Term Paper

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Abstract

This paper measures the public negative attitude toward the expansion of the nuclear power plant in South Carolina (SC) and create a shorter unidimensional scale that has better psychometric properties than the original data set. The data used is this paper is originally collected by John Besley (2013) and contains 68 variables, of which 18 items were selected. The data were analyzed in R Program, and was reduced into a shorter unidimensional scale that measures specifically the negative attitude toward the expansion of nuclear power plant in SC based on the result of Exploratory Factor Analysis (EFA). Next, the reduced scale is analyzed based on IRT with 2 Parameter Logistic (2PL) model. The 2PL model test information and standard error of measurement indicates that the 2PL model has high information when measuring individuals with abilities around 0 to 2 with a relatively low standard error. The result concludes that the reduced scale items Q3 to Q8 is a good scale that measures specifically the negative attitude toward nuclear plant expansion in SC, and it is especially effective when measuring the subjects that are more in opposition to it with a reasonably high information and low standard error, which has better psychometric properties than the initial data set. However, due to the lack of items that measure individuals with high ability, it raises concerns about whether the reduced scale can differentiate individuals with the higher ability accurately. To solve the problems, further work such as collecting more items that measure subjects who is extremely opposed to the expansion of nuclear power plant is required.

Introduction

Nuclear energy continues to be a controversial issue in the modern world. Resercher such as, Joseph Hughey, Eric Sundstrom, and John Lounsbury's surveyed the attitude of residents toward a nuclear power plant in their community twice in a 5-year interval. According to their research, the attitudes from resident were predominantly in favor of construction of nuclear power plant with 69% of support. However, five years later, attitudes turn predominantly negative with only 45% of support (Hughey et al, 1985). This raises a question of what might have caused the resident to have a negative attitude toward the construction of nuclear power. The primary goal of this paper is to measure the public negative attitude toward the expansion of the nuclear power plant in South Carolina (SC) and create a shorter unidimensional scale that has better psychometric properties than the original data set. The data used in this paper is from investigator John Besley's data published on the ICPSR (Besley, 2013). The data contains 68 variables and 606 observations. However, only 18 items were chosen out of 68 variables. Each of these items is a survey question that measures the public opinion, which is relevant to the public negative attitude toward the expansion of the nuclear power plant in SC. In the data, the higher score represents opposition to the expansion of nuclear power plant, and the lower score indicates support to the expansion of nuclear power plant. In addition, all item scores are on a scale of one to four, with the exception of item Q12 which has a scale of one to five. (see appendix table 1). To create a scale with better psychrometric properties, the Exploratory Factor Analysis (EFA) and Item Response Theory (IRT) will be used to determine which item to keep.

Method

Data Management

The data is directly downloaded as a R Data format, and program R is used to manipulate the data set. The variables that are irrelevant are dropped from the data, and all the observations with missing values are removed as they will not contribute to the understanding of the trait. The missing values are labeled as NA in the data set, so the only task needed for data cleaning is to exclude the data with NA values. After selecting the data and removing all the observations with missing values, the data has 18 items with 452 observations. Next, the summary statistics for each item are computed, and the result is organized in the summary statistics table includes, the mean, standard deviation, median, minimum, maximum, and standard error for all items (see appendix table 2). There are two items that need rekeying to match the direction of scoring in this paper. For example, the objective of this paper is to measure the negative attitude toward expanding nuclear power plant in SC. A higher value indicates that the subject is more in opposition to the expansion of nuclear power plant, whereas a lower score indicates the opposite. However, higher value in items Q9 and Q15 indicates support to the expansion of nuclear power plant. Hence, these items require rekeying to match the direction of scoring used in this paper. This can be easily accomplished by adding one to the maximum score, then use it to subtract the old value. This allows the new reversed value to match the meaning of the score in this paper. Since binary data are required for IRT, all items are recoded from ordinal to binary data. This is done by assigning all item scores less than 3 into 0, and assigning all item scores greater or equal to 3 into 1.

Scale reduction based on Exploratory Factor Analysis

A scale reduction that is based on Factor Analysis can be used to find a scale that has better psychometric properties. Specifically, Exploratory Factor Analysis (EFA) can be applied to develop a shorter unidimensional scale from a larger set of items. To analysis the data with EFA, it is important to understand the correlation between each pair of items. Since the data contain ordinal variable, the polychoric correlation matrix is computed instead of the correlation matrix (see appendix table 3). The polychoric correlation matrix shows that no correlations are outside of -1 to + 1 range and no items have correlation of 1.0 or 0 with other items. This indicates that the data is ready to perform the EFA. After the analyzing the polychoric correlation, EFA can be performed. To determine the number of factors used in the EFA model The-eigenvalue-greater-than-one rule, suggests by Henry Kaiser, is applied to the data. The criterion indicates that the number of factors should be based on the number of eigenvalues greater than one because "Those with eigenvalues less than 1.00 are not considered to be stable. They account for less variability than does a single variable and are not retained in the analysis" (Girden & Kabacoff, 2011, p. 157). As the result shown, there are only five eigenvalues that are greater than one, so five underlying factors will be assumed in the first EFA model (see table 1).

Table 1 Eigenvalues of the polychoric correlation matrix

EIGENVALUES OF THE POLYCHORIC CORRELATION MATRIX

Eigenvalues
5.2716468490
2.8943343718
1.8700631049
1.4634597601
1.1203649439
0.8805393610
0.8330726297
0.6475289375
0.6109284223
0.4949124195
0.4764963662
0.3829224592
0.3296426093
0.2751572374
0.2056077555
0.1773700363
0.0659527363
0.0000000001

In the first EFA model, five underlying factors are assumed, Ordinary Least Squares (OLS) is selected as the factor method. Noticed that the sum of squared (SS) loadings for factor 3, factor 4, and factor 5 are less than 1, which are relatively low. Since factor 3, factor 4, and factor 5 has low SS loading and for easier interpretation, two factors are assumed for the second EFA model (see table 2).

Table 2 EFA model 1 factor loading

EFA MODEL 1 FACTOR LOADING

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
SS loadings	3.062	1.412	0.885	0.555	0.514
Proportion Var	0.170	0.078	0.049	0.031	0.029
Cumulative Var	0.170	0.248	0.295	0.329	0.357

The next step is to determine which rotation to use. In this paper, orthogonal varimax rotation and oblique oblimin oration are considered. To determine which rotation to use, an EFA model based with oblique oblimin rotation is built to see the correlation between factors. The result shows that the two Factor are lowly correlated with a correlation of 0.22, and this suggests that the orthogonal varimax rotation is a better rotation option to use (see table 3).

Table 3 EFA oblique oblimin rotation factor correlations

EFA OBLIQUE OBLIMIN ROTATION FACTOR CORRELATIONS

Factor correlations	Factor 1	Factor 2
Factor 1	1.00	0.22
Factor 2	0.22	1.00

When orthogonal varimax rotation is done, the factor loading matrix of the EFA model shows that items Q3 to Q8 are highly correlated with factor 1 with all correlations above 0.54, but items Q1, Q2, Q13 are moderately or highly correlated with factor 1 and factor 2 with all correlations above 0.46, and item Q9 is highly correlated with factor 2 with correlation of 0.992. This indicates that item Q3 to Q8 are the best measure of factor 1 and item 9 is a good measure of factor 2. In addition, factor 1 has SS loading of 4.395 and factor 2 has SS loading of 2.738 (see table 4).

Table 4 EFA Orthogonal varimax rotation model Factor loadings

EFA ORTHOGONAL VARIMAX ROTATION MODEL FACTOR LOADINGS

	Factor 1	Factor 2
Q1	0.601	0.465
Q2	0.526	0.627
Q3	0.613	-0.148
Q4	0.778	0.041
Q5	0.772	0.072
Q6	0.771	0.149
Q7	0.547	0.030
Q8	0.809	-0.088
Q9	0.124	0.772
Q10	0.081	-0.653
Q11	0.157	-0.583
Q12	0.319	0.216
Q13	0.586	0.468
Q14	0.257	-0.045
Q15	0.132	0.383
Q16	0.229	-0.128
Q17	0.060	-0.349
Q18	0.027	-0.393
	Factor 1	**Factor 2**
SS loadings	4.395	2.738
Proportion Var	0.244	0.152
Cumulative Var	0.244	0.396

These results indicate that factor 1 measures the negative attitude toward the expansion of nuclear power plant in SC, and factor 2 may have been a measure of safety concerns of the nuclear power plant in SC. Lastly, a one final model that is required to build in order to have a scale that has better psychometric properties, and the purpose of EFA analysis is to find a scale that is unidimensional. For this reason, Items Q3 to Q8 are selected because they are highly correlated to factor 1 and have little to no correlation to factor 2. As a result, a final EFA model with items Q3 to Q8 is built. The factor loading matrix for the final EFA model suggests that item Q8 has the highest correlation with the negative attitude toward the expansion of nuclear power plant in SC which is 0.837, and item Q7 has the lowest correlation which is 0.618. The rest of the items have correlation between 0.672 to 0.802 (see table 5).

Table 5 Final EFA model with unidimensional scale

FINAL EFA MODEL WITH UNIDIMENSIONAL SCALE

	Factor 1
Q3	0.672
Q4	0.775
Q5	0.802
Q6	0.740
Q7	0.618
Q8	0.837

	Factor 1
SS loadings	3.327
Proportion Var	0.554

To prove that the final scale is more unidimensional, the ratio of the largest eigenvalue to the sum of all eigenvalues of the polychoric correlation matrix needs to be compared between the final scale and the initial scale. The larger this ration is, the more unidimensional a set of items is. Here, the initial scale has largest eigenvalue of 5.271647, the sum of all eigenvalues is 18, and the ratio of the ratio is 0.2928693. On the other hand, the final scale has largest eigenvalue of 3.753831, the sum of all eigenvalues is 6, and the ratio of the ratio is 0.6256386. Since, the final scale has a larger ration, this verified that the final scale is more unidimensional than the initial scale (see table 6).

Table 6 Ration of largest eigenvalue to the sum of all eigenvalues of the polychoric correlation matrix

RATION OF LARGEST EIGENVALUE TO THE SUM OF ALL EIGENVALUES OF THE POLYCHORIC CORRELATION MATRIX

	Initial Scale	Final Scale
Largest eigenvalue	5.271647	3.753831
Sum of all eigenvalues	18	6
Ratio of largest eigenvalue to the sum of all eigenvalues	0.2928693	0.6256386

The final EFA model provides a more unidimensional scale that measures specifically the negative attitude toward the expansion of nuclear power plant in SC. Thus, having a higher total score in these values indicates more in opposition to the expansion of nuclear power plant in SC. In general, the total score of the items should reasonably reflect an individual’s negative attitude toward the expansion of nuclear power plant in SC since all items’ correlation to factor 1 are high enough. However, the information gain for the EFA is not enough to identify differential capability of an item, and this will be analyzed based on the IRT.

Classical Test Theory: Cronbach’s Alpha

Lastly, with a more unidimensional scale. It is important to know the items' internal consistency. The internal consistency is measured with Ctonbach's alpha, also known as the coefficient alpha, from the Classical Test Theory (CTT). The result shows that the raw_alpha, which is the coefficient alpha, has a value of 0.77 (see table 7).

Table 7 Reliability Analysis

RELIABILITY ANALYSIS

	raw_alpha	std.alpha	G6(smc)	average_r	S/N	ase	mean	sd
	0.77	0.77	0.74	0.35	3.3	0.017	0.31	0.31
lower alpha upper	95% confidence boundaries							
0.73 0.77 0.8								

However, without any rule of thumb to follow, there is no way to tell whether a coefficient alpha value of 0.77 is sufficient. In this paper, the reliability indices cut-off values will be based on Joseph Ponterotto and Daniel Ruckdeschel' s criterion (see table 8).

Table 8 MATRIX FOR ESTIMATING ADEQUACY OF INTERNAL CONSISTENCY

MATRIX FOR ESTIMATING ADEQUACY OF INTERNAL CONSISTENCY COEFFICIENTS WITH RESEARCH MEASURES

Items Per Subscale	Rating	Sample Size		
		N < 100	N = 100 - 300	N > 300
≤ 6	Excellent	.75	.80	.85
	Good	.70	.75	.80
	Moderate	.65	.60	.75
	Fair	.60	.65	.70
	Excellent	.80	.85	.90
7 - 11	Good	.75	.80	.85
	Moderate	.70	.75	.80
	Fair	.65	.70	.75
≥ 12	Excellent	.85	.90	.90
	Good	.80	.85	
	Moderate	.75	.80	.85

Fair	.70	.75	.80

Note.—An internal consistency coefficient falling below the "Fair" rating for its particular cell would be deemed "Unsatisfactory."

Ponterotto, J., & Ruckdeschel, D. (2007, p. 1003).

Since the unidimensional scale obtained from the final EFA model has 452 observations, total of 6 items, and has a coefficient alpha value of 0.77, according to the cut-off value, the rating for the internal consistency is moderate. While the it may not be good or excellent, it has more than sufficient of internal consistency. Hence, the unidimensional scale obtained from the EFA model is reliable.

Item Response Theory

With the limitations of EFA, it is not possible to accurately measure individuals' abilities based on their performance on the test items and the difficulty of a specific test item. On the other hand, the IRT uses subjects' ability and difficulties of items as information on scaling items. Hence, it is necessary to create a model based on the IRT to further analyze whether a set of test items is informative. To perform the IRT, a unidimensional scale is required. The result from the final Exploratory Factor Analysis (EFA) model suggests that items Q3 to Q8 are a unidimensional scale that measures specifically the negative attitude toward the expansion of nuclear power plant in SC. As a result, items Q3 to Q8 are selected to perform the IRT analysis. There are different models that can be used to perform the IRT analysis, and there is no absolute best model for IRT analysis. In this paper, 3 models are built, which includes the 3 Parameter Logistic (3PL) model, the 2 Parameter Logistic (2PL) model, and Rasch model. The final model will be selected solely based on the Item Characteristic Curves (ICC) graph.

Starting with the 3PL, the 3PL model has three parameters includes the difficulty parameter, the discriminate parameter and, guessing parameter. The difficulty parameter describes the difficulty of a specific item, but this parameter is hard to interpret in the 3PL and 2PL model because the ICC in the graph crossed. The discrimination parameter helps differential capability of an item, and this parameter is used only in the 3PL and 2PL model. To illustrate, all items except item Q7 in the 3PL ICC graph increase rapidly as the ability increases. This indicates that most items have higher discrimination, and this suggests that these items have higher capability to differentiate a subject. The guessing parameter is unique to the 3Pl model, and its purpose is to identify whether a question is randomly answered. For example, sometimes subject may not fully understand the survey question. It is possible that the subject randomly selects an answer. This is a phenomenon Rasch model and 2PL model did not consider. To demonstrate, the 3PL ICC graph shows that the probability at the lowest ability to get item Q8 right did not start at probability of 0. However, other items do not really affect by the guessing parameter (see figure 1).

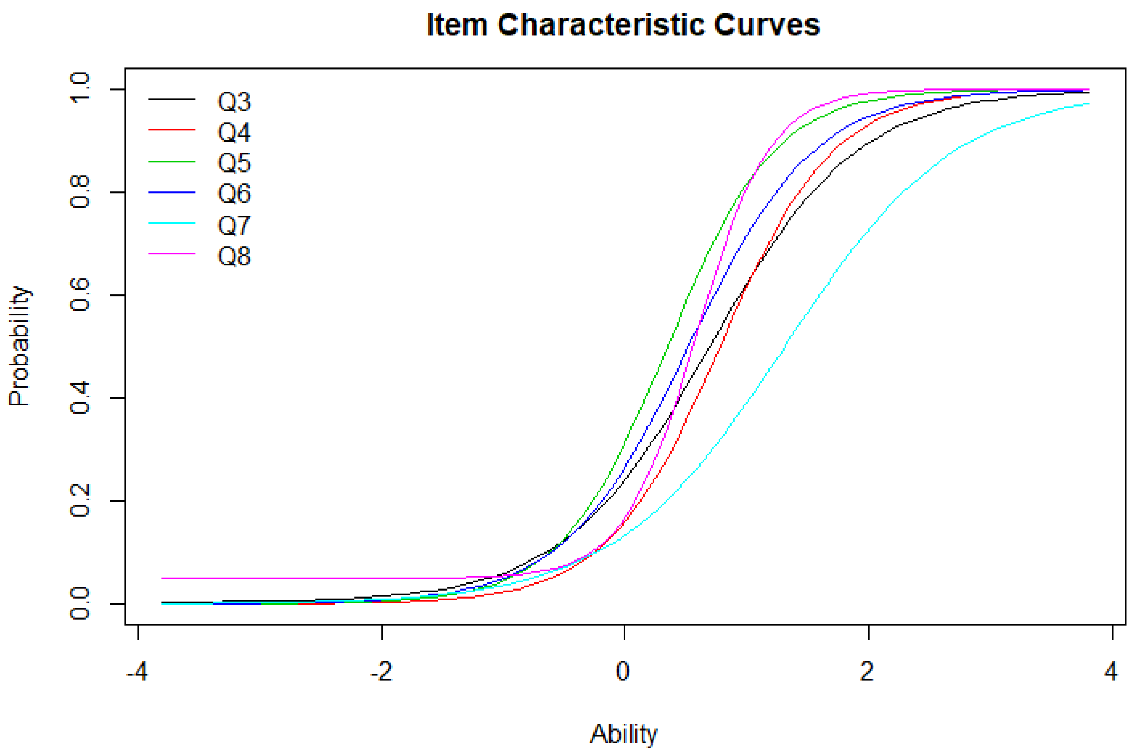

Figure 1 3PL ICC graph

The 2PL model has two parameters, includes the difficulty parameter and the discrimination parameter. Nevertheless, other than having all the items has the probability of 0 at lowest ability, the ICC graph looks identical to the 3PL ICC graph (see figure 2).

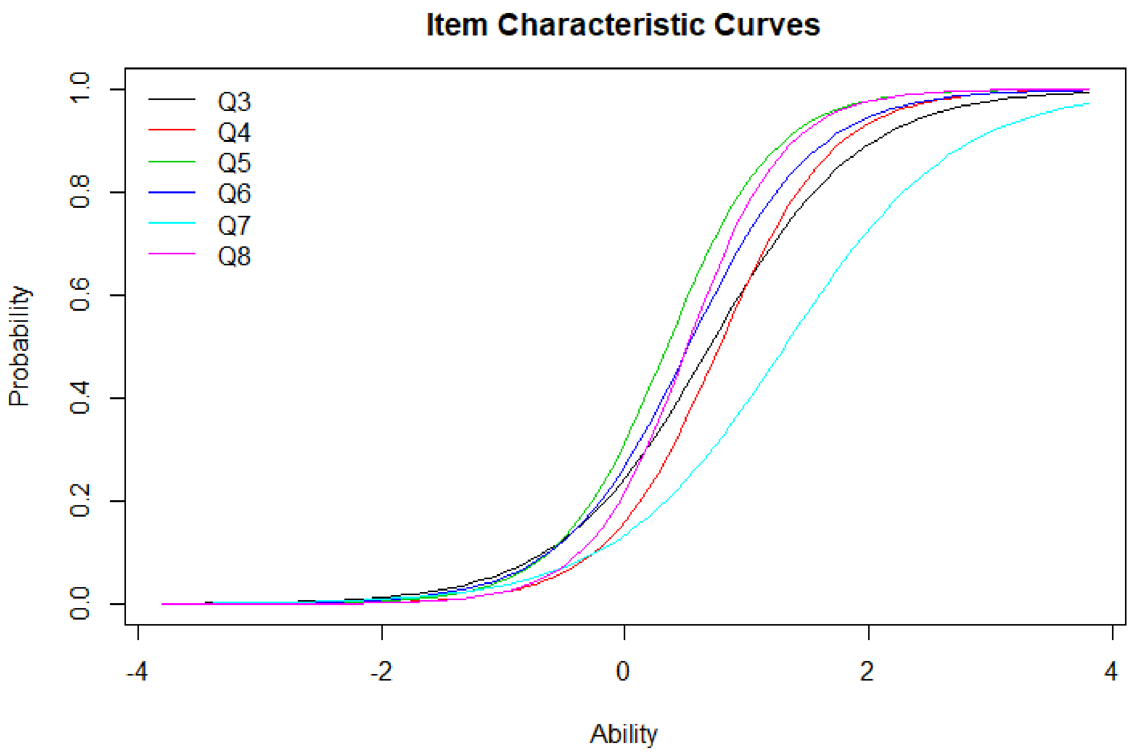

Figure 2 2PL model ICC graph

The Rasch model ICC has only the difficulty parameter. The Rasch model ICC graph shows that all items have logistic curve and most of the items have similar difficulties. In addition, the Rasch model forced the curves to be parallel, so it is easier to interpret the item difficulty than the 3PL model and 2PL model (see figure 1).

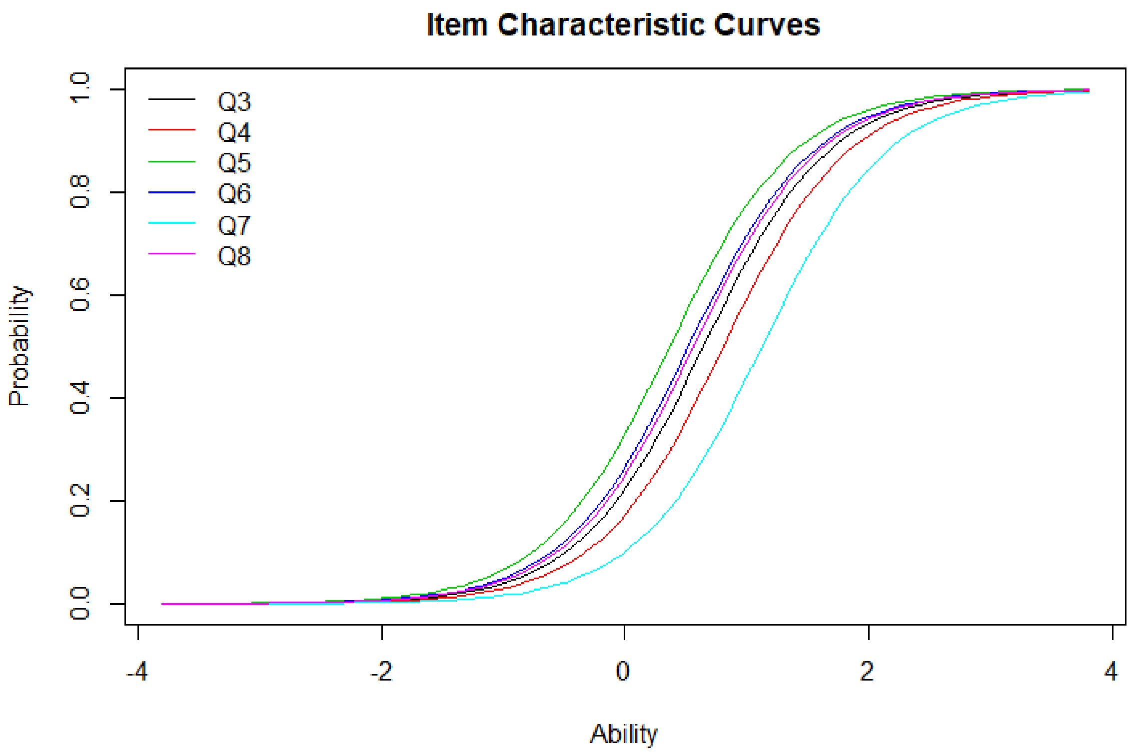

Figure 3 Rasch model ICC graph

In general, which model to select should depends on which ICC graph provide the most information that is needed to interpret a set of items. While providing the most information, the 3PL model only provide slightly more information that the 2PL model provided. The guessing parameter barely affected the shape of graph. In addition, the purpose for this paper is to measure the negative attitude toward the expansion of nuclear power plant in SC. It is more important to have the ability to differentiate subject ability on the higher difficulty, and have items that measures the subject who has higher ability. Regardless, the information provided by 3PL model does not contribute to the purpose of this paper, and the ICC graph for 2PL and 3PL are identical. It is not worth to build a more complicated model just to gain a slight information that is not required. On the other hand, the Rasch model forced all the curves to be paralleled, so it is easier to interpret the difficulties of items. However, forcing all the curves to be paralleled might not be practical in real life. Without the discrimination parameter, numerous of information is lost. To explain, in the 2PL ICC graph, although having lower discrimination, item Q7 is extremely difficult that only subjects with top ability will get it right. This means that a subject who get Q7 right are extremely opposed to the expansion of nuclear power plant in SC, but such information cannot be seen in the Rasch model ICC graph. Therefore, it is not worth for the simplicity to sacrifice so much important information. Consequently, based on the ICC graph, 2PL model is selected as a final model for IRT analysis. The 2PL model coefficient shows that every item has a difficulty above 0, with item Q7 being the hardest item, which has the difficulty value of 1.309. Additionally, item Q8 has the highest discrimination with a value of 2.502, and item Q7 has the lowest discrimination value of 1.42. This suggests that item Q8 has better capability of differentiating the attitude to nuclear expansion in SC while item Q7 can identify which subject is extremely opposed to nuclear expansion in SC (see table 9).

Table 9 2PL coefficient

2PL COEFFICIENT

Items	Difficulty	Discriminate
Q3	0.6931487	1.621709
Q4	0.7708302	2.144631
Q5	0.3393701	2.273539
Q6	0.5185703	1.922598
Q7	1.3091806	1.420250
Q8	0.5080030	2.502842

The above findings are reflected in the 2PL model item information curve (IIC) graph. The IIC graph shows that item Q8 provides the most information between ability 0 to 2. As for item Q7, despite giving relativity low information than other items in ability range from 0 to 2, it gives the most information when ability is greater than 2. The rest of the items has similar information coverage, but there is no information coverage in lower ability (see figure 4).

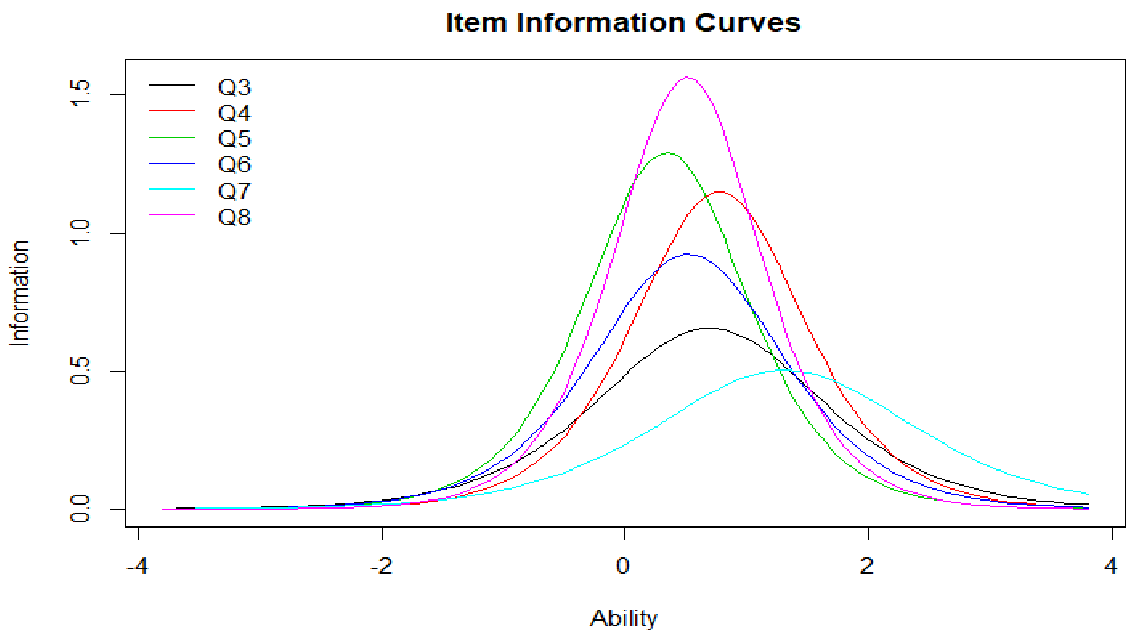

Figure 4 2PL IIC graph

Alternative, the test information and standard error of measurement plot illustrates that the test information are normally distributed with most of the abilities are close to the average 1. Furthermore, the standard error is high when the abilities are lower than -2, but the standard error is minimized when the ability is in between 0 to 2, which is when the test information is high. As the ability increase beyond 3, the standard error begins to increase rapidly again (see figure 5).

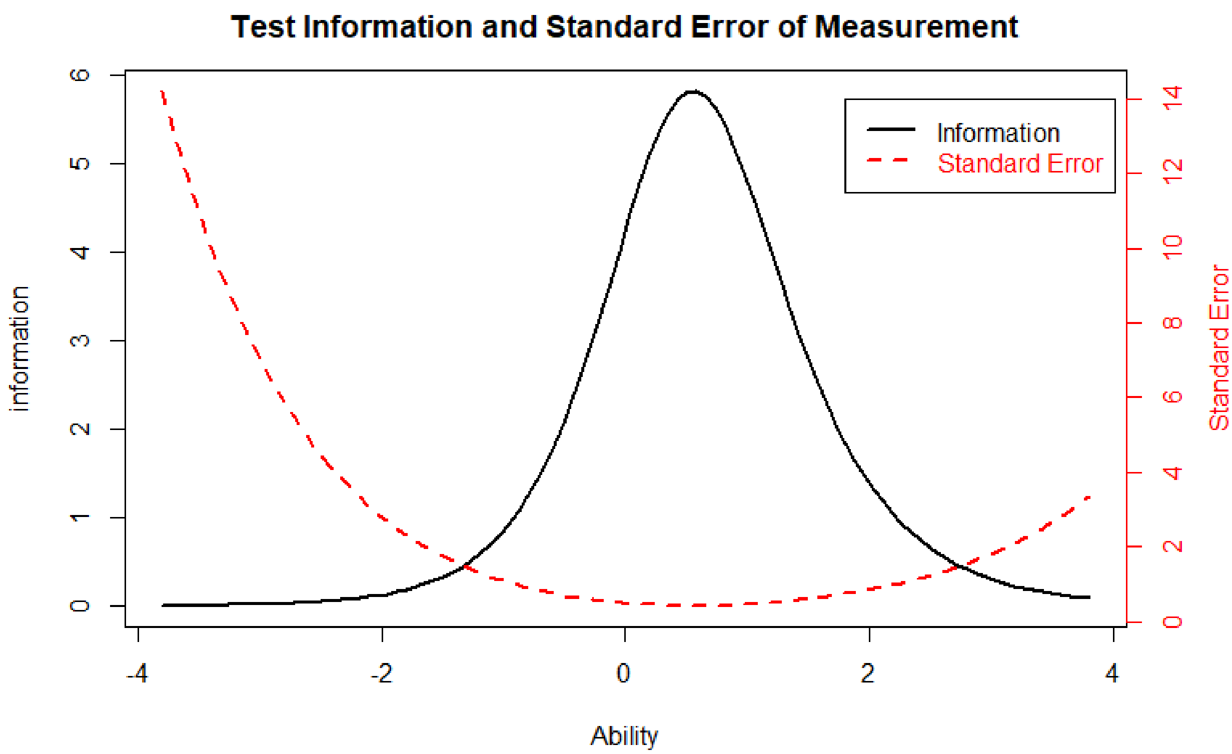

Figure 5 2PL Test information and SE of measurement

Result

The scale reduction based on EFA orthogonal varimax rotation model effectively selected items that are highly correlated to the negative attitude toward the expansion of nuclear power plant in SC. In addition to that, all the selected items have correlation above 0.61. The reduced scale with items Q3 to Q8 is proven to be unidimensional with a higher ratio of largest eigenvalue to the sum of all eigenvalues of the polychoric correlation matrix than the initial scale. According to Joseph Ponterotto and Daniel Ruckdeschel' s criterion, the coefficient alpha with a value of 0.77 has a moderate internal consistency, which is more than sufficient. The analysis based on IRT suggests that, using the 2PL model is most appropriate, by providing sufficient information on the high ability. The 2PL coefficient shows that item Q7 is the hardest item, with a difficulty value of 1.309. Additionally, item Q8 has the highest discrimination with a value of 2.502, and other items all have discrimination values above 1.5, except for item Q7, which has the lowest discrimination value of 1.42. The IIC graph of 2PL model shows that all items have high information around ability 0 to 2, whereas item Q7 provides great information on the higher ability. In addition to that, the 2PL model test information and standard error of measurement indicates that the 2PL model has high information when measuring individuals with abilities around 0 to 2 with a relatively low standard error.

Discussion

Overall, the reduced scale with items Q3 to Q8 that is selected based on the EFA has a unidimensional scale, that measures specifically the negative attitude toward the expansion of nuclear power plant in SC with an internal consistency that is above satisfactory. The further analysis of the reduced scale with items Q3 to Q8 that is based on IRT 2PL model provides great information on the high ability. In fact, higher ability means a subject is more in opposition to expansion in SC, and lower ability means the opposite. The objective in this paper is to measure the negative attitude toward nuclear expansion in SC and develop a scale that has better psychometric properties. Therefore, the high standard error in the lower ability range is totally neglectable, and high information in the higher ability measures the negative attitude toward nuclear expansion. Combine with the result found in the EFA model and IRT 2PL model, the result shows that the reduced scale items Q3 to Q8 is a good scale that measures specifically the negative attitude toward nuclear plant expansion in SC, and it is especially effective when measuring the subjects that are more in opposition to it with a reasonably high information and low standard error. As results shown by EFA and IRT, the reduced scale is proven to have better psychometric properties than the initial data set. Nevertheless, the measurement only has lower standard error between ability score 0 to 2. This is due to lack of high difficulty items, and the only difficult item is Q7. Although the standard error is not ridiculously high as the standard error for negative ability score, it still raises concerns about whether the reduced scale can differentiate subjects with the higher ability accurately. Another concern is that the local independent assumption was not checked, even though the unidimensional scale should mitigate the potential problem. To solve the problem, further work such as, collecting more items that measure subjects who is extremely opposed to the expansion of nuclear power plant is required, and this could also improve the internal consistency.

Appendix

Table 1 Item Summary

ITEM DESCRIPTION AND ITEM SCALE

Items	Item description	Item scale
Q1	The fairness of share benefits of nuclear power plant in SC	1 VERY FAIR 2 SOMEWHAT FAIR 3 SOMEWHAT UNFAIR 4 VERY UNFAIR
Q2	The fairness of share risk of nuclear power plant in SC	1 VERY FAIR 2 SOMEWHAT FAIR 3 SOMEWHAT UNFAIR 4 VERY UNFAIR
Q3	The effectiveness of public hearing about nuclear power in SC	1 VERY EFFECTIVE 2 SOMEWHAT EFFECTIVE 3 NOT TOO EFFECTIVE 4 NOT AT ALL EFFECTIVE
Q4	The fairness of way to give SC citizen a voice in decision-making about the nuclear power	1 VERY FAIR 2 SOMEWHAT FAIR 3 SOMEWHAT UNFAIR 4 VERY UNFAIR
Q5	The respect of decision-makers in public hearing process	1 A GREAT DEAL OF RESPECT 2 SOME RESPECT 3 NOT TOO MUCH RESPECT 4 NO RESPECT AT ALL
Q6	The trustworthiness of decision-makers in public hearing process about nuclear power	1 VERY TRUSTWORTHY 2 SOMEWHAT TRUSTWORTHY 3 NOT TOO TRUSTWORTHY 4 NOT AT ALL TRUSTWORTHY

Q7	The knowledge and expertise of decision-maker in public hearing process	1 VERY KNOWLEDGEABLE 2 SOMEWHAT KNOWLEDGEABLE 3 NOT TOO KNOWLEDGEABLE 4 NOT AT ALL KNOWLEDGEABLE
Q8	Legitimateness of deciding whether to expand nuclear power plant in public hearing process	1 VERY LEGITIMATE 2 SOMEWHAT LEGITIMATE 3 NOT TOO LEGITIMATE 4 NOT AT ALL LEGITIMATE
Q9	Concerns about safety of nuclear power plant	1 VERY CONCERNED 2 SOMEWHAT CONCERNED 3 NOT TOO CONCERNED 4 NOT AT ALL CONCERNED
Q10	Concerns about the environment impact of nuclear power	1 VERY CONCERNED 2 SOMEWHAT CONCERNED 3 NOT TOO CONCERNED 4 NOT AT ALL CONCERNED
Q11	Concerns about obtaining energy independence in the United States	1 VERY CONCERNED 2 SOMEWHAT CONCERNED 3 NOT TOO CONCERNED 4 NOT AT ALL CONCERNED
Q12	How expensive the nuclear power will end up	1 A LOT LESS EXPENSIVE 2 A LITTLE LESS EXPENSIVE 3 ABOUT THE SAME COST 4 A LITTLE MORE EXPENSIVE 5 A LOT MORE EXPENSIVE
Q13	Favor or oppose expanding nuclear plant in the midlands of SC.	1 STRONGLY FAVOR 2 SOMEWHAT FAVOR 3 SOMEWHAT OPPOSE

		4 STRONGLY OPPOSE
Q14	How important is to expand nuclear power plants in SC	1 MOST IMPORTANT ISSUE
		2 VERY IMPORTANT ISSUE
		3 SOMEWHAT IMPORTANT
		4 NOT TOO IMPORTANT
Q15	How angry one would be if disagree with final decision regardless of outcome	1 VERY ANGRY
		2 SOMEWHAT ANGRY
		3 NOT TOO ANGRY
		4 NOT AT ALL ANGRY
Q16	How much one heard about expanding nuclear power in SC	1 A LOT
		2 SOME
		3 A LITTLE
		4 NOTHING AT ALL
Q17	How much attention paid to new about nuclear power plant expansion in local newspapers	1 A LOT
		2 SOME
		3 A LITTLE
		4 NONE AT ALL
Q18	How much attention paid to TV about nuclear power plant expansion in local TV stations	1 A LOT
		2 SOME
		3 A LITTLE
		4 NONE AT ALL

Table 2 Summary Descriptive Statistics

SUMMARY DESCRIPTIVE STATISTICS

items	mean	SD	median	min	max	SE
Q1	2.119	0.8879	2	1	4	0.04176
Q2	2.055	0.9175	2	1	4	0.04315
Q3	2.21	0.8358	2	1	4	0.03931
Q4	2.139	0.8887	2	1	4	0.0418

Q5	2.405	0.7459	2	1	4	0.03508
Q6	2.343	0.7649	2	1	4	0.03598
Q7	1.954	0.7908	2	1	4	0.0372
Q8	2.299	0.8083	2	1	4	0.03802
Q9	3.179	0.9972	4	1	4	0.0469
Q10	3.146	0.928	3	1	4	0.04365
Q11	1.279	0.5668	1	1	4	0.02666
Q12	2.965	1.211	3	1	5	0.05696
Q13	2.133	0.9651	2	1	4	0.04539
Q14	2.783	0.7662	3	1	4	0.03604
Q15	2.186	0.9256	2	1	4	0.04354
Q16	2.637	0.977	3	1	4	0.04595
Q17	1.934	0.99	2	1	4	0.04656
Q18	1.858	0.8796	2	1	4	0.04137

Table 3 Polychoric Correlation

Table continues below

POLYCHORIC CORRELATION

	Q1	**Q2**	**Q3**	**Q4**	**Q5**	**Q6**	**Q7**
Q1	1	0.678	0.211	0.538	0.485	0.53	0.262
Q2	0.678	1	0.151	0.325	0.404	0.516	0.27
Q3	0.211	0.151	1	0.663	0.493	0.44	0.294
Q4	0.538	0.325	0.663	1	0.598	0.513	0.441
Q5	0.485	0.404	0.493	0.598	1	0.682	0.549
Q6	0.53	0.516	0.44	0.513	0.682	1	0.485
Q7	0.262	0.27	0.294	0.441	0.549	0.485	1
Q8	0.346	0.418	0.612	0.635	0.611	0.605	0.574
Q9	0.493	0.583	-0.0512	0.132	0.112	0.254	0.0515
Q10	-0.233	-0.19	0.05	0.0323	-0.0281	-0.0367	0.0979
Q11	0.00102	-0.24	0.0633	-0.00962	-0.0274	0.142	-0.181
Q12	0.35	0.363	0.142	0.261	0.159	0.225	0.115

Q13	0.637	0.686	0.168	0.451	0.398	0.516	0.227
Q14	0.141	0.07	0.159	0.206	0.235	0.177	-0.0333
Q15	0.309	0.342	-0.0181	0.187	0.118	0.155	0.104
Q16	0.0888	0.0874	0.0904	0.127	0.172	0.109	0.106
Q17	-0.0337	-0.207	0.044	-0.0328	-0.0147	-0.0303	-0.0228
Q18	-0.111	-0.267	0.0167	0.0664	-0.0645	-0.0708	-0.0306

Table continues below

	Q8	Q9	Q10	Q11	Q12	Q13	Q14
Q1	0.346	0.493	-0.233	0.00102	0.35	0.637	0.141
Q2	0.418	0.583	-0.19	-0.24	0.363	0.686	0.07
Q3	0.612	-0.0512	0.05	0.0633	0.142	0.168	0.159
Q4	0.635	0.132	0.0323	-0.00962	0.261	0.451	0.206
Q5	0.611	0.112	-0.0281	-0.0274	0.159	0.398	0.235
Q6	0.605	0.254	-0.0367	0.142	0.225	0.516	0.177
Q7	0.574	0.0515	0.0979	-0.181	0.115	0.227	-0.0333
Q8	1	-0.0945	0.159	0.0422	0.165	0.422	0.181
Q9	-0.0945	1	-0.654	-0.455	0.182	0.516	0.0907
Q10	0.159	-0.654	1	0.54	-0.215	-0.284	-0.0825
Q11	0.0422	-0.455	0.54	1	0.133	0.0629	0.288
Q12	0.165	0.182	-0.215	0.133	1	0.414	0.215
Q13	0.422	0.516	-0.284	0.0629	0.414	1	0.21
Q14	0.181	0.0907	-0.0825	0.288	0.215	0.21	1
Q15	0.104	0.123	-0.15	-0.433	0.0725	0.352	-0.253
Q16	0.0923	0.0885	0.0791	0.207	0.212	0.167	0.154
Q17	0.0324	-0.11	0.124	0.267	-0.112	-0.0182	0.0304
Q18	-0.0723	-0.131	0.182	0.363	-0.0462	-0.0693	-0.0647

	Q15	Q16	Q17	Q18
Q1	0.309	0.0888	-0.0337	-0.111
Q2	0.342	0.0874	-0.207	-0.267
Q3	-0.0181	0.0904	0.044	0.0167
Q4	0.187	0.127	-0.0328	0.0664
Q5	0.118	0.172	-0.0147	-0.0645

Q6	0.155	0.109	-0.0303	-0.0708
Q7	0.104	0.106	-0.0228	-0.0306
Q8	0.104	0.0923	0.0324	-0.0723
Q9	0.123	0.0885	-0.11	-0.131
Q10	-0.15	0.0791	0.124	0.182
Q11	-0.433	0.207	0.267	0.363
Q12	0.0725	0.212	-0.112	-0.0462
Q13	0.352	0.167	-0.0182	-0.0693
Q14	-0.253	0.154	0.0304	-0.0647
Q15	1	-0.111	-0.0995	-0.0735
Q16	-0.111	1	0.319	0.248
Q17	-0.0995	0.319	1	0.659
Q18	-0.0735	0.248	0.659	1

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