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CONSTRUCT VALIDITY IN NEURORESEARCH

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Construct validity in neuroresearch (Article)

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Abstract

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Neuroresearch is an integrated research method between qualitative method and quantitative method. This paper examines how prove the academic predictions (construt) in Neuroresearch through the construct validity. There are two (2) phases. Phase One, Orthogonal iteration approach. If the results of the Orthogonal iteration have been counted few times, and it is proved the instrument items to be significant with the variable (total score) and each indicator is minimum represented by at least 1 (one) point, then the academic predictions about the variables is proved. But if there is at least one indicator that is not represented by a minimum of 1 point, then the Orthogonal Iteration is not fit and had to go to the second stage. Second stage is Varimax Iterations approach through Principle Component Axis. The analogy of the variable is like a community that consists of a group of people (instrument item). Community (variable) is formed by a small group (indicator) and the members of the group (item) are not always correlated with the group (indicator). Proof of academic prediction of the second phase by calculating rotated component matrix which in the end, will "determine the new name of the indicators". © 2015 American Scientific Publishers.

Author keywords

A model research methods | Construct validity approach

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RESEARCH ARTICLE

Advanced Science Letters
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Construct Validity in NeuroResearch

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Neuroresearch is an integrated research method between qualitative method and quantitative method. This paper examines how prove the academic predictions (construt) in Neuroresearch through the construct validity. There are two (2) phases. Phase One, Orthogonal iteration approach. If the results of the Orthogonal iteration have been counted few times, and it is proved the instrument items to be significant with the variable (total score) and each indicator is minimum represented by at least 1 (one) point, then the academic predictions about the variables is proved. But if there is at least one indicator that is not represented by a minimum of 1 point, then the Orthogonal Iteration is not fit and had to go to the second stage. Second stage is Varimax Iterations approach through Principle Component Axis. The analogy of the variable is like a community that consists of a group of people (instrument item). Community (variable) is formed by a small group (indicator) and the members of the group (item) are not always correlated with the group (indicator). Proof of academic prediction of the second phase by calculating rotated component matrix which in the end, will "determine the new name of the indicators."

Keywords: A Model Research Methods, Construct Validity Approach.

1. INTRODUCTION

Neuroresearch is a method of social science research that tried to proportionately combine the qualitative research methods (exploratory research) and quantitative research method (explanatory and confirmatory). This method has been developed by Sasmoko since 1995 up to now for his master's programs and doctoral studies.[a] With the balanced combination of qualitative method and quantitative method, it needs valid and reliable research instruments (calibration). One of the calibration phase is testing the construct validity. This paper specifically examines the construct validity which appropriates to Neuroresearch through Orthogonal Iteration approach and/or Varimax Iteration.

2. CONSTRUCT VALIDITY APPROACH IN NEURORESEARCH

Neuroresearch method is not contradicting the quantitative research and qualitative research. In addition, Neuroresearch method wants to present alternative research methods that combining qualitative method with quantitative method, so it will complement one another. The result of qualitative research is in the form of the theoretical construct results that is the researchers' conclusion on theoretical study contextualized to the conditions of research population on research variables. The content of theoretical construct is the conceptual definition, dimensions, and research variables' indicators. Due to the academic predictions, the researchers need to test these predictions through construct validity. Lopez[b] said that the meaning of the construct validity is as a proof of its complex academic prediction.

Empirical analysis of construct validity are reviewed internally is how researchers describe the relationship of each instrument item with the variables that reflected as it was predicted by theoretical construct.[c] This paper proposes two (2) alternative construct validity approaches which suitable with Neuroresearch method.

The first Alternative Construct Validity Approach in Neuroresearch is the approach with the concept of correlation. Instrument item is valid if the item scores were significantly correlated with the variables score of that is the total item of each respondent.[d]

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[a]The implantation result of Construct Validity in Neuroresearch can be read in Binus University Library, Universitas Kristen Indonesia Library, and Harvest International Theological Seminary Library.

[b]Marcos Y. Lopez, "Determining the Construct Validity of a Critical Thinking Test," Educational Measurement and Evaluation Review, Vol. 4, No 1 (2013), http://ejournals.ph/index.php, accessed on 24 April 2015.

[c]Megan K. France an, "Conceptualization and Utility of University Mattering: A Construct Validity Study d Sara J. Finney," Measurement and Evaluation in Counseling and Development, Sage Journal, http://mec.sagepub.com/, accessed on 24 April 2015.

[d]Makna unidimensional satu dimensi yaitu variabel penelitian yang sedang dikaji ditandai dengan "semua" indikator-indikator yang ditemukan setelah melalui kajian teoritis secara mendalam. Dan semua indikator tersebut harus muncul dalam diri

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Table I. Recapitulation of calculation result of orthogonal iteration to find valid instruments.

		First calculation—Orthogonal iteration 1 (not yet valid)		Re-calculation result—Orthogonal iteration 2 (final)		
Ind	No of construct items	Valid	Drop	Valid	Drop	Number of "valid" item
1	2	3	4	5	6	7
X_1	1, 2, 3, 4, 5	1, 2, 5	3, 4	1, 2, 5	–	1, 2, 5
X_2	6, 7, 8, 9	8	6, 7, 9	8	–	8
X_3	10, 11, 12, 13, 14	10, 14	11, 12, 13	10, 14	–	10, 14
Total	14 items	8 items	6 items	6 items	–	6 items

Table II. Recapitulation of orthogonal iteration calculation result, with the final result was found that the approach is not able to proof as valid instrument.

		First calculation—Orthogonal iteration 1 (not valid)		Re-calculation result—Orthogonal iteration 2 (final)		
Ind	No item from construct	Valid	Drop	Valid	Drop	Number of "valid" item
1	2	3	4	5	6	7
X_1	1, 2, 3, 4, 5	1, 2, 5	3, 4	–	1, 2, 5	–
X_2	6, 7, 8, 9	8	6, 7, 9	8	–	8
X_3	10, 11, 12, 13, 14	10, 14	11, 12, 13	10, 14	–	10, 14
Total	14 items	6 items	8 items	3 items	3 items	3 items

Table III. Recapitulation of orthogonal iteration calculation result, with final result was found that the approach is not able to proof as valid instrument.

		First calculation—Orthogonal iteration 1 (not valid)		
Ind	No item from construct	Valid	Drop	Description
1	2	3	4	7
X_1	1, 2, 3, 4, 5, 6, 7, 8, 9, 10	1, 2, 3, 4, 5, 6	7, 8, 9, 10	
X_2		–	11, 12, 13, 14, 15, 16, 17, 18, 19, 20	Not qualify because there was no valid item
X_3	21, 22, 23, 24, 25, 26, 27, 28, 29	21, 22, 23, 24, 25	26, 27, 28, 29	
X_4	30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40	–	30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40	Not qualify because there was no valid item
X_5	41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55	41, 42, 43, 44	45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55	
Total	55 items	15 items	40 items	–

Mathematical approach is the Orthogonal Iteration (rotation) approach with the correlation formula of Product Moment. Orthogonal Iteration is used if the theoretical review of variable research is unidimensional concept.[e] There is a requirement in Orthogonal Iteration that is any indicator of the research should be represented at least with 1 (one) valid instrument item. Here is an example of recapitulation result of Orthogonal Iteration.

The table shows that researchers are testing a variable research instrument with 14 items (column 2). Calculation results of correlation (First Orthogonal Iteration) produce 8 valid items (column 3) and 6 drop/invalid items (column 4). Because the calculation results of First Orthogonal Iteration still has dropped items (invalid), then it must be recalculated or going to second Orthogonal Iteration phase. Calculation results of correlation (Second Orthogonal Iteration) produces 6 valid items (column 5) and there is no drop item (invalid). Calculation results of second Orthogonal iteration proved that each indicator is represented at least by 1 item. Based on Second Orthogonal Iteration calculation, then through the sixth instrument item may be referred to as "valid instrument."

The Second Alternative Approach of Construct Validity Neuroresearch is the approach with Cluster concept. A simple simulation can be seen in Table II. This second approach is simulated if the first approach failed, which there are indicators that are not represented by at least 1 instrument item (column 5). It means the academic prediction of researchers on research variables can be seen as failure. This failure is because the researcher were not too sharp in defining contextual indicators of the research population, it also because the lack of validity during content validity phase, perhaps also because of some problems in sentence constructing of instrument items, and etc.

responden baik secara bersama-sama maupun tidak secara bersama. The meaning of one dimension of unidimensional is research variable that being studied are marked with "all" indicators found after a depth theoretical study. And all indicators must appear in respondent either together or alone.

[e]Multidimensional meaning is research variable which being studied are marked with "some indicator" from "all the indicators that were found" through theoretical study. It means that significance of each item score is not based on total score of variable, but the total score of indicator.

Table IV. Result of 55 instrument items, total of iteration is 25 times.

Total variance explained.[a]			
	Extraction sums of squared loadings		
Component	Total	% of variance	Cumulative %
1	14,767	29,534	29,534
2	5,044	10,088	39,621
3	3,808	7,617	47,238
4	3,214	6,480	53,718
5	2,592	5,184	58,903
6	2,554	5,108	64,010
7	2,246	4,492	68,502
8	2,039	4,077	72,579
9	1,836	3,672	76,252
10	1,696	3,392	79,643
11	1,470	2,941	82,584
12	1,093	2,185	84,770
13	1,025	2,051	86,820

Note: [a]Compiled based on calculation result with the help of SPSS program.

Because the first approach is failed (Table II), then the calculation of Construct Validity in Neuroresearch changes into the next step by changing the mathematical approach through Varimax iteration (Rotation), called Second Alternative Approach. Varimax Iteration assume that:

(1) the indicator is a cluster,
(2) each indicator contains instrument items,
(3) each instrument item in indicator is not always mathematically correlated with its indicators, and
(4) the instrument item in an indicator may have high weighs for other indicators.

In Varimax Iterations, the weight is determined based on Eigen Value.

Here is an example of the construct validity approach in Neuroresearch which is through Varimax Iteration with Principle Component Axis.[f]

Based on Table III, it was found there are two (2) indicators, X_2 and X_4 which are not represented by a minimum of 1 (one) instrument item. So the first stage of construct validity is failed and must move to the second stage of contruct validity through Varimax Iteration with Principle Component Axis. The results are as following.

Based on Table IV, the number of indicators that are suitable with the context of the research population should have 13 indicator items with Eigen Value 86.820% from 100%. Sasmoko[16] decided that the Cumulative Eigen Value which was required by valid instrument have a minimum of >50%. This means the total of contextual indicators with the population for research variables is "4 indicator items" with a weight of 53.78% from 100%.

Furthermore, based on the analysis (Table IV), the next stage is to analyze the matrix component on 4 indicators which was rotated (rotated component matrix). At this stage, it was found the distribution of items by 4 indicators that have been in Varimax Iteration (rotation). Based on rotation results, it produced items distribution into 4 "New Indicators" as seen in Table V.

Table V. A new name of indicator based on result of grouping items in Table IV.

No	Item number based on grouping items of Varimax iteration	Indicator new name
1.	24, 22, 23, 49, 26, 8, 14, 29, 42	X_1
2.	48, 44, 43, 47	X_2
3.	45, 12, 13, 25	X_3
4.	20, 36, 38, 18, 4, 17	X_4
Total of items	23 items	

The determination of 4 "New Indicators" and also a new distribution of items, then the researcher should give a new name for the indicators.

A new name is giving by combining the meaning of item in some indicators and keeps linking the name meaning of the indicator with variable being studied.

Giving a new name for an indicator is an art for researchers itself. By specifying the name of the new indicator, the researcher does not necessarily conduct a theoretical study and add new theory. Because in giving a new name for indicators, researchers must consider the research variables and the result of past research.

Based on the findings of Table V above, it shows some consequences that Neuroresearch Research Methods can provide opportunities rebuilding framework of thinking and also reviewing the research hypothesis.

3. CONCLUSIONS

1. Construct validity in research of Neuroresearch can be done through the Correlation approach which is through Orthogonal iteration (Rotation)
2. If Orthoganal Iteration (rotation) is failed (indicator is not represented by instrument item), the researcher is does not need to do the test on research's instruments or take the test data of research instruments to its sample.
3. If Orthogonal Iteration (rotation) is failed (indicator is not represented by instrument item), the Varimax Iteration approach is another way of Construct validity on Neuroresearch which is by giving a new name to the indicator because composition changes of instrument item.
4. The suitable Varimax Iteration (rotation) is with Principle Component Axis approach.

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