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How Reliable and Valid Is the Student Autonomy Scale When Examined Through the Rasch Model?

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Abstract
Autonomy can influence students to regulate themselves through thinking, feeling, behaving, acting, being responsible for the decisions made and living them with social considerations. Several existing instruments for assessing student autonomy still contain items that are not yet relevant to the needs of Indonesian students. This presents an interesting opportunity to develop and adapt them to the diverse social, cultural, institutional, and academic backgrounds of Indonesian students, as well as the dynamics of diverse student populations. This study aims to develop a scale to validate student autonomy used purposive sampling. This study was conducted in 2024, involving 378 students as participants consisting of 39 males and 339 females aged 17-23 years at Padang State University. This instrument is called the Student Autonomy Scale. This study uses a quantitative approach with 40 questions with "yes-no" formats as answer choices—data analysis using the Rasch model and Winsteps software. The results showed that the Cronbach Alpha value, which measures the interaction between people and items, was 0.68, included in the sufficient category. In addition, the item reliability of 0.99 indicates that the items in the autonomy questionnaire can be used to measure autonomy in students. The use of theory-based assessment methods, cross-cultural trials, and adaptive technology are some of the solutions proposed to improve the measurement quality. The Student Autonomy Scale developed in this study has a novelty that is specifically designed for the context of students in Indonesia with various considerations by adapting a comprehensive autonomy theory and integrating several important aspects and providing more precise, accurate, and standardized analysis in the era of disruption and the 21st century.

Keywords: Autonomy Scale, University Student, Rasch Analysis, Instrument Validation and Reliability, Indonesian Version.

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Introduction

In higher education, developing student autonomy is one of the essential goals closely related to academic success and professional readiness. In the era of globalization, higher education is required to produce graduates with superior academic skills and individuals who are independent, critical, and able to make decisions responsibly (Bowen, 2018; Hilton & Pellegrino, 2012). Student autonomy refers to the ability of individuals to manage their learning, manage time, make responsible decisions related to their academic and career paths, and develop critical and independent thinking skills (Boud, 2012; Stefanou et al., 2013). This ability is becoming increasingly important considering the demands of the world of work that require graduates to face complex challenges (Hilton & Pellegrino, 2012).

However, despite recognising that student autonomy is essential in developing mature and competitive individuals, research on its implementation and impact is still limited, especially in developing countries. In some contexts, higher education systems are still top-down, where the university makes academic and administrative decisions more than the students themselves (Disterheft et al., 2012). This often results in limitations in the development of student autonomy, which can affect their ability to face the professional world after graduation (Hilton & Pellegrino, 2012). As attention to the importance of autonomy in education increases, the need for valid and reliable measurement tools to assess student autonomy is also increasingly urgent. In addition, valid and reliable measurement of student autonomy is essential for practical learning evaluation (Boud, 2012; Jang et al., 2010). This is the first step in identifying a comprehensive student autonomy profile that will be developed later. This instrument was developed by adapting a comprehensive theory of autonomy and integrating several important aspects, such as self-congruence, interest-taking, susceptibility to control,

nondependency, individuation, de-idealization, and parents as people. Integrating these aspects provides a broader and more in-depth measurement scope than scales that focus on only one or two dimensions of autonomy.

Assessment of student autonomy is crucial for understanding the extent to which students can take responsibility for their education and evaluating the effectiveness of educational programs aimed at improving this ability (Benson, 2010; Boud, 2012; Stefanou et al., 2013). Although many instruments have been developed to measure autonomy, questions about these instruments' validity and reliability are often still debated. Validity refers to the extent to which a measuring instrument actually measures the intended concept, while reliability refers to the consistency of the measuring instrument in providing the same results across conditions (Bajpai & Bajpai, 2014; Carmines, 1979; Clark & Watson, 2019).

Validation gaps occur when the measurement tool used to assess student autonomy does not accurately reflect the intended construct, either due to limitations in the instrument itself or because of inappropriate contexts of use (Chen et al., 2015). Many previous studies have attempted to develop and test measurement instruments for student autonomy. However, there are still shortcomings in the generalizability of the results, mainly when the instruments are applied across different cultural contexts or educational systems. Differences in the definition and interpretation of autonomy across countries and educational institutions also make it challenging to develop a universal measurement tool (Boud, 2012; Reeve et al., 2014). Furthermore, there is a lack of consistency in the use of measurement instruments and psychometric validation across different groups of students (Cheon et al., 2012; Soenens et al., 2009), lack of cross-cultural validation (V. I. Chirkov, 2009), limitations in long-term reliability testing (Deci & Ryan, 2012), and lack of research combining qualitative and quantitative methods (Creswell & Clark, 2017). Therefore, further research is needed to ensure that the measuring instruments used to assess student autonomy have adequate validity and reliability to be used effectively in various contexts. The developed instrument can provide data that is not only valid and reliable, but also fair, precise, and usable in various contexts. The Rasch model allows for detailed analysis of each item, provides item reliability and person reliability, tested items measure the same construct, and can be used across groups.

This article aims to review, develop and evaluate the validity and reliability of various measurement tools developed to assess student autonomy. This study will also highlight the challenges in measuring autonomy in various educational and cultural contexts and recommend developing better instruments. Thus, this article is expected to contribute to efforts to improve the quality of student autonomy assessment, which in turn can support the development of more effective educational policies.

Method

Participants

The subjects in this study as a source of measuring instrument data are Guidance and Counseling students of Universitas Negeri Padang. The data source criteria are students actively registered in the 2018-2024 admission year range. This study used purposive sampling with 378 students as participants. The following is the research participant data.

Table 1. Participants

No	Participants	Admission Year	Total
1.	Counseling Students Universitas Negeri Padang	2019	5
2.		2020	2
3.		2021	57
4.		2022	30
5.		2023	110
6.		2024	177
Total			378

Data collection was conducted by distributing questionnaires directly to participants in 2024. The students were informed about the general purpose of the study and assured that their data would be handled to protect their privacy. In this study, the researchers recruited all participants voluntarily without compensation or incentives.

Indonesian Version of Autonomy Questionnaire

The instrument is an inventory used to measure and collect data on students' autonomy conditions. The questionnaire on autonomy is based on a study of theory and the suitability of the item items with the conditions to be revealed. The concept of the instrument will collect data on aspects and levels of intrinsic motivation based on the autonomy theory. The questionnaire used is the result of a synthesis between the Index of Autonomous Functioning (IAF) from the Self-Determination theory (Deci & Ryan, 2000; Weinstein et al., 2012) with the Emotional Autonomy

Scale (EAS) (Steinberg & Silverberg, 1986) with the Guttman scale model. The Autonomy Questionnaire for Students was translated by a professional-translators into Indonesian Language, supervised by a 3-person supervisory team and 3 validator team members in counseling experts. This stage aimed to verify the translation appropriateness for the conceptual, cross-cultural, and linguistic equivalence features of the questionnaire. We present the results of the Autonomy Questionnaire for Students in Supplementary Materials.

In comparison to the initial version, the Autonomy Questionnaire for Students has a minor adjustment in the response category to a Guttman scale with "yes-no" formats as answer choices and involving seven representative samples. Meanwhile, the level of student autonomy should be determined with aspects that support the autonomy: self-congruence, interest-taking, susceptibility to control, non-dependency, individuation, de-idealization, and parents as people. Each statement item is presented in Favorable and Unfavorable items. The Rasch model is used to evaluate the quality of research instruments with trait latency characteristics and as a reference framework in compiling measuring instruments (Engelhard Jr, 2013; Sumintono & Widhiarso, 2014). Although these traits cannot be measured or observed empirically, they can be observed and measured through manifestations, characteristics, and interactions with the surrounding environment (Caspi et al., 2010; Fisher, 2007).

Data Analysis Procedure

The inventory was used and prepared using a Google Form platform. It was distributed to research targets via WhatsApp communication media. Respondents' questionnaire responses were automatically recorded on Google Drive. The collected data will be analyzed to obtain the results of the person-and-item validity, person-and-item reliability, and Unidimensionality Test (Bond & Fox, 2013; Sumintono & Widhiarso, 2014). The data collected from the research subjects will then be analyzed and interpreted. Data analysis in this study uses a quantitative approach, using descriptive analysis to determine validity and reliability. The results of validity and reliability are analyzed using the Rasch Model

Result and Discussion

Validity Test

After undergoing a scale accuracy test, items on the student autonomy instrument go through an item validity test. The validity test uses the Rasch Model using the Winstep application. In testing item validity, there are several requirements for an item in the instrument to be said to be valid. The requirements are 1) the Outfit Mean Square (MNSQ) value received: 0.5 < MNSQ < 1.5, 2) the Outfit Z-Standard (ZSTD) value received: -2.0 < ZSTD < + 2.0, and 3) the Point Measure Correlation (Pt Measure Corr) value received: 0.4 < Pt Measure Corr < 0.85 (Sumintono & Widhiarso, 2014).

An item can be valid when it meets at least one to two of the three requirements above (Sumintono & Widhiarso, 2014). In addition, the Outfit Mean Square (MNSQ) value that has met the criteria has shown that the instrument item is acceptable and can eliminate the other two requirements (Boone et al., 2013). The results of the validity test of the student autonomy instrument items can be seen in the following table.

Table 2. Validity item with Rasch (I = 40, N = 378)

Item	Total Score	Measure	Model S.E.	Infit		Outfit		PT-Measure		
				MNSQ	ZSTD	MNSQ	ZSTD	Corr.		Exp.
18	4	6.22	.50	1.02	.2	3.84	3.1	A	-.14	.07
35	3	6.51	.58	1.01	.2	3.24	2.4	B	-.08	.06
20	7	5.65	.38	1.01	.1	2.35	2.3	C	-.02	.09
38	246	.76	.11	1.22	4.8	1.28	4.6	D	-.01	.30
40	63	3.21	.14	1.05	.6	1.26	2.0	E	.13	.24
37	159	1.80	.11	1.20	5.5	1.23	5.0	F	.03	.31
34	54	3.40	.15	1.02	.3	1.21	1.5	G	.15	.23
32	16	4.78	.26	.99	.1	1.17	.6	H	.11	.14
1	375	-3.61	.58	1.00	.2	1.14	.4	I	.05	.06
33	375	-3.61	.58	1.00	.2	1.11	.4	J	.06	.06
39	158	1.81	.11	1.08	2.3	1.10	2.4	K	.19	.31
36	292	.11	.13	1.04	.5	1.06	.7	L	.21	.27
9	259	.59	.12	1.01	.2	1.03	.5	M	.28	.29

25	295	.06	.13	1.00	.1	1.00	.0	N	.26	.26
16	365	-2.10	.28	1.00	.1	.90	-.2	O	.14	.12
26	288	.17	.13	1.00	.0	.92	-.9	P	.30	.27
5	375	-3.61	.58	1.00	.2	.61	-.5	Q	.10	.06
2	376	-4.02	.71	1.00	.2	.58	-.5	R	.09	.05
19	370	-2.61	.36	1.00	.1	.77	-.4	S	.13	.10
15	348	-1.19	.19	1.00	.0	.88	-.5	T	.21	.18
3	350	-1.27	.20	.99	.0	.80	-.9	t	.22	.17
7	375	-3.61	.58	.99	.2	.76	-.2	s	.10	.06
23	344	-1.05	.18	.99	,0	.97	-.1	r	.20	.19
6	312	-.25	.14	.97	-.3	.98	-.1	q	.28	.24
24	273	.40	.12	.97	-.4	.96	-.5	p	.32	.28
11	325	-.53	.15	.97	-.2	.90	-.7	o	.28	.22
12	356	-1.54	.22	.97	-.1	.86	-.5	n	.21	.16
28	355	-1.49	.22	.97	-.1	.82	-.7	m	.22	.16
10	329	-.62	.16	.97	-.3	.91	-.6	l	.27	.22
8	367	-2.28	.31	.97	.0	.78	-.5	k	.20	.11
22	370	-2.61	.36	.97	.0	.68	-.7	j	.19	.10
17	317	-.35	.14	.96	-.4	.89	-.9	i	.31	.24
27	268	.47	.12	.95	-1.0	.90	-1.5	h	.37	.29
31	324	-.50	.15	.95	-.5	.89	-.8	g	.31	.23
14	322	-.46	.15	.95	-.5	.91	-.7	f	.32	.23
21	142	2.01	.11	.94	-1.5	.95	-1.1	e	.38	.30
4	303	-.08	.13	.94	-.7	.85	-1.4	d	.35	.26
13	361	-1.82	.25	.93	-.2	.64	-1.3	c	.27	.14
30	251	.70	.11	.93	-1.6	.91	-1.6	b	.40	.30
29	259	.59	.12	.93	-1.5	.88	-1.9	a	.40	.29

The table above shows the validity test results using the Rasch Model. Based on the item validity test, valid and invalid (not used) items are obtained in the student autonomy instrument. The results of the validity test above show that the MNSQ infit figure is between 0.5 and 1.5, which means that there are no outlier items in the measurement.

Realibility Test

After the item validity test, the student autonomy instrument went through the item reliability test. The reliability test was carried out using the Rasch Model and the Winstep application. The results of the reliability test using the Rasch Model will obtain three things: Reliability Person, Reliability Item, and Alpha Cronbach's. Furthermore, the data obtained are as follows.

Table 3. Item Reliability Test Results through the Rasch Model
Summary of 378 Measured Person

	Total Score	**Count**	**Measure**	**Model Error**	**Infit**		**Outfit**	
					MNSQ	**ZSTD**	**MNSQ**	**ZSTD**
Mean	28.4	40.0	1.45	.51	.99	.0	.96	.1
S.D.	2.8	.0	.69	.06	.37	1.2	1.29	1.0
Max.	34.0	40.0	3.28	.71	3.03	7.3	9.90	8.7

Min.	18.0	40.0	-.63	.42	.42	-2.3	.16	-.8
Real	RMSE	.54	True SD	.43	Separation .78		Person Reliability .38	
Model	RMSE	.51	True SD	.46	Separation .91		Person Reliability .45	
S.E. of Person Mean = .04								

Person RAW SCORE-TO-MEASURE CORRELATION = .99

CRONBACH ALPHA (KR-20) Person RAW SCORE "TEST" RELIABILITY = .68

The Cronbach Alpha coefficient indicating the interaction between the item and the person, represents this interaction, is 0.68, which is in the sufficient category. Furthermore, the Person Reliability value is 0.38 as an indicator of the consistency of respondents' answers, included in the weak category. The weak reliability of the person category is estimated due to the use of the Guttman scale with a yes/no format. Meanwhile, Item Reliability is 0.99, which is in the excellent category, which is a measure of the instrument item quality.

Summary of 40 Measured Item

	Total Score	**Count**	**Measure**	**Model Error**	**Infit**		**Outfit**	
					MNSQ	**ZSTD**	**MNSQ**	**ZSTD**
Mean	268.3	378.0	.00	.25	1.00	.2	1.10	.2
S.D.	118.4	.0	2.62	.17	.06	1.3	.63	1.6
Max.	376.0	378.0	6.51	.71	1.22	5.5	3.84	5.0
Min.	3.0	378.0	-4.02	.11	.93	-1.6	.58	-1.9
Real	RMSE	.31	True SD	2.61	Separation 8.51		Person Reliability .99	
Model	RMSE	.31	True SD	2.61	Separation 8.54		Person Reliability .99	
S.E. of Person Mean = .42								

UMEAN=.0000 USCALE=1.0000

Based on the person table and item table data, it describes the item and the person as good. This can be seen in the MNSQ INFIT and MNSQ OUTFIT values in the Person table approaching the ideal value of 1. The closer the value is to 1 (ideal), the better. Furthermore, in the Item table, the ZSTD INFIT and ZSTD OUTFIT values approach the ideal value of 0. The closer the value is to 0 (ideal), the better (Sumintono & Widhiarso, 2014).

According to the Rasch Model, the reliability criteria are as follows (Sumintono & Widhiarso, 2014).

Table 4. Reliability criteria *Alpha Cronbach* in *Rasch Model*

Value	**Criteria**
< 0,5	Bad
0,5-0,6	Ugly
0,6-0,7	Fair
0,7-0,8	Good
> 0,8	Very Good

Table 5. Reliability criteria *Person* and *Item* in Rasch Model

Value	**Criteria**
< 0,67	Weak
0,67-0,80	Fair
0,81-0,90	Good
0,91-0,94	Very Good

> 0,94	Excellent

In the student autonomy data disclosure instrument, the person measure shows the average score for all participants. The average score of participants that is greater than the average item (where the average item is 0.00 logit) indicates their general ability is more significant than the difficulty of the instrument items.

Unidimensionality

The unidimensionality test was conducted to determine whether the student autonomy instrument that had been developed could then measure student autonomy from respondents. The results of the unidimensionality test on the student autonomy instrument can be seen in the following table.

Table 6. Unidimensionality Test with Rasch Model (STANDARDIZED RESIDUAL variance)

		-- Empirical --			Modeled
Total raw variance in observations	=	81.8	100.0%		100.0%
Raw variance explained by measures	=	41.8	51.1%		51.4%
Raw variance explained by persons	=	6.5	8.0%		8.0%
Raw Variance explained by items	=	35.3	43.1%		43.4%
Raw unexplained variance (total)	=	40.0	48.9%	100.0%	48.6%
Unexplned variance in 1st contrast	=	3.4	4.1%	8.4%	
Unexplned variance in 2nd contrast	=	2.2	2.7%	5.5%	
Unexplned variance in 3rd contrast	=	1.9	2.3%	4.7%	
Unexplned variance in 4th contrast	=	1.8	2.2%	4.5%	
Unexplned variance in 5th contrast	=	1.7	2.0%	4.2%	

The results of the dimensionality test above in the raw variance explained by the measured section are known to have a value of 51.4%. This condition explains that the student autonomy instrument has met the minimum requirements in the unidimensionality test, which is a minimum of 20% (Sumintono & Widhiarso, 2014; Ziegler & Hagemann, 2015). In addition, the Unexplained variance in the first contrast section is known to have a value of 4.1%. This value has also met the minimum requirement below 15% (x <15%) (McIver, 1981). Based on these conditions, it can be concluded that the instrument developed can provide a picture of the respondents' variables.

Discussion

Based on the unidimensionality results, the autonomy instrument shows a variance value below 15%, which means that it can be measured as a whole. An impactful autonomy instrument will get accurate results about the function of individuals who can regulate themselves, starting from thinking, feeling, behaving, acting, and being responsible for decisions made without neglecting social interests (Boud, 2012; Ryan et al., 2015). This ability will build self-congruence, interest-taking, susceptibility to control, non-dependency, individuation, de-idealization, and parents as people.

Self-congruence is the initial aspect that builds student autonomy. This character feels himself as the creator of behavior, and fully approves of the actions he takes, thus indicating that the student is autonomous (Deci & Ryan, 2000). The concept of self-creation or congruence has the same meaning as authenticity, as the existential literature describes (Sheldon et al., 2012). When autonomous, a person's behaviour is based on inherent values, needs, and interests. Authorship manifests autonomy with greater consistency between behaviour, attitudes, and traits (Weinstein et al., 2012). The second aspect is interest-taking in the form of individual openness based on awareness, insight, and experience of oneself that affects one's autonomy and self-government (Hmel & Pincus, 2002). Interest-taking involves attention that encourages a person to accept positive experiences that may seem threatening (Hodgins, 2002; Weinstein et al., 2012).

The next aspect, susceptibility to control, is the urge to behave without external and internal pressure (Deci et al., 1994). Individuals with a high disposition for autonomy have higher personal choices and initiatives in situations themselves. The results of the same empirical research show that autonomous self-regulation is associated with lower experiences of stress and tension and that external and introjected forms of regulation are associated with high internal stress (Ryan, 1982; Ryan & Connell, 1989; Vallerand, 1997). The fourth aspect, non-dependency, indicates letting go of oneself in taking roles and freedom in solving problems. Emotional independence from others is related to taking roles as responsibility for one's behaviour.

Individuation is a process of building oneself as an individual who develops independently and is no longer dependent on parents (Stein, 2012). Meanwhile, de-idealization and parents are concerned about children's and parents' relationships. This relationship forms individual autonomy, not relying exclusively on parental assistance and having the perspective that the role and status of parents can make mistakes (Andersen, 2000). All of these aspects form the autonomy instrument that is developed. It can be emphasized that the development of the autonomy instrument will produce a student profile that regulates themselves rationally and is aware of their lives by creating, living, being responsible, not depending on others, and considering the social interests of the actions taken.

In Item Analysis, the first requirement is known to have two items that are not appropriate, namely numbers 18, 20 and 35, each of which has MNSQ OUTFIT values of 3.84, 2.35 and 3.24. Based on the second requirement, six items are inappropriate, namely numbers 18, 35, 20, 38, 37, and 39. The third requirement shows that at least 38 items have a PT MEASURE CORR value of less than 0.4 and less than 0.85. Related to the views of Boone et al. and Planinic et al., there are 37 items on student autonomy that have been declared valid in the sense of functioning normally, understood by students, and measurable in terms of autonomy (Boone et al., 2013; Planinic et al., 2019).

Several cultural factors, including exploring cultural factors, influence the invalidity of the three items. Most student autonomy measurement tools were developed and validated in the Western context, which may not be entirely relevant or valid in non-Western cultures, especially Indonesia (V. I. Chirkov, 2009). This research gap related to cross-cultural validation indicates the need to develop and test more inclusive and globally relevant measurement tools, especially in developing countries. Although several studies touch on the influence of culture on student autonomy, there is still a lack of in-depth exploration of how different cultural factors affect the perception and application of autonomy. Further research is needed to investigate how cultural factors shape autonomous learning patterns across educational contexts (V. Chirkov et al., 2003; Sciences et al., 2018).

Next is the time constraint factor of identifying autonomy in students. Many student autonomy measurement tools have been validated reliably at one point in time. However, few studies have examined the reliability of these instruments in the long term or the context of changing situations and learning environments. This is an essential gap in understanding how these measurement tools can survive and remain valid in various phases of student development (Deci & Ryan, 2012). Another limitation of longitudinal research is that research methods are based on a relatively long period to determine specific characteristics. Many studies on student autonomy are only conducted in the short term or use cross-sectional methods, so they do not provide a complete picture of how autonomy develops during the student's study period (Jang et al., 2010; Patall et al., 2018). This is a deficiency in research that uses a longitudinal design to track the development of autonomy and its impact on long-term learning outcomes.

The analysis of the tested autonomy level instrument is able to describe the dynamics of student abilities; this is in accordance with the research (Jang et al., 2010; Weinstein et al., 2012). This describes the tendency of student abilities, based on aspects, respectively 48.74% and 41.4%, which are in the low category in the aspects of de-idealization and parents as people. In this aspect, student abilities are concerned with the relationship between children and parents. This relationship still has the perception of the role and status of parents being the same between at home and outside the home, dependent and distrustful of parents (Pace & Zappulla, 2013; Rakipi, 2015). Overall, the research findings can describe several things, namely: being able to make their own decisions based on their beliefs without being too dependent on others, being responsible for their actions and decisions, accepting the consequences of every choice and its results, finding their own motivation that comes from within themselves based on personal values and desires, and Trying to think rationally and creatively and manage themselves.

Conclusion

This autonomy instrument is beneficial for revealing student autonomy. Differences in autonomy results based on gender have not been found because they do not meet the standard criteria as a representative measuring instrument. Thus, the items are suitable for use in the autonomy disclosure instrument are 37 items. Although the overall Cronbach Alpha results are pretty good, the Reliability item value is excellent, which indicates that the respondents' answers are consistent. In the unidimensionality test, the student autonomy instrument met the minimum requirements, with the conclusion that the instrument developed was able to provide a picture of student autonomy. Overcoming the gap in validating student autonomy measuring instruments requires a strategy that focuses on developing theory-based instruments, cross-cultural trials, and adaptive technology. By implementing this strategy, measuring instruments can be developed to be more valid, reliable, and appropriate for use in various cultural and educational contexts.

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