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Development of Pneumonia Risk Early Detection Instruments in Puskesmas Area, Semarang City

Korsini Heru Setiawan Tolang ✉, Wiwi Isnaeni, Masrukan

Universitas Negeri Semarang, Indonesia

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Abstract

This research was motivated by the absence of an early detection instrument for the risk of pneumonia that was tested for validity and reliability. Instruments about pneumonia found in integrated management of sick toddlers have less detailed indicators that only include breathing speed. The aim of the study was to produce an instrument of early detection of the risk of pneumonia that was valid and reliable. This research is a development research conducted in the Puskesmas ngemplak in Semarang. The subject of this study was 100 respondents. Test the content validity using Aiken's V formula and reliability test using Hoyt. In the trial, the reliability was analyzed using Alpha Cronbach. In the validity and reliability test the valid instrument items were more than 0.3 for each item and the instrument reliability was at 0.869> 0.7. The construct validity test using Confirmatory Factor Analysis (CFA) formed 3 factors, namely factor 1 (signs and symptoms), factor 2 (individual behavior) and factor 3 (environment). This study produces valid and reliable instruments. The benefit of this study is that instruments that are valid and reliable can be used as a standard guide in knowing how much a person is exposed to pneumonia

✉Alamat korespondensi:
Kampus Unnes Kelud Raya, Semarang, 50233
E-mail: Korsiniheru@gmail.com

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INTRODUCTION

Pneumonia is one of the acute respiratory infections that affects the lungs (alveoli tissue) (Depkes RI, 2004). In patients with pneumonia, pus and fluid will fill the alveoli, causing difficulty in absorbing oxygen and causing breathing difficulties (Depkes RI, 2007). Pneumonia is caused by pulmonary inflammation which makes breathing sick and a little oxygen intake (WHO, 2014).

Pneumonia in the world itself is one of the highest causes of death in children (WHO, 2004) . According to estimates from the World Health Organization (WHO) that this disease triggers 15% of all deaths of children under 5 years of age. Indonesia's own pneumonia disease is ranked the 10th largest disease every year as a cause of infant and under-five mortality (Depkes RI, 2013) . Pneumonia is the main cause of death in children under five in the world, it is estimated there are 1.8 million or 20% of child deaths due to pneumonia exceeding deaths from AIDS, malaria and tuberculosis (WHO, 2006). Basic health research in 2007 reported that infant mortality in Indonesia reached 15.5% (Riskesdas, 2007). . This causes pneumonia as the main cause of death for children under 5 years of age in Indonesia, the high rate of under-five mortality due to pneumonia results in the 4th MDG (Millennium Development Goals) target which aims to reduce child mortality by 2/3 from 1990 to 2014 not achieved (WHO, 2015)

Health workers must know the extent to which families know about pneumonia and family motivation in the prevention and treatment of pneumonia at home. Because a person's behavior is guided by attitudes, will, motivation and intention (Notoatmodjo, 2003) . Based on observations made on November 20, 2017 and preliminary studies, information obtained from the health center in Semarang shows that there is no standard instrument for surveying people with pneumonia . Guidelines for knowing pneumonia that are used only to calculate breathing rate per minute, how to detect only using an inadequate breath count because pneumonia can occur by many factors, so it is necessary to detect ways that involve extracting info on many factors. The factor in question is starting from the signs and symptoms, behavior or habits and the environment that is the cause of pneumonia ,Instrument development must go through stages of good development in order to get a quality instrument (Rusilowati, 2013) .

Based on these problems it is necessary to develop an instrument for early detection of pneumonia that has been tested valid, reliable and involves the process of extracting information about many factors that cause pneumonia. So that it is expected to be able to identify patients with pneumonia earlier, reduce the risk of death due to pneumonia, increase early awareness for the community and improve health status in the community as well as awareness of the dangers of pneumonia especially for children under 5 years of age.

METHODS

This study was designed with an instrument development research method. According to (Mardapi 2016: 132) there are ten steps that must be followed in the development of an instrument. At the tenth step in the research development of this instrument is the result of the final product in the form of valid and reliable instruments. The ten steps in question include: 1) determining instrument specifications; 2) writing instruments; 3) determine the scale of the instrument; 4) determine the scoring system; 5) reviewing the instrument; 6) conducting product trials; 7) analysis of test results; 8) revision; 9) assemble and refine the instrument and 10) evaluate the overall instrument.

The modification model for the development of Mardapi's instruments is carried out through three stages: the preliminary stage,

the development stage and the evaluation stage. The preliminary stage consists of determining instrument specifications, writing instruments up to determining the scoring specifications. The Development Phase consists of reviewing the instruments by experts, testing, analyzing up to revisions**.** The evaluation phase consists of assembling and refining instruments.

RESULTS AND DISCUSSION

The results of the research presented are detailed in sequence in accordance with the formulation of the research problem, which in this section added the results of the research in the form of characteristics of research instruments, validity and reliability based on expert judgment and the validity of the construct and reliability of the instrument. Based on the order that has been set can be described as follows:

Characteristics of the Instrument Early detection of the risk of pneumonia

The instrument was designed from the preparation of instrument lattices based on the theory of signs and symptoms of pneumonia, as well as other factors causing pneumonia, an instrument for early detection of pneumonia designed for use by health workers. The grid starts from the theory, so that the indicators that will be assessed appear . The grid was completed, then designed an instrument for early detection of pneumonia. An instrument for early detection of pneumonia in the form of an assessment sheet consisting of 35 items derived by 7 indicators . The assessment scale used in the early detection instrument for pneumonia is the guttman scale. Scoring system uses the guttman scale, namely the highest score 1 and the lowest 0 score

Expert Review, Small Scale Trial and Large Scale Trial .

Expert Review

According to experts, the results of the validation of the 3 experts showed that the assessment instrument could be implemented. k eempat experts give assessment scores on the sheet validation of grain instrument early detection of pneumonia, the highest score by the number 4 and the lowest scores with the number 1. After obtaining the assessment scores of experts will then be analyzed by a formula Aiken's V. Based on the results of validity test using the formula Aiken's V. Then, the results of the three experts were analyzed using Aiken's V formula. The results of Aiken V analysis can be seen in Table 1.

Table 1. Results of Analysis of Validity Content of Aiken V Instrument for early detection of pneumonia

Item No.	Aiken V Value	Criteria
1	0,89	Valid
2	1,00	Valid
3	0,78	Valid
4	1,00	Valid
5	1,00	Valid
6	0,33	Valid
7	0,89	Valid
8	1,00	Valid
9	0,33	Valid
10	1,00	Valid
11	1,00	Valid
12	0,67	Valid
13	0,89	Valid
14	1,00	Valid
15	1,00	Valid
16	0,67	Valid
17	1,00	Valid
18	0,89	Valid
19	0,67	Valid
20	1,00	Valid
21	0,78	Valid
22	0,89	Valid
23	0,89	Valid
24	1,00	Valid
25	0,67	Valid
26	0,89	Valid
27	0,89	Valid
28	1,00	Valid
29	0,78	Valid
30	1,00	Valid
31	0,78	Valid
32	0,89	Valid
33	1,00	Valid
34	0,33	Valid
35	0,89	Valid

In Table 1, the analysis results that all items (22 items) are declared valid. Because $r \geq r$ is critical 0.3 . This is in accordance with the criteria stated by Azwar (2014: 34) that if the validity coefficient ≥ 0.3 means that the item is declared valid.

After going through the validity test, the reliability test is then used. After validating the contents of the experts, further analysis is carried

out to determine the reliability based on expert judgment or between rater. Reliability between rater was analyzed by *two way ANOVA* test using SPSS 18.0 *software* . The results of the two way anava calculation using SPSS 18.0, then calculated again with the Hoyt formula.

r_xx = 1 - (S ^ 2 r) / (S ^ 2 s)

r_xx = 1 - 0,134 / 1,021

r_xx = 1 - 0.131 = 0, **869**

The results obtained with the Hoyt formula is 0.869, stating that the reliability coefficient obtained is high due to> 0.7.

The results calculated using the Hoyt formula show that in assessing the instruments the experts have an agreement and consistency of consistent content. reliability according to Khumaedi (2012: 29) states that the reliability coefficient of 0.70 or more is usually acceptable as good reliability .This is in line with Susanti's research (2015) which obtained that the reliability coefficient was in the high category (> 0.6) so that the instrument was declared reliable.

Small Scale Trial

Furthermore, the resulting data is said to be feasible or can be continued to be tested for validity if it meets the KMO MSA requirements ≥ 0.5. Following are the results of the trial feasibility of instruments in the field which can be seen in Table 2.

Table 2. KMO and Bartlett's Test in Small Scale Trial

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.632
Bartlett's Test of Sphericity	Approx. Chi-Square	282.407
	Df	21
	Sig.	0.000

The value of KMO = 0.6 3 2 > 0 ,5 that the first condition in terms of data adequacy has been fulfilled. Sig. 0,000 ≤ 0 , 05 can be called there is a correlation between multivariate variables .Requirements can be met to continue to see the value of correlation between multivariate variables can be seen in the output of Anti Image Correlation in Table 3

Table 3. Anti-image Correlation

Anti-image Correlation	Signs of coughs and colds in patients	Difficulty breathing the sufferer feels	Limp and fever	Patient nutritional status	Behavior or habits in the house	Air circulation	Humidity
Signs of coughs and colds in patients	.864a	-.487	-.068	-.137	.137	-.109	-.082
Difficulty breathing the sufferer feels	-.487	.701a	-.764	-.024	.056	-.046	-.014
Limp and fever	-.068	-.764	.738a	-.182	.134	-.028	.133
Patient nutritional status	-.137	-.024	-.182	.497a	-.976	.304	-.107

Tabel 4. KMO dan Bartlett's Large scale trial

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.					.695		
Bartlett's Test of Sphericity			Approx. Chi-Square		952.156		
			Df		21		
			Sig.		.000		
Behavior or habits in the house	137	.056	.134	-.976	.457a	-.305	.112
Air circulation	-.109	-.046	-.028	.304	-.305	.533a	-.817
Humidity	-.082	-.014	.133	-.107	.112	-.817	.547a

From the *output of Anti Image Correlation* Indicator 4 and indicator 5 have an anti image correlation value < 0 , 5 , so it does not meet the requirements for further testing. Unable variables to predict and cannot be further analyzed or excluded from other variables, so that the instrument must be repaired / revised

Large scale trial

In large-scale trials taking a sample of 100 respondents. 100 respondents were taken from the community in the puskesmas area. Large-scale tests examine construct validity and instrument reliability. The construct validity test to test the performance assessment instrument using Confirmatory Factor Analysis is presented and can be seen in Table 4 KMO = 0.695 ≥ 0.5 so that the requirements are met. Sig. 0,000. 0,05 First, in terms of the adequacy of data, it can be said that there is a correlation between multivariate variables. The fulfilled requirements can be continued by looking at the correlation values between multivariate variables, can be seen in the results of the anti-Image Matrics analysis to see the correlation of the items in the Anti Image Matrics Table, especially at the bottom of the Anti Image Correlation number that forms a diagonal (MSA) marked " a "(diagonally from top left to bottom right), there is no correlation indicator below 0.5, so the results of the analysis of this instrument have met the requirements for factor analysis. The following is the Anti Image Correlation Table which can be seen in Table 5 below .

Table 5. Results of Anti Image Correlation

No.	Indicator	Anti Image Correlation
1	Signs of coughs and colds in patients	0.697
2	Difficulty breathing the sufferer feels	0.792
3	Limp and fever	0.819
4	Patient nutritional status	0.644
5	Behavior or habits in the house	0.619
6	Circulation	0.596
7	Humidity	0.591

Based on Table 5 in the anti image column, it can be seen that the correlation value between items obtained a correlation value > 0.5, therefore factor analysis can be continued by

including all items. The next step is to see how many factors might be formed in the factor analysis with a sample size of 100, after a confirmatory factor analysis with the help of SPSS version 16.0, the resulting table is Total Variance Explained. The table shows that there are 3 components of the factors that are formed and can represent the number

indicator, there are 7 indicators analyzed, it turns out that eigenvalues> 1 means that 7 indicators can be grouped into 3 groups of factors. Test the construct validity using factor analysis can be run if the value of KMO> 0.5, Anti Image Corelation> 0.5, Eigenvalue ≥ 1 and Factor Loading ≥ 0.3 (Azwar, 2016: 123). , components with eigenvalues> 1 are the components used .Table 6

Table 6. Total Variance Explained

Component	Initial Eigenvalues		
	Total	% of Variance	Cumulative %
1	3.934	56.204	56.204
2	1.529	21.840	78.044
3	1.212	17.320	95.365
4	.190	2.709	98.074
5	.086	1.232	99.306
6	.038	.541	99.847
7	.011	.153	100.000

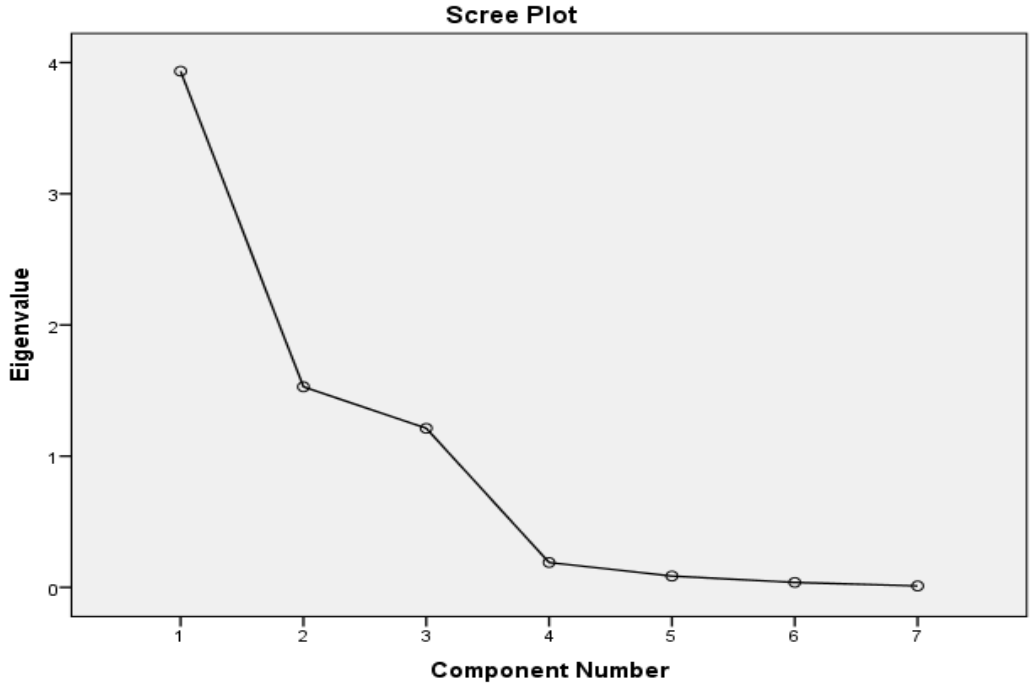

Figure 1. Overall the total of variance result can be drawn in the image screen Plot

Based on Figure 1 it appears that there are 3 points above the value 1 and the other points are below the value 1. This illustrates that there are 3 components that have an eigenvalue above the value of 1 .Furthermore, the determination of each item will be included in any of the three factors . The grouping of items and the magnitude of the loading factor from one factor is seen from the value of the loading factor which has a value> 0 , 3 . Grouping items into factors can be done by looking at the *Rotation Component Matrix* Table . Here are the results of Rotation Component Matrix

Table 7. Rotated Component Matrix

	1	2	3
Signs of coughs and colds in patients	.961	.158	.207
Difficulty breathing the sufferer feels	.961	.146	.196
Limp and fever	.954	.132	.213
Patient nutritional status	.270	.088	.907
Behavior or habits in the house	.175	.126	.930
Air circulation	.131	.960	.135
Humidity	.172	.960	.077

The matrix component shows the three components formed indicators of signs of cough and runny nose on the patient, difficulty breathing that felt by the patient, lethargy and fever grouping on component one. Indicators of the patient's nutritional status, behavior or habits in the home are grouped in component two while indicators of air circulation and humidity are grouped in component three. It can be seen inthe indicator distribution table that it is difficult to interpret, so extraction is done to see the value of the *component transformation matrix* . The *component transformation matrix value* after the digitization is presented in the matrix component.

Tabel 8. Component Transformation Matrix

Component	1	2	3
1	.778	.409	.477
2	-.388	.910	-.147
3	-.494	-.071	.866

From the table above the matrix component shows the three components with component transformation matrix value on component one is 0.778> 0.60, component two is 0.910> 0.60 and component three is 0.866> 0.60, it can be concluded that the instrument developed is constructively valid of the three dimensions, namely the dimensions of signs and symptoms (factor 1), dimensions of individual behavior (factor 2) and environmental dimensions (factor 3).

Reliability analysis of early detection instrument for the risk of pneumonia on a large scale test using Cronbach Alpha reliability test with SPSS 16.0 software. The results of the Cronbach Alpha reliability test analysis show

the estimated reliability of the instrument in a large scale test with an Alpha value = 0.856 7 0.7. This means that the instrument has a very high consistency rating. Increased reliability estimates from small scale and large scale shows that large scale test instruments have higher consistency values than small scale.

CONCLUSION

Based on the results of the research and discussion that has been done, it has been obtained an instrument of early detection of valid and reliable pneumonia risk so that it can be concluded as follows:

Standard instrument for early detection of pneumonia risk developed in the form of structured interview guide sheets totaling 35 questions consisting of 7 indicators. These indicators are signs of stones and colds in patients consisting of 3 items, symptoms of difficulty breathing consist of 10 points, symptoms of lethargy and fever consisting of 9 points, nutritional status consisting of 5 items, behavior and habits consisting of 3 items, air circulation consists of 3 items, and humidity consists of 2 items. Thirty-six items of early detection instrument for pneumonia risk developed and analyzed using Aiken's V formula were declared valid based on expert judgment. Each item gets a value of> 0 , so the 35 items of the instrument are valid.

The results of instrument reliability based on expert judgment through two way anava test using SPSS 18.0 software and calculated again with the Hoyt formula obtained reliability coefficient value of 0.869. This means that the three experts are consistent in assessing the instrument because the obtained correlation coefficient of reliability is> 70 .

Factors formed based on analysis of construct validity using confirmatory factor analysis (CFA) analyzed by SPSS 18.0 software are 3 factors. The factors that are formed are signs and symptoms, individual behavior and the environment Based on the results of field tests, the results of reliability were analyzed using Cronbach alpha formula of 0.856. This result is stated to have a high reliability coefficient because the value obtained is> 70 .

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