Instrument Adaptation Of Cognitive Test Anxiety Scale (Ctas-24) With Exploratory Factor Analysis (EFA) And Confirmatory Factor Analysis (CFA) Methods

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KEYWORDS
Academic Anxienty, Cognitive Test Anxienty Scale (CTAS-24), Exploratory Factor Analysis (EFA) Confirmatory Factor Analysis (CFA)

ABSTRACT:
Academic anxiety is a broad general construct that focuses on the preclinical anxiety experienced by learners in various educational contexts, namely the experience of negative affective responses in the presence of perceived academic stressors. There are 3 dimensions of academic anxiety, namely cognitive, emotional and physical. The Cognitive Test Anxienty Scale (CTAS-24) is the latest instrument to measure academic anxiety. An adaptation process is needed to fit the Indonesian context and culture. The purpose of this study is to determine the validation of CTAS-24 in the Indonesian version. The adaptation process was conducted by following the guidelines of the International Test Commission (ITC). Data were collected from 231 randomly selected university students in Indonesia. From the model evaluation analysis using GOF, the GFI value is 0.91 ≥ 0.90 (marginal fit), the RMSEA value is 0.034 < 0.05 (close fit), RMR value of 0.010 ≤ 0.05 (good fit), NFI value of 0.99 ≥ 0.90 (good fit) and AGFI value of 0.87 > 0.80 (marginal fit). These results mean that in the terrorist model, the model built can be declared fit, that 4 or 5 goodness of fit criteria are sufficient to assess the feasibility of a model. Therefore, it can be concluded that the structural model of academic anxiety is empirically proven because it has fulfilled five of the 8 goodness fit parameters.

1. Introduction

The Cognitive Test Anxienty Scale (CTAS-24) by Cassady, (2023)(Cassady et al., 2023; Cassady, 2022;Cassady et al., 2019) is a construct measure of academic anxiety, which is a generalised representation of the anxiety experienced by learners in educational settings. Academic anxiety has been identified as an indicator of pre-clinical anxiety that provides important predictive utility for clinical symptoms such as anxiety and depression, but also serves as a more inclusive representation than other commonly studied anxieties in academic contexts. Academic anxiety is a broad general construct focused on the pre-clinical anxiety experienced by learners in a variety of educational contexts, namely the experience of negative affective responses in the presence of perceived academic stressors Cassady et al., (2023). According to Cassady et al., (2023) the dimensions of academic anxiety can be seen from three symptoms, including cognitive, emotional and physical. Anxiety is a condition experienced by almost every individual (Hidayah et al., 2023). At a practical level, the identification of academic anxiety as an 'umbrella' construct that is hierarchically superior to multiple dimensions of situational anxiety in educational contexts supports the development and implementation of intervention efforts that students, parents and educators can undertake to support learners across a wider range of experiences (Cassady, 2022).

The individualised manifestation of anxiety for learners arises based on the interaction of environmental stimuli such as academic expectations, task perceptions and personal factors such as trait disposition towards anxiety, perceived efficacy, previous experience) that result in an assessment of the level of threat posed by the task as well as their ability to manage that threat (Cassady et al., 2022; Folkman, 2020; Lazarus, 1993, 2006; Putwain & Daly, 2014). However, when the appraisal of situational pressures and personal resources to fulfil the task is perceived to be beyond the student's control, the impression is one of threat and maladaptive

academic anxiety is likely (Keeley et al., 2008; Putwain & Symes, 2011, Putwain & Symes, 2011; Putwain et al., 2012; Van den Berg et al., 2010; Cassady, 2023).The more academic and social problems are not resolved, this makes their self-esteem towards school activities even lower (Hitipeuw, 2018). This anxiety not only affects their mental health, but can also interfere with academic performance and test readiness (Wahyudin et al., 2024).

The first domain focuses on self-assessment of cognitive limitations which is an accurate assessment of ability and preparedness, or a misinterpretation of the requirements facing the learner or their readiness to fulfil those goals (Cassady, 2010; Lazarus, 2005; Putwain & Aveyard, 2018). A second source leading to academic anxiety includes social pressure imposed by the expressed or implied expectations of significant others, self-comparison with peers, or discomfort with being in a group setting (Lowe & Lee, 2008; von der Embse & Witmer, 2014; Zeidner et al., 2005). A third source for academic anxiety is the application of extremely high personal standards-essentially expecting a level of performance that is not realistically achieved (e.g. perfectionism; Eum & Witmer, 2014), perfectionism; Eum & Rice, 2011; Burcaş & Creţu, 2021; 2018; Burcaş & Creţu, 2021). Fourth for academic anxiety is an unusually high level of distress or anxiety in certain temporal or situational contexts of high stakes, performance in front of a group, or when academically stressful or threatening events arise unexpectedly (Putwain & von der Embse, 2018; von der Embse, 2018; Von der Embse et al., 2017).

Increased levels of academic anxiety can be roughly aligned with three broad domains. The first is the experience of negative physiological symptoms activated through somatic response processes (e.g., increased heart rate, nausea, feelings of panic, or rushing; Cassady et al., 2023). In addition to exposing the learner to negative affective responses and parasympathetic nervous system activation, these physiological symptoms increase awareness of the perceived challenge or threat and may trigger additional symptoms of anxiety or depression (Cassady et al., 2019) and considerable cognitive detachment from the task at hand and a focus on self-deprecating ruminations or fears regarding ineffective performance (Chen & Chang, 2009; Eum & Rice, 2011; Sarason, 1977; Cassady & Johnson, 2002). Learners experiencing high levels of academic anxiety often adopt and implement maladaptive coping strategies (e.g., avoidance, withdrawal, procrastination; Thomas et al., 2017).If this condition continues in the long term, it will hinder students' academic achievement, social development, and developmental tasks (Hidayah et al., 2022). This exacerbates negative outcomes due to the suppression of effective self-directed learning strategies (Cassady & Finch, 2020).

The Cognitive Test Anxiety Scale- 24 (CTAS-24) has been demonstrated in previous research to be a reliable measure with evidence that the scores are a valid indication of the construct (Cassady et al., 2019). When used in the context of universal assessment in conjunction with other assessments that focus on identifying key academic strengths and weaknesses (Cassady & Thomas, 2020, the identification of ‘levels’ of academic anxiety is considered valuable in helping to identify learner needs that can promote access to resources that will support academic development (see Cassady & Thomas, 2020) et al.).

Preclinical anxiety, involves statistical analyses to assign groups of participants to levels of severity for the scale in question (Sarkın & Gülleroğlu, 2019). To address the common limitation of having different solution values for severity with preclinical anxiety measures (see Sarkin & Gulleroglu, 2019), the present study was designed to identify durable values for academic anxiety levels using the CTAS-24 (Cassady, 2023; Cassady, 2022; Cassady et al., 2019) that could be used in studies that use the scale to identify different levels of academic anxiety among learners.

Given the dimensionless nature of the CTAS-24 (Cassady, 2023; Cassady et al., 2019), using the CTAS-24 total score, would help identify different groups based on anxiety levels. Another statistical approach used to provide evidence of validity was the comparison of latent class solutions based on item responses and CTAS-24 total scores. Using total score values on the AAS-24, four levels of academic anxiety were identified as (a) No Anxiety (CTAS-24 score < 15), (b) Mild Academic Anxiety (CTAS-24 score 15-20), (c) Moderate Cognitive Test Anxiety Scale (CTAS-24 score 21-29), and (d) High Academic Anxiety (CTAS-24 > 29). Further research with diverse samples across different countries, cultures, ages, and genders is needed to determine the validity and reliability of these cut-off scores across different populations and contexts.

Future directions in this work are anticipated to focus on international and cross-cultural approaches to test the consistency and usefulness of the classes identified through the CTAS-24. Additionally, as this scale is freely accessible for use in educational and research purposes (Cassady, 2023; Cassady et al., 2022). Continuous

constructs (academic anxiety) when used in conjunction with other psychological constructs are generally best investigated with statistical models and research procedures that focus on continuous measurement approaches (regression design, SEM). The use of identified levels of academic anxiety is more appropriate in contexts where identifying learners with different levels of need in academic anxiety for simplified referral to increasingly supportive levels of intervention for academic stressors. there is no research that specifically examines the validation of the Indonesian version of the adaptation of this measuring instrument. Therefore, it is important to conduct research focusing on the process of adaptation and validation of the CTAS-24 measuring instrument that has been developed by Cassady (2023) Cassady in the Indonesian version.

2. Methodology

The subjects in this study were 231 students aged 17-23 years obtained through cluster sampling technique. Demographic data of research respondents can be seen in the following table1:

Respondent character	Frequency (n)	Percent (%)
Age (Years Old :		
- 17	32	13,9
- 18	54	23,4
- 19	81	35,1
- 20	64	27,7
Gender :		
- Male	89	38,5
- Female	142	61,5
Year of entry:		
- 2020	70	30,3
- 2021	83	35,9
- 2022	48	20,8
- 2023	30	13,0

Based on the table above, it was found that almost half of the research respondents were 19 years old, namely 81 respondents (35.1%), most of the respondents were female students, namely 142 respondents (61.5%), and almost half of the respondents were students who were enrolled in college in 2021, namely 83 respondents (35.9%).

Instrumens

The measurement tool adapted in this study is the Cognitive Test Anxienty Scale (CTAS-24) a test scale that includes a cognitive test developed by Cassady (2023). CTAS-24 consists of 24 items and there are three dimensions namely physical, cognitive and affective which describe the emotional response of individuals in dealing with academic anxiety.

Prosedur

The procedure for adapting measuring instruments refers to the ITC guidelines (Guidelines for Translating and Adapting Tests) (2nd edition) published by the International Test Commission (2019). The flow of adaptation can be seen in the following figure:

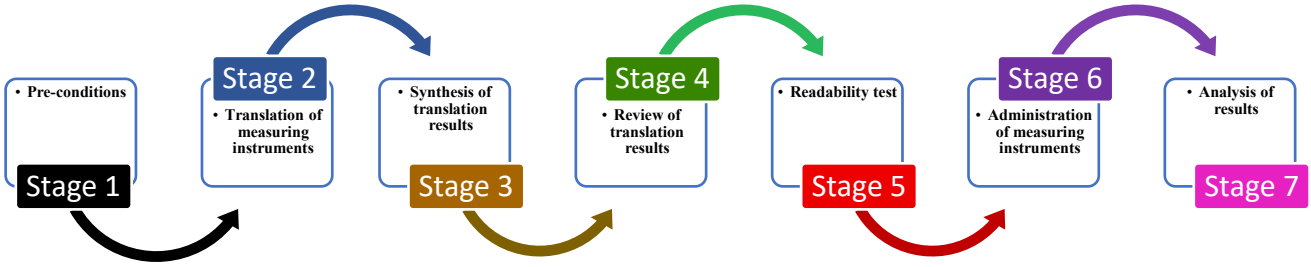

Figure 1. Flow of Instrument Adaptation

Stage 1: Pre-conditions. At this stage, the researcher corresponded via email to Jerrel C Cassady as the owner of the CTAS-24to obtain permission to adapt the CTAS-24. On 13 November 2023, the researcher received permission to adapt the CTAS-24 Cognitive Test 2nd Edition into Indonesian Language.
Stage 2: Translation of measuring instruments, CTAS-24 is a measuring instrument that is still in English. The first translation step was carried out by translating each item into Indonesian from two translators. Both translators were sworn (legal) translators who were not familiar with the construct of Academic Anxiety.
Stage 3: Synthesis of translation results. The translated results in stage two were then synthesised by the researcher to see the possible discrepancies between the two results. At the end of the synthesis process, the resulting items were then back-translated from Indonesian to English to see the extent to which the adapted items matched the original items. These results were then reviewed to proceed to the next stage.
Stage 4: Review of translation results. The synthesis results in stage three were then submitted to the Doctoral Faculty of Educational Psychology, State University of Malang for further expert judgement process. The experts chosen are experts who have criteria for research focus on educational psychology studies. The results of the items that have gone through expert judgement are attached.
Stage 5: Readability test. After going through the expert judgement process on the CTAS-24 measuring instrument, then the researcher conducted a readability test process on the finalised items. This readability test was given to 7 students studying in Mojokerto. This readability test was conducted to ensure that the instructions and all items could be easily understood by the participants. From the readability test process given to this student, the researcher got a suggestion to provide a clear Likert scale description on the CTAS-24 measuring instrument. This instrument has four answer categories, namely 'Strongly Agree' (SS), 'Agree' (S), 'Disagree' (TS), and 'Strongly Disagree' (STS). For the scoring, the researcher gave the highest rating to the statement 'Strongly Agree' (SS) and the lowest to the option 'Strongly Disagree' (STS) The scores were then calculated, with the proportion of items with the following conditions: SS=4, S=3, TS=2, STS=1
Stage 6: Administration of measuring instruments. At this stage, the researcher compiles the items in a scale and then distributes the scale to participants who meet the criteria.
Stage 7: Analysis of results. At this stage, the researcher analyses the data that has been collected. The analysis was carried out using the Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) approaches**.**

Research Results and Discussion

Bartlett Test of Sphericity Analysis

Bartlet's test of Sphericity is a quantity that states that a correlation matrix is either a unit matrix or not. If the Bartlet's test of Sphericity value indicates that it is not a unit matrix, it means that the data used can be calculated using the factor method, and vice versa. The Bartlet's test value is approximated by the Chi-square value at a certain significant level. If the calculated Chi-square value is greater than the table chi-Squre, it means that the correlation matrix is not a unit matrix, and vice versa. Another way is to compare the significance level for the calculated chi-square with a value of 2.5%. If the calculated significance level is less than 2.5%, then the calculated chi-square value lies in the critical region; so it can be concluded that the correlation matrix is not a unit matrix.

Table 2. Uji KMO dan Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.911
Bartlett's Test of Sphericity	Approx. Chi-Square	18267.670
	df	276
	Sig.	.000

In the output, the KMO value is 0.911, which is greater than 0.5. This result shows that the number of samples used has met the requirements for the adequacy of the number of samples and the data used can be used for factor calculations. The Chi-square value for the Bartlet test of Sphericity is 18267.760 at 276 degrees of freedom and a significance level of 0.001. Since the significance level is less than 2.5%, it can be concluded that the correlation matrix is not a unit matrix.

Eigenvalue Analysis, Analysis of Variance explained and Total Variance explained

Eigenvalue analysis is used to determine the number of reduced factors. The criteria for the number of reduced factors is determined only by the eigenvalue greater than one (1) for each component (factor). How many per cent of each factor/component is responded to by respondents is determined by the variance explained value. Factor one has the largest variance explained value; meaning that factor-1 is the factor that is responded to the most. Factor-2 is the factor that has the second variance explained value; meaning that factor-2 has the number-2 response. Factor-3 has the number of responses number-3; and so on. The total of the variance explained is the sum of each variance explained for each factor. If the value of the total variance explained is greater than 60, it can be interpreted that the calculation of factor analysis has a satisfactory level of results. If this level is achieved, then the interpretation of the factor analysis is not expected to be biased or deviated.

Table 3. Total Variance Explained

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	16.677	69.489	69.489	16.025	66.772	66.772	11.087	46.195	46.195
2	4.333	18.056	87.545	2.297	9.570	76.341	9.628	40.115	86.310
3	1.878	7.826	95.371	4.350	18.127	94.468	1.958	8.158	94.468
4	.421	1.753	97.124						
5	.269	1.121	98.245						
6	.117	.487	98.732						
7	.049	.204	98.936						
8	.045	.186	99.122						
9	.042	.175	99.296						
10	.036	.151	99.448						
11	.030	.126	99.574						
12	.020	.082	99.656						
13	.017	.073	99.728						
14	.014	.060	99.788						
15	.011	.044	99.832						
16	.009	.040	99.871						
17	.008	.032	99.903						
18	.007	.028	99.931						
19	.004	.016	99.948						
20	.004	.015	99.963						
21	.003	.013	99.977						
22	.002	.009	99.985						
23	.002	.009	99.994						
24	.001	.006	100.000						

Extraction Method: Maximum Likelihood.

From these results, it is obtained that the eigenvalue greater than one is three components. This means that the results of data counting produce three factors or groups of variables extracted into three factors, namely factor-1, factor-2 and factor-3, where the percentage of variance for factor-1 is 46.19%, the percentage of variance for factor-2 is 40.11% and the percentage of variance for factor-3 is 8.15% and the total variance percentage is 94.46%. Factor-1 which has a variance percentage of 46.19% means that 46.19% of the expected information is contained in factor-1, factor-2 which has a variance percentage of 40.11% means that 40.11% of the expected information is contained in factor-2, and factor-3 which has a variance percentage of 8.15% means that 8.15% of the expected information is contained in factor-3. The total percentage of variance of 94.46% means that the processed data provides 94.46% information. Within factor-1, factor-2 and factor-3 will consist of several variables that can provide the desired information. Because the total percentage of variance is greater than 60%, the total percentage of variance generated is (satisfactory).

Scree Plot Analysis

Scree plot is a form of graph made between the eigenvalue and the factor / component. The number of reduced factors can be determined from this scree plot graph; namely by making a horizontal line at an eigenvalue equal to one, a reduced factor will be seen whose eigenvalue is greater than one.

Figure 2. Scree Plot

From the graph above, it can be seen that there are three factors that have an eigenvalue greater than one; so it can be said that the variables will be reduced to three factors. The total variance that can be explained in the model is 94.46% which is divided into three factors where the first factor is physical at 46.19%, the second factor is cognitive at 40.11%, and the third factor is affective at 8.15%.

Mean and Standard Deviation of 24 CTAS-Indonesia items

Table 4. Mean and Standard Deviation of 24 CTAS-Indonesia items

No	Item	Mean	SD
1	I lose sleep worrying about exams	3,03	0,74
2	I'm more worried about doing as well as I can on the exam.	3,03	0,75
3	I get distracted when studying for exams because of the fear of failing	2,85	0,73
4	I have trouble remembering what I learnt for the exam	2,84	0,72
5	When I take exams, I often think that I will fail more and more.	2,91	0,74
6	I am not good at taking exams.	2,92	0,74
7	When I get a copy of the exam I need some time to calm down so I can think clearly.	2,85	0,73
8	At the beginning of the exam I worry so much that I often can't think straight.	2,86	0,72
9	When I take a difficult exam, I feel defeated before I even start.	2,87	0,72
10	When taking an important exam I worry	2,87	0,71
11	I tend to fail the intelligence questions in the final exam.	2,89	0,70
12	During exams, I always think about the consequences of failure.	2,90	0,70
13	When taking exams I worry so much that I make bad mistakes.	2,87	0,72
14	I cannot think when I am pressed to answer exam questions.	2,88	0,72
15	During exams, I often think that I am not very intelligent.	3,47	0,64
16	During lecture exams, I worry so much that I forget the truth that I know.	3,46	0,66
17	I am not good at taking exams.	3,45	0,65
18	During exams I feel that I don't do well.	3,45	0,65
19	I am a poor test-taker, because I have not learnt about the exam topic.	3,45	0,62
20	After taking the exam, I felt that I could have done better.	3,44	0,62
21	My exam results make me believe that I am not a good student.	3,44	0,62
22	I often realise the mistakes I made after taking the exam	3,43	0,61
23	When I finish a difficult exam, I dread looking at the grade.	3,44	0,61
24	I don't have much control over my test scores	3,42	0,61

Based on the results of the analysis of the mean and standard deviation values of the 24 items of CTAS-24 Indonesia, the minimum value of the average respondent's answer is 2.84 with an SD value of 0.72, namely in statement (4) I have difficulty remembering what I learned for the exam, andthe maximum value of the average respondent's answer is 3.47 with an SD value of 0.66, namelyin statement (15) during the exam, I often think that I am not very smart.

Confirmatory Factor Analysis

An item is said to have a meaningful factor loading if it has a value above 0.30. Thus, to facilitate visualisation, factor loading values above 0.3 are bolded.

Table 5. Results of Exploratory Factor Analysis CTAS-24

	Factor loading		
Item	**Faktor 1**	**Faktor 2**	**Faktor 3**
PS1	**0,992**		
PS2	**0,974**		
CG1	0,331	**0,935**	
CG2	0,337	**0,912**	
CG3		**0,835**	
CG4		**0,831**	
CG5	0,323	**0,944**	
CG6	0,320	**0,945**	
CG7	0,318	**0,942**	
CG8	0,303	**0,939**	
CG9		**0,927**	
CG10		**0,923**	
CG11	0,318	**0,941**	
CG12	0,312	**0,936**	
AK1		0,323	**0,915**
AK2		0,345	**0,881**
AK3		0,324	**0,902**
AK4		0,336	**0,892**
AK5		0,305	**0,944**
AK6		0,305	**0,939**
AK7		0,301	**0,943**
AK8		0,301	**0,934**
AK9			**0,942**
AK10			**0,932**

From these results, it can be seen that the items in the Indonesian CTAS-24 have a tendency to cluster in three factors, although there are items that have significant factor loadings on more than one factor. However, these items were not evaluated in this stage because EFA was used to identify the number of factors that set up the academic anxiety scale.

Analisis Reliabilitas

Table 6. Instrument Reliability Analysis

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
PS1	72.0303	172.073	.077	.980
PS2	72.0303	171.543	.103	.980
CG1	72.2165	156.979	.904	.973
CG2	72.2208	157.590	.890	.973
CG3	72.1472	158.865	.784	.974
CG4	72.1429	158.966	.781	.974
CG5	72.2078	157.096	.903	.973
CG6	72.2035	157.180	.901	.973
CG7	72.1991	157.291	.897	.973
CG8	72.1905	157.555	.888	.973
CG9	72.1688	158.011	.877	.973
CG10	72.1558	158.445	.861	.974
CG11	72.1991	157.265	.899	.973
CG12	72.1861	157.552	.891	.973
AK1	71.6061	160.327	.830	.974
AK2	71.6061	159.892	.831	.974
AK3	71.6104	160.082	.828	.974
AK4	71.6147	160.012	.833	.974
AK5	71.6147	160.664	.829	.974
AK6	71.6234	160.714	.826	.974
AK7	71.6190	160.854	.826	.974
AK8	71.6320	160.929	.823	.974
AK9	71.6277	161.156	.807	.974
AK10	71.6407	161.214	.806	.974

Overall, the Cronbach alpha value obtained is 0.975. For each factor, it has a different Cronbach's alpha value, namely factor 1 (physical) of 0.987, factor 2 (cognitive) of 0.994, and factor 3 (affective) of 0.993. All of these values are above the recommendation from (SAĞLAM, n.d.) which provides a minimum value of good reliability of 0.70. These results indicate that the Indonesian CTAS-24 has good reliability when measured as unidimensional and when it stands alone as a factor.

The next analysis is factor analysis using the CFA (Confirmatory Factor Analysis) approach. (Legate et al., 2023) suggest that CFA (Confirmatory Factor Analysis) is part of SEM (Structural Equation Modeling) to test how measured variables or indicators are good at describing or representing a number of factors. In CFA factors are also referred to as constructs. Measurement theory is used to determine how measured variables describe systematically and logically a construct displayed in a model. (Belisle et al., 2005) suggests that CFA (Confirmatory Factor Analysis) is one of the multivariate analysis methods used to test or confirm a hypothesised model. The hypothesised model consists of one or more latent variables, which are measured by one or more indicator variables. Latent variables are variables that are not measurable or cannot be measured directly and require indicator variables to measure them, while indicator variables are variables that can be measured directly.

This approach was chosen to see whether the Indonesian CTAS-24 measuring instrument data is in accordance with the original theory developed earlier, which has 3 latent factors. (Hu & Bentler, 1999) mentioned that the accuracy of the model can be seen from several parameters, including chi square p value ($p > 0.05$), Goodness of fit (GFI > 0.9), Root mean square error of approximation (RMSEA < 0.05), Comparative fit index (CFI > 0.9), and Standardised Root Mean Square Residual (SRMR < 0.08). The results of the ARS-Indonesia CFA (Confirmatory Factor Analysis) can be seen in the following table:

Table 7. Factor Loading CFA results

Item		**λ**
Faktor 1 : physical		1,10
PS1	I lose sleep worrying about exams	0,89
PS2	I'm more worried about doing as well as I can on the exam.	
Faktor 2 : kognitif		
CG1	I get distracted when studying for exams because of the fear of failing	0,99
CG2	I have trouble remembering what I learnt for the exam	0,97
CG3	When I take exams, I often think that I will fail more and more.	0,87
CG4	At the beginning of the exam I worry so much that I often can't think straight.	0,86
CG5	When taking an important exam I worry	1,00
CG6	I tend to fail the intelligence questions in the final exam.	1,00
CG7	During exams, I always think about the consequences of failure.	0,99
CG8	I cannot think when I am pressed to answer exam questions.	0,99
CG9	During exams I feel that I don't do well.	0,97
CG10	I often realise the mistakes I made after taking the exam	0,96
CG11	When I finish a difficult exam, I dread looking at the grade.	0,99
CG12	I don't have much control over my test scores	0,99
Faktor 3 : afektif		
AK1	I am not good at taking exams.	0,97
AK2	When I get a copy of the exam I need some time to calm down so I can think clearly.	0,95
AK3	When I take a difficult exam, I feel defeated before I even start.	0,96
AK4	During the exam I felt that I did not do well.	0,95
AK5	I was a poor test-taker, as I had not learnt about the test topic.	0,99
AK6	After taking the exam, I felt that I could have done better.	0,99
AK7	My exam results make me believe that I am not a good student.	0,99
AK8	I often realise the mistakes I made after taking the exam	0,98
AK9	When I finish a difficult exam, I dread looking at the exam score	0,98
AK10	I don't have much control over my test scores	0,97

The factor loading value is the factor loading value on the latent variable with its indicators. The loading factor value must be above 0.70. According to (Legate et al., 2023), a loading factor value ≥ 0.7 is said to be ideal, meaning that the indicator is valid to measure the construct it forms, in empirical research experience, a

loading factor value ≥ 0.5 is still acceptable, even some experts tolerate the number 0.4, thus a loading factor value ≤ 0.4 must be removed from the model. In some cases, loading requirements above 0.70 are often not met, especially for newly developed questionnaires. Therefore, loading between 0.40-0.70 should still be considered to be retained (Legate et al., 2023)

From the preliminary results of ARS-Indonesia CFA (Confirmatory Factor Analysis) analysis, it was found that each item on each indicator had a value of more than 0.70. These results indirectly indicate that each statement item used in the instrument can be declared valid so that each statement item in this instrument is retained.

Model Accuracy Test

Table 8. Precision Parameters Of The Initial Model

Parameter Fit	Output	Kriteria	Keterangan
Absolute Fit Measures			
P-Value for Test of Close Fit	0,086	< 0,05	Not Fit
Chi-Square p value	3302,28		Not fit
GFI (Goodness of Fit Index)	0,46	≥ 0,90	Not fit
RMSEA (Root Mean Square Error of Approximation)	0,231	< 0,05	Not fit
RMR (Root Mean Square Residual)	0,018	≤ 0,05	Good fit
Incremental Fit Measures			
NFI (Normed Fit Index)	0,87	≥ 0,90	Marginal fit
AGFI (Adjusted Goodness of Fit Index)	0,34	> 0,80	Not fit
RFI (Relative Fit Index)	0,86	≥ 0,90	Marginal fit
IFI (Incremental Fit Index)	1,00	≥ 0,90	Marginal fit

From the analysis of model evaluation using GOF (Goodness Of Fit), the p-value for test of close fit is 0.086 > 0.05 (not fit), the GFI (Goodness of Fit Index) value is 0.46 < 0.90 (not fit), the RMSEA (Root Mean Square Error of Approximation) value is 0, 231 > 0.05 (not fit), RMR (Root Mean Square Residual) value of 0.018 ≤ 0.05 (good fit), NFI (Normed Fit Index) value of 0.87 < 0.90 (marginal fit) and AGFI (Adjusted Goodness of Fit Index) value of 0.34 < 0.80 (not fit). These results mean that in the terrorist model, the model built cannot be declared fit. Because the model does not meet the criteria for a fit model, a model modification is carried out to obtain a model that meets the fit criteria.

Model modification is done through two methods, namely eliminating items that have factor loading below 0.5. This is done because factor loading <0.5 indicates that the item has low quality. However, from the modelling results obtained, all items have factor loading above 0.5 so that this model modification is not carried out. The next option is to covariate the items according to the results that appear on the modification indices. In this study, modification indices were carried out on items that were on the same dimension to avoid cross-loading between dimensions so as not to change the original theoretical model so that it could be theoretically justified. The items covaried are AK3 and AK2, CG4 and CG3, AK4 and AK2, AK4 and AK3, CG7 and CG6, and several other items with a total covariance of 36 processes. The results of testing the modified (final) model can be seen in the following table:

Table 9. Accuracy Parameters Of The Final Model

Parameter Fit	Output	Kriteria	Keterangan
Absolute Fit Measures			
Chi-Square p value	270,09	≥ 0,05	Good fit
GFI (Goodness of Fit Index)	0,91	≥ 0,90	Marginal fit
RMSEA (Root Mean Square Error of Approximation)	0,034	< 0,05	Close fit
RMR (Root Mean Square Residual)	0,010	≤ 0,05	Good fit
Incremental Fit Measures			
NFI (Normed Fit Index)	0,99	≥ 0,90	Good fit
AGFI (Adjusted Goodness of Fit Index)	0,87	> 0,80	Marginal fit
RFI (Relative Fit Index)	0,99	≥ 0,90	Good fit
IFI (Incremental Fit Index)	1,00	≥ 0,90	Good fit

From the model evaluation analysis using GOF (Goodness Of Fit), the GFI (Goodness of Fit Index) value is 0.91 ≥ 0.90 (marginal fit), the RMSEA (Root Mean Square Error of Approximation) value is 0.034 < 0.05 (close fit), RMR (Root Mean Square Residual) value of 0.010 ≤ 0.05 (good fit), NFI (Normed Fit Index) value of 0.99 ≥ 0.90 (good fit) and AGFI (Adjusted Goodness of Fit Index) value of 0.87 > 0.80 (marginal fit). These results mean that in the terrorist model, the model built can be declared fit. Hari et al (2014) say that 4 or 5 goodness of fit criteria are sufficient to assess the feasibility of a model. Therefore, it can be concluded that the structural model of academic anxiety is empirically proven because it has fulfilled five of the 8 goodness fit parameters.

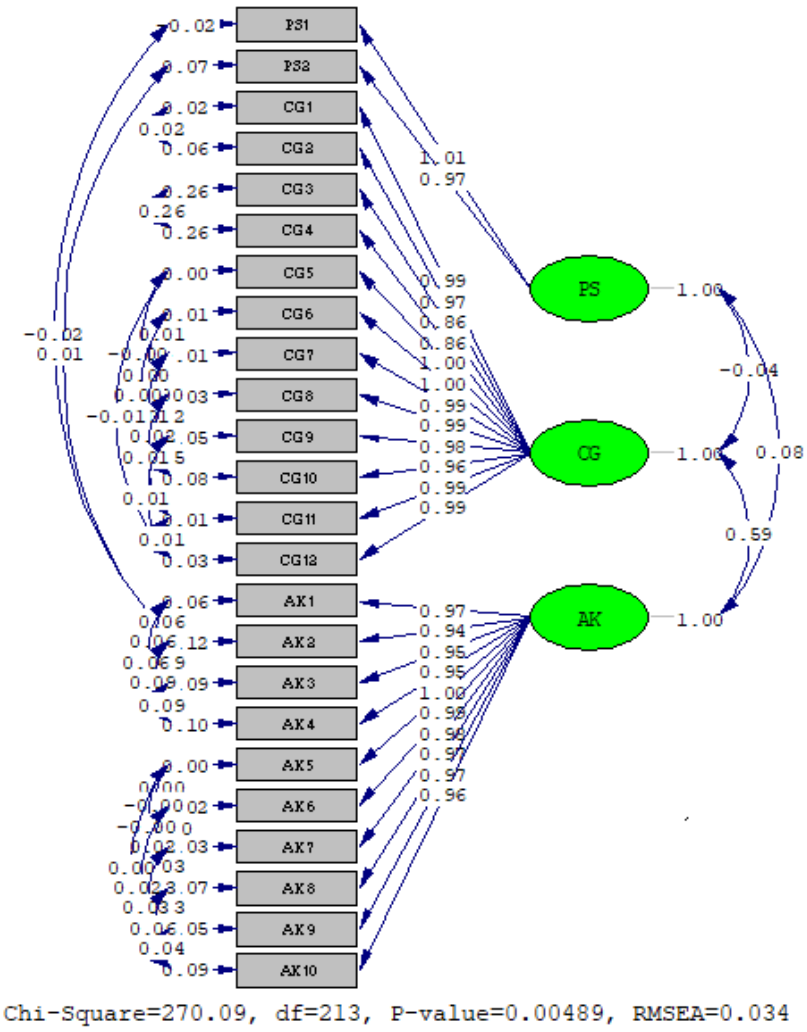

Figure 3. Final modelling results

Coherent Validity

The main purpose of CFA (Confirmatory Factor Analysis) is to test the construct validity of the theory underlying the measurement. A fit model is a key indicator that the measuring instrument being tested truly reflects the theoretical construct being measured (Hair Jr et al., 2019). In addition to the accuracy of the model in CFA (Confirmatory Factor Analysis) analysis, construct validity can also be seen from CR (Construct Reliability). CR (Construct Reliability) is obtained by calculating the square of the sum of factor loading (Li), for each dimension and the amount of error variance (ei) for each dimension shown in the following formula (Hair Jr et al., 2019). Factor Analysis of the Indonesian Version of the CTAS-24 Instrument Adaptation: Exploratory and Confirmatory Approaches and can be seen in Table 8. Table 8 shows that the three

dimensions of the Indonesian version of the ARS have a CR value> 0.7 so that it can be concluded that the Indonesian ARS measuring instrument has good construct reliability so that it fulfils the principle of convergent validity.

$$CR = \frac{\left(\sum_{i=1}^{n} L_i\right)^2}{\left(\sum_{i=1}^{n} L_i\right)^2 + \left(\sum_{i=1}^{n} e_i\right)}$$

High construct reliability (CR ≥0.7) indicates that there is internal consistency, which means that all items consistently represent the same latent construct. The results of the calculation of construct reliability on the Indonesian version of the CTAS-24 measuring instrument.

Table 10 . CR (Construct Reliability) Value

Hasil Analisis						**Reliabilitas**	
Indikator	**Item**	**SLF**	**e**	**CR**	**AVE**	**CR (0,70)**	**AVE (0,50)**
Physical	PS1	1,01	-0,02	0,987	0,975	Reliabel	Reliabel
	PS2	0,97	0,07				
Cognitive	CG1	0,99	0,02	0,994	0,932	Reliabel	Reliabel
	CG2	0,97	0,06				
	CG3	0,86	0,26				
	CG4	0,86	0,26				
	CG5	1,00	0,00				
	CG6	1,00	0,01				
	CG7	0,99	0,01				
	CG8	0,99	0,03				
	CG9	0,98	0,05				
	CG10	0,96	0,08				
	CG11	0,99	0,01				
	CG12	0,99	0,03				
Affective	AK1	0,97	0,06	0,993	0,937	Reliabel	Reliabel
	AK2	0,94	0,12				
	AK3	0,95	0,09				
	AK4	0,94	0,10				
	AK5	1,00	0,00				
	AK6	0,99	0,02				
	AK7	0,98	0,03				
	AK8	0,97	0,07				
	AK9	0,97	0,05				
	AK10	0,96	0,09				

Conclusion

This study purpose to validate the adaptation of the CTAS-24measuring instrument into the Indonesian version. Based on the results of CFA analysis, it is known that the Indonesian CTAS-24has three dimensions, namely physical (2 items), cognitive (12 items) and Affective (10 items). This indicates that the Indonesian CTAS-24 is valid in measuring the construct of Academic Anxienty Scale. The Indonesian CTAS-24also fulfils the criteria of convergent validity based on the calculation of construct reliability. The reliability of the CTAS-24-Indonesia is also quite good, both when viewed as a unidimensional and multidimensional

construct. This indicates that the CTAS-Indonesia (24 items) is valid and reliable in measuring academic anxiety in the Indonesian student population.

The contribution of this research is to provide validation and enrichment of test anxiety measurement instruments to make them relevant and reliable in specific cultural or population contexts. This research also contributes to the development of theory, methodology and quality of academic anxiety measurement, and provides practical guidance for application in education and psychology.

Limitation

A limitation of this study is that although it was successful in validating and customising the instrument for a specific context, the results are still affected by limitations such as the sample size which may be under-representative, limitations of cultural and linguistic adaptation, a focus solely on quantitative approaches, as well as potential respondent bias. In addition, this study tends to be orientated towards the original structure of the instrument, which may not capture dimensions of test anxiety that are more relevant to the target population. These limitations may be an area of improvement and further exploration for future researchers.

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Reference

Belisle, A., Gautier, M.-S., Ghozali, F., Plantier, F., & Wechsler, J. (2005). A collision tumor involving basal cell carcinoma and lentigo maligna melanoma. *The American Journal of Dermatopathology*, *27*(4), 319–321.

Burcaş, S., & Creţu, R. Z. (2021). Multidimensional perfectionism and test anxiety: A meta-analytic review of two decades of research. *Educational Psychology Review*, *33*, 249–273.

Cassady, J. C. (2010). Test anxiety: Contemporary theories and implications for learning. *Anxiety in Schools: The Causes, Consequences, and Solutions for Academic Anxieties*, *2*, 7–26.

Cassady, J. C. (2022). Anxiety in the schools: Causes, consequences, and solutions for academic anxieties. In *Handbook of Stress and Academic Anxiety: Psychological Processes and Interventions with Students and Teachers* (pp. 13–30). Springer. https://doi.org/10.1007/978-3-031-12737-3_2

Cassady, J. C. (2023). Cognitive Test Anxiety Scale. In *International Handbook of Behavioral Health Assessment* (pp. 1–18). Springer.

Cassady, J. C., & Finch, W. H. (2020). Revealing nuanced relationships among cognitive test anxiety, motivation, and self-regulation through curvilinear analyses. *Frontiers in Psychology*, *11*, 1141.

Cassady, J. C., Finch, W. H., Nicholson, O. D., & Oedy, M. M. (2023). Using self-identified symptoms to reveal differential test anxiety profiles and supports: a mixed-methods study. *Educational Psychology in Practice*, 1–20.

Cassady, J. C., & Johnson, R. E. (2002). Cognitive test anxiety and academic performance. *Contemporary Educational Psychology*, *27*(2), 270–295.

Cassady, J. C., Pierson, E. E., & Starling, J. M. (2019). Predicting student depression with measures of general and academic anxieties. *Frontiers in Education*, *4*, 11.

Cassady, J. C., & Thomas, C. L. (2020). Identifying and supporting students with affective disorders in schools: Academic anxieties and emotional information processing. In *Handbook of educational psychology and students with special needs* (pp. 52–74). Routledge.

Cassady, J., Finch, W. H., & Heath, J. A. (2022). Early Assessment of Cognitive Skills, Self-Regulated Learning Skills, and Attitudes toward Education Predict University Success at Graduation. *Journal of Postsecondary Student Success*, *1*(4), 84–111.

Chen, I., & Chang, C.-C. (2009). *Cognitive load theory: An empirical study of anxiety and task performance in language learning*.

Eum, K., & Rice, K. G. (2011). Test anxiety, perfectionism, goal orientation, and academic performance. *Anxiety, Stress, & Coping*, *24*(2), 167–178.

Folkman, S. (2020). Stress: appraisal and coping. In *Encyclopedia of behavioral medicine* (pp. 2177–2179). Springer.

Hair Jr, J. F., LDS Gabriel, M., Silva, D. da, & Braga, S. (2019). Development and validation of attitudes measurement scales: fundamental and practical aspects. *RAUSP Management Journal*, *54*(4), 490–507.

Hidayah, N., Ramli, M., Kirana, K. C., Hanafi, H., & Yunita, M. (2022). School anxiety identification after online learning post COVID-19. *2022 2nd International Conference on Information Technology and*

Education (ICIT&E), 112–116.
Hidayah, N., Ramli, M., Kirana, K. C., Hanafi, H., Yunita, M., & Rofiqoh, R. (2023). Conceptual design of digital anxiety detection-tools for students school anxiety. *International Conference on Educational Management and Technology (ICEMT 2022)*, 335–341.
Hitipeuw, I. (2018). Social media-based consultation for an IT student. *World Trans. on Engng. and Technol. Educ*, *16*(4), 448–451.
Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, *6*(1), 1–55.
Keeley, J., Zayac, R., & Correia, C. (2008). Curvilinear relationships between statistics anxiety and performance among undergraduate students: Evidence for optimal anxiety. *Statistics Education Research Journal*, *7*(1), 4–15.
Lazarus, A. A. (2005). Multimodal therapy. *Handbook of Psychotherapy Integration*, *2*, 105–120.
Lazarus, R. S. (1993). From psychological stress to the emotions: A history of changing outlooks. *Annual Review of Psychology*, *44*.
Lazarus, R. S. (2006). *Stress and emotion: A new synthesis*. Springer publishing company.
Legate, A. E., Hair Jr, J. F., Chretien, J. L., & Risher, J. J. (2023). PLS-SEM: Prediction-oriented solutions for HRD researchers. *Human Resource Development Quarterly*, *34*(1), 91–109.
Lowe, P. A., & Lee, S. W. (2008). Factor structure of the Test Anxiety Inventory for Children and Adolescents (TAICA) scores across gender among students in elementary and secondary school settings. *Journal of Psychoeducational Assessment*, *26*(3), 231–246.
Putwain, D., & Daly, A. L. (2014). Test anxiety prevalence and gender differences in a sample of English secondary school students. *Educational Studies*, *40*(5), 554–570.
Putwain, D., & Symes, W. (2011). Perceived fear appeals and examination performance: Facilitating or debilitating outcomes? *Learning and Individual Differences*, *21*(2), 227–232.
Putwain, D. W., & Aveyard, B. (2018). Is perceived control a critical factor in understanding the negative relationship between cognitive test anxiety and examination performance? *School Psychology Quarterly*, *33*(1), 65.
Putwain, D. W., Connors, L., Symes, W., & Douglas-Osborn, E. (2012). Is academic buoyancy anything more than adaptive coping? *Anxiety, Stress & Coping*, *25*(3), 349–358.
Putwain, D. W., & Symes, W. (2011). Teachers' use of fear appeals in the Mathematics classroom: Worrying or motivating students? *British Journal of Educational Psychology*, *81*(3), 456–474.
Putwain, D. W., & von der Embse, N. P. (2018). Teachers use of fear appeals and timing reminders prior to high-stakes examinations: Pressure from above, below, and within. *Social Psychology of Education*, *21*(5), 1001–1019.
SAĞLAM, R. (n.d.). *RELIABILITY IN PSYCHOMETRY*.
Sarkın, D. B. Ş., & Gülleroğlu, H. D. (2019). Anxiety in prospective teachers: Determining the cut-off score with different methods in multi-scoring scales. *Educational Sciences: Theory & Practice*, *19*(1), 3–21.
Thomas, C. L., Cassady, J. C., & Heller, M. L. (2017). The influence of emotional intelligence, cognitive test anxiety, and coping strategies on undergraduate academic performance. *Learning and Individual Differences*, *55*, 40–48.
Van den Berg, M. E. L., Castellote, J. M., Mahillo-Fernandez, I., & de Pedro-Cuesta, J. (2010). Incidence of spinal cord injury worldwide: a systematic review. *Neuroepidemiology*, *34*(3), 184–192.
von der Embse, N. (2018). The Promise of School-Based Mental Health within Multi-Tiered Systems of Support: A Response to Humphrey. *Psychology of Education Review*, *42*(1), 39–44.
Von der Embse, N. P., Schoemann, A. M., Kilgus, S. P., Wicoff, M., & Bowler, M. (2017). The influence of test-based accountability policies on teacher stress and instructional practices: A moderated mediation model. *Educational Psychology*, *37*(3), 312–331.
von der Embse, N. P., & Witmer, S. E. (2014). High-stakes accountability: Student anxiety and large-scale testing. *Journal of Applied School Psychology*, *30*(2), 132–156.
Wahyudin, H., Ramli, M., Chusniyah, T., Eva, N., & Oktasari, M. (2024). Solution-Focused Brief Counseling: An Effective Strategy for Reducing Anxiety During School Exams. *Edu Consilium: Jurnal Bimbingan Dan Konseling Pendidikan Islam*, *5*(1), 17–24.

Zeidner, M., Shani-Zinovich, I., Matthews, G., & Roberts, R. D. (2005). Assessing emotional intelligence in gifted and non-gifted high school students: Outcomes depend on the measure. *Intelligence*, *33*(4), 369–391.