

ADHD among Indonesian Primary School Students: Measurement and Prevalence

Supra Wimbarti
Center for Public Mental Health,
Faculty of Psychology, Universitas Gadjah Mada
supra@ugm.ac.id

Sri Kusrohmaniah
Center for Public Mental Health,
Faculty of Psychology, Universitas Gadjah Mada
koes_psi@ugm.ac.id

Abstract

In Indonesia, adequate screening instruments for the early detection of attention deficit and hyperactivity disorder (ADHD) in primary school students is not available prior to the study. We aimed to assess the Indonesian version of the Conners 3 Teacher Rating Scale (Conners 3-T) in an Indonesian setting and assess the prevalence of ADHD in primary school children. The study participants comprised 314 primary school students aged 6-12 years old. Conners 3-T was translated from English to Bahasa Indonesia and back-translated into English. Those students suspected of ADHD were further diagnosed by a senior child psychologist for diagnosis. The results showed that Conners 3-T has a good psychometric quality ($\alpha = .96$). The quality and accuracy of the screening tool with *Receiver Operating Characteristic* analysis showed a discrimination value (Area Under Curve) of 75.5%, cut-off value of ≥ 35 with sensitivity value of .67 and specificity of .62. *Conclusion:* This study indicated that Conners 3T had good sensitivity and specificity as a screening tool. We also found that 45.85% of children were suspected of ADHD symptoms. Further thorough psychological evaluation for diagnostic purposes revealed 8.09% of these children were diagnosed with ADHD. We concluded that the prevalence of children with ADHD in Indonesia is within the common range, and we recommend using the Indonesian Conners 3-T to screen children suspected of ADHD in Indonesia.

Keywords: Conners 3 Teacher Rating Scale, neurodevelopment, sensitivity, specificity, cutting point, screening tool.

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Introduction

Attention Deficit/Hyperactivity Disorder (ADHD) is one of the most prevalent neurodevelopmental issue in primary school children. According to the American Psychiatric Association (American Psychiatric Association, 2013), the prevalence of children with ADHD was currently at 5%. Over the years, prevalence of ADHD in different countries varies. For example, Polanczyk, de Lima, Horta, Biederman, and Rohde found that the global prevalence of ADHD is 5.29% (Polanczyk et al., 2007).

In the United States, the National Institute of Mental Health (National Institute of Mental Health, 2009) found that the prevalence of children with ADHD is 8.6%. In 2017, there is a rapid increase in the United States' prevalence of children with ADHD (Zablotsky et al., 2019). Meanwhile, the prevalence in Canada, in 2010, reached 5.29% (Charach A., 2010) and in Iran it was 4% (Mohammadi et al., 2021). Additionally, a study conducted by Wamulugwa, Kakooza, Kitaka, Nalugya, Kaddmumukasa, Moore, Sajatovic, and Katabira showed that the prevalence of children with ADHD in Uganda is 11.7% (Wamulugwa et al., 2017). In Turkey, Ercan, Kandulu, Uslu, Ardic, Yazici, Basay, Cahide, Rohde reported that the ADHD prevalence to be 12.91% (Ercan et al., 2013).

Despite being a common case in Indonesia, no exact ADHD percentage of prevalence had been obtained, whether in public or school; mainly because research on prevalence was limited only to several regions. Christina, Herini, & Gamayanti found that the prevalence of ADHD among school-aged children in Yogyakarta was 5.47%; and 7.48% in Cangkringan District (Christina et al., 2016).

ADHD symptoms began to appear from before the age of 12 when children are typically in primary school (American Psychiatric Association, 2013). Hyperactive behavior was a problem in primary school because schools have standardized schedules, rules, and activities. ADHD children often experienced difficulties in maintaining their behavior to conform to social expectation. Behavioral issues in ADHD children were evident in situations where they must abide by the rules, complete tasks, be deprived of intense stimulation, and absence of adult figure to accompany them. Indonesia embraces a collectivistic culture where people in the neighborhood maintain harmonious relationship in which almost everyone knows everyone else, including members of the family, which school they go, with whom they hang out with. People learn this since they are very young and as they grow old they are mandated to keep the harmonious relationship where ever they live. Unexpected behavior that will harm the relationship is detected early especially in the school setting. Therefore, teachers need to be able to detect unexpected behavior whether it is deviant and tends towards clinical or still in the range of acceptable one. Children who are "naughty" will be corrected immediately. This generalization of teachers is harmful to students who are suspected of suffering from ADHD. It is important that handy screening tool should be available.

Besides being linked to a damaged cognitive function, academic and family function, children with ADHD were also linked to damaged social functions and risky behavior, including emotional dysregulation (Bunford et al., 2015). Grygiel, Humenny, Rębisz, Bajcar, and Świtaj found that children with ADHD are commonly experienced rejection within their peers of friends and to have difficulties in understanding and providing appropriate responses in social situations (Grygiel et al., 2018). This made them hasty or careless in conducting information processing and perceived their surroundings in a more pessimistic way. Short attention span also hindered children with ADHDs' ability in listening and made them easily distracted, thus disrupting their ability to respond to social cues. Children with hyperactive and impulsive type of ADHD tended to be reckless in processing information and were biased in interpreting and responding to social cues. (Uekermann et al., 2010).

Teachers are essential figures in the early detection of ADHD in school-aged children. ADHD also often showed comorbidity with other disorders, such as depression, autism spectrum disorder, learning disabilities, Tourette syndrome, behavioral disorders and opposition behavior disorders, anxiety disorders, sleep disturbance as well as disruptive mood dysregulation disorder (Mphahlele et al., 2020). These factors sometimes become hindrances in conducting diagnosis of ADHD. Preliminary interview with three primary school teachers in the Special District of Yogyakarta, Indonesia showed that, despite its importance, teachers still struggle to detect ADHD. They found the detection method to be unfamiliar, causing them to experience difficulties in conducting extensive observation (Siregar & Wimbarti, 2018). For that reason, it is common for children with ADHD to receive little attention from the teachers. They were often viewed as misbehaving children, hence, ADHD children often received incorrect treatment. Furthermore, as the teachers already have a stigma towards children with ADHD, they are also more likely to perceive children with ADHD to have lower performance than the average student (Metzger & Hamilton, 2021).

Previously, we conducted clinical adaptation of The Strength and Difficulties Questionnaire, Teacher Reports (SDQ-TR) to detect behavioral and hyperkinetic disorders (Siregar & Wimbarti, 2018). The finding showed that SDQ-TR, which used *Pedoman Penggolongan Diagnosis Gangguan Jiwa* (Mental Disorder Diagnosis Classification Guidelines, or PPDGJ III) as the standard to conduct the diagnosis,

was sensitive and specific in measuring behavioral and hyperkinetic disorders. However, this study had limitations in regards to the methods used, which was that the random selection of the research subjects was made by the teachers in each class, leading to potential bias. SDQ-TR is not a culture-free test. Based on research in various countries, there were differences in the total cut-off score. In addition, non-confirmation of item 7 in SDQ-TR was also due to cultural differences. Therefore, we thought that developing an ADHD early detection reference tool for teacher, education and psychology practitioners, especially in the Public Health Center other than SDQ-TR is needed. The existence of screening tool for ADHD that proven having strong psychometric property not only benefited the teacher at school but also nurse, psychologist, and medical doctor in the public health center.

Conners 3-T was placed second highest with a percentage of 31%, after the Wechsler Intelligent Scale for Children (WISC), for the purpose of ADHD assessment. Conners 3-T also showed good validity and reliability to be used as ADHD testing tool. For that reason, the development of Conners 3-T is important to help teachers early detect ADHD. Until now there has not been any adaptation or psychometric testing on Conners 3-T in Indonesia.

This research aims at conducting adaptation and calculating the psychometric properties of Conners 3-T, as well as finding out the prevalence of ADHD in Indonesia. This research is expected to help teachers and health practitioners to detect ADHD symptoms that appear among school-age children and help children receive an appropriate developmental intervention. Furthermore, Conners 3-T can be a supporting assessment tool in diagnosing ADHD for psychologists, and general practitioner in public health center. Data on the prevalence of ADHD and its comorbidities will help psychologists, psychiatrists, and education practitioners to develop educational intervention programs that are appropriate for ADHD children.

Methods

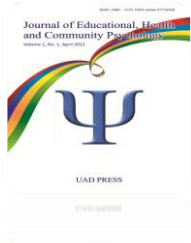
Participants

A total of 314 Indonesian children aged 6-12 from 12 primary schools in Yogyakarta City and Sleman Regency participated in this study. The selection of schools and participants were done randomly by the researchers. Conners 3-T is a screening test for children, administered by the class teacher. Informed consents were given to parents who is the children participated in the study. Children with ADHD were students who had Conners 3-T score above the cut-off and fulfilled the criteria for diagnosis by a senior psychologist. Meanwhile, children without ADHD were children who had Conners 3-T scores below the cut-off and did not fulfill the diagnosis criteria by the psychologists. The non-ADHD participants was determined based on similarities in age with the ADHD subject group. All participants were students with IQ scores above 80 and had no physical disorders, to avoid comorbidities with other developmental disorders.

Instruments

The Conners 3 Teacher Rating Scale (Conners 3-T) was used as a screening tool to identify children with ADHD. The Conners 3-T consists of 28 items measuring inattention, hyperactivity/impulsivity, and 12 additional items to see the tendency of teachers' assessment towards the children (positive or negative) that can influence the final score of the Conners 3-T. Rating was conducted based on daily observation at school by home-room teachers who have known the children for at least 6 months. Questionnaire was in the form of rating scale with the score 0 to 3; with 0 = not true at all (never, seldom) and 3 = very much true (very often, very frequently). Some of the items are asking teacher whether a particular child in the past month:

1. Is constantly moving.
2. Has trouble keeping his/her mind on work or play for long.
3. Appears to be unaccepted by group.



Procedure

The study applied the following procedures for validation of the Conners 3-T: First, we translated the Conners 3-T from English to Bahasa Indonesia by a certified language expert and back-translated into English by another language expert. The researchers purchased the test from the publisher and intend to use it for research purpose only, so that they did not seek a permission from the publisher nor the developer. The researchers also did not alter any item(s) from the original version. Other individuals who intend to use for early detection might need the permission. Then, 13 experts in Psychology were invited to evaluate the content validity. Furthermore, we finalized the Indonesian translation of the Conners 3-T based on feedback from the experts. We then tested for the instrument readability by giving the Conners 3-T to three teachers to identify if the language used can be understood by them, and revised the instrument accordingly. After that, we conducted trial on 113 primary school teachers (from six schools) to assess instrument reliability. Then we screened the children with ADHD in Yogyakarta City and Sleman Regency using the Conners 3-T. The classroom teacher conducted the assessment on between 10-20 children based on their observation. Subsequently, a clinical child psychologist diagnosed the child through parent interviews and child observations. The results from screening and psychological evaluations were then be analyzed using Receiver Operating Characteristic (ROC) (Pintea & Moldovan, 2009) to determine the cut off score. Children whose scores above the cut off were classified into the ADHD group, while the scores below the cut off were classified as the non-ADHD group. Informed consents were obtained from the parents who agreed to participate in the study.

Data Analysis

Cronbach's Alpha analysis was conducted to see the reliability of the instrument. Aiken V was used to obtain the content validity. ROC analysis was utilized to discriminate between ADHD and non-ADHD, according to an established cut-off point (Pintea & Moldovan, 2009). The cut-off point was established in the analysis.

Results

The Indonesian translation of Conners 3 Teacher Rating Scale

The Conners 3-T have shown a high internal reliability (Cronbach's Alpha), ranging from .81 to .96. Table 1 presents the reliability data of three subscales of the Conners 3-T. From this finding we concluded that the reliability of the Conners 3-T was satisfactory.

Table 1
Conners 3T Reliability

Subscale	Cronbach's Alpha	Number of items
ADHD	.96	28
Positive Impression (PI)	.83	6
Negative Impression (NI)	.81	6

We presented the results of individual item analysis in Table 2. The V values obtained ranged between .833 – 1.000 showing that Conners 3-T has adequate content validity. Area Under the Curve (AUC) with ROC method was found to be 75.5% (67.8% - 83.1%). Statistically, an AUC of 75.5% was classified as medium (Dahlan, 2009). A value of 75.5% shows that if the Conners' score is used to diagnose the presence of ADHD symptoms in 100 subjects, then a correct conclusion can be found in 75 of them. The intersection of Conners 3T in conducting screening of ADHD symptom indication is 34.5 with sensitivity of 0.67 and specificity of 0.616, meaning that Conners 3-T will be able to screen with a positive result on subjects indicated with ADHD as much as 66% and able to screen with a negative result on subjects not indicated to have ADHD at 61%.

Table 2

Conners 3T Aikens V Coefficients.

Item no.	Aikens V	Item no.	Aikens V	Item no.	Aikens V	Item no.	Aikens V
1	.93	11	.93	21	.97	31	.90
2	.93	12	1.00	22	1.00	32	.93
3	.97	13	.93	23	.97	33	.97
4	.97	14	.90	24	1.00	34	.97
5	.87	15	.97	25	.90	35	.97
6	1.00	16	.87	26	1.00	36	.97
7	.97	17	.83	27	.97	37	.90
8	.97	18	.90	28	1.00	38	.93
9	.96	19	.97	29	1.00	39	.93
10	.93	20	1.00	30	.90	40	1.00

Table 3

Presents the results of screening quality test of the Conners 3-T

Area	Std. Error	Asymptotic Sig.	Asymptotic	95%	Confidence
			Interval	Lower Bound	Lower Bound
.76	.04	.00	.68	.83	

The intersection point of Conners 3-T is rounded to ≥ 35 . Other than finding the AUC and the point of intersection, a Likelihood Ratio analysis was also conducted with results of positive likelihood ratio (LR +) of 1.46, and negative likelihood ratio (LR-) of 0.20. This shows that subjects with an ADHD symptoms indication are 1.46 more likely to be positively detected than subjects without ADHD

indications, and subjects with ADHD indications were 0.20 less likely to be detected negatively by Conners 3-T than subjects without ADHD indication.

Prevalence of ADHD

Based on psychologists' diagnosis to 173 participants, 14 students were identified to have ADHD with inattention, hyperactivity, or a combination of both. From this number, calculation of the prevalence of ADHD in children aged 6-12 years based on psychologists' diagnosis yields 8.09%. Meanwhile, the prevalence of children with indications of ADHD based on Conners 3-T as a screening tool found 144 from 314 were indicated to have ADHD. Therefore, around 45.85% primary school students aged 6-12 years in the city of Yogyakarta City and Sleman Regency were suspected to have ADHD symptoms.

Discussion

The study aims to evaluate the psychometric qualities of the Conners 3-Teacher Rating Scales that had been translated and tested in Indonesia. In addition, we also aim to explore the prevalence of ADHD in Indonesia. Prior to the study, an adequate screening tool for ADHD in primary school students is not available and the prevalence of ADHD in Indonesia, particularly in Yogyakarta, is still unknown. Findings from this study indicated that the Indonesian translation of Conners 3-T has a good validity and reliability as a screening tool for ADHD in school age children. Having this validated screening tool available enabled us to screen children with ADHD and reported the prevalence of ADHD in Indonesia. To our knowledge, this is the first to report the psychometric properties of the Conners 3-T and the prevalence of ADHD in Indonesia.

The Indonesian adaptation of Conners 3-T

Psychometric property testing results show that Conners 3-T has a high validity, and reliability that is satisfactory, at the subscale of ADHD, positive impression and negative impression. The reliability is consistent scores of the original Conners, which is 0.75-0.93 (Conners, 2009), and researches in other countries. For example, Izzo, Donati, and Primi found in Italy, Conners 3-T had the reliability score ranging from 0.88-0.96 (Izzo et al., 2019). Several studies conducted previously on the Conners

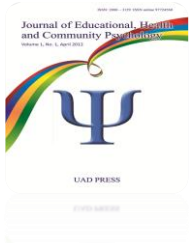
3-T in several countries, with different population and cultural background also showed results that were not dissimilar, strengthening the fact that Conners 3-T has satisfactory reliability. For instance, Christiansen, Hirsch, Drechsler, Wanderer, Knospe, Gunther, & Lidzba (2016) in Germany, based on factor analysis yielded the values were .94 for Inattention, .96 for Hyperactivity, .94 for Learning Problems/Executive Functions, .94 for Aggression, and .88 for Peer Relations. A systematic review and meta-analysis in China from sixty-seven studies with a total of 275,502 individuals revealed the prevalence of ADHD among children and adolescents was 6.26%, being the highest type was Attention Deficit followed by Impulsivity type and Mixed type (Wang, Liu, Li, Xu, Liu, Shi, & Chen, 2017). Furthermore, the distribution in this research was also normal, which indicated that the sample used in this research can represent the population in general, thus proving the applicability of this research in the general population.

Conners 3-T is the latest ADHD screening tool that has been adapted to DSM-5. When reviewing Conners 3-T as a screening tool, one other thing that must be noted is the validity of the clinical instrument. Based on the results of rigorous analysis, it is found that Conners 3-T has a satisfactory screening quality in conducting screening on ADHD symptoms. There are two types of interpretation in diagnostic research, ie clinical interpretation and statistical interpretation. These two interpretations may or may not be in line with each other. In research that is considered clinical, it is advised that clinical interpretation is compared with statistical interpretation because it is inseparable from the other instruments that are measuring a similar thing and the screening quality of these instruments. For example, in this research, when seeking to interpret statistically, the AUC of Conners 3-T can be classified as medium (e.g 75.5%).

The prevalence of ADHD

This study revealed two calculations of ADHD on prevalence in children aged 6-12 years, which were scored based on screening results using Conners 3-T and diagnosis from clinical child psychologists. Prevalence obtained from screening showed larger compared to prevalence from diagnosis by psychologists. This might be caused by the fact that Conners 3-T only used one informant (teacher), and because the Conners 3-T was developed as a screening tool to determine the number of children indicated with ADHD in the school environment, therefore if these screening results were to be continued into the diagnosis stage, then it would need further checking with other informants (e.g. parents) in different settings. Result of screening using Conners 3-T was followed by diagnosis by senior child psychologists using DSM-5, yielding a smaller number of participants who are truly ADHD.

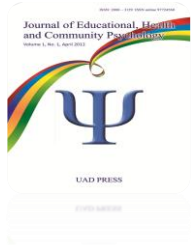
Compared to the findings in the previous studies, there was an average increase of .61% - 2.62% children who were diagnosed as ADHD. The increase in ADHD prevalence in Yogyakarta was consistent with findings in the Western countries which showed an increase in prevalence over the years. The increase of estimated prevalence reflects differences in demographic between the sample of the research. The change in social structure over the past 50 years was suspected to contribute to the increase in ADHD prevalence in the studies conducted. This increase can be linked to the presence of changes in diagnostic criteria in each version of DSM (Brault & Lacourse, 2012), and a more detailed implementation of DSM-5 diagnostic criteria compared to previous criteria. Besides, the average increase in prevalence was also estimated due to teachers and parents being more sensitive towards ADHD symptoms than before (Štuhec et al., 2015). In accordance with the study in Israel, the rise of prevalence in children with ADHD is caused by the parents' increased attention towards ADHD symptoms that could enhance their children's academic performance (Davidovitch et al., 2017). The increase or growth in ADHD prevalence average indicated an increase in the number of actual ADHD cases, an increase of ADHD detection and diagnosis, and changes in diagnostic practice over time, which may possibly be influenced by the increase of awareness towards ADHD (Visser et al., n.d.).



The increase in awareness towards ADHD among health practitioners, teachers and parents, as well as the decrease in stigma related to ADHD, were thought to have contributed to the increase in ADHD prevalence. Sociodemographic factors such as age, gender, low socioeconomic status, family dysfunction and environmental factors were suspected to be linked with high ADHD prevalence (Myhre, Låg, Villanger, Oftedal, Øvrevik, Holme, Aase, Paulsen, Bal-Price, & Dirven, 2018); Döpfner et al., 2008). Several sociodemographic factors (i.e. male, urban area, low socioeconomic family, large families, living with single parents, family history of ADHD, premature birth, birth with lower than average weight, and bottle-feed children), family and parenting factors were significantly linked to the growth in ADHD symptom (Deault, 2010; El-Nemr et al., 2015). Furthermore, children who are exposed in prenatal smoking and alcohol use will have greater risk in having ADHD (Hoang et al., 2021).

Previous study (Christina et al., 2016) reported a high prevalence of children with ADHD in cities compared to in rural areas. This was due to the risk factors of hyperactivity family history, complication during pregnancy, as well as consumption of food containing preservatives and artificial coloring that were higher in the city. In line with another study,

Differences between prevalence in this study with previous researches in Yogyakarta and Sleman might be attributed to risk factors that are surrounding children with ADHD such as changes in social structure, change in demography, society's sensitivity towards ADHD, consumption of food preservatives and artificial color that are higher in this research area. The higher prevalence based on Conners' results also needs to be reviewed further, because a high Conners' scores can be due to several things, such as impression of teacher towards the students, the need for other informants besides the teachers, the possibility of co-morbidity with other disorders, causing uncertainty about ADHD being the primary diagnosis.



Conclusion

This study revealed the prevalence of ADHD in Indonesian children as 8.09%. This number is similar with the range of prevalence in other countries. The Indonesian translation of Conners 3-T has satisfactory psychometric qualities. The Indonesian Conners 3-T is an ADHD screening tool that is sensitive and specific. A cut-off of 35 becomes the reference for whether a child is suspected to have ADHD or not. Now, teachers may use this tool to early screen children who are suspected of having ADHD and early treatment and intervention for children with ADHD can be provided.

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Disclosure

The author reports no conflicts of interest in this work.

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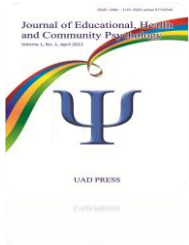
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