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Internal Reliability and Validity of Pediatric Symptom Checklist-17 Indonesian Version for Behavioral Problem Identification in Adolescent Population

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Abstract— We developed a thematic, Indonesian-translated version, of Pediatric Symptom Checklist 17 (PSC-17) to assess the prevalence of the behavioral problem in the adolescent population. This study is a cross-sectional study aiming to assess the validity and reliability of PSC-17 in the Indonesian language. A questionnaire of seventeen questions was prepared to assess behavioral problems in the form of attention, internalizing, and externalizing symptoms. The study population is adolescents aged 15-17 years old in Gorontalo City, Province of Gorontalo, Indonesia. Subjects were asked to self-answer the questionnaire. The scale of the problem in internalizing, attention, and externalizing subscales were calculated from the obtained results. Validity was measured by using Pearson correlation strength test and reliability was measured by using Cronbach's Alpha reliability test. As many as 384 participants were enrolled, in which 380 complete answers towards the PSC-17 Indonesian Version were obtained. Pearson correlation strength test showed that PSC-17 is valid under the Pearson r product moment of $df = 378$ under two-tailed alpha $\alpha = 0.05$ ($p < 0.001$). Cronbach's Alpha reliability test showed high reliability of the PSC-17 ($\alpha = 0.821$). Based on our findings, Indonesian version PSC-17 is a valid and highly reliable set of questions to assess pediatric behavioral problems, especially in the adolescent population.

Keywords— PSC-17, behavior problems, early detection, validity, reliability

1. Introduction

Pediatric population has their own form behavioral problem, which can be divided into attention, externalizing, and internalizing. Attention behavior may be exhibited in children having developmental problem, which psychologically described as inability to focus, inability to finish a given task properly, and difficulty remaining proper and calm (e.g. sitting still) [1]. Internalizing symptoms can be described as tendency of depression, anxiety, nervousness and withdrawal from society, which were related to the feeling of guilt, sadness, fear, and extreme worry [2]. In the opposite, externalizing symptoms manifests as a tendency of temperamental emotion, reduced attention, hyperactivity, difficulty of problem-solving, antisocial, and increased aggression [3]. These behaviors exhibited differently in each child and can be much more subtle in adolescent. However, studies have shown that if ignored, these behaviors can lead to many academic, socioeconomic, and health problem when the child grows to adult [4,5,6]. Therefore, early detection of pediatric behavioral problem is very important.

Detection of pediatric behavioral problem is not an easy task, even for experts, especially if a child is still too young or already hitting adolescence [7]. Evidence showed that child might lie due to various stimuli [8,9], which potentially giving the wrong response towards investigator and finally false negative result. However, the behavioral changes due to existing behavioral problem may be identified through caregiver and observation. Such an attempt has been made by developing an instrument of 35-questions called Pediatric Symptom Checklist (PSC). The development of PSC begins in 1979 as an attempt to identify the symptoms of behavioral problem in inpatient children [10]. There are originally 35 questions in the original

PSC, in which the total score can be subcategorized into the subscale of attention, externalizing, or internalizing symptoms. The original instrument of PSC is not built based on the cause of those behavioral problems, but more based on the behavioral symptoms itself [10,11]. Hence, PSC does not give diagnosis but rather only justify the existence of behavioral problem [10,12]. Although seemed complementary for supporting clinical diagnosis, this in turn has proven to be an effectively flexible method to detect behavioral problems in children due to any disease, as long as there is evidence that correlates between the PSC result and the presumed cause itself. This has been demonstrated in studies that attempted to screen behavioral problems in pediatric patients with human immunodeficiency virus (HIV) infection, epilepsy, diabetes, and sickle cell diseases [13,14,15,16]. However, the original PSC is rather too long and a simplified version is sought by many for more practical for everyday use. A shorter version, the PSC-17, which contains around half of the original question, has been developed two decades ago to further ease investigation and increase the applicability of the questionnaire [12].

The accessibility of PSC and PSC-17 worldwide is limited by its original language. This urges each nation to develop their own local version of PSC. The development of localized PSC has been done such as in Portuguese [17], Dutch [18,19], Setswana [15], Spanish [20], and Korean [21]. Development of Indonesian version of PSC-17 has just begun recently. However, it faced a generally known problem in which a directly translated research instrument may face validity and reliability issues due to cross-cultural differences [22]. Hence, the validity and reliability of Indonesian version of PSC-17 is still unclear and remains to be further studied for both academic and practical purpose.

2. Materials and Methods

2.1 Study Design

This study is a cross-sectional analytical observational study aimed to assess validity and reliability of Indonesian-translated PSC-17 on adolescent population. Based on study design, validity will be assessed through cross-item correlation test, while reliability will be measured through internal consistency test. Study was done in Gorontalo City (Gorontalo Province, Indonesia) between April through May 2019. This study has been approved by Universitas Airlangga Faculty of Dental Medicine Ethical Clearance Commission with clearance No. 125/HRECC.FODM/IV/2019. This study also has been recommended by Governor of Gorontalo Province, Indonesia, with Research Recommendation No. 070/Kesbang/Pol/1012/2019.

2.2 Population and Samples Criteria

The study population is adolescent aged 15-17 years old. Samples were high school students in Gorontalo City (Gorontalo Province, Indonesia). Inclusion criteria for participants were adolescent aged 15-17 years old attending high schools in Gorontalo City who agreed and signed the informed consent. To remain included, participants are obliged to fulfill the PSC-17 questionnaire. Exclusion criteria were any participants who refused to sign the informed consent and did not completely answer the PSC-17 questionnaire.

2.3 Subject Characteristic

Subjects in this study were expected to be homogenous, with guaranteed expectation of the last complete education is middle school, no stable income, and unmarried due to high school rules. There is no psychiatric diagnosis attempt to be performed in this study due to the study design. Information about these subject characteristics was obtained through separate questionnaire.

2.4 Questionnaire of Pediatric Symptom Checklist 17 Indonesian Version

Questionnaire concept of Indonesian PSC-17 is based on original PSC developed by Jellinek and Murphy in 1979 and later finalized in 1988 [11]. The seventeen questions were derived from brief PSC-17, which is further developed by more experts including the same original PSC authors [12]. To acquire the Indonesian version, the main author and first co-author translated the PSC-17 directly into Indonesian. Difference on translation then discussed between authors to obtain a single, complete sentence of question. Necessary modifications of the wording are made and discussed by authors to make it more comprehensive and understandable contextually. Finally, backward translation is performed to maintain context between original and Indonesian-translated version. Preliminary, simulated pilot testing then performed to the prototype of the translated questionnaire to assess the expectable validity and reliability by answering the questionnaire at random values.

There are three symptoms assessed, which are attention symptoms, internalizing symptoms, and externalizing symptoms. Out of seventeen questions, five are designated to identify attention symptoms, the other five are designated to internalizing symptoms, and the last seven are designated to identify externalizing symptoms. Each symptom was representing one respective subscale. Each question bears points of subscale, which is 0 point if the respondent identifies the question as “never happened”, 1 point if “seldom happened”, and 2 points if “often happened”. These points are tallied as subscale score and total score. We used the original 7 as cutoff of attention subscale, 7 as cutoff of internalizing subscale, 5 as cutoff of externalizing subscale, and 15 as cutoff of total score. The cutoff value determines the minimum score to identify behavioral problem. The more score is tallied, the closer it is indicated that the respondents has behavioral problem. Complete form of PSC-17 Indonesian Version is present as Figure 1.

PEDIATRIC SYMPTOM CHECKLIST – 17 (PSC – 17)

Nama : _____ No. Responden : _____
 Tanggal Lahir : _____ Tanggal Periksa : _____

Berilah tanda pada kolom yang paling menggambarkan keadaan Anda	TIDAK PERNAH	KADANG-KADANG	SERING	Penilaian		
				I	A	E
1. Gelisah, Tidak bisa tenang						
2. Merasa sedih						
3. Banyak melaman						
4. Menolak (tidak suka) berbagi						
5. Tidak memahami perasaan orang lain						
6. Putus asa						
7. Susah berkonsentrasi						
8. Bertengkar dengan anak lain						
9. Memandang rendah dirimu sendiri						
10. Menyalahkan orang lain untuk masalah yang terjadi						
11. Tampak murung						
12. Tidak menaati peraturan						
13. Bertindak seolah-olah digerakkan oleh mesin (tanpa berpikir)						
14. Mengganggu anak-anak lain						
15. Mencemaskan banyak hal						
16. Mengambil barang yang bukan miliknya						
17. Perhatian mudah teralihkan						
Total Skor						

Petunjuk Penilaian:

- Isilah kotak-kotak yang tidak dibenarkan pada kolom paling kanan dengan skor 0 untuk "Tidak Pernah", 1 untuk "Kadang-kadang" dan 2 untuk "Serang"
- Jumlahkan skor pada masing-masing kolom
 Skor internalisasi Y PSC-17 ditunjukkan oleh jumlah skor pada kolom I
 Skor Atensi Y PSC-17 ditunjukkan oleh jumlah skor pada kolom A.
 Skor Eksternalisasi Y PSC-17 ditunjukkan oleh jumlah skor pada kolom E.
 Total Skor Y PSC-17 adalah jumlah skor pada kolom-kolom I, A, dan E

Petunjuk Singkat
 Y PSC-17 – I \geq 5
 Y PSC-17 – A \geq 7
 Y PSC-17 – E \geq 7
 Skor total \geq 15

Skor yang lebih tinggi menunjukkan semakin tinggi kemungkinan adanya gangguan perilaku

Form adapted with permission
 @1988, M. Jellinek & J. M. Murphy, Massachusetts General Hospital
 Email : MMURPHY6@mgh.harvard.edu

Figure 1. Indonesian Pediatric Symptom Checklist-17 (PSC-17) Form

2.5 Data Collection

Data were collected in two days timespan to avoid time restrain-related stress in respondents that may affect the result. Data were collected in designated schools for better investigator-to-participant contact and more data yield. In the first day, the PSC-17 Indonesian version questionnaire and informed consent forms were packaged in one anonymous brown envelope and distributed into participants. Subject then asked to completely fulfill the data by themselves within a day. In the next day, the answered questionnaire then submitted back to investigator. Due to the confidential nature of PSC-17 result, answered questionnaires were submitted to investigator using the same anonymous envelope along with the informed consent form as

the method of subject identification.

2.6 Data Analysis

Data analysis was performed using IBM SPSS 22.0. Prior to further statistical analysis, data were tested for normal distribution using Kolmogorov-Smirnov test. Pearson correlation strength test was used to measure cross-item validity. Pearson r product moment critical value with degree of freedom equal to total respondent minus two ($df = N - 2$) was used to standardize the validity. Cronbach's alpha test was performed to assess internal consistency for instrument reliability. As per consensus, the alpha (α) value of <0.5 regarded as unacceptable, $0.5 \leq \alpha \leq 0.6$ as poor, $0.6 \leq \alpha \leq 0.7$ as questionable, $0.7 \leq \alpha \leq 0.8$ as acceptable, $0.8 \leq \alpha \leq 0.9$ as good, and $0.9 \leq \alpha$ as excellent reliability.

3. Results

3.1 Population Characteristic

As many as 384 participants were enrolled, in which 380 participants completed all of the PSC-17 Indonesian Version questions. Based on Kolmogorov-Smirnov test, it is shown that our study population has significantly higher male population ($p < 0.001$) and expectedly homogenous age distribution ($p < 0.001$). We found that our population is showing an abnormal distribution of total score ($p = 0.01$), which indicates a rather high amount of behavioral problem in our study population. The same can be observed in internalizing score ($p < 0.001$), attention score ($p < 0.001$), and externalizing score ($p < 0.001$). Nominal and percentage account of each respective detected abnormalities were summarized in Table 1.

Table 1. Subject Characteristic and Score Distribution

Characteristic	N	%	Mean	SD
Sex				
Male	218	57.37		
Female	162	42.63		
Age			16.02	0.65
Attention score				
<7	337	88.68	4.24	1.87
≥ 7	43	11.32		
Externalizing score				
<7	329	86.58	3.77	2.38
≥ 7	51	13.42		
Internalizing score				
<5	243	63.95	3.76	2.13
≥ 5	137	36.05		
Total score				
<15	271	71.32	11.78	5.16
≥ 15	109	28.68		

3.2 Validity Test: Cross-Item Correlation

To measure PSC-17 Indonesian Version validity, we performed Pearson correlation strength test between

the all translated questions and each tallied score. Pearson correlation strength test showed that all questions used in PSC-17 Indonesian Version are correlated to its subscales and total score under Pearson r product moment of $df = 378$ with two-tailed alpha $\alpha = 0.05$ ($p < 0.001$). All subscales and total score also correlated with each other under Pearson r product moment of $df = 378$ with two-tailed alpha $\alpha = 0.05$ ($p < 0.001$). The majority of the question is also found to be correlated to each other ($p < 0.05$). Only minor amount of question which is not correlated to each other, such as Question 2 that appear to not correlated with Question 4, 5, and 16, Question 4 and 6 that appear to not correlate with each other, and Question 7 towards Question 8 ($p > 0.05$). However, all the seemingly uncorrelated questions were positively correlated with all three subscales ($p < 0.001$). The test result is summarized in Table 2.

Table 2. Cross-Correlation Test Result

Item		Internalization score	Externalization Score	Attention Score	Total Score
Question 1	r	.483**	.199**	.628**	.519**
	P	.000	.000	.000	.000
Question 2	r	.667**	.149**	.413**	.494**
	P	.000	.004	.000	.000
Question 3	r	.458**	.302**	.708**	.585**
	P	.000	.000	.000	.000
Question 4	r	.199**	.588**	.211**	.430**
	P	.000	.000	.000	.000
Question 5	r	.154**	.521**	.251**	.395**
	P	.003	.000	.000	.000
Question 6	r	.581**	.226**	.383**	.483**
	P	.000	.000	.000	.000
Question 7	r	.433**	.281**	.630**	.537**
	P	.000	.000	.000	.000
Question 8	r	.224**	.584**	.224**	.443**
	P	.000	.000	.000	.000
Question 9	r	.728**	.250**	.445**	.577**
	P	.000	.000	.000	.000
Question 10	r	.298**	.594**	.292**	.503**
	P	.000	.000	.000	.000
Question 11	r	.677**	.195**	.462**	.537**
	P	.000	.000	.000	.000
Question 12	r	.211**	.663**	.301**	.502**
	P	.000	.000	.000	.000
Question 13	r	.300**	.397**	.593**	.522**
	P	.000	.000	.000	.000

Question 14	r	.210**	.666**	.321**	.510**
	P	.000	.000	.000	.000
Question 15	r	.677**	.348**	.523**	.630**
	P	.000	.000	.000	.000
Question 16	r	.174**	.515**	.263**	.405**
	P	.001	.000	.000	.000
Question 17	r	.490**	.259**	.667**	.563**
	P	.000	.000	.000	.000
Internal Score	r		.355**	.668**	.819**
	P		.000	.000	.000
External Score	r			.450**	.771**
	P			.000	.000
Attention Score	r				.846**
	P				.000

** . Correlation is significant at the 0.01 level (2-tailed). Pearson r product moment critical at 0.137131 – 0.128339

*. Correlation is significant at the 0.05 level (2-tailed). Pearson r product moment critical at 0.104552 – 0.097824

N=380

3.3 Reliability Test: Internal Consistency

Cronbach's alpha reliability test was performed to assess the internal consistency of all questions regarding to each produced score. Reliability test showed good reliability of the PSC-17 Indonesian Version ($\alpha=0.85$) based on overall score. If this score is broken down into their respective area, it is shown that PSC-17 Indonesian Version still retain a acceptable reliability ($\alpha=0.73$) based on total score only, good reliability ($\alpha=0.83$) based on internalizing symptom score, good reliability ($\alpha=0.84$) based on attention symptom score, and good reliability ($\alpha=0.82$) based on externalizing symptom score. Summary of reliability test is presented in Table 3.

Table 3. Cronbach's Alpha Internal Consistency Test Result

Tested Subscale	α
Externalizing subscale only	0.817
Internalizing subscale only	0.831
Attention subscale only	0.841
Total score only	0.734
All scores	0.847

4. Discussion

In this study we developed a translated version of PSC-17. To further make it understandable to our participants, we modified all of the PSC-17 questions by translating it into Indonesian language. The goal of PSC-17 Indonesian Version of remains the same as the original PSC, but offers easier completion, faster obtainable result due to reduced amount of question, and more accessible to Indonesian speakers.

In this study, cross-item validity was measured based to three subscales present in all PSC-17 version, which are attention, internalizing, and externalizing problem subscale. The validity measured is only internal validity due to the study design. Verification of questionnaire item validity can be done by measuring the correlation strength between questions and scales [23]. We found that our study provides satisfying validity based on correlation between question and its represented subscale plus total score. However, poor amount of publications verifying the cross-item validity of translated PSC-17 version made it hard to compare our result albeit of satisfying findings.

PSC-17 Indonesian Version is still at the early phase of its development. The lack of local evidence on how Indonesian-translated PSC-17 is related to any psychiatric diagnosis hinder us to make conclusions about predictive validity. Because of this, we also cannot independently make score cutoff based and instead based on the original 15 total score cutoff [12,24]. Cutoff is important in PSCs, since it helped verify that the version of PSC is able to predict the chance of a mental health problem being diagnosed. Based on study on its Korean-translated counterparts, PSC has shown high predictive validity of 91.7% on cutoff value of 14 for total score based on the diagnosis of attention deficit hyperactivity disorder (ADHD), major depressive disorder, ADHD with oppositional defiant disorder, Tourette's disorder, selective mutism, separation anxiety disorder, enuresis, and mental retardation [21]. It is must be noted that PSC cutoff can differs greatly between places and countries. For example, the 35-questions version from East Palo Alto (United States), Japan, Dutch, and original PSC (United States) used 12, 17, 22, and 28 respectively for total score cutoff [10,19,21,25]. Moreover, the original PSC-17, which is even developed by the same author of the original PSC, used 15 as cutoff [24]. Hence, we strongly advise that currently PSC-17 Indonesian Version should only be used for mental health screening. We urge that until its predictive validity is measured based on the clinical diagnosis, PSC-17 Indonesian Version must not be used alone for diagnosis of mental health problem.

We measured reliability of Indonesian version of PSC-17 by measuring its internal consistency value. It is worth noting that the lack of publications of translated PSC-17 version has forced us to compare our results with any version of both PSC and PSC-17. In study this used the same score cutoff of attention symptoms, externalizing symptoms, internalizing symptoms, and total score, which are 7,7,5, and 15 respectively based on the original PSC-17 [12,24]. Compared to the recent reliability test on original PSC-17, we found that our Indonesian-translated version has similar overall Cronbach's alpha value. This similarity also observed on internalizing symptom score ($\alpha_{\text{Indonesian}}=0.83$ vs $\alpha_{\text{original}}=0.78$), attention symptom score ($\alpha_{\text{Indonesian}}=0.84$ vs $\alpha_{\text{original}}=0.82$), and externalizing symptom score ($\alpha_{\text{Indonesian}}=0.82$ vs $\alpha_{\text{original}}=0.81$) [24]. Compared to the other translated version of any PSC, PSC-17 Indonesian Version showed a lower overall alpha value ($\alpha_{\text{Indonesian}}=0.85$ vs $\alpha_{\text{Korean}} = 0.95$) but nevertheless still retain high reliability [21]. This suggests that Indonesian version of PSC-17 successfully produced satisfying reliability for practical use just like the original version of PSC-17.

We found it is important to mention that in this study, we used self-assessment as our main data taking method and still yielding satisfying internal validity result. The original PSC-17 is not meant to be used for self-assessment and the questionnaire is answered by the parents [24,26]. However, it must be noted that in adolescent setting, parents-answered PSC-17 are biased due to higher parent frustration, lower parent-child

connectedness, and the increased actual ²² diagnosis of an emotional or behavioral disorder in the children [27]. Hence, there is discrepancy on result between self-answered and parents-answered PSC-17. This phenomenon sparked the development of Youth PSC (Y-PSC), and finally the briefer Youth PSC-17 (Y-PSC-17). Both Y-PSCs were self-answered by the respondents. However, only the original Y-PSC that has been validated while Y-PSC-17 validity and reliability test result remains unpublished [27,28]. Our result showed that, even after self-answer, PSC-17 Indonesian Version still yield good validity and reliability. This indicates the needs of confirmation whether self-answered and parents-answered PSCs have significant difference. Because of this finding, we suggest that more comprehensive measurement of instrument validity based on the answerers must be done on every translated PSC.

Our limitations of this study are mainly because of the subject population characteristic. In this study, our population is very homogenous and having abnormal amount of predicted behavioral problem although we reached sufficient number of samples. Hence, adequate normal distribution might not be achieved and may affect our overall interpretation. This also indicates the needs of local government to conduct critical screening of mental health to adolescent population for behavioral problem detection. Secondly, we used the self-report methods, which may affect our data result. Because of this, further studies to confirm the significance due to the way PSC-17 questions is answered are needed. The third limitation is that our Indonesian version of PSC-17 still does not offer standardized diagnostic support but rather only help identify existence of symptoms. Hence, further comparison studies with the participation of medically diagnosed patients are needed to assess the diagnostic significance of this checklist. The fourth limitation is the lack of external check that is actually out of scope from this study design. The PSC and PSC-17 has shown a great test-retest reliability and predictive validity, which are both cannot be measured in our study. Hence, further studies comparing between PSC-17 and standard diagnostic instrument such as Child Behavior Checklist (CBCL) are required to confirm our findings. Lastly, we found that many of PSC-17 validity and reliability studies is done in more than a decade ago. Moreover, lack of publication on localized version of PSC-17 made difficulties in comparing our reliability result. This hinders us to create more up-to-date conclusion and compare our findings to more recent studies. It is advised that all further version of PSC-17 must be assessed regularly for its reliability and validity, since such kind of research instrument tends to change and adapt along with the time.

Conclusion

Based on our findings, it is clear that Indonesian version of PSC-17 is a valid questionnaire with high reliability to detect adolescent behavioral problems. It must be noted that PSC-17 Indonesian Version, just like the other versions of PSC, is only a screening tools means to identify the behavioral problem symptoms. The PSC-17 Indonesian Version is not meant to be a diagnostic tool. We advised that diagnosis of mental health problem using all version of PSC-17 as screening tools should be taken along with established diagnosis methods, as well as evidence base confirming that PSC-17 can gives proper outcome towards the meant diagnosis.

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