Adaptation and Validation of Psychological Capital Questionnaire (PCQ-12) in Academic Context: Rasch Model Analysis

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Abstract. Psychological capital is the condition of persons maintaining a positive attitude and effectively facing unpleasant conditions. This enables the completion of assignments and preparation for future success. Adaptation of psychological capital questionnaire for Indonesia was due to the absence of a measuring tool used within educational context. Therefore, this study aimed to adapt and validate Psychological Capital Questionnaire (PCQ-12) in the Indonesian language. The subjects comprised Senior high school (SMA) students from the Malang Raya area, totaling 348 participants. Furthermore, data analysis was conducted using Rasch model. The results showed that the PCQ-12 met the principles of unidimensionality and local independence. The Questionnaire comprised 12 items, with an instrument, item, and person reliability of 0.89, 0.98, and 0.88, respectively. Items that were challenging to agree upon included numbers 2, 5, 7, and 11, as well as items 8, 9, and 12. The PCQ-12 appropriately categorized response options into 6 choices, ensuring its suitability for use in Indonesia.

Keywords: Adaptation, psychological capital questionnaire, rasch model

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Introduction

Psychological capital is the condition of persons maintaining a positive attitude and effectively facing unpleasant conditions. This enables the completion of assignments and preparation for future success. According to Datu et al. (2018), Psychological capital is widely applied in the industrial world. However, numerous experts argue about its important role in education. Psychological capital was initially used in the industrial field and successfully improved employee performance. Luthans et al. (2012) extended the model to business schools, developing it into academic programs through interventions that comprise teaching design, pedagogy, and curriculum. These efforts help persons overcome barriers to academic achievement, such as stress, fatigue, anxiety, worry, and resistance to change. Yusdiana et al. (2019) mentioned that anxiety is consistently associated with failure. The fear to failure often leads to anxiety before attempting a task, reluctance to take risks, and overall academic hesitation. Students experiencing these conditions require high levels of psychological capital to succeed.

The PCQ-12 can be applied in the field of education because the conditions, activities, and objectives of the sector are similar to workplace (Martínez et al., 2019; Cotton et al., 2002). Educational activities include scheduled and programmed tasks, resource allocation, and efforts to achieve high performance. Additionally, education necessitates self-motivation, perseverance, and identifying pathways and obstacles to achieving learning goals. Carmona-Halty (2020) conducted a series of studies showing that psychological capital as a mediator, plays a significant role in schools by establishing good relationships between students and academics (Carmona-Halty et al., 2019a).

Psychological capital consists of hope, self-efficacy, resilience, and optimism (Luthans et al., 2012). Self-efficacy can influence the academic

performance of students. At a high level, it establishes a strong sense of self-confidence and belief in completing tasks, enabling high learning outcomes. Hidajat et al., (2023) explained that self-efficacy influenced academic motivation. According to Fatimah et al., (2024), it influenced academic engagement. Datu and Valdez (2016) reported the relationship between psychological capital and academic engagement which improved performance.

Optimism of students influences academic performance, specifically in career planning. This was supported by Rand et al. (2020) who reported that hope and optimism, directly and indirectly, affected academic performance and psychological well-being. According to Icekson et al. (2020), optimism enhances academic performance. It is important to note that higher self-efficacy leads to better academic performance (Meera & Jumana, 2015). Self-efficacy influences performance with self-discipline as a mediator (Jung et al., 2017).

Carmona-Halty et al. (2019b) reported the existence of an influence between positive emotions and academic performance, with psychological capital and academic engagement as mediators. In the study conducted by Gholampour et al. (2020), the relationship between optimism and academic engagement was reported. Kim et al. (2019) mentioned that optimism is related to academic performance. Fang and Ding, (2020) showed direct proportionality between psychological capital and academic engagement.

Psychological capital consists of self-efficacy, hope, resilience, and optimism. Using separate scales for each aspect would require multiple instruments. However, the measurement of psychological capital comprises the 4 aspects. Luthans and Youssef-Morgan (2017) stated that psychological capital consists of 4 constructs of psychological resources, namely self-efficacy, hope, resilience, and optimism. These constructs function and interact synergistically to produce positive resource strength for a person to achieve success.

Psychological capital has been proven to provide benefits in the field of education. Carmona-Halty, et al. (2019c) discovered that basic psychological needs influence academic performance with psychological capital as a mediator. According to Datu and Valdez. (2019), psychological capital correlates positively with life satisfaction and academic engagement. Its application in the field of education offers significant benefits, presenting the need for a reliable measuring tool. The measurement was facilitated through the development of Psychological Capital Questionnaire (PCQ-24), consisting of 24 items, by Luthans in 2007. The PCQ-24 was shortened to PCQ-12, initially applied to employees and subsequently to the educational field by Martínez et al. (2019). Setyandari and Purwanto (2020) adapted the long version into Indonesian for use in an educational context. However, there is currently no specific short version, specifically designed to measure psychological capital in academic context.

An effort to address the need for tests measuring psychological capital in the educational context is to adapt existing tools, specifically Psychological Capital Questionnaire (PCQ-12). Based on this explanation, the issue arising from using psychological measurement tools developed abroad is the cultural differences that lead to varied behavioral samples, impacting the test outcomes. Therefore, the characteristics of the test, such as validity and reliability, differed significantly. This study aims to adapt the measurement instruments and test the validity and reliability of the estionnaire.

Methods

Study Design

This quantitative study comprised the adaptation of an existing measurement instrument from an industrial setting to the educational context. The adaptation process included adjustments to language, culture, and context, following the guidelines provided by (Iliescu, 2017).

Participants and Ethical Tests

The study subjects used were Senior high school (SMA) students in Malang. The sampling method used was non-probability sampling, specifically quota sampling, which includes selecting samples based on predetermined quotas. According to Crocker et al. (2008), a sample size of 200 was adequate. Since the PCQ-12 consists of 12 items, a minimum of 120 participants was deemed necessary. The sample size of this study was determined by following the procedures of Crocker et al. (2008). The number of subjects used was 348, meeting the criteria for testing the measurement tool. Data was collected after receiving approval from the ethics committee. Finally, ethical clearance was obtained from the State University of Malang with number 22.2.9/UN32.851/KM/2022. Demographic data of the study subjects can be seen in table 1.

Study Instrument

Psychological capital was measured using the PCQ-24, which comprises 24 items developed by (Luthans et al., 2007). Meanwhile, a shorter version, the PCQ-12, consisting of 12 items, was developed and initially administered to employees. In further developments, it was applied to the educational field by (Martínez et al., 2019) in Spanish. The short version was adapted into Indonesian within the context of education. Permission for the adaptation was obtained, with the stipulation

that not all items could be shown in the article, while a few examples were provided. The instrument features 6 response options, namely strongly agree (SS), agree (S), moderately agree (AS), moderately disagree (ADS), disagree (DS), and strongly disagree (SDS).

Study Procedures

The instrument adaptation process followed the procedure outlined by the International Test Commission for Test Adaptation, which includes (1) translating the instrument, (2) synthesis I, (3) back translation, (4) synthesis II, (5) testing content validity, (6) instrument trial, and (7) psychometric properties. (Hernández et al., 2020; Beaton et al., 2000).

Figure 1 shows the process flow of adapting the measurement instrument. The stages started with obtaining permission through email from the developers. The next step was reviewing the theoretical concepts used in the questionnaire by Luthan.

Table 1
Subject Data

No	School name	Gender		Total
		Male	Female	
1	SMA Bina Bangsa	6	8	14
2	SMAN 1 Lawang	4	12	16
3	SMA Aisiyah		14	14
4	SMAN 2 Batu	9	8	17
5	SMAN 5 Malang	4	5	12
6	SMA Darul Qur an	5	6	11
7	SMA PGRI 6	8	7	15
8	SMA Muhammadiyah	7	8	15
9	SMAI Karang Ploso	7	8	15
10	SMA Surya Buana	5	4	9
11	SMAN 1 Batu	16	8	24
13	SMA 1 Kepanjen	25	25	50
14	SMAN 1	30	30	60
15	SMAN 3	24	26	50
	Total	153	195	348

The translation of the measurement instrument was adjusted to the educational context by the study analyst, an English language and a psychology expert, both educated abroad. Subsequently, evaluation was conducted to decide whether to use one of the translations, before proceeding to synthesis I. Synthesis was conducted by an educational psychologist with a Ph.D. qualification from abroad, and the criteria adopted were relevance and clarity.

Results of synthesis I were presented to 2 translators for retranslation into the original language (back translation). The back translation was compared, which does not have to be the same. Subsequently, synthesis II, also known as expert judgment in language form, was performed by 2 experts. The judgment was conducted based on 2 criteria for comparison to evaluate the success of the process. These include language similarity, and assessing how closely formal words match. Another criterion is the similarity of interpretability, evaluating whether paired items were interpreted similarly, even when the wording differed. Language expert judgment was conducted by 2 experts with a Doctorate qualification in English and a Master's degree from overseas.

The results of Synthesis II were provided for expert judgment to test content validity or ICV (Polit et al., 2007). The review of this judgment was conducted by measurement experts and psychologists, totaling 12 people with Ph.D. qualifications both domestically and internationally. The criteria adopted were (1) similarity, (2) relevance, (3) importance, and (4) clarity. This expert judgment was conducted using a 4-point rating scale ranging from inappropriate to appropriate.

The readability test was conducted by students to ensure an understanding of the meaning of the items. The readability test was conducted by 10-20 SMA students using a 5-point rating scale ranging from very inappropriate to very appropriate. Before the trial test,

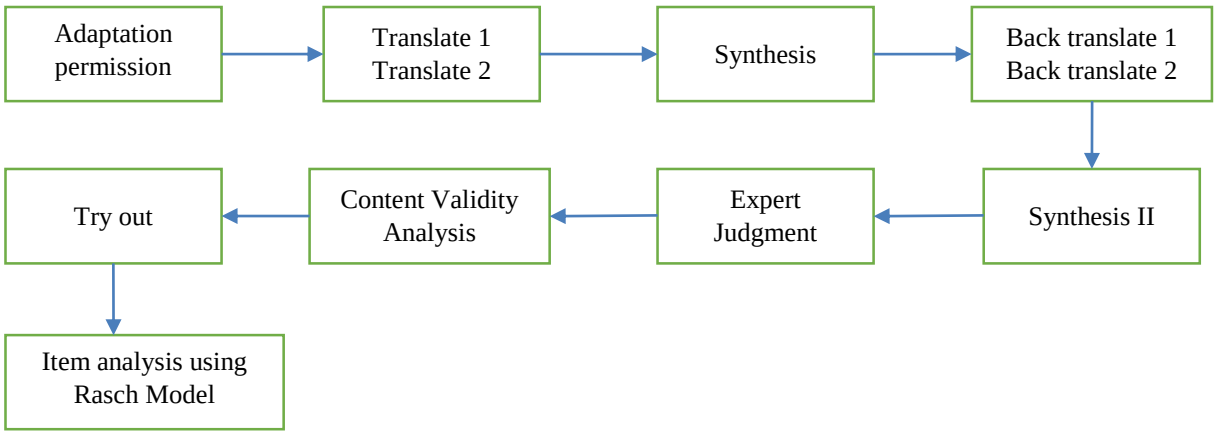

Figure 1. The process flow of adapting the measurement instrument

face validity was considered. Psychometric properties testing includes the validity and reliability of the study instrument. An example of the adapted measurement instrument is shown in table 2.

Table 2
Examples of Adapted Psychological Capital Questionnaire Items

No	Original Scale		Adaptation
		Self-Efficacy	
1	I feel confident in representing my work area in meetings with management.	I feel confident in representing my ideas concerning my studies.	*Saya merasa percaya diri dalam menyampaikan ide-ide mengenai studi saya.*
		Hope	
4	If I should find myself in a jam at work, I could think of many ways to get out of it.	If I should find myself in a jam about my studies, I could think of many ways to get out of the jam.	*Jika saya mengalami kesulitan dalam studi, saya dapat mencari cara untuk menyelesaikan masalah tersebut.*
		Resilience	
9	I usually take stressful things at work in stride.	I usually take stressful things in stride with regard to my studies.	*Saya biasanya dapat menghadapi tekanan dengan tenang jika terkait dengan studi saya*.
		Optimism	
12	I'm optimistic about what will happen to me in the future as it pertains to work.	I'm optimistic about what will happen to me in the future as it pertains to my studies.	*Saya optimis dengan apa yang akan terjadi terkait dengan studi saya di masa depan*

Table 3
Content Validity

No Item	*Similarity*	*Clrity*	*Relevancy*	*Importance*	Description
1	.96	.94	.96	.96	equivalent
2	.96	.90	.94	.94	equivalent
3	.85	.90	.90	.90	equivalent
4	.88	.88	.90	.94	equivalent
5	.92	.90	.96	.94	equivalent
6	.94	.92	.92	.92	equivalent
7	.92	.90	.90	.92	equivalent
8	.83	.79	.85	.85	equivalent
9	.85	.81	.94	.92	equivalent
10	.96	.92	.94	.94	equivalent
11	.98	.98	.98	.98	equivalent
12	.96	.96	.98	.98	equivalent

Data Analysis

Data analysis was conducted using Rasch model with the assistance of Winstep software. Rasch model is an item response theory analysis that tests validity and reliability by explaining the interaction between a person and test items.

Several criteria were used to determine a good or fit item including the Infit MNSQ value of each item. The mean and standard deviation values were summed and compared. When the logit value is greater than this sum, it signified a misfit item. Other criteria were the Outfit Mean of Square value .5 < MNSQ < 1.5, Outfit Z standard value (ZSTD) -2.0 < ZSTD < +2.0, and point measure correlation value (Pt mean corr) .4 < Pt Measure Corr < .85 (Sumintono and Widiarso, 2014).

Results and Discussion

Psychological Capital Questionnaire Evidence

The content validity of items for the instruments was measured using Aiken'V based on V (Value). Aiken (1985) formulated a method for determining the coefficient based on the assessment of a panel of experts regarding the extent to which an item represents the construct being measured. The value of Aiken'V coefficient ranged from 0-1.

Judgment was conducted by experts with doctoral qualifications from both abroad and domestically, ongoing doctoral education abroad, as well as educational psychologists. The study also conducted a readability test on 10 students of SMAN 8 Malang. The content validity of the psychological Capital scale was tested using Aiken's V with 12 panelists and 6 answer choices, generating an accepted coefficient of .73. Furthermore, the lowest validity index was .79, implying that all items meet the content validity criteria. Table 3 presents the complete content validity test results.

Rasch Model Test

Data Cleaning

The first stage in conducting Rasch analysis was to discard subjects identified as outliers. Based on this criterion, 360 out of 708 subjects were discarded. The identification process was performed using the MNSQ outfit limit. According to Boroel et al. (2017), the ideal MNSQ outfit limit generally ranged from .50-1.50. Therefore, 348 subjects remained for further analysis using Rasch model.

Unidimensionality and Local Independent Assumptions

Data analysis using the Rasch model fulfilled 2 assumptions: unidimensionality and local independence. Unidimensionality was essential in evaluating the measurement capability of the instrument. Its requirement was met when the raw variance of the data was at least 20% (Holster & Lake,

2016). Psychological capital showed the results of Raw Variance explained by the measure of 48.7%. This implied that the questionnaire fulfilled the principle of unidimensionality. Additionally, the unexplainable variance should ideally not be more than 15%. The results of Rasch model test showed that all unexplained variances were below 10%, meeting this criterion.

Local independence is the level of relationship between residuals and items. Its requirement was met when the result did not exceed .30 (Wicaksono et al., 2021; Debelak & Koller, 2020). The questionnaire showed residual correlations ranging from -.16 to .37, with a value of .37 for items 1 and 2. This indicates that these items measure the same construct. Therefore, the questionnaire was suggested to have met the assumptions of unidimensionality and local independence.

Fit Statistic and Reliability

Summary of Fit Statistic Index

The results showed that comparing the average value and standard deviation based on the criteria of item fit, using outfit MNSQ limit, led to a value of 1.26. The logit value obtained was .74-1.60, with items no. 9 and 11 scoring 1.44 and 1.61, both exceeding the acceptable range. Based on the MNSQ outfit, the value ranged from .76-1.61, with item 11 showing 1.61, which was greater than the acceptable limit of 1.5. The ZSTD outfit logit value ranged from -3.50-6.84, signifying the presence of misfit items (items 1,2,5,6,9,11). However, Pt measure obtained logit .55-.74, where all met the acceptable limit.

In Table 4, the average person and item measures were 1.61 and .00, respectively. This signified that students felt adequately challenged by the test. The standard deviation value of the person was 1.28, showing variation in the level of psychological capital of the subjects. Meanwhile, the item standard deviation value of .56 implied variation in the pattern of distribution of answers. The diverse study subjects showed variation in the level of psychological capital, from high to low. It was important to note that the distribution of answer patterns was quite varied from strongly agree to strongly disagree, with a positive standard deviation value signifying a tendency towards agreement.

The person separation value of 2.71 showed that the subjects were homogeneous in the responses provided. Meanwhile, the item separation value of 7.12 signified high measurement accuracy. Chi-square showed the fit index value to be 8812.98 with a p-value <.000. The reliability of the questionnaire was supported by a Cronbach Alpha of .89, signifying good consistency.

Table 4
Summary of Fit Statistic

	Person	Item
N	348	12
Measure		
Mean	1.61	.00
Standard deviation	1.28	.56
Standard error	.7	.17
Outfit mean square		
Mean	1.00	1.00
Standard deviation	.30	.24
Separation	2.71	7.12
reliability	.88	.98
Cronbach's alpha	.89	
Chi-square	8812.98	

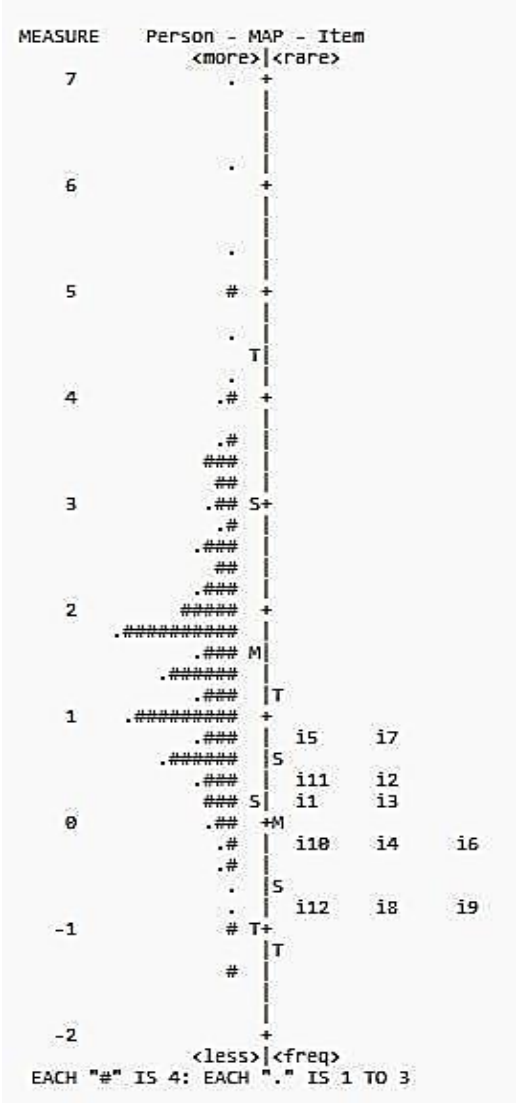

Figure 2. Wright Map

Wright Map

The Wright map shows the items that were most difficult for subjects to agree on. According to figure 2, items 2, 5, 7 and 11 were the most challenging in terms of agreement, while 8, 9 and 12 were the easiest. It is

Table 5
Rating scale analysis

Answer Choice	Observed count	percentage	Observed average	Rating scale Threshold	Standard Error
Strongly disagree	10	0	-.88	None	None
Disagree	143	3	-.35	-3.47	.32
Moderately disagree	533	13	.29	-1.37	.09
Moderately agree	1305	31	1.12	- .18	.05
Agree	1595	38	1.99	1.34	.04
Strongly agree	590	14	3.43	3.68	.05

Table 6
Calibration item

Category	Item number	Logit value	Standard error	Outfit MNSQ	Point Mass Corr
Difficult items to agree on.	5	.88	.07	.80	.69
	7	.83	.07	.98	.66
	11	.43	.07	1.61	.55
	2	.37	.07	.76	.74
Items in the medium category.	1	.26	.07	.85	.71
	3	.23	.07	.87	.68
	4	.22	.08	.95	.64
	6	.23	.08	.77	.70
Easy items to agree on.	10	-.28	.08	1.06	.64
	9	-.74	.08	1.37	.56
	12	-.76	.08	1.05	.62
	8	-.79	.08	.97	.61

important to note that easy or difficult to agree is not a criterion or group approach but a general assessment of subjects on questionnaire items.

Rating Scale Diagnosis

Rating scale validity testing was a test conducted to verify whether the choices provided were clear and understandable to respondents. Rasch model analysis included a verification process for the rating assumptions given in the measuring instrument. The questionnaire uses a Likert scale with 6 response choices, namely strongly disagree, disagree, moderately disagree, moderately agree, agree, and strongly agree. According to Van Zile-Tamsen (2017), the ideal threshold distance between answers was 1.4-5.0 logits. The adapted item response choice fell within this range, signifying that the threshold distances were appropriate. A complete explanation of psychological capital questionnaire threshold limits is provided in table 5.

Table 6 categorized items based on the difficulty of agreement. According to Wicaksono et al. (2021), the logit value of items under the difficult and easy to agree category were >.31 and -.3, respectively. Items that are difficult to agree on include 5,7,11 and 2, and those in the medium category were 1,3,4, 6 and 10. Meanwhile, items 10, 9, 12, and 8, were considered easy to agree.

Discussion

Psychological capital questionnaire is a measuring instrument consisting of 4 aspects also known as constructs. These aspects include self-efficacy, hope, resilience, and optimism. Based on the test results, the psychological capital construct is separate, proving its unidimensionality.

The presence of outliers in the initial screening shows that the data collection process using Google Forms was less effective. Some subjects were careless in taking the test, failing to reflect the real condition. Natanael et al. (2022) mention that online questionnaires tend to result in random and unserious responses, contributing to a higher number of outliers. The data collection is influenced by the emotional condition of the subjects, which can lead to less accurate data. According to Andangsari et al. (2019) testing psychological scales using the internet raises emotional reactions, thereby affecting the results.

The alpha reliability coefficient in Rasch model was not the main determinant of instrument quality (Sari & Saleh, 2023). Item and respondent reliability coefficients are crucial in determining the quality of instruments with rating scales (Fisher, 2018). An instrument is considered good and very good when the value is above .81-.91, respectively. The questionnaire measured using Rasch analysis showed alpha, person, item, and Cronbach's Alpha reliability of .88, .85, .98, and .89. A high consistency was observed in each measurement. Saputra et al., (2023) stated that a study including the same subject of SMA/SMK students

showed different reliability results. This implied a low and high consistency on respondents and items, respectively. In previous study conducted by Martinez (2019), PCQ 12 was analyzed using confirmatory factor analysis (CFA). The results showed that all items met factor loading with a reliability of 0.80 for a sample of Spanish students and .89 for a sample of Spanish and Chilean students. Anwar et al. (2023) conducted a similar analysis using CFA, with a specific focus on item reliability. This study presented a more complete reliability by including both person and item.

The most difficult items to agree with were 2, 5, 7, and 11. These items state "I feel confident that I can contribute to discussions about study strategies", "Currently, I rate myself as moderately successful in my field of study", and "Currently, I am achieving the goals I have set about my studies", "I always see the good side of things related to my studies", respectively. A relationship exists between the items with student assertiveness and self-disclosure. Based on Indonesian culture, there is a tendency for difficulty in self-disclosure. Ekiyani et al. (2024) mentioned that the assertiveness level of SMK/SMA students was in the medium and low categories. Students had limitations in expressing thoughts and feelings, hence, feeling less confident in determining the response.

Item 11 was the most difficult to agree and was considered not fit. The item states "I always see the good side of things related to my studies", featuring optimism. Students tend not to be overly optimistic, thereby increasing academic performance. Icekson et al., (2020) stated that students who are over-optimistic tended to decrease academic performance due to underestimation of academic activities at school.

A rating scale validity test was conducted to verify whether the choices used were confusing for subjects. Rasch model analysis provided a verification process for the rating assumptions given in the measuring instrument such as a psychological capital questionnaire in the form of a Likert scale with 6 answer choices. The range of choices starts from strongly disagree, disagree, moderately disagree, moderately agree, agree, to strongly agree. The analysis showed a progression in logit values from -.88, -.35, .29, 1.12, 1.99, and 3.43 for score 1 (strongly disagree), score 2 (disagree), score 3 (moderately disagree), score 4 (moderately agree), score 5 (agree), and score 6 (strongly agree). This presented a clear increase across the choices, suggesting the ability of subjects to effectively distinguish between these options. Additionally, the Andrich threshold values support the appropriateness of the rating scale. Moving from negative to positive, it sequentially validates that the response options are suitable for the subjects. The results show that despite the six-answer format being less common in Indonesia, students did experience difficulties in the usage.

Study Weaknesses

The initial screening featured a lot of outliers, thereby causing less effectiveness of the data collection process using Google Forms. This was attributed to some subjects taking the test carelessly with unreal conditions being presented. A large number of outliers showed that data collection using online questionnaires caused a tendency to give answers randomly and not be serious. On the other hand, this data collection is also affected by the emotional condition of the subjects causing less accurate data.

Conclusion

In conclusion, the analysis showed that the adaptation of psychological capital questionnaire in an academic context represented a good instrument and met internal and external validity. The questionnaire had a good person and item reliability. The instrument has shown sequential answer choices. This implied that it does not need to be simplified despite using 6 answer choices. The questionnaire was adopted in the context of education and administered to SMA students.

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