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Psychometric properties of the Polish version of the Cognitive Triad Inventory (CTI) – preliminary study

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Summary

Aim of the study. The aim of this study was to translate and evaluate the Polish version of the Cognitive Triad Inventory (CTI), an instrument developed to measure the cognitive triad conceptualized by Beck as an important variable in depression.

Subject or material and methods. A sample of N=86 adults included depressed, non-depressed and prisoners completed a survey test battery comprised of CTI, CES-D, and STAI.

Results: This study provided evidence for the reliability and validity of the Polish CTI. Exploratory factor analysis showed the one-factor model to best fit the data, as in the American version.

Discussion. The division into self, world, and future is an unwieldy taxonomy with highly overlapping categories. Because the three-factor model did not fit the data very well it is suggested that it would be reasonable to label that one CTI factor "Self-Relevant Negative Attitude".

Conclusions, This study examined the psychometric properties and factor structure of the CTI on both clinical and nonclinical samples, and confirms that CTI may be used to measure the cognitive triad. Evaluation of suicidal ideation was also discussed.

psychometric properties / depression / cognitive triad / suicide

INTRODUCTION

Depression is the leading cause of disability worldwide, and is a major contributor to the global burden of disease. Globally, more than 350 million people of all ages suffer from depression [1]. One of the most empirically supported etiological models of depression is the cognitive vulnerability-stress model, which has its origins in the theory of depression developed by Aaron Beck [2].

Beck proposed that an individual develops a self-concept, which reflects their representations of the self, world, and future based on ongoing patterns of everyday noxious experiences with family members and peers during childhood. Such a self-concept is solidified either by repeated negative experiences or experiences interpreted in ways that are consistent with this self-schema. While a negative cognitive style may lie dormant, significant life stress can activate an individual's negative self-schema, influencing information processing, and causing external stimuli to be screened, coded and evaluated within the framework of this schema [3]. According to this theory, the cognitive system consists of different levels of cognition: the cognitive triad, faulty information processing, and schemas.

The self-schema exerts a significant influence on information processing by selectively screening what information is extracted from both internal and external sources, and affecting both the encoding and retrieval of information. Negative cognitive schemas, when activated, are the basis for a negative view of the self, world, and future. Such negative views are called the cogni-

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tive triad of depression. The cognitive triad manifests itself in negative automatic thoughts and causes an individual's perception and thinking to be distorted in a negative way. There is strong empirical support for both the cognitive triad [4] and a negative cognitive style as vulnerability factors for depression [5].

Assuming that the cognitive triad is a key factor of depression, Beckham at al. [6] developed an instrument for measuring it. The Cognitive Triad Inventory (CTI) consists of 36 items comprising three scales reflecting the three major aspects of the triad: View of the Self, View of the World and View of the Future. Constructing their inventory, Beckham et al. [6] left only items with an item-scale correlation higher than r<.25. The American version of the CTI shows excellent internal consistencies (Cronbach's alpha from .81 to 0.95) and high correlations with the Beck Depression Inventory (BDI).

There are many diagnostic scales in Poland designed to identify depressed patients [7]. Some of them are self-rating scale like Beck Depression Inventory [8], The Centrum of Epidemiologic Studies – Depression Scale [9] or Brief Self-Rating Scale of Depression and Anxiety [10]. Another are checklists scales like Hamilton Depression Rating Scale [8] or Montgomery-Asberg Depression Rating Scale [8]. There are also depression subscales in global functioning scales (e.g. General Health Questionnaire [11]). However, in Poland, there are lack of standardized assessment instruments to measure the various aspects of depressed functioning, especially the cognitive triad. To close this gap, this study evaluated the Polish version of the CTI on a clinical and non-clinical sample.

1. METHOD

1.1 Translation

A bilingual translator translated the Cognitive Triad Inventory into Polish. Subsequently, the Polish version of the inventory was translated back into English. The differences between the translations were analyzed. In the final version of the inventory, only item 2 was changed, from negative to positive phrasing. This was done to avoid double negation, which would make it more difficult for the respondents to answer the question. As this item is not part of any scale, this did not change the arrangement of items in any way as compared to the English version.

1.2. Participants

A sample of N=86 adults completed a battery of self-report techniques. The subjects included 29 depressed patients from the Central Clinical Hospital in Lodz, 29 prisoners from Prison No. 1 in Lodz, and 28 undergraduate students. The mean age was 32.94 (SD=12.58) with a span of 19 to 65 years. Participants 25 years of age or younger comprised 34.9% of the sample, 32.5% of the sample was between 26 and 36 years of age, and 32.6% was over 37 years of age. The groups significantly differed in terms of age, with the undergraduate students being much younger (M=25.79; SD=9.073) than both the depressed patients (M=35.28; SD=13.62) and prisoners (M=37.52; SD=11.72). Females comprised 58.1% (n=50) of the sample.

Undergraduate students were recruited by an in-class presentation, while prisoners and patients by personal invitation. Participants completed a survey test battery comprised of CTI, CES-D, and STAI. Four weeks after taking the survey, fifty-eight participants were asked to complete the same test battery again. Fifty-six returned a second response. Questionnaires were filled in individually, either at a university or hospital/prison laboratory. Informed consent was obtained and none of the participants received credit for participation. Six participants who did not fill in all inventories were excluded from the survey.

1.3. Measures

The Cognitive Triad Inventory (CTI) consists of 36 items and comprises three scales: View of the Self, View of the World, and View of the Future [6]. Each scale consists of 10 items keyed in both positive and negative directions (30 items are scored and 6 serve as fillers). Individuals are asked to rate how the item applies to them at the time of testing on a 7-point Likert scale. Negatively phrased items were reverse coded in a

way that high scores represented positive views and low scores represented negative views.

The Center for Epidemiologic Studies – Depression Scale (CES-D) measures self-reported symptoms associated with depression experienced in the past week. The CES-D includes 20 items comprising six scales reflecting the major dimensions of depression: depressed mood, feelings of guilt and worthlessness, feelings of helplessness and hopelessness, psychomotor retardation, loss of appetite, and sleep disturbance [12]. Response categories indicate the frequency of occurrence of each item, and are scored on a 4-point scale ranging from 0 (rarely or none of the time) to 3 (most or all of the time). Total scores range from 0 to 6, with higher scores representing more depressive symptoms. The Polish version of the CES-D showed excellent internal consistency (α=0.90) [9].

The State/Trait Anxiety Inventory (STAI) is an instrument for measuring anxiety in adults [13]. STAI includes 40 items comprising two scales: State Anxiety (X1), as a temporary condition, and Trait Anxiety (X2) as a more general and long-standing quality. Each scale consist of 20 items scored on a 4-point scale. Scores range from 20 to 8, with higher scores correlating with greater anxiety. The Polish version of the STAI showed excellent internal consistency, ranging from 0″ .83 to 0.92 for the X1 scale, and from 0.86 to 0.92 for the X2 scale.

2. RESULTS

2.1. Means and Standard Deviations

Means, standard deviations, and item-scale correlations for each item of the CTI were shown in Table 1 – *next page*. All items demonstrated an item-scale correlation with their scale of r≥0.46 and lower correlations with the other two scales. Two items from the View of the World scale showed the highest correlations with a different scale, that is, item 24 (r=0.53 for the View of the Future compared to r=0.52 for its scale) and item 34 (r=0.60 for the View of the Self compared to r=0.53 for their own scale). In spite of such scores, the following analyses were calculated with both items as part of their original scales, as in the English version of the CTI.

Correlation coefficients were calculated to assess how strongly the subscales were associated with each other. The correlations between the subscales ranged from 0.728 to 0.843 (see Table 2 – *next page*). They were very high, but also very similar to those observed in other studies (e.g., [14]). This might suggest that the triad refers to views of the self as a whole and to two aspects of that self – the self's world and the self's future [4].

2.2. Factor analysis

High correlations between the subscales suggested that a single underlying dimension might be present. To determine whether the three-factor model would fit the present CTI data, exploratory factor analysis (EFA) was employed. Seven factors scored eigenvalues of over 1, accounting for 70.11% of the total variance explained. However, according to Cattell's scree test, only the first two factors lay above the debris. The first factor had an eigenvalue of 12.83 (total variance explained 42.79%) and the second factor had an eigenvalue of 2.18 (total variance explained 54.91%). The one-factor solution resulted in two items with a factor correlation lower than 0.4 [15]. Both items originally came from the View of the World scale (items 18 and 30). The two-factor solutions, developed with oblimin rotations, showed that one factor consisted of View of the Self and View of the Future items, and the second factor consisted of View of the World items. However, factor loadings for the second factor were not satisfactory (see Table 1). After considering the two-factor solution (using oblimin rotations, residual correlation and interpretability), the one-factor solution emerged as the most suitable for psychological interpretation.

2.3. Reliability estimation

Internal consistency of the scales and the total CTI score was assessed by applying Cronbach's alpha. The alpha coefficients of original CTI ranged from 0.81 to .93 for the subscales and amounted to 0.95 for the overall score. Reliability analysis revealed that internal consistencies

Table 1. Descriptive statistics, intercorrelations and factor loadings

	Mean and Standard Deviation		Item-Scale Correlation		Factor Loadings One-Factor Solution	Factor Loadings Two-Factor Solution	
Variables	M	SD	Subscale Correlation[1]	Total Scale Correlation	1	1	2
CTI 3(wp)	4.81	1.62	0.680	0.490	0.461		0.527
CTI 5(sn)	5.41	1.73	0.834	0.798	0.810	0.786	
CTI 6(fp)	5.53	1.78	0.767	0.702	0.726	0.786	
CTI 8(wp)	5.65	1.13	0.586	0.505	0.511		0.234
CTI 9(fp)	5.35	1.45	0.796	0.702	0.726	0.781	
CTI 10(sn)	4.80	1.77	0.460	0.435	0.401	0.332	
CTI 11(fp)	5.42	1.61	0.867	0.805	0.829	0.867	
CTI 12(wp)	4.67	1.75	0.597	0.600	0.587		0.499
CTI 13(sn)	5.66	1.36	0.757	0.719	0.724	0.659	
CTI 15(fn)	5.50	1.67	0.730	0.654	0.656	0.646	
CTI 16(fn)	3.62	1.92	0.650	0.594	0.581	0.563	
CTI 17(sp)	5.05	1.54	0.683	0.674	0.688	0.694	
CTI 18(wn)	4.98	1.86	0.563	0.395	0.331		0.749
CTI 19(fn)	5.05	1.84	0.742	0.711	0.699	0.638	
CTI 20(wp)	5.94	1.22	0.537	0.519	0.527		0.202
CTI 21(sn)	5.41	1.91	0.790	0.755	0.760	0.738	
CTI 23(wn)	4.63	1.80	0.717	0.634	0.598		0.709
CTI 24(wp)	5.30	1.92	0.523*	0.537	0.543		0.202
CTI 25(sp)	5.40	1.37	0.808	0.778	0.811	0.830	
CTI 26(fn)	5.36	1.89	0.734	0.682	0.672	0.625	
CTI 27(wn)	5.86	1.63	0.489	0.463	0.450		0.408
CTI 28(fp)	5.19	1.41	0.777	0.739	0.770	0.816	
CTI 29(sn)	3.92	2.07	0.643	0.578	0.543	0.444	
CTI 30(wn)	4.79	1.77	0.597	0.442	0.391		0.727
CTI 31(sp)	5.40	1.35	0.789	0.779	0.801	0.801	
CTI 32(fn)	5.34	1.62	0.688	0.724	0.717	0.631	
CTI 33(sp)	5.15	1.65	0.827	0.793	0.814	0.832	
CTI 34(wp)	5.31	1.52	0.532*	0.596	0.618		0.299
CTI 35(sn)	4.02	1.75	0.706	0.642	0.635	0.594	
CTI 36(fp)	5.50	1.41	0.806	0.768	0.795	0.836	

[1] Correlations with the original scale (View of the Self, View of the World, or View of the Future); * item had a higher intercorrelation with another scale than with its own scale; sn – self negative item; sp – self positive item; wn - world negative item; wp – world positive item; fn – future negative item; fp – future positive item.

are lower in the Polish version, especially for the View of the World scale. Cronbach's alpha for this scale is 0.77, which is still above the criterion of 0.70 recommended for measurement instruments. The removal of any items from this scale did not improve Cronbach's alpha score (it did not exceed 0.77). Internal consistency was high in the scales View of the Self (α=0.895) and View of the Future (α=0.912). Finally, the coefficient for the total CTI score (α=0.948) indicated a high level of internal consistency (see Table 2).

Table 2. Intercorrelation between subscales and reliability coefficients

	Intercorrelation			Reliability	
Variables	Overall Scale	View of the Self	View of the World	Cronbach's alpha	rtt
Full scale				0.948	0.831
View of the Self	0.950			0.895	0.827
View of the World	0.887	0.781		0.777	0.815
View of the Future	0.937	0.843	0.728	0.912	0.779

The four-week test-retest reliability of the CTI was examined using interclass correlation coefficients (ICC). According to the results, temporal stability at 4 weeks was very good, from 0.78 to 0.83, with 0.83 for the overall score. These results suggest that the cognitive style of thinking is stable over time both in clinical and nonclinical samples.

2.4. Concurrent Validity

A correlation matrix was constructed to evaluate the concurrent validity of the CTI (see Table 3).

Table 3. Correlation of the CTI with the CES-D and the STAI scales

	Measures of Depression and Anxiety		
CTI Scale	CES-D	STAI-1	STAI-2
VS t1	-0.689	-0.563	-0.769
VS t2	-0.747	-0.627	-0.809
VW t1	-0.706	-0.616	-0.769
VW t2	-0.763	-0.613	-0.728
VF t1	-0.645	-0.547	-0.711
VF t2	-0.616	-0.615	-0.629
TS t1	-0.73	-0.617	-0.805
TS t2	-0.772	-0.678	-0.795

All correlations are significant at p<0.000. VS – View of the Self; VW – View of the World; VF – View of the Future; TS – CTI total score; t1 – first measurement; t2 – second measurement (four weeks after the first one).

The correlation between the CTI and the CES-D was strong (r=-0.73, p<0.000). All three subscales of the CTI had very similar correlations with the depression scale, varying from -0.64 to -0.70. Similarly, the correlations between the CTI and the anxiety as a trait scale of the STAI was very high (r=-0.80 p<0.000). As predicted, correlations with the anxiety as a state scale was lower (r=-0.61, p<0.000).

The outcomes of the study suggest that the depressed individuals and prisoners should have lower scores on the CTI scale. Indeed the results of one-way analysis of variance and Tukey's post hoc analysis show that the depressed individuals scored significantly lower on all CTI scales than the prisoners and students (see Table 4 and Figure 1 – *next page*). Similarly, the prisoners had lower scores on the CTI scales than the students, but the differences were not statistically significant. Unexpectedly, the prisoners scored higher (but not significantly so) on the View of the Future scale than the students. For all variables, the effect size, calculated by eta squared, was low to moderate. To determine the difference between clinical and nonclinical samples, a t-test for independent samples was performed on the data. Nonclinical sample had lower scores on CTI Total score (t(55)=5.137; p<0.000; Cohen's d=1.38), the View of the Self scale (t(55)=4.706; p<0.000; Cohen's d=1.26), the View of the World scale (t(55)=4.333; p<0.000; Cohen's d=1.16) and on the View of the Future scale (t(55)=5.005; p<0.000; Cohen's d=1.34). The effect size for these comparisons was very high.

There were also significant differences between subjects with suicidal ideations (M=117.92; SD=23.318) and those without them (M=160.89; SD=28.166) in the CTI total score (t(83)=5.181; p<0.000; Cohen's d=1.56). In terms of the subscales, the biggest differences between subjects with and without suicidal ideations were found on the View of the Self scale (t(83)=5.226; p<0.000; Cohen's d=1.57) and on the View of the Future scale (t(83)=4.741; p<0.000; Cohen's d=1.42). Differences in the View of the World scale were also significant (t(83)=4.017; p<0.000; Cohen's d=1.21). In exploratory logistic regression analysis, the only significant factor was the CTI total score,

Table 4. Concurrent Validity

		CES-D	STAI-1	STAI-2	VS	VW	VF	TS
Patients	M	32.21	51.52	57.19	41.10	46.14	41.38	128.62
	SD	13.70	13.65	8.16	1.84	8.42	9.175	24.38
	Min	1	20	40	17	30	22	71
	Max	51	76	73	58	61	57	171
Prisoners	M	18.66	43.31	44.25	54.31	53.14	58.17	165.62
	SD	12.41	11.90	1.09	6.89	7.58	7.56	19.09
	Min	0	27	25	38	32	38	115
	Max	49	67	66	64	68	70	200
Students	M	11.89	33.93	39.56	55.39	56.46	56.14	168.00
	SD	11.91	8.67	1.31	12.06	9.55	12.85	32.99
	Min	1	20	24	20	30	19	75
	Max	48	55	67	70	67	70	205
ANOVA	F (p) η^2	18.963 (p<0.000) 0.314	17.362 (p<0.000) 0.282	24.559 (p<0.000) 0.383	16.963 (p<0.000) 0.299	1.892 (p<0.000) 0.208	23.926 (p<0.000) 0.366	20.715 (p<0.000) 0.333

VS – View of the Self; VW – View of the World; VF – View of the Future; TS – CTI total score

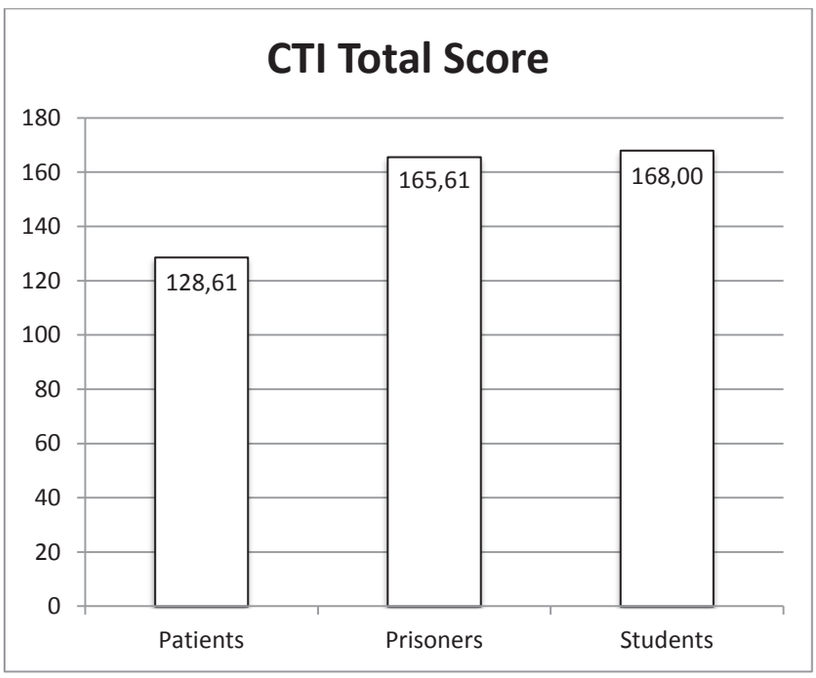

Figure 1. Mean CTI Total Score in three different groups

while the CES-D was not (as shown in Table 5 – *next page*). The overall prediction accuracy was 87%, with 95.8% of the subjects correctly classified as not suicidal (sensitivity) and 38.5% of suicidal subjects correctly identified as such (specificity), which is still insufficient for the test to be used for diagnostic purposes.

3. DISCUSSION

Item analysis showed the Polish CTI items to have similar psychometric properties to those on the American CTI. All items demonstrated high item-scale correlation with their scales and with the total score, and very high correlations

Table 5. Logistic Regression Models Discriminating Between Suicidal and Non-Suicidal Tendencies

		B	SE	Wald	df	p Level	Exp(B)
Block 1	CTI (TS)	-0.33	0.015	4.555	1	0.033	0.968
	CES-D	0.058	0.033	3.096	1	0.78	1.060
	Constant	1.166	2.711	0.185	1	0.677	3.210

CTI (TS) – Total Score scale of CTI

between subscales (from 0.728 to 0.843). Furthermore, explanatory factor analysis revealed that the one-factor model is the most suitable for psychological interpretation. These results are very similar to those reported from other studies, all of which failed to confirm the three-factor model [16]; [17]. Haaga et al. [4] stated that the division into self, world, and future is an unwieldy taxonomy with highly overlapping categories. In the cognitive triad what is negatively perceived is the future of the self rather than the future as such. The depressed person "anticipates that his current difficulties or suffering will continue indefinitely ... when he considers undertaking a specific task in the immediate future, he expects to fail" [2]. The world construct also incorporates the view of the self rather than a judgment about the world at large. Beck claimed that a depressed person "sees the world as making exorbitant demands on him and/or presenting insuperable obstacles to reaching his life goals." [2] Haaga et al. concludes that "the triad refers to views of the self as a whole and two aspects of the self, not three completely distinct entities." [4] Accordingly, McIntosh and Fischer showed that the three-factor model did not fit the data very well. They suggested that it would be reasonable to label that one CTI factor "Self-Relevant Negative Attitude." [17]

However, even though Anderson and Skidmore [16] and Pössel [14] could not confirm the three-factor model either, they showed the six-factor model to fit the data better than the other models. The above-mentioned authors concluded that their studies confirmed Beck's three-factor model, with item phrasing (negative vs. positive) being a significant variable influencing the factor structure. The Polish version of the CTI did not fit the six-factor model.

The four-week retest reliability was very good, which means that CTI scores are stable both in the clinical and nonclinical samples. This study also showed that the CTI is a valid instrument. The correlations between the CTI and both depression and anxiety inventories were very high. There were also significant differences between clinical, nonclinical, and prison samples. Finally, this study revealed significant differences in the CTI total score for persons with suicide ideations. Furthermore, the CTI predicted suicidal tendencies better than the CES-D score.

4. LIMITATIONS

The present study, just as any other, has a number of limitations. The main limitation is linked to the small study group. Even though the results obtained are very similar to those reported for other language versions, given the study group one should draw conclusions cautiously. It must also be remembered that all studies on the CTI (except the one conducted by the authors of the inventory [6]) have been done on non-clinical groups, usually comprised of students. Another major limitation due to the small sample is the fact that it was impossible to carry out confirmatory factor analysis. The exploratory analysis used in the present study could not fully determine the factor loadings of the inventory. In the future, it would be extremely useful to verify whether the inventory is consistent with Beck's theory. Such verification would be particularly important in light of the fact that there still remains controversy in international research as to the number of CTI factors and their goodness of fit to the cognitive triad model.

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