Indonesian version of Runco Ideational Behaviour Scale via Rasch analysis

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Abstract. This study focuses on translating and validating the Indonesian version of the Runco Ideational Behaviour Scale (RIBS) to assess creative thinking among high school students in Indonesia. Creativity assessment in education and psychology often faces challenges, balancing between detailed, time-consuming tests (e.g., TTCT, CAT) and self-report questionnaires (e.g., CBI, CAQ, K-DOCS). The RIBS, designed to evaluate the generation of creative ideas through originality and divergent thinking, was applied to 583 Indonesian high school students, including 225 males and 358 females. Our analysis showed that the Indonesian RIBS (IDN-RIBS) exhibits psychometric solid properties, with high reliability for individuals (0.88) and items (0.98). Of the 23 items analyzed, 22 were retained, with 1 item discarded due to their misfit (MNSQ outfit value > 1.5 logit), indicating no gender bias in the assessment. This research contributes significantly by offering a robust tool for evaluating creativity in educational settings, supporting the development of creative capacities among students.

Keywords: Creative thinking assessment; Runco ideational behavior scale; Rasch model; Indonesian version.

1 Introduction

In the 21st century, improving students' creative thinking abilities is crucial to compete in many professional fields effectively. Creative thinking is the capacity to surpass established, unrelated, conventional ideas, norms, patterns, and connections to generate significant novel ideas, forms, techniques, and interpretations [1][2][3][4]. Creative thinking is the process of generating original, divergent, and creative ideas [5]. According to a recent revision, creative thinking is now defined as the ability to produce, assess, and enhance ideas that can lead to new solutions, advance knowledge, and impactful expressions of imagination [6]. The ability of students to think creatively is the basis for acquiring all other skills [7]. The significance of developing creative thinking skills arises from the fact that students can develop their ideas via creative thinking by

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combining various problemsolving strategies [8]. We can determine a student's level of comprehension and personality by assessing their problem-solving abilities. Typically, problems come unexpectedly and require creativity and creative answers [9]. The solution to a problem instructs students on investigating the problem's root cause and offers them new perspectives on the most effective therapy.

Each student tackles problem-solving with an unmatched uniqueness [10]. Each student's creativity is unique from their perspective [11]. As a cognitive talent, creativity teaches students how to generate original solutions to problems using their reasoning [12]. Problem-solving is acognitive exercise that helps pupils develop and polish their creative thinking skills. Tension in learning accomplishment, which leads to academic inequalities amongst students, is one element that contributes to the variation in student creativity.

Over the past decade, education and psychology specialists have attempted to develop methods for measuring creativity. Initially, a method for quantifying creativity was created through costly and time-consuming test steps. These phases also necessitated the assistance of qualified personnel during the testing process. Guilford [13] incorporated the Consensual Assessment Technique (CAT) and the Torrance Tests of Creative Thinking (TTCT) [14] [15] [16] into his theory of the structure of the intellect (CAT) [17]. On the other hand, creating a psychometric scale to evaluate creativity through self-reports has been aggressively pursued as an option for time-efficient labor costs that are simpler and easier to implement in the field. For instance, the Creative Achievement Questionnaire [18] and the Kaufman Creativity Scale Domain (KCS-D) are used to measure components of creative behavior [19]. The Runco Ideational Behaviour Scale (RIBS) measures creativity more comprehensively than other instruments. RIBS measures creativity by adhering to the fundamental concept that "ideas can be perceived as the products of unique, varied, and creative thinking" [5].

RIBS dependability has been developed in several regions of the world with distinct study specifications, different age groups, and several languages. RIBS has seen widespread use across several countries and regions, such as the United States [20][21][22][23], United Kingdom [24] [25], Australia [26], Spain [27], Greece [28], Germany [29], Turkey [30], China [31], Taiwan [32], Thailand [33], and Singapore [34]. This study differs from those reported in the literature review and was conducted in a different language with a larger sample.

The primary purpose of this paper was to assess the 23 items of the original RIBS in the context of the Indonesian language (Bahasa) and examine scale reliability and validity.

2 Method

2.1 Participant

a total of 583 participants, aged between 16 and 19 years (mean age = 16.78, standard deviation=1.15), were gathered from eight provinces within Indonesia for the study. Participants came from a range of provinces, including Banten 16 (2.74%), Jakarta 139

(23.84%), West Java 156 (26.76%), Central Java 28 (4.80%), East Java 219 (37.56%), East Kalimantan 16 (2.74%), Riau 5 (0.86%), and South Sumatra 4 (0.69%). Table 1 displays the attributes of the survey participants

Table 1. The demographic details of the participants (n =583)

	Total (%)	Mean Measure	S.E Mean	Model Reliability
Gender				
— Female	225 (38,69%)	.57	.07	.92
— Male	358 (61.40%)	.50	.05	.90
Province				
— Banten	16 (2.74%)	.02	.53	.97
— Jakarta	139 (23.84%)	.57	.08	.89
— West Java	156 (26.76%)	.62	.07	.89
— Central Java	28 (4.80%)	.47	.16	.89
— East Java	219 (37.56%)	.49	.07	.91
— East Kalimantan	16 (2.74%) 5	.31	.28	.93
— Riau	(0.86%)	.77	.53	.93
— South Sumatra	4 (0.69%)	1.03	.82	.95

2.2 Procedure

Respondents were given a 23-item Runco Ideational Behavior Scale. From May 2023 to June2023, data were collected and exchanged online via WhatsApp and Google Forms. Respondents were informed about the study's goals, a statement that they are not required to share personal information, and assurances that their personal data will be kept confidential.

2.3 Instrumentation

The Runco Ideational Behavior Scale (RIBS) is a scale developed to measure ideational behavior, which is the ability of an individual to generate original, divergent, and creative ideas. It was first developed by Mark A. Runco, Jonathan A. Plucker & Woong Lim in 2001. Initially, RIBS was developed with 93 items, but after further analysis and revision, the number of items was reduced to 23, which are more focused and well-interpreted through factor analysis. These items are specifically designed to reflect ideational behavior, covering aspects such as the frequency and originality of the ideas produced by an individual. The Cronbach's alpha score for RIBS reached 0.92, indicating a very high level of reliability. This score means that the items in the scale are

consistent in measuring the same concept, namely ideational behavior. Factorial analysis supports the construct validity of RIBS, showing a single dominant factor consistent with the theoretical basis of the scale. In the RIBS, the answer choices for each item are arranged in a Likert scale format, ranging from 1 to 5. This scale is used to assess the frequency or intensity of the ideational behavior measured by the item, with the following answer choices: Never (1), Rarely (2), Sometimes (3), Often (4), and Very Often (5). This study's use of RIBS was for the replication of a previous study but with a larger sample size, and it was adapted to Indonesian (Bahasa) to assess the creative ideational condition of an individual.

2.4 Data Analysis

The quality of the RIBS scale was measured using the Winsteps (version 5.1.7.0) computer program and associated manual instruction [35]. The Rasch model is used for determining (1) objective measurement, (2) conformity with the Rasch measurement model overall, (3) threshold analysis using the partial credit model, (4) the measurement of items, and (5) the measurement of individuals along with the Wright map.

3 Results

3.1 Objective measurement

In the initial step, there are two tests to assess how well the data items and persons taken meet the model for ideal measures. The optimal fit is in the MNSQ OUTFIT range of 0.5 – 2.00 logit [36]. IDN-RIBS reveals that the average value for 23 items is 0.98 logit, implying that all objects are in excellent condition for measurement. Meanwhile, for personnel, we noticed that out of 1184 persons who filled out, 601 people indicated misfits. Person misfit in this study is someone who does not offer answers or leaves answers blank, is inconsistent, and is not severe when completing creative ideation. Thus, only 583 respondents could be examined in this study, which is ideal for measurement

3.2 Conformity with the Rasch measurement model overall

The findings from the Rasch analysis applied to the IDN-RIBS are documented in Table 2. The person reliability index of 0.89 denotes significant consistency among respondents, whereas the item reliability index, at .98, reflects outstanding reliability scores. Additionally, the Cronbach's alpha coefficient, standing at 0.88, confirms the reliability of the IDN-RIBS

Table 2. Descriptive statistics for person and item measures (I =23, N =583).

	Reliability	Separation index	Mean measure*)	Cronbach's alpha	Raw variance explained by measures**)

Person	.90	3.05	.53	.90	36%
Item	.98	6.72	.00		

*) Logit Scale Measurement.

**) Calculated using Principal Component Analysis (PCA)

3.3 Threshold: partial credit model

A rating scale that does not confuse respondents when selecting an answer is proper. The respondent must easily comprehend the offered rating scale. The assessment utilizes a 5-point Likert scale, detailed in Table 3.

Table 3. Thresholds and fit indices for item response format (I =23, N =583).

Category	Andrich Threshold	Observed Average	Observed Count (%)	Infit	Outfit
Never (1)	NONE	-1.34	2	1.07	1.06
Seldom (2)	-2.66	.28	17	.961	.961
Occasionally (3)	-.78	.36	39	.02	.02
Frequently (4)	.822	.941	3	.991	.991
Almost Always (5)	.62	.77	39	.01	.01

Table 3 demonstrates that the answer choices utilized in the IDN-RIBS are suitable, i.e., each respondent is not confused and can accurately recognize and grasp the IDN-RIBS answer choices. This finding is corroborated by an upward logit movement in the mean observed value and the Andrich Threshold, progressing from the minimal logit (NONE) associated with the lowest rating to the maximal logit for the highest score (2.62 logits)

Figure 2 shows response points provided by IDN-RIBS as a standard curve, with response points 1, 2, 3, 4, and 5 already comprehended by respondents, as shown by the curve's peaks at each response point. The research findings suggest that the four answer options provided are legitimate on the instrument or that the respondent is not confused while responding; nevertheless, one response point should be deleted from the IDN-RIBS answer options. Following the findings of [37], the hill-shaped curve indicates the response point on the instrument that is simple for responders to comprehend.

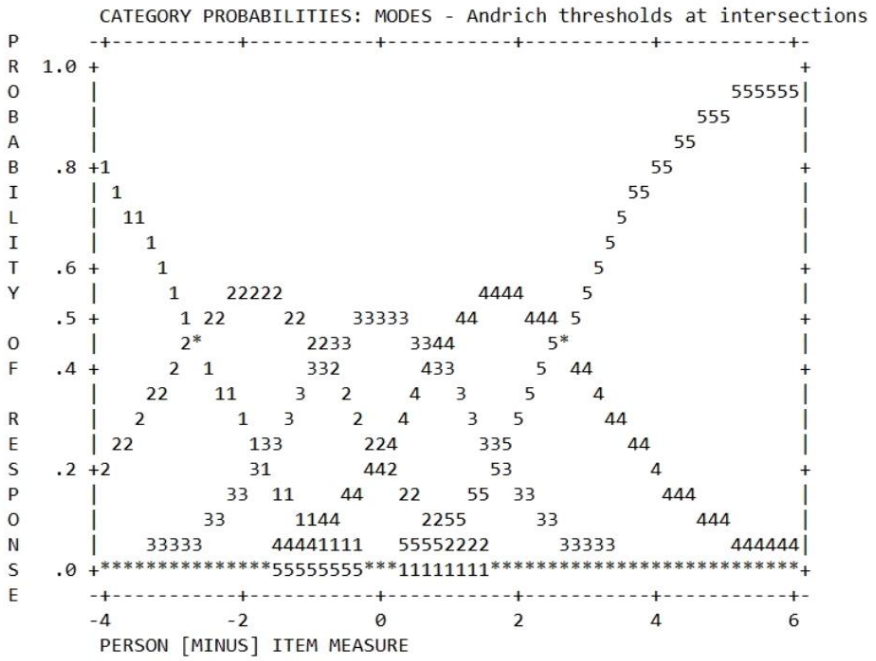

Fig. 1. Probability and empirical categorical curves.

3.4 Item measure

Table 4 displays the item measure indicating the distribution and ranking of things from simplest to most challenging. Item 11 is the most difficult item (.75 logit) for all respondents who read Ideide saya sering dianggap "tidak praktis" atau "aneh" / My ideas are often considered "impractical" or even "wild.". In contrast, item 3 is the most readily accepted (-.87 logit) by all respondents who read it Saya sering merasa semangat dengan ide-ide baru yang yang saya miliki/ I often get excited by my own new ideas.

In addition, all items in the IDN-RIBS have an outfit value of MNSQ, ZSTD, and Point Measure Correlation that satisfies the criteria, indicating that the item is following the item measure prediction data, the optimal range for the Point Measure Correlation is defined as (MNSQ = 0.5 to MNSQ 1.5; ZSTD from -2.0 to 0.0), with ZSTD < +2.0 and PTMEA Corr. ≥ 0.40 [38], [39]. Based on the study's findings that the IDN-RIBS has stable validity and extremely excellent consistency for measuring creative ideation, the IDN-RIBS is a valid and reliable instrument.

Table 4. Overview of the item measurement (I =23, N =583).

Item	Total Score	Measure	S.E Model	Infit MNSQ	Infit ZSTD	Outfit MNSQ	Outfit ZSTD	Pt.

								Measure Corr.
11	1674	.75	.06	.68	6.25	1.40	6.19	.40
21	1675	.74	.06	1.37	-5.61	.72	-5.49	.63
18	1799	.37	.06	.92	6.64	1.41	6.39	.49
15	**1800**	**.35**	**.06**	**1.60**	**9.15**	**1.59**	**8.79**	**.57**
5	1809	.34	.06	.72	-5.43	.72	-5.32	.63
8	1826	.28	.06	.91	-1.68	.91	-1.58	.60
23	1836	.25	.06	.72	-5.61	.74	-4.98	.65
9	1844	.23	.06	.68	-6.39	.69	-6.18	.67
16	1851	.21	.06	1.47	7.38	1.46	7.10	.46
20	1862	.17	.06	.80	-3.85	.80	-3.81	.57
17	1866	.16	.06	.83	-3.10	.83	-3.07	.63
4	1914	.02	.06	.71	-5.72	.71	-5.59	.61
13	1924	-.02	.06	1.15	2.54	1.15	2.57	.53
1	1941	-.07	.06	.72	-5.44	.73	-5.22	.63
14	1943	-.07	.06	1.28	4.66	1.27	4.35	.51
7	2014	-.29	.06	.891	-2.06	.89	-1.92	.58
22	2016	-.30	.06	.06	1.02	1.06	1.03	.52
19	2039	-.37	.06	1.04	.80	1.06	1.08	.51
6	2051	-.41	.06	.83	-3.16	.82	-3.26	.61
12	2064	-.45	.06	1.17	2.83	1.16	2.73	.50
2	2076	-.49	.06	.83	-3.30	.83	-3.07	.60
10	2090	-.53	.06	1.13	2.21	1.12	1.99	.50
3	2193	-.87	.06	.83	-3.23	.84	-2.83	.59

3.5 Person measure and the Wright map

Beyond the metrics for items, this study includes an evaluation of individual creative ideation through the person measure. The outcomes of this evaluation are detailed in Table 5.

Table 5. Overview of individual measurement (I =23, N =583).

Person Enrty Number	Total Score	Measure	S.E Model	Infit MNSQ	ZSTD	Outfit MNSQ	ZSTD	Pt. Measure Corr.
316	114	5.80	1.01	0.97	0.30	0.82	0.17	0.13
116	110	4.05	0.49	0.86	-0.22	0.85	-0.23	0.26
295	109	3.83	0.45	1.02	0.18	1.22	0.66	-0.27
265	107	3.47	0.40	0.91	-0.19	0.90	-0.20	0.01
671	107	3.47	0.81	-0.52	0.79	0.79	-0.57	0.24
816	39	-2.47	0.32	0.53	-2.00	0.55	-1.86	0.13

435	36	-2.81	0.34	1.23	0.85	1.36	1.25	-0.82
584	34	-3.06	0.36	0.83	-0.55	0.79	-0.66	.520
817	34	-3.06	0.36	0.75	-0.85	0.80	-0.66	.120
818	24	-5.83	1.02	0.96	0.28	0.73	0.07	.20

Table 5 shows the top five and bottom five responses from the 583 respondents who participated in this study, according to Rasch's computation. Respondent number 1020, a 17-year-old guy from Jakarta, earned the highest person measure (5.80 logits; S.E = 1.01), representing the most innovative ideational. In contrast, a male respondent, number 736, aged 17 and from Banten, had the lowest creative ideational (-5.83 logit; S. E=1.02) compared to all of the respondents in this study.

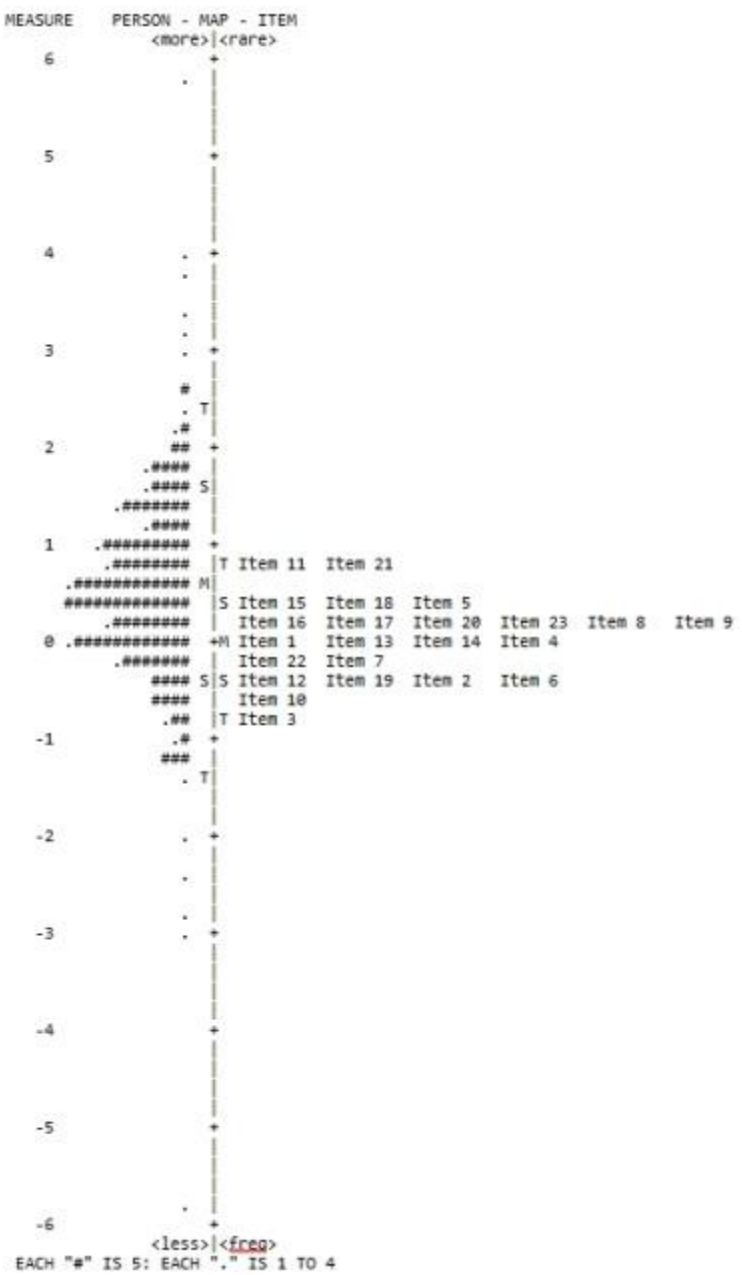

Fig. 2. Wright person-item Rasch map for ID-RIBS (n =583)

Following the findings of item parameter estimation, we used a Wright-map to determine the distribution of respondents' ability and item difficulty on the "Rasch ruler" with the same logit. Figure 2 depicts the Wright-map visualization for IDN-RIBS.

Figure 2 also shows how IDN-RIBS assesses creative ideas. This approach allowed us to quickly compare the distribution patterns of respondents on the Wright map to the item distributions based on Rasch computations. This comparison was conceivable because individuals and items share the same unit, and logits are equal-interval units [40].

3.6 The DIF analysis

Using this approach, we compared individuals and objects Individual 0513 will likely agree with Item 5 in some capacity, or Individual 1885 is inclined to disagree with item 3 in a certain

Table 6. Results of DIF Contrast Analysis on IDN-RIBS items (I =23, N =583)

Demographic	Aspect	DIF Items				
Person	Male	Item 8 (-.28)	Item 9 (-.29).	Item 13 (.29)	Item 16 (.23)	Item 17 (.29)
Item	Female	Item 8 (.28)	Item 9 (.29)	Item 13 (-.29)	Item 16 (-.23)	Item 17 (-.29)

Table 6 shows items that indicated DIF (Prob. <0.05) on the gender aspect. However, we did not remove these items because the DIF contrast value was not indicated > 0.64.

4 Discussion

The meticulous examination of the IDN-RIBS tool through the lens of the Rasch measurement model has significantly enhanced our comprehension of the quantification of creative ideation. Utilizing the principles of the Rasch model [41], this investigation validates the reliability and efficacy of the IDN-RIBS, further establishing its utility across various fields. The derived indices for person and item reliability, coupled with Cronbach's alpha coefficient, underscore the consistent performance of the instrument [42]. Such consistency is essential for ensuring the IDN-RIBS capability to measure creative thinking processes in diverse assessment environments accurately. The confirmation of these metrics within the Rasch model framework underscores the instrument's precision and relevance in evaluating creative ideation, marking it as a substantial contribution to psychological and educational research domains [5] [43] [44]. The threshold analysis of this study provides further insight into the IDN-RIBS efficacy [45]. Utilizing a 5-point Likert scale, the instrument can elicit clear, differentiated responses from participants [46] [47]. This clarity is paramount in avoiding common pitfalls like response bias, ensuring that the data collected reflects the respondents' proper levels of creativity [48]. The appropriate calibration of response categories, evidenced by the Andrich threshold and observed averages, confirms that respondents could ac-

curately interpret and engage with the rating scale [49]. Such precision in response interpretation is essential for accurately capturing the nuanced dimensions of creative ideation

Item analysis of the IDN-RIBS disclosed a broad spectrum of item difficulties, demonstrating the instrument's effective differentiation capability among participants regarding their creative capacities. This range of difficulty levels is pivotal for an evaluative tool, enabling the distinction between varying degrees of creative ideation among individuals [50]. Through an intricate examination of the items, identifying the most significant challenges alongside those most easily navigated, avenues for further refinement are illuminated [51]. Modifying the distribution of item difficulties could amplify the IDN-RIBS proficiency in gauging creative ideation over an expanded range, thus ensuring a comprehensive capture of the creativity spectrum within a demographic

Employing the Wright map visualization within this study introduces an innovative approach to assessing creative ideation. This graphical depiction highlights the variance in creative abilities among participants and delineates the relationship between specific items and these abilities [35]. Such visual insights are invaluable, allowing educators and psychologists to customize support and interventions with greater precision [52]. By delineating the contours of creativity in this way, the IDN-RIBS enhances comprehension of the underlying dynamics, thereby facilitating the development of focused strategies to nurture creative ideation.

The investigation into Differential Item Functioning (DIF) within the IDN-RIBS presents an essential consideration for its deployment across varied demographic segments [53]. While the DIF analysis identified slight variances in how items function across genders, such insights necessitate a reassessment of the item construct to affirm cultural and demographic impartiality. This dimension of the study accentuates the imperative for continual item scrutiny and adjustments, striving to eradicate inherent biases and ensure that the IDN-RIBS delivers a just evaluation of creative ideation to all individuals, irrespective of their demographic characteristics

In summary, the investigation of the IDN-RIBS instrument represents a considerable advancement in the domain of creative ideation assessment. The outcomes corroborate its applicability and dependability, yielding significant consequences for applied practices and future scholarly inquiries. As the IDN-RIBS undergoes continuous refinement and customization, its contribution to our comprehension and facilitation of creative processes becomes more pronounced. This study not only substantiates the IDN-RIBS as an effective measure for evaluating creativity but also underscores the critical need for ongoing, rigorous review of evaluative tools to align with the diverse requirements of various demographics. Through such meticulous evaluation and enhancement, the IDN-RIBS is poised to substantially impact psychology, education, and related fields, promoting the development and support of creative capabilities worldwide.

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