International Journal of Evaluation and Research in Education (IJERE)
Vol. 13, No. 3, June 2024, pp. 1356~1362
ISSN: 2252-8822, DOI: 10.11591/ijere.v13i3.28038

Adaptation and validation of the children's cognitive triad inventory for Indonesian students

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Article Info

Article history:

Received Jul 10, 2023
Revised Aug 11, 2023
Accepted Sep 6, 2023

Keywords:

Adolescent
Adaptation
Cognitive triad inventory
Confirmatory factor analysis
Psychometric properties

ABSTRACT

Depression causes student learning problems. Depressive symptoms are influenced by automatic thoughts that contain a negative cognitive triad. A valid and reliable instrument to measure the cognitive triad in adolescents is essential to identify one of the risk factors for depressive disorders in adolescents. At the same time, Indonesia has no instrument to measure this. This study aims to adapt the children's cognitive triad inventory (CTI-C) into an Indonesian version and to examine its psychometric properties. Data were collected from 1,184 students aged 13-19 (mean=15.32, SD=1.62) using the 36-item CTI-C. The CTI-C instrument adaptation process refers to the international test commission (ITC). The results of confirmatory factor analysis (CFA) showed comparative fit index (CFI)=0.95, Tucker-Lewis's index (TLI)=0.94, root mean square error of approximation (RMSEA)=0.071, standardized root mean square residual (SRMR)=0.056, and goodness of fit index (GFI)=0.82, with a load factor range of 0.43-0.80 for the view of self, 0.43-0.68 for the view of the world, and 0.37-0.70 for the view of the future. The Cronbach's alpha coefficient ranged from 0.81 to 0.84 for the subscales and 0.93 for the total score. Thus, the Indonesian version of the CTI-C can measure the cognitive triad in Indonesian students aged 13-19.

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1. INTRODUCTION

One of the main causes of the global adolescent illness burden is depression disorders [1]. Study by Rapee *et al*. [2] found that psychopathology often initially appears during adolescence. Based on data from the Indonesia National Family Life Survey was found that 7.2% of adolescents aged 15-19 years experienced significant depression, and 22.0% experienced moderate depression [3]. Another study in 2020 found that 41.15% of adolescents had depressive symptoms [4].

Depressed adolescents are at high risk of experiencing problems at school [5], [6]. It is because the symptoms of depression usually manifest themselves at school, such as difficulty concentrating when learning, difficulty thinking well, difficulty solving learning problems, forgetting things quickly, and reluctance to engage in learning activities. Sometimes it also makes it difficult for them to follow the rules in class. As a result, students who are depressed often skip classes, have low motivation to learn and thus low learning achievement, and are not promoted or dismissed from school. Teachers need to be able to recognize the symptoms of depression in their students to anticipate the development of worsening depression.

According to Beck's Causal Chain theory, depressive symptoms are influenced by automatic thoughts that contain negative views of the self, the world, and the future-known as the negative cognitive triad [7]. This

negative cognitive triad arises from cognitive distortions resulting from negative cognitive schemas activated by adverse life events. This negative view of the self, the world, and the future plays a role in initiating depression, maintaining depression, and worsening depressive symptoms in individuals [8]. The negative cognitive triad contributes 43.5% to depressive symptoms [9].

On the assumption that the cognitive triad is the primary key to the development of depression, Beckham *et al*. [10] developed the cognitive triad inventory. Several studies showed that cognitive symptoms associated with depression begin in childhood, with similar cognitive patterns between children, adolescents, and adults who experience depression [11]. Furthermore, Kaslow *et al*. [11] developed the children's cognitive triad inventory (CTI-C) for children and adolescents.

Based on the researcher's investigation, no studies in Indonesia still adapt and validate instruments that measure the cognitive triad, which, according to Beck [8], is essential in developing and maintaining depressive symptoms. This study focuses on adapting the CTI-C to the Indonesian language and evaluating its psychometric properties. It includes testing its factor structure using confirmatory factor analysis (CFA) testing its reliability and validity. The hypothesis is that the Indonesian version of the CTI-C is a valid and reliable instrument for measuring the cognitive triad in students 13-19 years old. It is hoped that with a valid and reliable instrument that measures the cognitive triad in adolescent students, guidance and counselling teachers will be able to identify one of the risk factors for depressive disorders, which will prevent and minimize the severity of depressive disorders in adolescent students.

2. RESEARCH METHOD

2.1. Participants

The participants were students aged 13-19 years (mean=15.32, SD=1.62), with a total of 1,184. A total of 748 (68%) participants were female, and the remaining 446 (32%) were male, 844 (71.3%) were junior high school students, and 340 (28.7%) were high school students. Sampling was done through an accidental sampling technique. Participants came from different regions of Indonesia, with the majority from the island of Java. All participants in this study expressed their willingness to participate through informed consent. The research instruments have received ethical approval from the Research Ethics Committee of the University of Surabaya 119A/KE/X/2022. In this study, the minimum sample size is 20 times the number of items for CFA [12]. The CTI-C instrument has 36 items, so the minimum sample size required is 720.

2.2. Adaptation procedures

The adaptation process of the CTI-C instrument refers to the international test commission (ITC) guidelines for translating and adapting. The researcher corresponded with Kaslow *et al*. [11], the author of the CTI-C, to obtain permission and approval to adapt the CTI-C to the Indonesian version. Permission and consent were obtained by email on 1 July 2022. The following are the stages of adaptation that have been implemented.

1) The CTI-C development phase consists of several stages, including: i) Forward translation, i.e., the translation of the original items into the Indonesian language, was carried out by two independent translators, using the criteria of having a background in psychology, understanding Indonesian culture, being proficient in both languages, and having an IELTS score of at least 6.5 and or having lived in a country where English is the daily language for at least one year; ii) Synthesise the results of forward translation, which aims to select words that have the most appropriate meaning for the original item, are culturally appropriate, and are easy to understand; iii) A back-translation was performed to check that the items translated into Indonesian matched the original items. This process was carried out by two translators who were different from the forward translation process to obtain objective translation results; and iv) Synthesis of the back-translation results aims to see the conformity between the back-translated and original items.
2) The validation phase of the translated results was carried out by three expert reviewers with the following criteria: a background in psychology, knowledge of English, understanding of Indonesian in the Indonesian cultural context, and knowledge of psychological instruments. These three experts had never been involved in the translation process before.
3) The cognitive interview phase. This phase was carried out with eleven panelists, aged 12-16, in junior and senior high school, by interviewing them using the Zoom application. Each panellist rated each item, indicating their understanding of the sentences in the question and making suggestions for improvement according to their understanding. This involves adding prepositions, changing word positions, and substituting synonyms. All changes have been made to ensure that the meaning of each item remains the same.
4) The confirmation phase or empirical analysis. After the Indonesian language version of the research questionnaire was ready, the researcher collected data from adolescents aged 12-19 in junior and senior high schools from October to December 2022 through an online form. The questionnaire included information about the purpose of the research, criteria for participants, confidentiality of participant data,

and an explanation of research risk mitigation. As the participants were adolescents, the questionnaire included a statement about parental consent. The questionnaire can only be completed if the participant has parental consent and is willing to do so.

2.3. Instruments

The CTI-C used in this study is the CTI-C, which underwent a translation process by researchers based on the ITC guidelines for translating and adapting tests. Previous studies have used the CTI-C with research participants aged 9-19 [11], [13]–[15]. This is a self-report instrument consisting of 36 items with three response options, namely yes=3, maybe=2, and no=1. There are three subscales in the CTI-C: views of the self, the world, and the future. Each subscale is divided into items measuring positive and negative cognitions. The scoring method is to reverse the scores of the items that measure negative cognitions. The overall score was then compiled. The lower the total score, the more negative the cognitive triad; conversely, the higher the total score, the more positive the cognitive triad.

The children depression inventory (CDI) used in this study is the CDI adopted in Indonesia [16] for children and adolescents aged 7-19 years, with a reliability value of α=0.746 (N=2,987). The CDI is a 27-item scale comprising three response options, each with a score of 0, 1, 2, a score of 0 indicates minimal symptoms, and a score of 2 indicates significant symptoms. Scoring was done by adding up the twenty-seven CDI items. The total score ranges from 0 to 54. The higher the total score, the greater the depression experienced.

2.4. Validity evidence

2.4.1. Evidence-based on internal structure

Construct validity was tested concerning the internal structure of the CTI-C using CFA. CFA was performed using LISREL 8.8 to test the fit of the measurement model. According to Hair *et al*. [17] the validity of the measurement model is determined by the level of goodness-of-fit (GoF) that is acceptable for the measurement model. In this study, the model is indicated as an acceptable model fit if the root mean square error of approximation (RMSEA) ≤0.08 [12], [18], [19], standardized root mean square residual (SRMR) ≤0.08 [20], Tucker-Lewis Index (TLI) ≥0.90 [21], comparative fit index (CFI) ≥0.90 [12], [22], [23].

2.4.2. Evidence-based on test-content

Validation was assessed using the content validity index (I-CVI) and the content validity scale (S-CVI) [24]. The expert reviewers' assessment is based on a Likert scale ranging from 1-4 (1=not relevant, 2=somewhat relevant, 3=moderately relevant, and 4=relevant). The data used to calculate content validity came from the expert reviewer's assessment of the relevance, importance, and clarity between the translated instrument items and the definition of the construct and measurement objectives [25]. A reviewer score of 1 or 2 is worth 0.00, while a score of 3 or 4 is worth 1.00. All converted scores were then summed and divided by the number of reviewers. This score is called the I-CVI index. The sum of the average I-CVI scores is called the S-CVI.

2.4.3. Evidence-based on relation to other variables

This validity was determined by testing the correlation of each subscale of the Indonesian version of the CTI-C with the CDI, adapted into Indonesian. Referring to previous studies, the CTI-C score correlated with the CDI score [11], [26]. The test used was Spearman's rho correlation.

2.5. Reliability analysis

The reliability analysis evaluates the instrument's consistency, precision, and accuracy while measuring the construct. If the composite reliability coefficient and Cronbach's alpha coefficient are higher than 0.70, the instrument is considered to have strong reliability [27]. Hair *et al*. [28] states that a composite reliability coefficient of more than 0.70 indicates sufficient internal consistency in the measurement model.

3. RESULTS

3.1. Validity evidence

3.1.1. Evidence-based on internal structure

CFA showed RMSEA=0.071, SRMR=0.056, TLI=0.94, and CFI=0.95. The Indonesian version of CTI-C has a load factor range of 0.43-0.80 for a view of the self, 0.43-0.68 for a view of the world, and 0.37-0.70 for a view of the future. It is known that the lowest load factor is 0.37; according to Hair *et al*. [17], load factor 0.30-0.40 is the minimum level of an item that can be interpreted as structure. Meanwhile, a load factor ≥0.70 is an item with a well-defined structure. In this instrument, there are four items (items 5, 13, 21, 33) with well-defined structures in the view of the self subscale, only one item in the view of the future subscale (item 26), and none in the view of the world subscale. The load factor for each item is shown in Table 1.

Table 1. Standardized factor loading the CTI-C Indonesian version items

View of self		View of world		View of the future	
Item	Standardized factor loading	Item	Standardized factor loading	Item	Standardized factor loading
1	0.48	2	0.43	4	0.60
5	0.75	3	0.48	6	0.49
7	0.42	8	0.55	9	0.37
10	0.55	12	0.69	11	0.56
13	0.70	14	0.60	15	0.58
17	0.44	18	0.62	16	0.39
21	0.80	20	0.62	19	0.41
25	0.57	23	0.68	22	0.43
29	0.68	24	0.44	26	0.70
31	0.56	27	0.56	28	0.56
33	0.77	30	0.54	32	0.58
35	0.52	34	0.57	36	0.55

3.1.2. Evidence-based on test-content

In this study, items 1, 17, 18, and 19 have an I-CVI Clarity score of 0.67 (<0.70). Items with an I-CVI below 0.70 should be discarded [29]. However, the researcher revised these four items as the I-CVI for relevant and vital was=1.00. These four items were then revised according to the input from the expert reviewer. The S-CVI was=0.96, which indicates that the scale has content validity. The scale has content validity when the S-CVI is ≥0.90 [30]. The Indonesian version of the CTI-C content validity index is shown in Table 2.

Table 2. I-CVI and S-CVI on the Indonesian version of the CTI-C instrument

Items	I-CVI (relevant)	I-CVI (clarity)	I-CVI (important)	Interpretation
1	1.00	0.67	1.00	Revised/removed
2	1.00	1.00	1.00	Appropriate
3	1.00	1.00	1.00	Appropriate
4	1.00	1.00	1.00	Appropriate
5	1.00	1.00	1.00	Appropriate
6	1.00	1.00	1.00	Appropriate
7	1.00	1.00	1.00	Appropriate
8	1.00	1.00	1.00	Appropriate
9	1.00	1.00	1.00	Appropriate
10	1.00	1.00	1.00	Appropriate
11	1.00	1.00	1.00	Appropriate
12	1.00	1.00	1.00	Appropriate
13	1.00	1.00	1.00	Appropriate
14	1.00	1.00	1.00	Appropriate
15	1.00	1.00	1.00	Appropriate
16	1.00	1.00	1.00	Appropriate
17	1.00	0.67	1.00	Revised/removed
18	1.00	0.67	1.00	Revised/removed
19	1.00	0.67	1.00	Revised/removed
20	1.00	1.00	1.00	Appropriate
21	1.00	1.00	1.00	Appropriate
22	1.00	1.00	1.00	Appropriate
23	1.00	1.00	1.00	Appropriate
24	1.00	1.00	1.00	Appropriate
25	1.00	1.00	1.00	Appropriate
26	1.00	1.00	1.00	Appropriate
27	1.00	1.00	1.00	Appropriate
28	1.00	1.00	1.00	Appropriate
29	1.00	1.00	1.00	Appropriate
30	1.00	1.00	1.00	Appropriate
31	1.00	1.00	1.00	Appropriate
32	1.00	1.00	1.00	Appropriate
33	1.00	1.00	1.00	Appropriate
34	1.00	1.00	1.00	Appropriate
35	1.00	1.00	1.00	Appropriate
36	1.00	1.00	1.00	Appropriate

3.1.3. Evidence-based on relation to other variable

The Spearman rho correlation analysis between the Indonesian version of the CTI-C and the Indonesian version of the CDI showed a significant negative correlation value (r=-0.856, p=0.000). In contrast, the correlation of each subscale of the Indonesian version of the CTI-C can be seen in Table 3. The view of the future subscale has the most significant negative correlation with the CDI compared to other subscales.

This suggests that a positive view of the future contributes most to depression relative to views of the self and the world.

Table 3. Correlation of the CTI-C Indonesian version with CDI

Variables	CDI
View of self	-0.123***
View of world	-0.118***
View of the future	-0.696***
CTI-C	-0.856***

*** p<0.001

3.2. Reliability analysis

The item-total correlation is in the range of 0.303-0.732, which means that the items on the Indonesian version of the CTI-C scale can differentiate between individuals who have a high positive cognitive triad and those who have a low positive cognitive triad as presented in Table 4. The Cronbach's alpha coefficient for the CTI-C is 0.936, with a range of 0.81-0.87 for each subscale. The Indonesian version of the CTI-C has a composite reliability range of 0.82-0.87 as shown in Table 5.

Table 4. Item-total correlation the CTI-C Indonesian version

Self		World		Future	
Item	r it	Item	r it	Item	r it
1	0.409	2	0.695	4	0.531
5	0.653	3	0.432	6	0.424
7	0.424	8	0.732	9	0.604
10	0.533	12	0.517	11	0.705
13	0.411	14	0.421	15	0.492
17	0.572	18	0.559	16	0.646
21	0.404	20	0.627	19	0.578
25	0.606	23	0.499	22	0.525
29	0.494	24	0.507	26	0.432
31	0.342	27	0.303	28	0.502
33	0.648	30	0.417	32	0.390
35	0.502	34	0.483	36	0.514

Table 5. Pearson correlation, Cronbach's alpha, and composite reliability

		Pearson correlation			Reliability	
	CTI-C	1	2	3	Cronbach's α	Composite reliability
1	View of self	-			0.873	0.85
2	View of world	0.090**	-		0.848	0.87
3	View of future	0.092**	0.771**	-	0.814	0.82

** p<0.01

4. DISCUSSION

This study aims to adapt the CTI-C instrument into an Indonesian version for adolescents. The content validity test using the I-CVI shows that four items need to be revised, namely two items on the self-perception subscale (items 1 and 17), one item on the world-perception subscale (item 18), and one item on the future-perception subscale (item 19). The four items are considered less likely to be understood by the adolescent participants in this study. Nevertheless, the four items demonstrated good relevance and importance for measuring the cognitive triad in their respective subscales in the Indonesian context. This consideration led the researcher to decide to revise the four items. The Indonesian version of the CTI-C has acceptable content validity for the S-CVI index, namely S-CVI ≥0.90 [30].

The CFA results show that the model fits with the model proposed by Kaslow *et al*. [11]. The model is indicated as an acceptable model fit if the results show that the RMSEA index≤0.08, SRMR≤0.08, TLI≥0.90, CFI≥0.90 [31]. In essence, Jackson *et al*. [32] stated no consensus on the appropriateness index must be disclosed. According to the presumptions made by Jackson *et al*. [32], the absolute, incremental, and parsimony match suitability indices must be reported. It is also required to provide residual-based indices, specifically RMSEA and SRMR, especially for the absolute fit index. The Indonesian version of CTI-C has a load factor range of 0.37-0.80. According to Hair *et al*. [17], a load factor of 0.37 is still acceptable because the minimum level of an item can be interpreted as a structure if the load factor is between 0.30-0.40.

The test of criterion validity is indicated by the correlation value between the Indonesian version of the CTI-C and other variables that are correlated with these variables according to previous studies [9], [11], [14]. The Indonesian version of the CTI-C has a significant negative correlation with the overall CDI, with a solid correlation value of R^2=0.7327. This means that the cognitive triad contributes 73.27% to depression. Looking at the subscales of the cognitive triad, the relationship between views of the future and depression is the most highly correlated compared to the other subscales. The more positive adolescents view the future, the lower their depression, and vice versa. The other subscales, namely views of the self and the world, are related to depression but have a low correlation value.

The reliability results show that the Indonesian version of the CTI-C, both in the form of subscales and as a whole, has good internal consistency reliability. The Cronbach's alpha coefficient is 0.936, with a range of 0.81-0.87. The composite reliability range is 0.82-0.87. A scale with a Cronbach alpha value and composite reliability greater than 0.70 indicates an instrument has an excellent internal consistency estimate [17], [27], [28].

5. CONCLUSION

This study concluded that the Indonesian version of the CTI-C is a valid and reliable instrument that can be used to measure the cognitive triad in adolescent students in Indonesia aged 13-19 years. This instrument consists of three subscales measuring views of the self, the world, and the future. In addition, the CTI-C can be used to identify one of the risk factors for depression in adolescent students to anticipate the development of higher levels of depression symptoms.

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ISSN 2252-8822

Vol. 1 No. 1, July 2012

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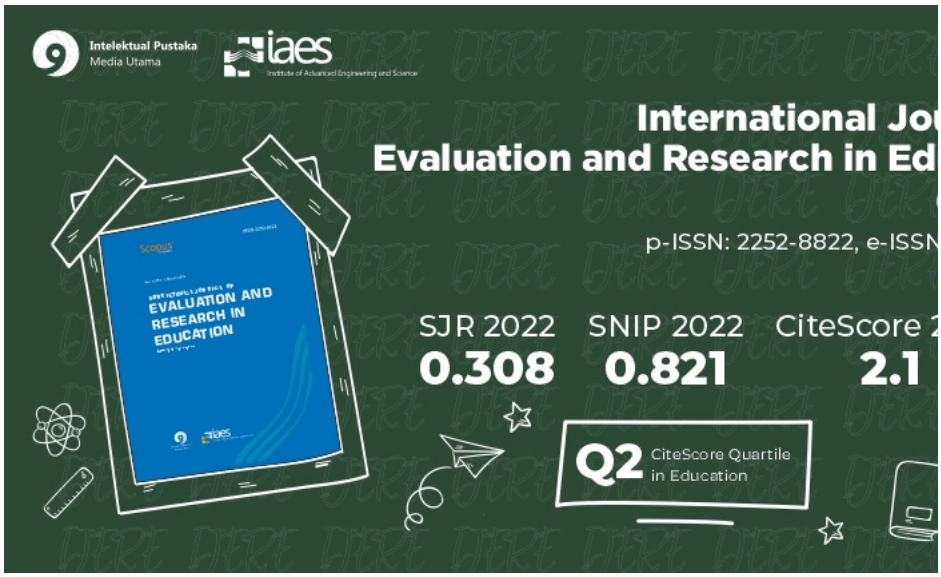

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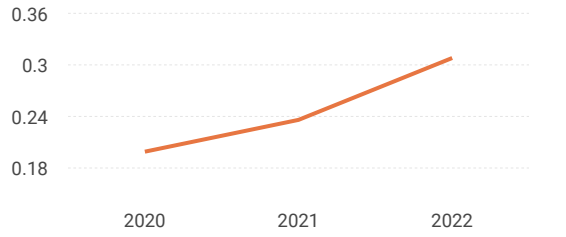

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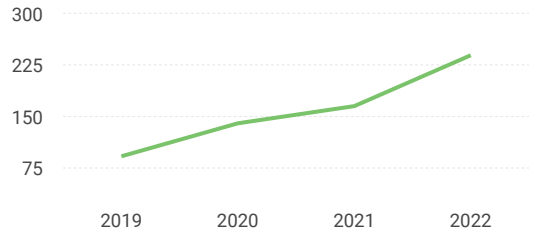

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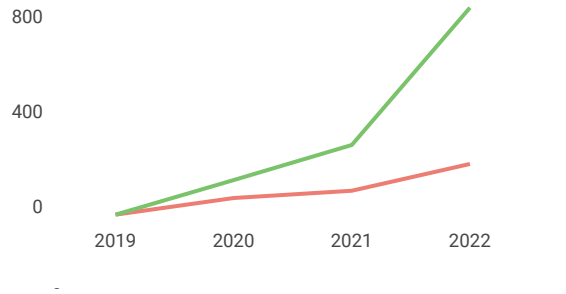

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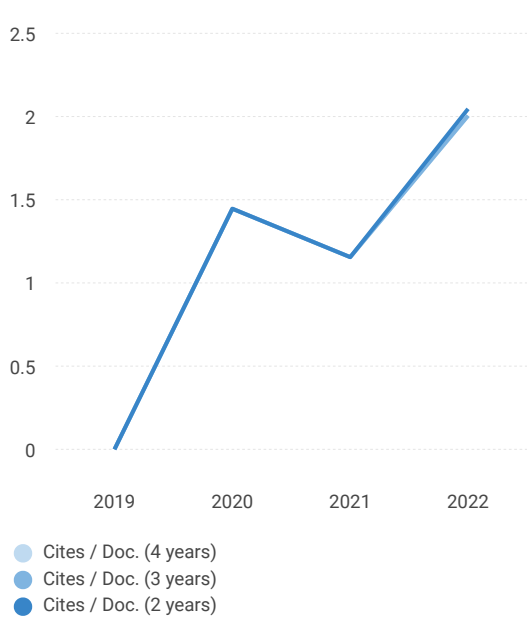

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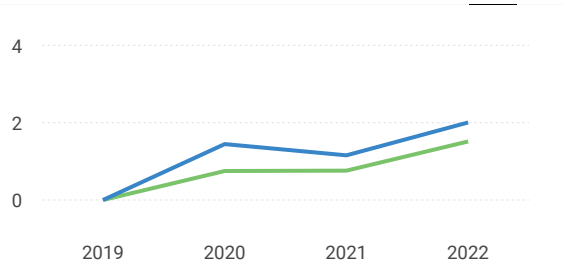

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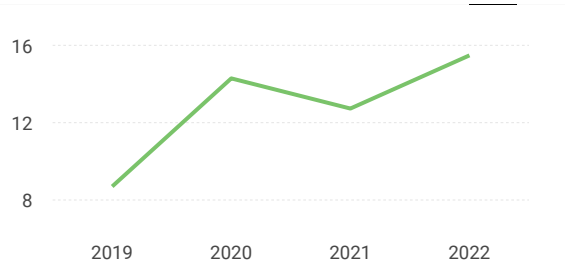

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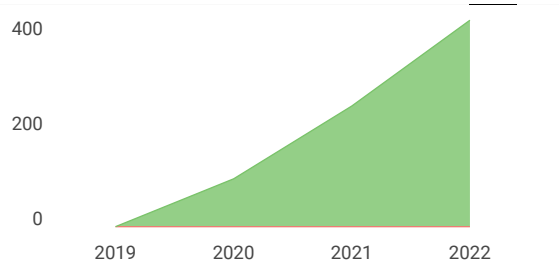

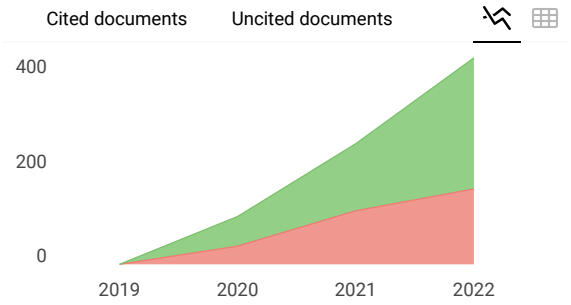

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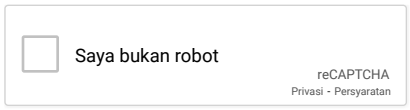

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