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Burns Anxiety Inventory Factor Model: Validation in a College Student Population

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Abstract. Anxiety is one of the most common psychological disorders experienced by university students across the world. However, many cases of anxiety remain unidentified despite individuals exhibiting clinical symptoms. One of the instruments used to measure anxiety is the Burns Anxiety Inventory (BAI). Nevertheless, studies on the validity of this instrument in the Indonesian context are still limited. This study aims to evaluate the factor structure of the BAI. The research focused on examining the factor structure of the BAI (33 items) using a Confirmatory Factor Analysis (CFA) approach and testing its validity through distinct group evidence. The sample consisted of active university students aged 18–25 in the Greater Jakarta (Jabodetabek) area, with a total of 400 participants. CFA results of the BAI indicated that the three-factor model demonstrated an acceptable fit to the data and was empirically justifiable. Additionally, distinct group validity was supported by findings showing that female participants reported significantly higher levels of anxiety than male participants, consistent with previous empirical studies. These findings indicate that the BAI are valid and reliable instruments for measuring anxiety among Indonesian university students.

Keywords: *anxiety; burns anxiety inventory; validation; measurement; students*

Introduction

Anxiety is one of the most common psychological disorders experienced by students worldwide. A meta-analysis of 89 studies involving approximately 130,090 undergraduate students found that 39.65% of students experienced high levels of non-specific anxiety (Ahmed et al., 2023). The study's findings indicate that nearly four in ten students worldwide face psychological challenges, specifically related to anxiety, during their studies.

The current global situation aligns with the situation in Indonesia. Anxiety among Indonesian students is also a mental health issue that increasingly requires special attention. Students experience various pressures during their studies at university. One study demonstrating this is the study by Astutik et al. (2020), which found that 51.1% of students experience anxiety of varying severity. Consistent with these findings, El-Matury et al. (2018) reported that over 70% of students experience anxiety.

Various factors can cause anxiety in students. Research conducted by Beiter et al. (2015) indicates that ten key factors that require attention as they can trigger anxiety are academic performance, pressure to succeed, post-graduation plans, financial concerns, sleep quality, relationships with friends, relationships with family, health, body image, and self-esteem. In addition to these factors, excessive use and usage of social media are also known to increase the risk of anxiety and mental health problems in students (Jiang, 2021; Lai et al., 2023)

Various studies have also demonstrated the negative impact of anxiety on students. Hasibuan and Riyandi (2019) found that anxiety symptoms were significantly associated with student academic achievement. Students with higher levels of anxiety tended to demonstrate lower academic achievement. Jallaleng et al. (2021) found that high levels of anxiety can negatively impact student engagement in learning activities.

However, many cases of anxiety go undetected even though individuals exhibit clinical symptoms. A national survey showed that over 50% of adults experiencing symptoms suggestive of an anxiety disorder never received a formal diagnosis from a professional (Momin et al., 2023). These findings suggest that early detection of anxiety disorders remains minimal. Individuals with undetected anxiety may ultimately experience a decreased quality of life and miss opportunities for appropriate intervention.

Early detection of anxiety disorders is crucial to prevent more serious psychological impacts. One method individuals can use independently is through the use of Likert-based psychological measurement tools. These tools allow respondents to assess the frequency or severity of their psychological symptoms. One instrument that can be used to measure anxiety levels is the Burns Anxiety Inventory (BAI) (Burns, 1989). The BAI is designed to evaluate anxiety symptoms across three main aspects: anxious feelings, anxious thoughts, and physical symptoms. This tool is relatively easy to administer and can be used in the context of initial screening for anxiety symptoms without requiring a direct clinical diagnosis. Several studies have used the BAI to measure anxiety levels in specific sample groups (Arsović et al. 2021; Mayorga et al. 2016).

The BAI (Based on the Indonesian Language Assessment) has demonstrated good convergent validity, discriminant validity, and reliability (Burns, 1989). A study by Ortuño-Sierra et al. (2015) attempted to adapt the BAI into a Spanish version and demonstrated good

consistency and discriminant validity between clinical and non-clinical groups. The results also demonstrated a robust structure for the instrument, which consists of three factors that shape anxiety. However, no studies of the BAI have examined its psychometric properties in the Indonesian context. Therefore, further studies of the BAI adapted to Indonesian culture are essential before it can be used for various anxiety measurement purposes in Indonesia.

Although the Burns Anxiety Inventory (BAI) is widely accessible and can be used to detect anxiety symptoms, its use in academic research is still less common than other anxiety measurement instruments such as the Beck Anxiety Inventory (Beck et al., 1993) or the State-Trait Anxiety Inventory (Marteau & Bekker, 1992). This may be due to the limited number of scientific publications specifically evaluating the psychometric validity and reliability of the BAI across various populations and cultural contexts. Therefore, more research is needed to provide evidence of the validity and reliability of this measurement tool to ensure its widespread use

In addition to testing internal structural validity, this study also examined construct validity by examining distinct-group evidence, which is a method of demonstrating the validity of a test by demonstrating that test scores consistently differ as predicted based on a person's placement in a particular group (Cohen & Swerdlik, 2018). Much of the literature has reported higher levels of anxiety in women than in men. Armstrong et al. (2002) found that in a non-clinical population, women reported higher levels of anxiety on the Beck Anxiety Inventory total score than men, particularly on cognitive symptoms of anxiety. McLean et al. (2011) also found similar results, indicating a higher prevalence of anxiety disorders in women. Therefore, examining differences in anxiety between men and women can provide additional validity information in measuring anxiety using the BAI.

Method

Research Design

This study employed a non-experimental quantitative research design and a cross-sectional study approach, where data was collected at a specific point in time from eligible

participants, and no manipulation of the research variables was performed (Creswell & Creswell, 2018). The cross-sectional design allows researchers to identify relationships between variables and confirm the measurement model without intervention or manipulation of the research variables

This study focuses on testing the BAI factor structure using Confirmatory Factor Analysis (CFA). This test can be used to obtain validity evidence, specifically internal structure evidence. Evidence of internal structure validity demonstrates the validity of measurement results by analyzing the relationship between items in the measuring instrument with the established theoretical structure (AERA, APA, & NCME, 2014). CFA analysis can be used to test the suitability of the measurement model of the measuring instrument with empirical data referring to the theoretically established dimensional structure (Brown, 2015; Hair et al., 2019; Kline, 2023). CFA testing was conducted using the Weighted Least Squares Mean and Variance Adjusted (WLSMV) estimation method, because this method is considered more accurate for analyzing data with ordinal scale characteristics such as the Likert scale (Brown, 2015). In addition, construct validity testing was also conducted, focusing on the evaluation of distinct group evidence. This test was conducted to determine the level of anxiety in women is higher than in men, in accordance with previous empirical data findings. The results in line can show evidence of the validity of measuring anxiety with the BAI measuring tool (Cohen & Swerdlik, 2018).

Population and Sample

The population in this study were active students domiciled in the Greater Jakarta area (Jakarta, Bogor, Depok, Tangerang, and Bekasi) aged between 18 and 25 years. Students were limited to an age range also based on a certain developmental stage, namely emerging adulthood. The emerging adulthood developmental stage is a stage that is vulnerable to psychological problems, such as anxiety, because at this stage individuals enter a period of life transition and experience a lot of social pressure (Arnett, 2000).

The research sample was collected using convenience sampling. This sampling technique is the most commonly used in social science research. Participants are selected or included in the study based on their accessibility and willingness to participate (Creswell & Creswell, 2018; Howitt & Cramer, 2020). According to Hair et al. (2019), an adequate sample size for factor analysis is generally no less than 200 participants. Research with more complex models is recommended to collect larger samples.

The study involved 400 participants. 271 (67.8%) were female, while 129 (32.3%) were male. The participants' ages ranged from 18 to 25 years, with an average age of 19.79 years (SD = 2.163). The largest age group was 18 years old, with 154 (38.5%). Participants resided in the Greater Jakarta area, with the majority of participants coming from Jakarta, with 193 (48.3%).

Table 1.
Participant Description

	Participants	
	Frequency	Percentage
Age		
18	154	38.5%
19	102	25.5%
20	32	8.0%
21	23	5.8%
22	26	6.5%
23	20	5.0%
24	24	6.0%
25	19	4.8%
Domicile		
Bekasi	26	6.5%
Bogor	81	20.3%
Depok	69	17.3%
Jakarta	193	48.3%
Tangerang	31	7.8%

Research Instrument

The research instrument used in this study was the Burns Anxiety Inventory (Burns, 1989). This measuring instrument is a self-report measuring instrument designed to assess an individual's anxiety level through three main dimensions: (1) anxious feelings, (2) anxious thoughts, and (3) physical symptoms. This instrument consists of 33 statement items and is

measured using a 4-choice Likert scale with a score range from 1 (not at all) to 4 (very severe). Individuals with a high total score indicate experiencing symptoms of anxiety (Burns, 1999). The measuring instrument was translated by the researcher and the following is the translation result of the measuring instrument into Indonesian.

Table 2
The Burns Anxiety Inventory Measuring items

No	Real Item	Translation Item
Dimension *Anxious Feeling*		
1.	*Anxiety, nervousness, worry, or fear*	Kecemasan, kegugupan, kekhawatiran, atau rasa takut.
2.	*Feeling that things around you are strange or unreal*	Merasa bahwa hal-hal di sekitar Anda terasa aneh atau tidak nyata.
3.	*Feeling detached from all or part of your body*	Merasa terpisah dari seluruh atau sebagian tubuh Anda.
4.	*Sudden unexpected panic spells*	Serangan panik yang tiba-tiba dan tidak terduga.
5.	*Apprehension or a sense of impending doom*	Perasaan gelisah atau firasat buruk yang akan terjadi.
6.	*Feeling tense, stressed, "uptight," or on edge*	Merasa tegang, stres, gelisah, atau tertekan.
Dimension *Anxious Thought*		
7.	*Difficulty concentrating*	Kesulitan berkonsentrasi.
8.	*Racing thoughts*	Pikiran yang sulit dikendalikan.
9.	*Frightening thoughts*	Pikiran yang menakutkan.
10.	*Feeling that you're on the verge of losing control*	Merasa bahwa Anda hampir kehilangan kendali.
11.	*Fears of cracking up or going crazy*	Ketakutan akan "hancur" atau menjadi gila.
12.	*Fears of fainting or passing out*	Ketakutan akan pingsan atau kehilangan kesadaran.
13.	*Fears of physical illnesses, heart attacks, or dying*	Ketakutan akan penyakit fisik, serangan jantung, atau kematian.
14.	*Concerns about looking foolish or inadequate*	Kekhawatiran terlihat bodoh atau tidak mampu.
15.	*Fears of being alone, isolated, or abandoned*	Ketakutan akan sendirian, terisolasi, atau ditinggalkan.
16.	*Fears of criticism or disapproval*	Ketakutan terhadap kritik atau ketidaksetujuan.
17.	*Fears that something terrible is about to happen*	Ketakutan bahwa sesuatu yang mengerikan akan segera terjadi.
Dimension *Physical Symptoms*		
18.	*Skipping, racing, or pounding of the heart (palpitations)*	Detak jantung terasa tidak teratur, cepat, atau berdebar-debar.
19.	*Pain, pressure, or tightness in chest*	Nyeri, tekanan, atau sesak di dada.
20.	*Tingling or numbness of toes and fingers*	Kesemutan atau mati rasa pada jari-jari tangan dan kaki.
21.	*Butterflies or discomfort in the stomach*	Perasaan tidak nyaman di perut.
22.	*Constipation or diarrhea*	Sembelit atau diare.
23.	*Restlessness or jumpiness*	Gelisah atau gugup.
24.	*Tight, tense muscles*	Otot yang tegang dan kaku.
25.	*Sweating not brought on by heat*	Berkeringat yang tidak disebabkan oleh panas.

26.	*A lump in the throat*	Rasa mengganjal di tenggorokan.
27.	*Trembling or shaking*	Gemetar atau menggigil.
28.	*Rubbery or "jelly" legs*	Kaki yang terasa lemas.
29.	*Feeling dizzy, lightheaded, or off balance*	Merasa pusing, ringan kepala, atau kehilangan keseimbangan.
30.	*Choking or smothering sensations or difficulty breathing*	Sensasi tercekik atau kesulitan bernapas.
31.	*Headaches or pains in the neck or back*	Sakit kepala atau nyeri di leher atau punggung.
32.	*Hot flashes or cold chills*	Sensasi panas atau dingin yang tiba-tiba.
33.	*Feeling tired, weak, or easily exhausted*	Merasa lelah, lemah, atau mudah lelah.

Result

The analysis was conducted on the 33-item BAI measurement instrument. The first step was to test the internal consistency reliability using Cronbach's alpha values. The results showed that the Cronbach's alpha values for each dimension were Anxious Feeling (α = .858), Anxious Thought (α = .916), and Physical Symptoms (α = .947). These values indicate that the BAI anxiety measurement has excellent reliability across all three dimensions.

Next, a first-order CFA test was conducted to assess the factor structure of the measuring instrument, namely anxious feelings, anxious thoughts, and physical symptoms. Model fit can be assessed by referring to the recommended cut-off limits (Browne & Cudeck, 1993; Hu & Bentler, 1999). The results of the first-order CFA model fit test can be seen in Table 3.

Table 3.
Model Fit First Order CFA BAI

Fit Indices	Value	Suggestion *Cut off*	Result
χ^2 (*p*-value)	1513.57 (p < .001)	p > .05 (*very sensitive to sample size*)	*Poor fit*
CFI	.946	≥ .95 (*Good fit*), ≥ .90 (*Acceptable fit*)	*Acceptable fit*
TLI	.942	≥ .95 (*Good fit*), ≥ .90 (*Acceptable fit*)	*Acceptable fit*
RMSEA	.072	≤ .06 (*Good fit*), ≤ .08 (*Acceptable fit*)	*Acceptable fit*
SRMR	.051	≤ .08 (*Good fit*), ≤ .10 (*Acceptable fit*)	*Good fit*

In the first-order CFA, the factor loading values for each item in each dimension can also be seen. The results of the CFA analysis indicate that all indicators forming the three dimensions—anxious feeling, anxious thought, and physical symptoms—have significant factor

loading values ($p < .001$). When viewed across all items, it is known that all items have factor loading values > .5. This indicates that all items demonstrate validity in weighting measurements according to their respective dimensions. An overview of the factor loading values for all items can be seen in Table 4.

Table 4.
Factor Value Loading Items First Order CFA

Dimensions	*Item*	*β*	*p-value*
Anxious Feeling	BAI1_AF	.805	<.001
	BAI2_AF	.663	<.001
	BAI3_AF	.685	<.001
	BAI4_AF	.844	<.001
	BAI5_AF	.797	<.001
	BAI6_AF	.878	<.001
Anxious Thought	BAI7_AT	.730	<.001
	BAI8_AT	.793	<.001
	BAI9_AT	.842	<.001
	BAI10_AT	.816	<.001
	BAI11_AT	.820	<.001
	BAI12_AT	.745	<.001
	BAI13_AT	.740	<.001
	BAI14_AT	.693	<.001
	BAI15_AT	.722	<.001
	BAI16_AT	.727	<.001
	BAI17_AT	.859	<.001
Physical Symptoms	BAI18_PS	.834	<.001
	BAI19_PS	.861	<.001
	BAI20_PS	.708	<.001
	BAI21_PS	.805	<.001
	BAI22_PS	.764	<.001
	BAI23_PS	.838	<.001
	BAI24_PS	.808	<.001
	BAI25_PS	.737	<.001
	BAI26_PS	.792	<.001
	BAI27_PS	.831	<.001
	BAI28_PS	.836	<.001
	BAI29_PS	.814	<.001
	BAI30_PS	.814	<.001
	BAI31_PS	.757	<.001
	BAI32_PS	.755	<.001
	BAI33_PS	.705	<.001

The assessment of covariance between factors is important to determine the extent of the relationship between the dimensions in the BAI measurement instrument, namely Anxious Feeling, Anxious Thought, and Physical Symptoms. These three factors theoretically represent the main components of the anxiety construct. Therefore, a high covariance value between factors indicates a close relationship between these dimensions, which also supports the multidimensional construct validity of the BAI instrument. Based on the analysis results, it can be seen that all factors are highly interrelated. A more detailed description can be seen in Table 5, and a visualization of the CFA model can be seen in Figure 1.

Table 5

Covariance Values Between Factors in BAI

	Anxious Feeling	Anxious Thought	*Physical Symptoms*
Anxious Feeling	-		
Anxious Thought	.882***	-	
Physical Symptoms	.775***	.806***	-

****p* < .001*

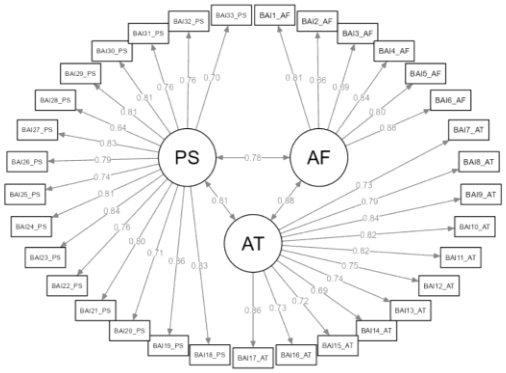

Figure 1. BAI CFA First Order Model Diagram.

After examining the factor loading and covariance values between factors in the previous analysis, the Average Variance Extracted (AVE) value was also examined, indicating convergent validity. The AVE value indicates how much of the indicator's variance can be explained by the latent construct compared to the error variance (Hair et al. 2019). The analysis results show that the AVE values for each dimension are as follows: anxious feeling (AVE = .613), anxious thought

(AVE = .598), and physical symptoms (AVE = .628). This indicates that each factor has good convergent validity.

To test construct validity based on distinct group evidence, an independent sample t-test analysis was conducted on anxiety scores measured using the BAI by gender. Anxiety scores were calculated based on the average (mean) value of all items.

The analysis results showed a significant difference between the anxiety levels of the male group (M = 2.177. SD = .701) and the female group (M = 2.477. SD = .705), with a t(398) value = -3.988. $p < .001$. The effect size was measured using Cohen's d = -.427. which is included in the medium effect size category. This finding supports the construct validity of the BAI instrument, where theoretically female individuals tend to show higher levels of anxiety than males.

Discussion

This study aims to evaluate the factor structure of the Burns Anxiety Inventory (BAI). In the process of developing a psychological test instrument, the length of the test and the number of items that must be responded to need to be considered. Based on reliability testing, excellent Cronbach's alpha values were found for all BAI dimensions. This reliability value indicates high internal consistency. Generally, a Cronbach's alpha value is categorized as good. A high reliability coefficient provides confidence in good measurement homogeneity, which means it is indeed measuring a single construct (Cohen & Swerdlik, 2018).

CFA testing conducted on measurements using the BAI instrument showed generally acceptable results. Based on the model fit test, the fit indices CFI, TLI, RMSEA, and SRMR fell into the acceptable fit category, while the chi-square value indicated a poor fit. Although the chi-square statistic showed significance, indicating a discrepancy between the theoretical model and the observed data, this is a common occurrence in CFA analysis, especially in large samples. The chi-square statistic is known to be highly sensitive to sample size, tending to reject the model even when the practical discrepancy between the model and the data is very small (Kline, 2023). Therefore, model fit evaluation is more appropriately based on a combination of various fit

indices that are less sensitive to sample size. Considering that the main indices such as CFI, TLI, RMSEA, and SRMR showed acceptable values, it can be concluded that the BAI factor structure has adequate construct validity and is in line with the proposed theoretical framework.

Furthermore, it can also be seen that all BAI items show a factor loading value. This result indicates that each item has a good contribution to its latent factor. In accordance with the opinion of Hair et al. (2019) a factor loading indicates the ability of the item to provide an explanation of the latent factor. Referring to the Average Variance Extracted (AVE) value, anxious feeling, anxious thought, and physical symptoms, it can be concluded that the AVE value of the three dimensions exceeds the recommended minimum limit (Hair et al., 2019). An AVE value indicates that each factor is able to explain more than half of the variance of its indicators. This indicates that convergent validity at the construct level has been achieved well, where the items in each dimension are collectively able to adequately represent the intended latent construct.

Construct validity evaluation is not only conducted by examining the internal structure of the measuring instrument, such as through factor analysis, but also needs to be supported by other forms of validity to obtain a more comprehensive picture and determine measurement accuracy (Furr, 2021). One approach used in this study is validity based on distinct group evidence, which tests whether the measuring instrument can differentiate groups that theoretically have different levels of anxiety (Cohen & Swerdlik, 2018). Referring to theory and previous empirical findings, women tend to show higher levels of anxiety than men. This is explained by various factors, including biological, hormonal, social, and psychological differences. According to McLean et al. (2011), women have a higher prevalence of anxiety disorders due to the complex interaction between biological and social factors, such as gender expectations and social roles. The findings in this study support this assumption, with female participants showing significantly higher anxiety scores than male participants. These results indicate that the BAI instrument is able to differentiate groups based on gender in accordance with theoretical predictions.

These findings provide empirical evidence that the three-dimensional structure of the BAI (anxious feeling, anxious thought, and physical symptoms) has solid construct validity. All test results indicate that the BAI can accommodate anxiety measurement in accordance with the hypothesized theoretical basis, namely that anxiety measurement is based on three main dimensions: anxious feeling, anxious thought, and physical symptoms. Based on these results, several suggestions can be made to address the various limitations of this study. This study only examines the evidence for internal structure validity and construct validity by referring to distinct groups of evidence.

Further research is recommended to conduct validity testing, focusing on validity measures beyond those conducted in this study. Another form of validity that can be explored is the relationship to other variables. This validity evidence evaluates the extent to which the measurement results of an instrument are correlated with other variables that are theoretically close or relevant (AERA, APA, & NCME, 2014). Further research could examine the correlation between anxiety measurements using the BAI and other widely used anxiety measures, such as the Beck Anxiety Inventory (Beck et al., 1993) or the State-Trait Anxiety Inventory (STAI) (Marteau & Bekker, 1992). It is also recommended to conduct tests using other variables that are theoretically related to anxiety, such as depression and well-being (Chuning et al., 2024; Malone & Wachholtz, 2018).

Another limitation of this study is the relatively homogeneous populations in both studies, namely college students in non-clinical settings. Future research is also recommended to test anxiety measurements using the BAI in more diverse populations. This could include populations with groups of various ages, cultural backgrounds, or specific clinical groups (e.g., patients with generalized anxiety disorder or PTSD) to assess the consistency of the BAI's factor structure.

Further research will also be conducted comparing anxiety measurements using the BAI in its evaluation of clinical versus non-clinical settings. This study used a cross-sectional design, meaning data collection was conducted at only one point in time. Further longitudinal research

could also be conducted to assess the consistency of BAI measurements over time to ensure the long-term stability of this measurement tool.

Conclusion

The results of this study indicate that the Burns Anxiety Inventory (BAI) has good evidence of validity. This instrument has been shown to consist of three main factors: anxious feelings, anxious thoughts, and physical symptoms. Therefore, the BAI can be recommended for comprehensive and in-depth anxiety measurement, especially in clinical contexts and psychological research that require more detailed data.

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