Adapting and Testing the Indonesian Version of the Psychometric Properties of the Cognitive Flexibility Inventory (CFI) Measuring Tool

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Abstract. *Cognitive flexibility is an important mental ability to facilitate cognitive restructured learning. This ability can be used as a benchmark for an individual's adaptive function in dealing with life changes. This study aims to examine the psychometric properties of the Cognitive Flexibility Inventory (CFI) developed by Dennis and Vander Wal (2010), which was adapted into Indonesian language. The CFI measuring instrument consists of 20 items with 2 factors, namely the Alternatives and Control factors. Tests were carried out using Exploratory Factor Analysis and Confirmatory Factor Analysis. This study involved 1250 early adult individuals in Indonesia (mean age=24.71 years) who were divided into two groups of samples randomly for exploratory analysis (n=300) and confirmatory analysis (n=950). The results of the analysis show that the two-factors structure of the 15 CFI items in the Indonesian version has psychometric properties that are acceptable fit. These results shows that the Indonesian version of CFI can be used for research or assessment tool for various cognitive therapies. For future research it is recommended to conduct a concurrent validity testing for the Indonesian version of CFI.*

Keywords: *cognitive flexibility inventory Indonesian version; confirmatory factor analysis; exploratory factor analysis.*

INTRODUCTION

Cognitive flexibility is one aspect of executive functions that includes the ability to generate diverse ideas, consider alternative responses, and modify behaviour to manage changing circumstances (in Oshiro et al., 2016). Cognitive flexibility can be defined as the ability to switch cognitive sets to adapt to changes in environmental stimuli (Dennis & Vander Wal, 2010). Johco (in Oshiro et al., 2016) explains that cognitive flexibility is an essential mental ability to facilitate cognitive restructuring learning as a skill to improve adaptive functioning and the ability to adjust in changes in life circumstances.

Previous studies have shown that cognitive flexibility relates to various aspects of human life. Yıldız-Akyol & Boyacı (2020) found that cognitive flexibility is one of the predictor factors for students' career future. In addition, cognitive flexibility was found to correlate with mental

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well-being in adolescents (Demirtaş, 2020), life satisfaction (Odacı & Cikrikci, 2019), and played a role in the mechanism linking emotional clarity with emotional regulation (Kim & Hyun, 2018). Research in Clinical Psychology shows that cognitive flexibility is a mediator of the relationship between neuroticism and depressive symptoms, Generalized Anxiety Disorder (GAD), panic disorder, social phobia, and PTSD (Clarke & Kiropoulos, 2021). This is also supported by the research of Rosa-Alcázar et. al. (2020) which found that the group of individuals with obsessive-compulsive disorder had a lower cognitive flexibility score than the group with generalized anxiety group. Furthermore, Rosa-Alcázar et. al. (2020) state that cognitive flexibility needs to be involved in treatment for Obsessive Compulsive Disorder (OCD) and GAD patients.

Before research on cognitive flexibility develops, research on executive function is first studied because it is considered the central aspect in understanding cognitive abilities in individuals. Measurement of executive functions has multiplied, even researched early with the use of performance-based tests such as the Stroop Test or Stroop Colour Word Interference Test (in Alvarez & Emory, 2006), Wisconsin Card Sorting Task (Alvarez & Emory, 2006), Dimensional Change Card Sorting Task (Ezekiel et al., 2013), and Trail Making Test (in Llinàs-Reglà et al., 2017). Generally, several types of performance-based tests measure the development of executive functions ranging from infants to adults.

Recent models assume that executive functions consist of various components that can be researched separately (Miyake et al., 2000). Miyake et. al. (2000) believe that crucial aspects in executive functioning consist of working memory, inhibitory control, and cognitive flexibility (Buttelmann & Karbach, 2017). The development of executive function constructs was based on the need for observable behavioural measurements because at that time this research underwent a paradigm shift from the study of behaviour to the study of the brain. Therefore, many researchers are beginning to re-examine these constructs by developing new measurement tools that measure alternatives to executive functions by emphasizing the cognitive flexibility component to re-describe human behaviour instead of studying the brain.

The development of cognitive flexibility measuring instruments was started by Martin & Rubin (1995) with their measuring instrument, the Cognitive Flexibility Scale (CFS). CFS measuring instruments have good validity and reliability so that this measuring instrument has been widely adapted in various countries, one of the most recent is the development of the Japanese Cognitive Flexibility Scale Version (CFS-J) in 2016 (Oshiro et al., 2016). In addition to CFS, there are actual self-report measuring instruments that are also quite often used, such as The Behavioral Rating Scale of Executive Function (BRIEF) (in Strang et al., 2017), Cognitive Flexibility Inventory (CFI) (Dennis & Vander Wal, 2010), The Flexibility Scale (Strang et al., 2017), and Cognitive Control and Flexibility (CCFQ) (Gabrys et al., 2018). However, of these measuring instruments, CFI is one of the most widely used measuring instruments and has been adapted to various languages in the world.

The Cognitive Flexibility Inventory (CFI) measuring instrument consists of 20 statements developed by Dennis & Vander Wal (2010). CFI is a self-report measuring tool that is simple, short, easy to administer and score, and more practical for measuring treatment results (Dennis & Vander Wal, 2010). CFIs can be used for both research purposes and therapeutic interventions, such as to determine the cognitive flexibility perceived by individuals receiving behavioral cognitive interventions and measure the cognitive flexibility that individuals use to think adaptively when faced with stressful situations/events (Dennis & Vander Wal, 2010).

CFI was developed to overcome the limitations of CFS in assessing cognitive flexibility. CFS was designed to measure aspects of cognitive flexibility that were deemed necessary for effective communication. Meanwhile, no self-report explicitly addresses the cognitive flexibility that underlies

one's proficiency in challenging thinking and restructuring maladaptive beliefs. Therefore, CFI was developed with this purpose so that it can be used as an assessment in Cognitive Behavioral Therapy (Dennis & Vander Wal, 2010). CFI consists of two subscales namely the Alternative subscale, which measures the ability of individuals to find different explanations and come up with several solutions, and the Control subscale which measures the individual's ability to see difficult situations as something that can be faced (Dennis & Vander Wal, 2010).

CFI has been adapted to various languages such as Turkish, Russian, Iranian, Italian, Japanese, and Chinese.Sapmaz & Dogan (2013) found a significant relationship between the Turkish version of CFI and the English version (r = 0.97, p < 0.001). The results of the factor analysis also showed that the Turkish version of the CFI scale has a structure consisting of 2 factors and was found to be a valid and reliable scale for measuring the level of cognitive flexibility. CFI-R, or CFI adapted into Russian, was also found to have a 2-factor model. However, there were some revisions and modifications to the CFI-R after a factor analysis. In CFI-R, the overall number of items remains 20 items, but there are modifications, namely in items number 1, 2 and 15 which were originally on the Alternative scale to the Control scale, while statement items no 14 and 19 from the Control scale to the Alternative scale (Kurginyan & Osavolyuk, 2018). Similar modifications are also found in CFI-I, or CFI adapted into Iranian (Shareh et al., 2014). Unlike the Turkish and Russian versions of the CFI, the CFI-I concluded that this measuring instrument consists of 3 factors. On CFI-I, items 14 and 19 that were originally on the Control scale were moved to the Alternative scale; items 2 and 15 that were originally on the Alternative scale were moved to the Control scale; and items 8 and 10 were moved into a new category called the "Alternative for human behaviors" scale.

Another difference is seen in the CFI adapted into Italian (Portoghese et al., 2020). Using Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA), Portoghese et. al. (2020) found a version consisting of two factors, and containing 19 statement items (11 items on the Alternative scale and 8 items on the Control scale). In the EFA process, it was found that item number 1 was quite problematic due to the high value of cross loading on both factors. The problem with item number 1 is also found in the Russian version of CFI (Kurginyan & Osavolyuk, 2018) and Iran (Shareh et al., 2014). In addition to the previously mentioned adaptations, CFI adapted into Japanese was also found to have 2 factors (in Oshiro et al., 2016), and CFI adapted into Chinese has also been indicated to have good fit (Wang et al., 2022).

Based on the description above, CFI adaptation studies in different countries provide different results. There are differences in the number of items and differences in the grouping of items into 2- and 3-factor models. Therefore, this study aims to adapt the CFI measuring instrument and explore the psychometric properties of CFI in early adult individuals in Indonesia. The analysis in this study focuses on identifying the structure of CFI factors, estimating the reliability of measurements, and testing the validity of the scores they produce. As far as researchers have searched, until now there has been no adaptation of CFI measuring instruments into Indonesian. Several previous studies on cognitive flexibility in Indonesia were conducted using CFS developed by Martin & Rubin (1995) (Aufa et al., 2019), Cognitive Flexibility scale developed by Bilgin (2009) (Putra et al., 2019) and CFI developed by Dennis & Vander Wal (2010) (Handayani, 2022; Oktaviani, 2020; Sirait, 2019). However, the psychometric properties of the measuring instruments in the study are still limited to reliability scores and item discrimination power scores by looking at the range of corrected grain-total correlation scores only. This study is expected to contribute to the use of psychological scales that are in accordance with the Indonesian context, so that deepening research related to the function of cognitive flexibility can be further developed with measuring instruments that already have good psychometric properties.

METHOD

Participants in the study were early adult individuals. To recruit participants, researchers collect data about the research through social media such as Instagram, Twitter, LinkedIn, WhatsApp as well as through announcements to researchers' colleagues in various regions in Indonesia. 1,250 participants were involved in the study (male = 195; female = 1055) aged 18-40 years (average age = 24.71, SD = 4.59). The majority of research participants (table 1) were female (84.4%), worked as students (45.0%), had a recent bachelor's education level (S1) (48.6%), and were domiciled in Java Island (75.8%).

Table 1.
Demographic Data of Research Participants (EFA)

	Category	F	%
Gender	Male	45	15.0
	Female	255	85.0
	Total	300	100
Occupation	Students/ University students	126	42.0
	Civil Servant	8	2.7
	Private servants	73	24.3
	Public Sector Employee/BUMN	5	1.7
	Entrepreneur	24	8.0
	Not Working	31	10.3
	Others	33	11.0
	Total	300	100
Education	Junior High School	1	0.3
	Senior High School	88	29.3
	Associate's degree (D3)	17	5.7
	Bachelor's Degree (S1)	155	51.7
	Master's Degree (S2)	39	13.0
	Doctoral's Degree (S3)	0	0.0
	Total	300	100
Residence	Sumatera	31	10.3
	Java	230	76.7
	Kalimantan/Borneo	12	4.0
	Sulawesi/ Celebes	6	2.0
	Bali dan Nusa Tenggara	16	5.3
	Maluku/ Moluccas dan Papua	5	1.7
	Total	300	100

The instrument used in this study was the CFI developed by Dennis & Vander Wal (2010). The CFI measuring instrument consists of 20 items spread over 2 factors, namely Alternative (12 items with a positive direction and 1 item with a negative direction) and control (2 items with a positive direction and 5 items with a negative direction). On the Alternative factor some examples of the statement items are "I consider multiple options before making a decision", "I like to look at difficult situations from many different angles", and "It is important to look at difficult situations

from many angles". While on the Control factor some examples of the statement items are "When encountering difficult situations, I become so stressed that I cannot think of a way to resolve the situation", "I feel I have no power to change things in difficult situations", and "When I encounter difficult situations, I just don't know what to do". The answer format consists of 5 choices with a score between 1-5 (1 = Strongly disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly agree).

Table 2.
Demographic Data of Research Participants (CFA)

	Category	F	%
Gender	Male	150	15.8
	Female	800	84.2
	Total	950	100
Occupation	Students/ University students	437	46.0
	Civil Servants	50	5.3
	Private servants	235	24.7
	State-owned Company/BUMN	10	1.1
	Entrepreneur	50	5.3
	Not Working	85	8.9
	Others	83	8.7
	Total	950	100
Education	Junior High School	3	0.3
	Senior High School	371	39.1
	Associate's degree (D3)	46	4.8
	Bachelor's Degree (S1)	452	47.6
	Master's Degree (S2)	77	8.1
	Doctoral's Degree (S3)	1	0.1
	Total	950	100
Residence	Sumatera	96	10.1
	Java	718	75.6
	Kalimantan/Borneo	34	3.6
	Sulawesi/ Celebes	31	3.3
	Bali and Nusa Tenggara	59	6.2
	Maluku/ Moluccas and Papua	12	1.2
	Total	950	100

The original version of CFI (Dennis & Vander Wal, 2010) was translated by the forward translation method by the third researcher then re-examined by the first and second researchers independently. Then, to maintain language accuracy and equivalence, an evaluation of translational results is carried out by consulting two validators independently. The first validator is a native speaker Indonesian who has adequate English proficiency and has an educational background in psychology. The second validator is a native speaker Indonesian who has study experience and lives in an English-speaking country and has an educational background in Psychology. The determination of the final translation result considers the assessment and input of both validators, so that a translation is generated as attached in table 3.

Table 3.

CFI Scale Statement in English and Indonesian Version

Statements in English	Indonesian version
I am good at "sizing up" situations.	Saya pandai dalam mencermati situasi.
I have a hard time making decisions when faced with difficult situations.	Saya kesulitan membuat keputusan ketika menghadapi situasi sulit.
I consider multiple options before making a decision.	Saya mempertimbangkan beberapa pilihan sebelum membuat sebuah keputusan.
When I encounter difficult situations, I feel like I am losing control.	Ketika saya menghadapi situasi yang sulit, saya merasa seperti kehilangan kendali.
I like to look at difficult situations from many different angles.	Saya cenderung melihat situasi sulit dari berbagai sudut pandang yang berbeda.
I seek additional information not immediately available before attributing causes to behavior.	Saya mencari informasi tambahan sebelum menentukan penyebab dari perilaku.
When encountering difficult situations, I become so stressed that I cannot think of a way to resolve the situation.	Ketika menghadapi situasi sulit, saya menjadi stres sehingga tidak dapat memikirkan cara untuk menyelesaikannya.
I try to think about things from another person's point of view.	Saya mencoba memikirkan sesuatu dari sudut pandang orang lain.
I find it troublesome that there are so many different ways to deal with difficult situations.	Saya merasa kewalahan karena ada begitu banyak cara yang berbeda untuk menghadapi situasi sulit.
I am good at putting myself in others' shoes.	Saya pandai menempatkan diri dalam posisi orang lain.
When I encounter difficult situations, I just don't know what to do.	Ketika saya menghadapi situasi sulit, saya tidak tahu apa yang harus dilakukan.
It is important to look at difficult situations from many angles.	Melihat situasi sulit dari berbagai sudut pandang adalah hal yang penting.
When in difficult situations, I consider multiple options before deciding how to behave.	Ketika dalam situasi sulit, saya mempertimbangkan beberapa pilihan sebelum memutuskan bagaimana harus berperilaku.
I often look at a situation from different viewpoints.	Saya sering melihat sebuah situasi dari sudut pandang yang berbeda.
I am capable of overcoming the difficulties in life that I face.	Saya mampu mengatasi kesulitan-kesulitan yang saya hadapi dalam hidup.
I consider all the available facts and information when attributing causes to behavior.	Saya mempertimbangkan semua fakta dan informasi yang tersedia ketika menentukan penyebab dari perilaku
I feel I have no power to change things in difficult situations.	Saya merasa tidak memiliki kekuatan untuk melakukan perubahan dalam situasi sulit.
When I encounter difficult situations, I stop and try to think of several ways to resolve it.	Ketika saya menghadapi situasi sulit, saya berhenti sejenak dan mencoba memikirkan beberapa cara untuk mengatasinya.
I can think of more than one way to resolve a difficult situation I'm confronted with.	Saya dapat memikirkan lebih dari satu cara untuk mengatasi situasi sulit yang saya hadapi.
I consider multiple options before responding to difficult situations.	Saya mempertimbangkan beberapa pilihan sebelum merespons situasi sulit.

The next step is to conduct a pilot study to provide evidence of item analysis and reliability in small samples. This step is done to ensure that the language used is clear enough and that

the scale-out instructions can be understood and worked out correctly by the target participants. The sample in this pilot study was 66 young adults living in Java Island with an age range of 17-29 years (M= 21.61 years, SD= 2,778). The test results in the pilot study showed that this CFI version Indonesian had an alpha Cronbach value of a= 0.836. All items show a corrected item-total correlation score above 0.3 (range 0.352-0.642) so that no items are aborted or modified at this stage. From the results of this pilot study, it can be concluded that respondents can understand the content and language of items from the adapted CFI. After conducting tests in a pilot study, researchers then take data on a large scale.

CFI is structured based on the concept of multidimensional executive function, which describes one measuring construct, namely cognitive flexibility. Psychometric property tests are carried out using 2 stages: Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA). False discoveries can be avoided by dividing the sample into two groups for EFA and CFA (Anderson & Magruder, 2017). Data analysis was carried out by dividing the respondents' data into two groups at random, namely 300 data for EFA testing and 950 people for CFA testing. EFA is carried out to determine the number of factors that make up the construct measured while CFA is carried out to see the model's accuracy from the scale tested (Hair et al, 2014).

The model's accuracy in this study refers to the parameters presented by Matsunaga (2010). A model is declared "good fit" if it meets the parameters of Root Mean Square Error of Approximation (RMSEA < 0.06), Comparative Fit Index (CFI > 0.95), and Standardized Root Mean Square Residual (SRMR < 0.1). Meanwhile, the model is declared "acceptable fit" if it meets the parameters of Root Mean Square Error of Approximation (RMSEA < 0.08), Comparative Fit Index (CFI > 0.9), and Standardized Root Mean Square Residual (SRMR < 0.1).

In addition to testing factor analysis, the study also conducted validity tests and reliability tests. Convergent validity and CFI validity tests were carried out through composite reliability and average variance extracted measurements (Hair et al, 2014). Meanwhile, reliability testing is seen from the Cronbach Alpha coefficient. All statistical processing in this study was carried out using JASP 0.14.0 software.

RESULTS AND DISCUSSION

Descriptive Statistical Data & Reliability Score

Table 4 shows the average score (M), standard deviation (SD) and correlation of 20 CFI items. From the table, it can be seen that all statement items in the CFI have a positive correlation with the overall total score of the CFI, with the range r= 0.404 to r= 0.653, p < 0.001. The CFI reliability test was conducted by looking at Cronbach's Alpha value. The reliability test results with Cronbach's Alpha on the overall CFI item (N= 20) show that the CFI has a satisfactory reliability of a= 0.866 (see Table 5).

Exploratory Factor Analysis

Exploratory Factor Analysis EFA testing is still carried out even though CFI is an adaptation of the English version (Dennis & Vander Wal, 2010) which has two factors. This test was done because several CFI adaptation studies in some countries showed findings of different factor structures from the original CFI measuring instruments. Researchers performed EFA testing to provide more definitive empirical data on the form of CFI factors in different samples.

Table 4.
Item Intercorrelation Matrix Test Results

Variable	CFI01	CFI02	CFI03	CFI04	CFI05	CFI06	CFI07	CFI08	CFI09	CFI10	CFI11	CFI12	CFI13	CFI14	CFI15	CFI16	CFI17	CFI18	CFI19	CFI20	CFI Total
1. CFI01	—																				
2. CFI02	0.105	—																			
3. CFI03	0.248	-0.107	—																		
4. CFI04	0.232	0.539	-0.032	—																	
5. CFI05	0.257	0.026	0.29	0.016	—																
6. CFI06	0.31	0.037	0.4	0.046	0.457	—															
7. CFI07	0.228	0.486	0.035	0.642	0.057	0.066	—														
8. CFI08	0.23	-0.019	0.313	0.016	0.414	0.404	0.032	—													
9. CFI09	0.103	0.395	-0.032	0.549	-0.039	-0.025	0.564	-0.104	—												
10. CFI10	0.409	0.139	0.228	0.18	0.301	0.308	0.182	0.364	0.054	—											
11. CFI11	0.233	0.493	0.042	0.564	0.047	0.081	0.63	0.025	0.518	0.165	—										
12. CFI12	0.25	-0.065	0.333	-0.002	0.347	0.388	0.03	0.419	-0.047	0.261	-0.025	—									
13. CFI13	0.269	0.005	0.486	0.079	0.401	0.478	0.126	0.412	-0.015	0.306	0.077	0.505	—								
14. CFI14	0.334	0.101	0.323	0.152	0.444	0.434	0.191	0.531	0.043	0.429	0.136	0.483	0.558	—							
15. CFI15	0.31	0.269	0.143	0.317	0.159	0.152	0.323	0.13	0.245	0.308	0.32	0.184	0.297	0.319	—						
16. CFI16	0.283	0.062	0.35	0.09	0.33	0.476	0.128	0.386	0.023	0.315	0.069	0.44	0.536	0.533	0.352	—					
17. CFI17	0.181	0.45	0.051	0.534	0.082	0.088	0.539	0.038	0.471	0.179	0.597	0.016	0.129	0.157	0.351	0.058	—				
18. CFI18	0.193	0.023	0.286	0.09	0.291	0.316	0.108	0.317	0.044	0.23	0.068	0.338	0.434	0.398	0.259	0.404	0.062	—			
19. CFI19	0.31	0.162	0.234	0.185	0.316	0.338	0.218	0.303	0.087	0.307	0.218	0.311	0.441	0.434	0.38	0.422	0.221	0.501	—		
20. CFI20	0.32	0.075	0.419	0.134	0.351	0.418	0.159	0.383	0.01	0.311	0.149	0.407	0.616	0.502	0.327	0.533	0.136	0.542	0.606	—	
21. CFITotal	0.524	0.455	0.404	0.568	0.477	0.521	0.603	0.468	0.43	0.539	0.572	0.456	0.601	0.653	0.579	0.576	0.562	0.502	0.625	0.635	—
Mean	3.632	2.692	4.336	2.899	3.854	4.088	3.022	4.011	2.936	3.528	3.264	4.334	4.199	4.016	3.4	4.027	3.197	4.036	3.715	4.056	
SD	0.839	1.069	0.69	1.136	0.948	0.791	1.152	0.835	1.091	0.946	1.104	0.762	0.728	0.836	0.92	0.767	1.145	0.781	0.926	0.786	

Table 5.

Reliability Test Results

Item	Test Item Correlation	When The item is deleted
CFI01	0.458	0.860
CFI02	0.363	0.865
CFI03	0.343	0.864
CFI04	0.483	0.860
CFI05	0.398	0.863
CFI06	0.458	0.860
CFI07	0.530	0.858
CFI08	0.398	0.862
CFI09	0.333	0.866
CFI10	0.466	0.860
CFI11	0.489	0.859
CFI12	0.392	0.863
CFI13	0.550	0.858
CFI14	0.599	0.856
CFI15	0.512	0.858
CFI16	0.520	0.859
CFI17	0.474	0.860
CFI18	0.439	0.861
CFI19	0.562	0.856
CFI20	0.583	0.856

In this study, the factor structure obtained from EFA found similarities in the number of factors with the original CFI, but four items were in different factors. From the EFA results, item number 1 is not included in both CFI factors. Then, in the original CFI version, item no. 15 is included in factor 1, namely Alternative. But in this study, item no. 15 is included in factor 2, namely Control. Similarly, in items no. 14 and 19, the original CFI version is included in factor 2, namely Control. However, the EFA results show that these two items are included in factor 1 i.e. Alternatives.

The results of the scree plot test showed that two factors were recommended by the data (see figure 1). The total variance that this model can explain is 50.462%, which is divided into 2 factors, namely the first factor of 32.871% and the second factor of 17.591%.

Calculation of loading factor using oblique rotation (promax) with maximum likelihood approach (table 6). Oblique rotation is used because CFI constructs have interrelated factors. The loading factor limit used in this study is 0.4, so items with a loading factor score below 0.4 will be removed (Pituch & Stevens, 2016). From table 6 it can be seen that CFI items have a tendency to group into 2 factors. However, item number 1 does not have a factor loading score in either factor 1 or factor 2.

Confirmatory Factor Analysis

CFA is performed to confirm the structure of the factors that EFA has generated. In this study, CFA was performed in several stages to obtain a fit model, using different sample data from EFA testing (N = 950). At the first stage, CFA was carried out to confirm the structure of the original CFI factor developed by Dennis & Vander Wal (2010) Based on CFA testing, it was found that the model
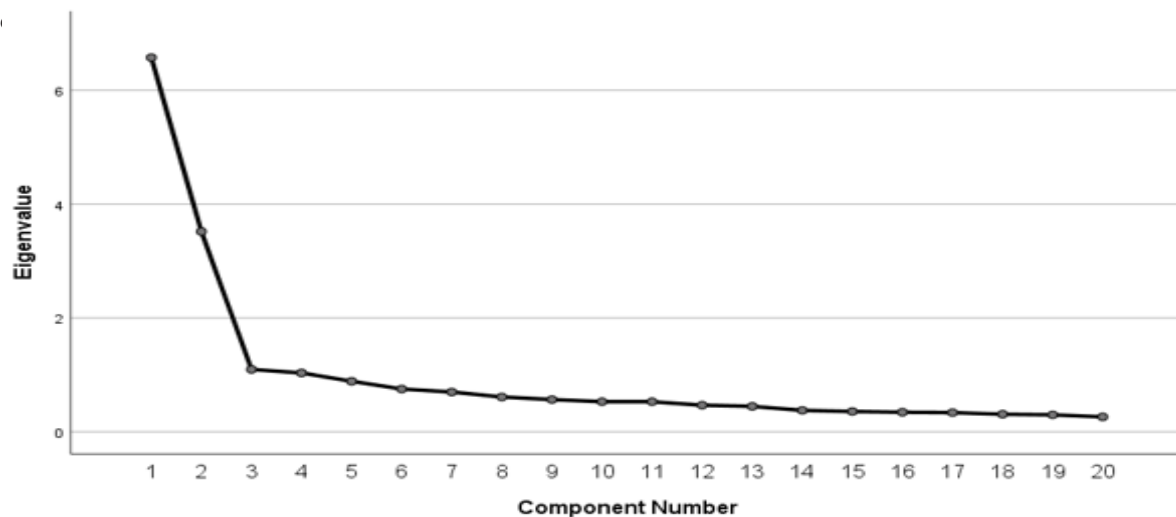
Figure 1.
Scree Plot

Table 6.
Weight Distribution Factors CFI Scale Confirmatory Factor Analysis

Item	Factor 1	Factor 2	Uniqueness
CFI01			0.771
CFI02		0.646	0.608
CFI03	0.610		0.658
CFI04		0.789	0.413
CFI05	0.582		0.638
CFI06	0.668		0.556
CFI07		0.803	0.365
CFI08	0.653		0.605
CFI09		0.746	0.506
CFI10	0.432		0.717
CFI11		0.803	0.365
CFI12	0.656		0.613
CFI13	0.815		0.358
CFI14	0.762		0.428
CFI15		0.415	0.666
CFI16	0.697		0.531
CFI17		0.748	0.449
CFI18	0.595		0.676
CFI19	0.544		0.611
CFI20	0.770		0.384

Note: The rotation method used is Promax.

At the second stage, CFA is carried out to confirm the structure of the CFI factor with the recommended factor of the EFA result. In this test, item number 1, which reads "I am good at observing the situation", was not included in the test because it was not included in the 2 factors.

The second phase of the CFA showed results that the model did not meet the "fit" criteria (CFI = 0.883, RMSEA = 0.077, SRMR = 0.081, and GFI = 0.895), but had a better parameter accuracy index than the model produced in the first stage CFA.

Furthermore, a third stage CFA was carried out with model modifications to obtain a model that has a parameter accuracy index that meets the criteria of "fit" or "acceptable fit". This modification is done by removing items that have an insignificant loading factor or tend to be low, namely items number 3, 5, 10 and 15. Items number 3, 5, 10, and 15 respectively read, "I consider several options before making a decision", "I tend to see difficult situations from a variety of different points of view", "I am good at putting myself in the shoes of others", and "I am able to overcome the difficulties I face in life". In the third model, the number of items tested in the final stage CFA was 15 statements. The test results of this 3rd model show that this model has met the criteria of the "acceptable fit" model parameters (CFI = 0.928, RMSEA = 0.071, SRMR = 0.057, & GFI = 0.927).

Table 7.
Results of CFA

Item	Original		Modification 1 (suggestion EFA)		Modification 2 (delete 5 items with FL > 0,3)	
	Factor 1	Factor 2	Factor 1	Factor 2	Factor 1	Factor 2
CFI 1	0.391		Deleted		Deleted	
CFI 2	0.043			0.676		0.675
CFI 3	0.367		0.350		Deleted	
CFI 4		0.868		0.885		0.885
CFI 5	0.501		0.508		Deleted	
CFI 6	0.495		0.484		0.464	
CFI 7		0.933		0.919		0.922
CFI 8	0.463		0.482		0.463	
CFI 9		0.730		0.730		0.733
CFI 10	0.446		0.442		Deleted	
CFI 11		0.839		0.840		0.841
CFI 12	0.467		0.471		0.467	
CFI 13	0.552		0.550		0.548	
CFI 14		0.192	0.610		0.601	
CFI 15	0.356			0.366	Deleted	
CFI 16	0.535		0.532		0.537	
CFI 17		0.792		0.798		0.793
CFI 18	0.474		0.484		0.497	
CFI 19		0.257	0.586		0.604	
CFI 20	0.581		0.586		0.599	
Parameter Accuracy Model	GFI = 0.795 RMSEA = 0.120 CFI = 0.695 SRMR = 0.167		GFI = 0.895 RMSEA = 0.077 CFI = 0.883 SRMR = 0.081		GFI = 0.927 RMSEA = 0.071 CFI = 0.928 SRMR = 0.057	

The final model of cognitive flexibility measurement can be seen in figure 2. From the results of this test, factor 1 is referred to as Alternative factor, while factor 2 is referred to as Control factor.
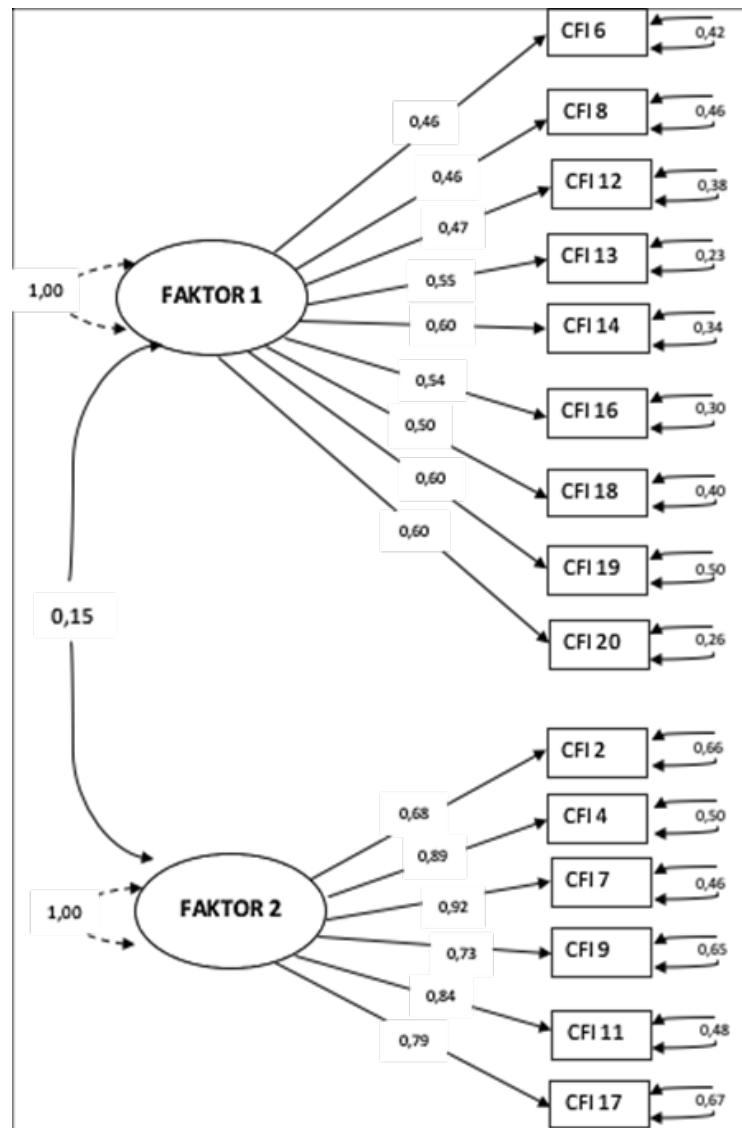
Note: Faktor 1: Factor 1; Faktor 2: Factor 2

Figure 2.

CFI Instrument Measurement Model

Convergent Validity

This study conducted convergent validity testing through composite reliability (CR) to strengthen the construct validity of CFA results. A CR index of ≥ 0.7 indicates that all items represent the same latent construct consistently (Hair et al, 2014). The number of loading factors and the sum of the error variance of each item are used to calculate the CR (see table 7). The test results show that the Alternative and Control factors have a CR value of > 0.7, so it can be concluded that both CFI factors meet the convergent validity.

Discussion

The test results of EFA and CFA show that the Indonesian version of CFI has 2 factors consisting of 15 statements. The Alternative Factor consists of 9 statements, and the Control factor consists of 6 statements. The results of this test have differences with the original version of the CFI measuring instrument developed by Dennis & Vander Wal (2010). This modification was then

carried out by researchers to obtain psychometric property testing results that met the criteria of "acceptable fit".

The EFA test results show that statement number 1 ("I am good at observing the situation") does not have a meaningful loading factor in either factor 1 or factor 2. The adaptation of the CFI measuring instrument into Italian (Portoghese et al., 2020), Russian (Kurginyan & Osavolyuk, 2018) and Iranian (Shareh et al., 2014) also showed similar results, namely that statement no. 1 was found problematic. Furthermore, Portoghese et. al. (2020) stated that this statement no. 1 is suspected of having a high bias in the self-evaluation of personal skills.

In addition, statements numbers 14 and 19 on the original CFI were included in the Control Factor, while the EFA test results in this study all three statements were included in the Alternative Factors. Similarly, statement number 15 in the original CFI was included in the Alternative Factor, while the test results in this study showed that the statement was included in the Control Factor. This modification was also found in the Russian version of the CFI adaptation performed by Kurginyan and Osavolnyuk (2018).

Table 8.
Convergent Validity Test Results Table

Factor	Item Number	λ	λ^2	Eror	CR
Alternative	CFI06	0.649	0.421	0.579	
	CFI08	0.643	0.413	0.587	
	CFI12	0.676	0.457	0.543	
	CFI13	0.780	0.609	0.391	
	CFI14	0.755	0.570	0.430	
	CFI16	0.741	0.550	0.450	0.899
	CFI18	0.657	0.432	0.568	
	CFI19	0.671	0.450	0.550	
	CFI20	0.777	0.603	0.397	
	Total Alternative	6.349	4.505	4.495	
Control	CFI02	0.715	0.511	0.489	
	CFI04	0.816	0.666	0.334	
	CFI07	0.822	0.676	0.324	
	CFI09	0.739	0.546	0.454	0.901
	CFI11	0.812	0.659	0.341	
	CFI17	0.753	0.567	0.433	
	Total Control	4.657	3.625	2.375	

Kurginyan & Osavolyuk (2018) modified statements no 14 and 19 from Control Factors to Alternative Factors, and statements no 1, 2 and 15 from Alternative Factors to Control Factors. The findings in the study of Shareh et al (2014) also found that the same statement number was also considered problematic. In the Iranian version of CFI, Shareh et. al. (2014) modified the structure of the CFI model into 3 factors (Alternative, Control, and Alternative Factors for human behaviours).

Another modification to the CFI Indonesian version is to remove 4 items with a low loading factor value (< 0.4), namely statements number 3, 5, 10 and 15. Statements nos. 3, 5, 10, and 15 respectively read "I consider several options before making a decision", "I tend to look

at difficult situations from different points of view", "I am good at putting myself in the shoes of others", and "I can overcome the difficulties I face in life". Statements 3 and 5 are suspected to have a high tendency toward social desirability among Indonesians. Both of these items have less verifiable attributes. These attributes are more difficult to test for correctness through verification on other sources of information, so they are more susceptible to deception, especially the deception of adjusting responses to social expectations (Widhiarso & Suhapti, 2009). This case can be seen from statement number 3 as many as 91.1% of participants chose the answers "Appropriate" and "Very Appropriate". Meanwhile, in item number 5, 69.8% of participants chose the answers "Appropriate" and "Very Appropriate". Meanwhile, items 10 and 15 are suspected of containing bias in evaluating skills.

The Indonesian version of CFI also showed good convergent validity results, as evidenced by the Composite Reliability (CR) test on Alternative and Control factors showing a CR value of > 0.7. Thus, this study provides a proven cognitive flexibility version Indonesian measuring tool that has good psychometric properties. Therefore, this measuring instrument can be used in research on cognitive flexibility in the early adult population in Indonesia. The sample used in this study consisted of various demographic groups in Indonesia which included the last level of education (junior high school, high school, diploma, bachelor, master, and doctoral), type of work (students/ students, civil servants, State-owned Company, private employees, entrepreneurs, and not working), and domiciles representing various regions (Sumatra, Java, Kalimantan, Sulawesi, Bali and Nusa Tenggara, Maluku Islands and Papua). On the other hand, the number of respondents by gender is still unequal, where there are far more female respondents than male respondents.

The Constraint of this study is the process of translating measuring instruments that only use forward translation and have not involved backward translation. Researchers seek to adapt measuring instruments by involving the process of previewing translated results by involving o have a good understanding of both languages. In addition, before taking data, researchers first conduct a pilot study to provide evidence of item analysis and reliability in small samples.

The results of the pilot study showed that the language used in this adaptation questionnaire could be understood and worked on correctly by the target participants. Another limitation is that concurrent validity testing has not been carried out with other measuring instruments that test similar variables so that it has not been able to provide evidence of concurrent validity. This study has also not been equipped with a method to obtain an explanation of respondents' perception assessment of problematic items.

CONCLUSION

The results of this study present a two-factor structure of CFI version Indonesian that has an acceptable fit model among the initial adult sample group. These results suggest that the psychometric properties of Indonesian CFI are comparable to native CFIs, making them usable to further research cognitive flexibility in populations using Indonesian. Based on the test results, the implication of this study is that this measuring tool can be an alternative to be used in research on cognitive flexibility in Indonesia and evaluate the results of cognitive interventions given to clinical samples.

For the future research, adaptations of this measuring instrument can be developed for testing in other groups, such as clinical samples, intermediate adult age groups, advanced adults, children, and adolescents. Subsequent research may also include validity testing using concurrent validity.

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