, 2019) found that the relationship between growth mindset and school well-being, growth mindset and persistence, as well as persistence and school well-being all three had a significant positive relationship. That is, the higher the growth mindset of students, the higher the level of school well-being of students. The higher the level of student growth mindset, the higher the student's persistence. The greater the student's persistence, the higher the student's level of school well-being. This research is in line with research conducted by researchers on Resilience in which there is an aspect of persistence. Resilience helps individuals to rise from difficult situations so that individuals will continue to struggle to achieve their goals despite experiencing many failures and misfortunes (Rahmadani & Suwarjo, 2022). When viewed from the relationship between resilience and growth mindset, Dweck explains that students who have a growth mindset view intelligence and ability as something that can be changed so that they will usually have perseverance, persistence, and consider the difficulties encountered as a process and a challenge (C. Dweck, 2006). Having a growth mindset can predict the high degree of autonomy in student learning motivation so that it has a positive impact on student persistence (Zhao et al., 2018). This means that students with a growth mindset tend to have a good level of resilience.

Based on the research above, it can be illustrated that the mindset is an important aspect. Therefore, to measure an individual's mindset whether he has a fixed or growing mindset, a mindset scale instrument is needed. The mindset scale instrument was adapted from the mindset quiz made by Carol Dweck (2008). This mindset scale initially consisted of only 6 items and was known as the Implicit Theory of Intelligence Scale which was created by Dweck in 2000 (Park, 2021). Next comes a scale with 8 items called the Implicit Theories of Intelligance Scale (Troche, S. J., & Kunz, 2020) or the Growth Mindset Scale (Rammstedt, 2021). Several years later, a new scale was developed which consisted of 11 items and was analyzed using the CFA. Not many studies have used the Rasch model to test the validity and reliability of the mindset scale instrument. Some of the studies mentioned above tend to use CFA with previous scale items. This makes researchers interested in conducting this study using the latest 16 item scale and using the Rasch model.

In order to be used properly, the validity and reliability of the mindset scale instrument must be ensured. This needs to be done to ensure that the data can represent the actual situation and categorize the individual mindset correctly. The validity of the instrument shows the degree of accuracy, namely the accuracy between the data attached to the object and what is reported. Therefore, it is important to do a validity test to measure the validity of an instrument (Sugiyono, 2019). While a reliable instrument can show the degree of determination or consistency. Reliability concerns the extent to which a measuring instrument can be trusted for its stability (Yusup, 2018). Whether this mindset scale instrument can work the same in different populations, for example in individuals with certain age and gender categories. An instrument can be said to be reliable after the instrument has been tested for reliability. Validity and reliability tests that are carried out properly and appropriately can overcome factors that can affect the validity and reliability of an instrument such as the subject being measured and the user of the measuring instrument. In Indonesia itself, it is still very rare to find research on mindset measuring tools. This has prompted researchers to develop a mindset scale instrument that hopes that the instrument can be used in counseling institutions to measure individual self-growth.

2. Method

2.1. Research Design

The research used the Rasch model to test the validity and reliability of the mindset scale instrument. An instrument considered to be valid if it was able to measure what it should measure (Sugiyono, 2018). Meanwhile, reliable meant (Sugiyono, 2017) that an instrument that was used many times could produce relatively the same data. The consistency of the instrument could be seen when the items in an instrument were tested several times on the same or almost the same respondents (Din, Rosseni; Zakaria, Mohammad; Mastor, Khairul; Razak, 2009). The mindset scale instrument was tested using the Rasch model. By investigating the item polarity, unidimensionality, item reliability, item mapping, and separation analysis in the Rasch model. Those analysis were able to test the validity and reliability of the instrument (Yasin et al., 2018). The researcher translated Dweck's mindset quiz into Indonesian and changed the pronunciation into a mindset scale. Furthermore, the results of the translation were tested on linguists to ensure the suitability and there was no change in the meaning of each item of the translated statement. After the mindset scale had gone through the language test and was declared appropriate, the mindset scale instrument was tested on the respondents using the Google form.

2.2 Research Respondents

Research respondents consisted of 544 students from various universities ranging from diploma, undergraduate, professional education, masters and doctoral education levels in Indonesia. The majority of respondents were female with a total of 421 (77.4%) while male respondents amounted to 123 (22.6%). The age range of the respondents varied from 17 to 56 years.

2.3. Data Collection

Data was collected using a mindset scale in the Google form. Researchers had included informed consent at the beginning of the scale so that it could be ascertained that every respondent who filled the data had agreed that the data would be used for research purposes. Before filling out the instrument section, respondents were asked to fill in data consisting of

age, gender, participation in the organization, and residence. Furthermore, respondents filled in the mindset scale instrument consisting of 16 statements with answer choices arranged based on a 6-point Likert scale starting from strongly agree, agree, mostly agree, mostly disagree, disagree, and strongly disagree. Of the 16 statements, they were divided into 8 negative statement items with low to high scores (0-5) which were in items number 1, 2, 4, 6, 9, 10, 12, and 14. Meanwhile, other items such as number 3, 5, 7, 8, 11, 13, 15, and 16 were in positive statements with scores from high to low (5-0). Dweck (2008) categorized individual mindsets into four categories, namely: strong growth mindset, growth mindset with some fixed ideas, fixed mindset with some growth ideas, and strong fixed mindset. The mindset categories were listed in the table 1.

Table 1. *Mindset scale scoring table*

Categorization	Points value
Strong Growth Mindset	61-80 points
Growth Mindset with some Fixed Ideas	41-60 points
Fixed Mindset with some Growth Ideas	21-40 points
Strong Fixed Mindset	0-20 points

2.4. Data Analysis

The statement items were then analyzed to find its validity and reliability using the Rasch model. The Rasch model could indicate the interactions that exist between respondents and items at the same time by looking at the probability that was reflected in the logical value of selecting an item in a group of respondents (Wibisono, 2018). There were several criteria that could be used to measure the level of instrument suitability using the Rasch model. Fisher developed a five-criteria scale instrument (Fisher, Jr., 2007) used in the study. The closer the results of the instrument analysis with the Rasch model, it could be interpreted that the instrument had a good validity and reliability. The Fisher's five criteria was presented in Table 2.

Table 2. *Rating scale instrument quality criteria Fisher*

Criterion	Poor	Fair	Good	Very Good	Excellent
Person and item measurement reliability	<0.67	0.67-0.80	0.81-0.90	0.91-0.94	>0.94
Person and item strata separated	2 or less	2-3	3-4	4-5	>5
Variance in data explained by measures	<50%	50-60%	60-70%	70-80%	>80%
Unexplained variances in contrast 1-5 of	>15%	10-15%	5-10%	3-5%	<3%
Item model fit mean-square range extremes	<0.33->3.0	0.34-2.9	0.5-2.0	0.71-1.4	0.77-1.3
PCA of residuals					

4. Findings and Discussion

The field test to measure the validation and reliability of the mindset scale in the Indonesian version adapted from the original version developed by Dweck in 2008 (C. S. Dweck, 2008) involved 544 university students. The students involved came from various universities in Indonesia where most of them were female students (77.4%). The age range of respondents was between 18-56 years as can be seen in Table 3. Meanwhile, from the respondent's identity data, it can be seen that 60.8% of respondents reported actively participating in organizational activities both internally on campus or off-campus activities. Considering the background of their residence, respondents were identified as coming from various places and mostly from

rural areas 46.7%, from small cities by 31.1%, 21.1% from big cities, and the rest filled others. The background of organizational activity and residence were interesting factors to reveal as it can provide an idea of whether these two factors can affect a person's mindset which should be investigated more thoroughly in further research.

Table 3. *Demographic data of respondents*

Demographic	N (N_{total}=544)	Percentage
Gender		
Male	123	22.6%
Female	421	77.4%
Age		
18-40 (young adulthood)	536	98.5%
41-60 (middle adulthood)	8	1.5%
Participation in organization		
Participate	331	60.8%
Not participate	213	39.2%
Residence		
Countryside/villages	254	46.7%
Town/small city	169	31.1%
Capital city/big city	115	21.1%
Others	6	1.1

By performing a reverse score on the negative statement number, the data was then analyzed according to the Rasch criteria specified in Table 2. A summary of the results can be seen in Table 4. Person reliability on the mindset scale indicated a good value, which was above 0.80 and was in the good category according to Fisher (Fisher, 2007). This means that this scale has respondents who are consistent in working on the scale. However, the value of the person strata separated was still below 3 and it was in the fair category. This showed that the scale items were still less sensitive or not wide enough on the continuum to distinguish respondents with various variations. In other words, the scale was not yet strong enough to accurately distinguish the varying abilities of respondents. Meanwhile, considering the items, it was known that the reliability of the item was very good at 0.99 meaning that the internal consistency of the scale in measuring the mindset was very good. The result was also supported by the high separation score of 9.96, which meant that the respondents involved in this study were very varied. The Cronbach's alpha shown of the scale test has also reached 0.88, which means that the internal consistency of this scale in measuring the mindset is good and reliable (Taber, 2018).

Table 4. *The summary of Rasch model criteria*

Criterion	Value/Score/Logit	Category
Person reliability	0.88	Good
Person strata separated	2.70	Fair
Item measurement reliability	0.99	Excellent
Item strata separated	9.96	Excellent
Alpha Cronbach	0.88	High
Variance explained by measures	44.2%	Poor
Unexplained variance	11.8%	Fair

Based on Table 4. the results of the dimensionality test are often referred to as instrument construct validation, however, the results of this test showed the value that fell from the Fisher's

criteria. The variance value explained by measures was 44.2% below the expectation of a good value that was at 50% and above. However, when referring to other studies, it was found that the acceptable criteria for the variance explained by measures was above 40% and the unexplained variance value was below 15% (Mofreh et al., 2014; Ng et al., 2018; Sumintono, 2018). Meanwhile, the percentage of unexplained variance shows a result of 11.8% which was in the fair category and was still reliable for use. These two criteria indicate the purity and level of contamination of other factors in measuring the respondent's mindset. The value which was still quite low in the variance explained by measure meaning that there were many other factors that were not related to this scale. The result was actually supported by the person strata separated value which was also still quite low in differentiating the mindset of the respondents. In general, the results of 44.2% and 11.8% were still acceptable based on other references as in the study of Mofreh et al. (Mofreh et al., 2014).

After analyzing the validity and reliability of the mindset scale in general, a misfit test was also carried out to investigate the suitability of the items on the scale. In Fisher's criteria, in the good category of MNSQ on Outfit was between 0.71 to 1.4 (Fisher, 2007). The results in this study indicated that all existing items had met these criteria. This means that all existing items can be maintained and used as all of them have properly measured the mindset variable. Another general criterion that was often used for misfit test was according to Boone et al., which was between 0.5 and 1.5 in MNSQ on Outfit and all of these items had also fulfilled the criteria (Boone et al., 2014). The range of MNSQ Outfit values in the study was 0.87-1.34 which can be seen in Table 5.

Table 5. *The results of misfit test*

Entry	Infit		Outfit		PT-Measure	
Number	MNSQ	ZSTD	MNSQ	ZSTD	CORR.	EXP.
15	1.14	2.0	1.34	4.4	0.48	0.51
1	1.25	3.6	1.18	2.5	0.56	0.53
11	1.12	1.8	1.21	3.0	0.50	0.53
5	0.93	-1.1	1.12	1.7	0.49	0.52
2	1.11	1.8	1.08	1.3	0.58	0.54
16	1.06	0.9	1.10	1.6	0.53	0.55
4	1.07	1.2	1.05	0.9	0.58	0.58
3	1.06	0.9	1.02	0.3	0.50	0.48
10	0.96	-0.7	1.04	0.7	0.60	0.61
13	0.93	-1.3	1.03	0.5	0.52	0.55
14	0.97	-0.5	1.03	0.5	0.64	0.64
9	1.01	0.3	0.98	-0.4	0.61	0.60
7	0.88	-1.9	0.95	-0.6	0.52	0.52
6	0.87	-2.5	0.92	-1.4	0.63	0.61
8	0.85	-2.5	0.92	-1.3	0.55	0.55
12	0.85	-2.8	0.87	-2.3	0.65	0.60

Research related to instrument validation and reliability tests usually focuses on checking the rating scale function on an instrument. Therefore, a category structure test was carried out on this mindset scale to find the function of answer choices on this scale which consisted of six choices with a score range of 0-5 starting from strongly disagree, disagree, mostly disagree, mostly agree, agree, and strongly agree. The analysis showed good results as in general all the answer choices had been chosen by respondents. In addition, the category measure illustrated a consistent increase in the available answer choices from -3.57 to 3.94 which can be seen in Figure 1. In other words, the rating scale function used was good and able to perform consistency in the direction of respondents' answers.

SUMMARY OF CATEGORY STRUCTURE. Model="R"

CATEGORY LABEL	SCORE	OBSERVED COUNT	%	OBSVD AVRGE	SAMPLE EXPECT	INFIT MNSQ	OUTFIT MNSQ	ANDRICH THRESHOLD	CATEGORY MEASURE	
0	0	163	2	-.35	-.75	1.48	2.29	NONE	(-3.57)	0
1	1	1004	12	-.34	-.37	1.08	1.22	-2.38	-1.64	1
2	2	1209	14	-.13	.00	.77	.75	-.37	-.56	2
3	3	2298	26	.41	.43	.79	.76	-.43	.29	3
4	4	3090	36	1.04	1.01	.93	.93	.41	1.71	4
5	5	940	11	2.22	2.21	1.07	1.01	2.77	(3.94)	5

OBSERVED AVERAGE is mean of measures in category. It is not a parameter estimate.

Figure 1. *Summary of category structure*

The further analysis was carried out to investigate the number of questions that were specifically the most difficult and the easiest to agree on (Chong et al., 2022; Patras & Hidayat, 2020). Based on the map of item measure, there were three questions that were indicated the most difficult to agree on including the item number 14, 10 and 6. Meanwhile, there was one item considered as the easiest to agree on that was number 13. It can be seen in Table 6. The three most difficult statements to agree on turned out to be those that contained negative sentences and these sentences could be quite confusing to the respondents so that it was classified as the most difficult item to answer, while the statements that were easiest to agree on turned out to be positive sentences. These results imply that respondents may have difficulty in agreeing with negative sentences because their meanings can be quite confusing.

Table 6. *The detail statements considered difficult or easy in the mindset scale*

Item number	Statement
14	*Anda dapat mempelajari hal-hal baru, tetapi Anda tidak dapat benar-benar mengubah tingkat bakat dasar Anda.*
	You can learn new things, but you can't really change your basic level of talent.
10	*Bakat Anda di suatu bidang adalah sesuatu tentang Anda yang tidak dapat banyak Anda ubah.*
	Your talent in an area is something about you that you can't change very much.
6	*Anda dapat mempelajari hal-hal baru, tetapi Anda tidak dapat benar-benar mengubah kecerdasan Anda.*
	You can learn new things, but you can't really change your basic intelligence.
13	*Anda selalu dapat secara substansial mengubah seberapa banyak bakat yang Anda miliki.*
	You can always substantially change how much talent you have

Generally, the validity and reliability test using the Rasch model is to test whether the model being tested fits the criteria or the existing Rasch model. In this case, the conformity of the mindset scale with the Rasch model can be seen in Figure 2. There was no visible pattern that was far between the Rasch curve and the mindset scale curve which was represented by connected cross points. There were only 3 points that were furthest from the Rasch curve, although in general they could still be tolerated as they still fit to the Rasch curve.

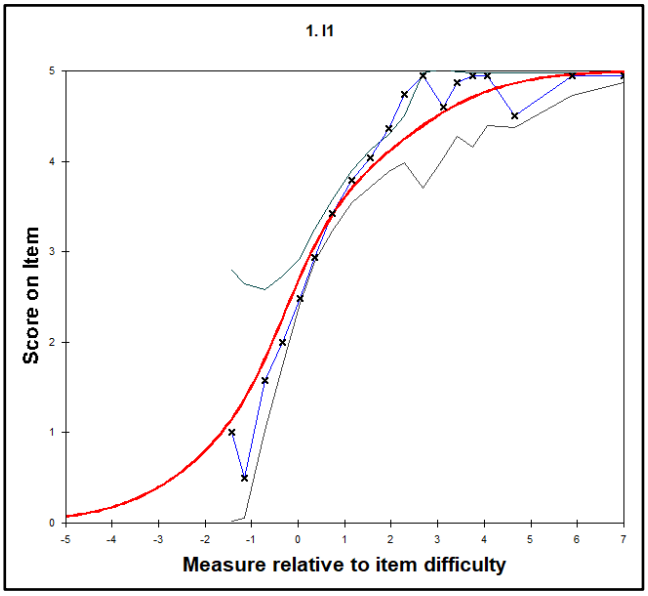

Figure 2. Rasch model curve

As stated by Wesselink (Wesselink, 2019), the Dweck mindset instrument was an instrument that was often used, however, reports on the validity and reliability of this instrument were still very limited. In his research, Wesselink tried to uncover the items that caused problems in filling in the high school students as the respondents and found the most difficult items were numbers 1, 5, 10 and 13 while the questions that did not cause problems were 8, 11 and 15. The problems identified were the misunderstanding of the respondents and difficult word choices of the item statement. The finding has similarities with the current research as both make language adaptations on the Dweck instrument. Problems that were very likely to arise in the translation instrument were difficult to understand in terms of language and word choices. Item number 10 in both Wesselink's research and this study tended to be considered as having a difficult character to agree with, especially because the choice of words used was considered difficult by the respondents. Further the statement was in negative form that could lead to misunderstanding.

The Dweck mindset instrument in the initial version consisted of 6 items and had been extensively researched for its validity and reliability showing high results (Park, 2021). One of them conducted by Blackwell et al., (Blackwell et al., 2007) showed a value of 0.78 and a test-retest reliability of 2 weeks interval of 0.77. While the development of a mindset scale of 16 items used in this study has been widely used but there has been limited research that measures its validity and reliability, especially in the Indonesian version. This study is one of the studies that is expected to provide an overview of the validity and reliability of the Indonesian version of the Dweck mindset scale which is expected to be widely used to measure the mindset. The results shown in this study have also indicated that this instrument fits the Rasch model. However, the number of respondents who fill out this scale can be said to be still limited considering the student population in Indonesia that is very large. Further research is expected to increase the number of research subjects and be able to analyze using other models such as exploratory factor analysis (EFA). In addition, further research is also expected to be able to measure the growth mindset broadly related to how student performance can be optimized, so that the development and quality of students in Indonesia can be maximized.

5. Conclusion

The results of the Rasch model test on the mindset scale showed good results based on the internal consistency of the instrument which indicated a reliability value of 0.99 and Cronbach's alpha value of 0.88. Meanwhile considering the construction validation, the instrument still did not meet the fair criteria on the Fisher standard (Fisher, 2007) however, according to Mofreh et al., and Ng et al., (Mofreh et al., 2014; Ng et al., 2018) the value of 44.2% obtained was considered acceptable. Examining the validity of each item on the scale, the results of the misfit test also showed that each item had met the standard of a good instrument in accordance with Fisher's criteria. The MNSQ value was between 0.71-1.4 in the good category.

5.1 Recommendations

The study recommends further research with a setting in Indonesia by expanding the research sample to investigate the categorization of university students' mindsets that can be useful in intervention in maximizing the students' potential.

5.2 Ethical Text

The research was declared to be ethically appropriate by the ethical committee in Universitas Negeri Yogyakarta with the decision numbered T/42/UN34.21/TU/2022 on August 11, 2022. There is no conflict of interest between the authors. The contribution rate of the first author to the article is 40%, the second author is 30% and the third author is 30%.

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