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DATA 5070

Factor Analysis allows us to look at the relationship between a large number of variables (such as in this case, the questionnaire on ESI – Expression of Spirituality Inventory) and see whether they can be grouped and summarized using a smaller number of factors or latent (hidden) variables. Spirituality Adjective List (SAL) is an exploratory self-report questionnaire made up of 40 items that was designed to study the concept of spirituality. 1422 participants completed a questionnaire examining views on their spirituality by choosing their sample characteristics using the five-point scale, rate the extent to which you agree with each statement as it applies to participants. The questionnaire had 100 items and answers were given on a scale of 0 to 4 where 0 is Strongly Disagree, 1 is Disagree, 2 is Neutral, 3 is Agree and 4 is Strongly Agree.

There are different types of factor analysis, and different methods for carrying out. Two types of FA are exploratory factor analysis which is used to describe the data by grouping together variables that are highly correlated; confirmatory factor analysis is to test the theory of latent processes. This paper will focus primarily on exploratory factor analysis using Principal Components Analysis (PCA), including questions that Dr. MacDonald listed in the assignment prompt.

PCA aims to summarize the patterns of correlations among observed variables, to reduce many observed variables to a small number of factors, to provide an operational definition for an underlying process by using observed variables [Textbook*, pg. 612]. The following steps of conducting PCA are:

- Measuring a set of variables
- Preparing the correlation matrix
- Extracting a set of factors from the correlation matrix
- Determining the number of factors
- Rotating the factors to increase interpretability
- Interpreting the result.

* Refers to the textbook provided by Dr. MacDonald in Blackboard named Primer on Factor Analysis.
[ ] The square bracket refers to Appendix.

1 Measurement

1.1 Reliability of SAL items- we are measuring the items for reliability analysis; we obtained the reliability score of 0.90 which is above the threshold of 0.9 according to Cronbach's Alpha table [I]. Therefore, we can conclude that the items that were used for spirituality is reliable.

Reliability Statistics

Cronbach's Alpha	*N of Items*
.90	40

Though, there is a downside to the dataset. It has been reported that some populations appear to have difficulty completing the ESI due to its long length, repetitiveness, and possibly not having the ability to understand English language (not all of them are native speakers). While this is important for reliability, we might dismiss this as we have a good score for reliability.

1.2 Descriptive Statistics - We also can determine the descriptive statistics of all variables by using the Descriptive Statistics in Analyze Tool in PSPP.

1.2.1. Missing values

There are missing values in categorical variables which include age and sex, but they are not useful for this paper, hence we can dismiss those missing values. Consequently, SAL variables don't contain missing values. (Output for first variable is in next section and the rest of the variables are in Appendix[II])

1.2.2 Frequencies

We can use the **frequency** statistics to count the number of times that each SAL occurs. For instance, COD 1 (sal1- Cognitive Orientation toward Spirituality), out of 1422 participants in the sample, 28 chose 0.00 indicating that they strongly disagreed with the statement. Here is the output of the frequencies conducted for COD 1/sal1 in PSPP [III]:

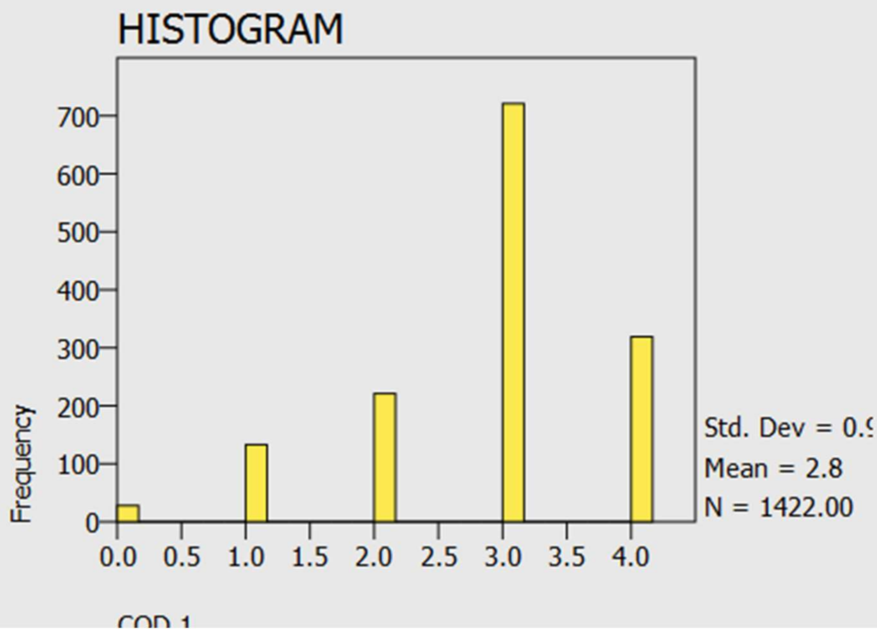
* Refers to the textbook provided by Dr. MacDonald in Blackboard named Primer on Factor Analysis.
[ ] The square bracket refers to Appendix.

COD 1

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
	.00	28	1.97	1.97	1.97
	1.00	133	9.35	9.35	11.32
	2.00	221	15.54	15.54	26.86
	3.00	721	50.70	50.70	77.57
	4.00	319	22.43	22.43	100.00
	Total	1422	100.0	100.0	

COD 1

N	*Valid*	1422
	Missing	0
Mean		2.82
S.E. Mean		.03
Std Dev		.95
Variance		.90



Interpretation of the figure above: I used **histogram** to visualize the frequencies of the SAL 1 variable and **3** (indicates Agree) is the most selected for Cognitive Orientation toward Spirituality. (Look at table in appendix for the rest of the Sal variables)

1.2.2 Basic Descriptive Stats

Below are the descriptive statistics of the variables in the sample, and we notice that all standard deviation is more than 0.60 which indicates how widely spread the data are and the mean of each item is close to each other in terms of the average number.

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[ ] The square bracket refers to Appendix.

Report

	Mean	N	Std. Deviation
COD 1	2.82	1422.00	.95
EWB 2	3.10	1422.00	.77
EWB 3	2.84	1422.00	.78
COD 4	2.95	1422.00	.79
EWB 5	2.98	1422.00	.83
EWB 6	2.28	1422.00	1.13
REL 7	2.21	1422.00	.98
REL 8	2.65	1422.00	.98
REL 9	3.11	1422.00	.88
REL 10	3.20	1422.00	.98
COD 11	2.88	1422.00	.86
COD 12	2.87	1422.00	.85
PAR 13	1.57	1422.00	1.29
EWB 14	2.93	1422.00	.89
COD 15	2.92	1422.00	.81
PAR 16	2.28	1422.00	1.36
EWB 17	2.39	1422.00	.91
PAR 18	2.41	1422.00	.98
PAR 19	3.40	1422.00	.64
COD 20	3.21	1422.00	.59
COD 21	2.78	1422.00	.90
EPD 22	2.38	1422.00	1.09
REL 23	2.39	1422.00	1.21
PAR 24	2.41	1422.00	1.21
EWB 25	2.99	1422.00	.67
COD 26	2.81	1422.00	.88
PAR 27	2.38	1422.00	1.29
EWB 28	2.48	1422.00	1.11
COD 29	3.03	1422.00	.79
EPD 30	2.53	1422.00	.89
EPD 31	2.90	1422.00	.87
EPD 32	2.90	1422.00	.83
COD 33	3.10	1422.00	.73
COD 34	2.99	1422.00	.75
COD 35	3.01	1422.00	.78
EWB 36	2.85	1422.00	.80
EPD 37	3.33	1422.00	.93
EWB 38	2.77	1422.00	.87
EWB 39	2.69	1422.00	.85
EWB 40	3.12	1422.00	.87

<u>2 Conducting correlation matrix and how many factors to be extracted</u>

<u>2.1 Conducting a factor analysis using varimax rotation</u> - Since factor analysis deviates from a correlation matrix, we can determine the factorial dimensionality using PCA method with varimax rotations of the factor solution by using Factor Analysis in PSPP in Analyze Tool and here's the following output for the factor analysis:

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[ ] The square bracket refers to Appendix.

Total Variance Explained

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	8.95	22.38	22.38	3.77	9.43	9.43
2	3.44	8.59	30.97	4.04	10.09	19.52
3	1.72	4.29	35.26	2.01	5.03	24.55
4	1.62	4.05	39.30	2.03	5.09	29.64
5	1.43	3.59	42.89	2.81	7.04	36.67
6	1.30	3.24	46.13	2.17	5.44	42.11
7	1.22	3.06	49.19	1.54	3.84	45.95
8	1.15	2.88	52.07	2.45	6.12	52.07
9	1.00	2.50	54.57			
10	.97	2.41	56.98			
11	.88	2.20	59.18			
12	.87	2.18	61.36			
13	.84	2.09	63.46			
14	.82	2.04	65.50			
15	.77	1.92	67.42			
16	.74	1.84	69.26			
17	.71	1.77	71.03			
18	.69	1.72	72.75			
19	.67	1.68	74.43			
20	.66	1.65	76.08			
21	.63	1.57	77.65			
22	.62	1.56	79.21			
23	.59	1.47	80.69			
24	.58	1.46	82.14			

Figure (not completely shown) explained: As there are 40 SAL variables, 40 factors extracted from running factor analysis. However, a lot of these factors are meaningless since we want to extract the smallest number of factors that we can, that best explains the patterns in our data. Each component has a quality score called an Eigenvalue. Only components with eigenvalues *more* than 1.00 are likely to be represented real underlying factors, so in this case, we extract **8** factors at 1.15 for total initial eigenvalue.

The % of Variance column illustrates how much of the variance in the data can be explained by each other. We notice that the first few factors account for relatively large proportion of variance compared to the latter factors.

There is only one sal variable has lower communality [VI] which meant that this variable doesn't contribute significantly to the fit of the overall variables. With that being said, communality values are generally higher for all the sal variables which indicates that the variables are well represented by 8 factors. For instance, about 68% of the variability of REL 9/sal9 is explained by the first 8 factors.

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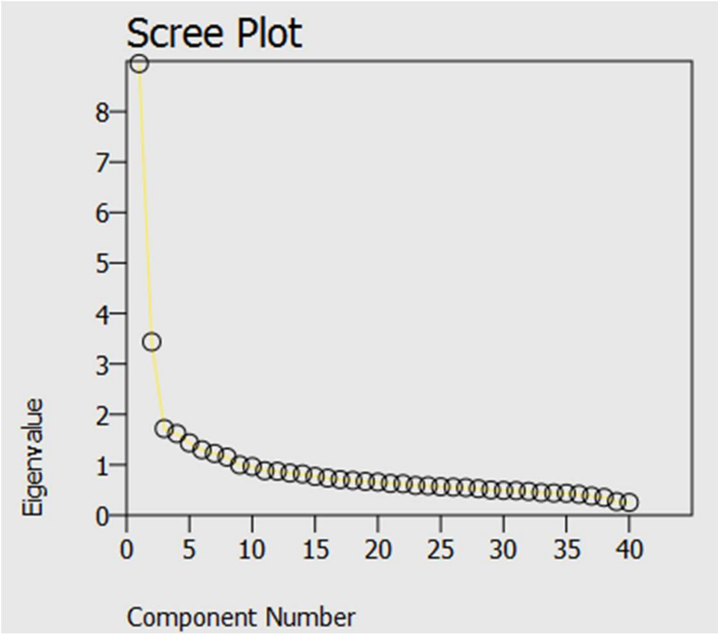

The figure above is a scree plot which visualizes the eigenvalues we obtained. Although it is hard to tell which component has eigenvalue at least 1, but the breaking point of the scree-plot with the help of the output above is at 8 or 9 factors; extractions of only 8 factors would account for about 2.90 % of variance but improves the overview of rotation component matrix.

3. Rotating the factors to increase the interpretability.

3.1 Identifying the correct method of rotation is appropriate when certain assumptions have been met:

- Establishing the data to be adequate for the factor analysis (through KMO)
- Establishing the data to be normally distributed (through Bartlett's test of Sphericity)

There is no KMO test option in PSPP; however, I can run the syntax [V] with KMO added (it automatically comes with Bartlett's test of Sphericity) and that's how the output came out:

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.92
Bartlett's Test of Sphericity	Approx. Chi-Square	17822.90
	df	780
	Sig.	.000

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The KMO value of 0.92 is adequate enough for the factor analysis and the Bartlett's test of Sphericity is less than p-value = 0.001, and thereby indicating that the data is normally distributed. Bartlett's test evaluated all factors together and each factor separately against the hypothesis that there are no factors.

3.2 Rotating the factors

The rotation component matrix table below describes the factor loading of each of the variables onto each of their factors. In the varimax rotated component loading matrix, we treat a rotated loading coefficient of 0.50 or higher as a high loading. I highlighted the variables that load most strongly onto **Factor 1** which items seem to refer to the importance of awareness of spirituality through experiences of life. For **Factor 2**, items seem to have strong religious beliefs. For **Factor 3,** interestingly, items seem to have beliefs of paranormal phenomena of a psychological nature such as ghosts, spirits, superstitious, etc. For **Factor 4,** items seem to have expressed through a sense of meaning and purpose for existence, and most importantly, a perception of self as being competent and able to cope with the difficulties of life and limitations of human being/existence. For **Factor 5**, items seem to the importance of having beliefs, attitudes and perceptions regarding the nature of spirituality. For **Factor 6**, items seem to somewhat account everything except religious beliefs and superstitious. For **Factor 7**, it is similar to Factor 3 since there is only one highly component matrix for PAR 19. For **Factor 8**, items seem to be EPD 30 which represent someone who undergoes some spiritual/supernatural thing or miracles in life. Based on those factor representations, this provide sufficient evidence that the varimax rotation method is appropriate for the factor analysis to be carried out on the 8 variables.

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[ ] The square bracket refers to Appendix.

Rotated Component Matrix

	Component							
	1	2	3	4	5	6	7	8
COD 1	.13	.21	.19	.04	.04	.71	-.07	.07
EWB 2	.14	.17	.01	.12	.12	.73	.04	.08
EWB 3	.47	.00	.02	-.19	.19	.18	.15	.16
COD 4	.37	.06	.15	-.05	.46	.17	.01	.12
EWB 5	.58	-.02	-.07	.01	.09	.01	.26	.23
EWB 6	.05	.20	.03	.20	.05	.08	-.06	.63
REL 7	.16	.31	.00	-.22	.17	.11	.03	.52
REL 8	.05	.67	-.03	-.05	.02	.13	-.07	.30
REL 9	.01	.77	.04	.03	.03	.09	.06	.23
REL 10	.03	.74	.28	.10	.07	.15	.08	.01
COD 11	.72	.10	.00	.03	.05	.07	.09	.08
COD 12	.70	.12	-.04	.01	.08	.15	.00	-.09
PAR 13	-.07	-.03	.79	-.11	.05	.02	.02	.05
EWB 14	-.07	.17	.01	.59	.05	.03	.24	.17
COD 15	.56	.05	.04	.28	.25	.00	.08	.07
PAR 16	.10	.35	.56	.33	.09	.12	-.32	-.01
EWB 17	.50	.09	.14	.24	.12	.22	-.14	.28
PAR 18	.28	.11	.21	.28	.00	.06	-.03	.46
PAR 19	.18	.08	-.04	.23	.09	.00	.68	.00
COD 20	.11	.04	.03	.15	.62	.09	.20	.06
COD 21	.03	.08	.03	.57	.17	.11	-.09	.20
EPD 22	.03	.47	.17	.21	.07	.11	-.10	.45
REL 23	.04	.55	.01	.19	.04	.08	-.30	.17
PAR 24	-.01	.27	.67	.02	-.03	.08	.13	.15
EWB 25	.30	.09	.02	.47	.05	.28	.18	.20
COD 26	.36	.04	.07	.39	.14	.19	.07	-.14
PAR 27	.15	.35	.55	.31	.10	.10	-.30	.01
EWB 28	.01	.04	-.08	.18	.21	.11	-.27	.17
COD 29	.03	-.05	-.01	.07	.37	.19	.48	.16
EPD 30	.29	.28	.14	.13	.10	.08	.09	.55
EPD 31	.23	.36	.00	.03	.07	.40	.19	.37
EPD 32	.15	.13	.02	.18	.21	.66	.02	.14
COD 33	.10	.18	-.04	.25	.67	.21	.06	-.09
COD 34	.24	.14	-.01	.06	.71	.00	-.06	.05
COD 35	.28	.01	.09	-.02	.68	.03	.02	.17
EWB 36	.22	-.05	-.03	.30	.21	.13	.25	.47
EPD 37	.05	.81	.18	.06	.10	.08	.08	.01
EWB 38	.51	.11	-.02	.00	.41	.00	-.15	.21
EWB 39	.59	.08	.00	.06	.25	.09	-.12	.15
EWB 40	.29	.58	.03	.11	.13	.09	.03	.03

3.2 Creating new subscale variables

Interestingly, there are no considerate overlaps with factor rotation component matrix coefficients between the components. With that being said, we could create new SAL subscale variables using identified factors as a basis for the development of subscales. Think of the

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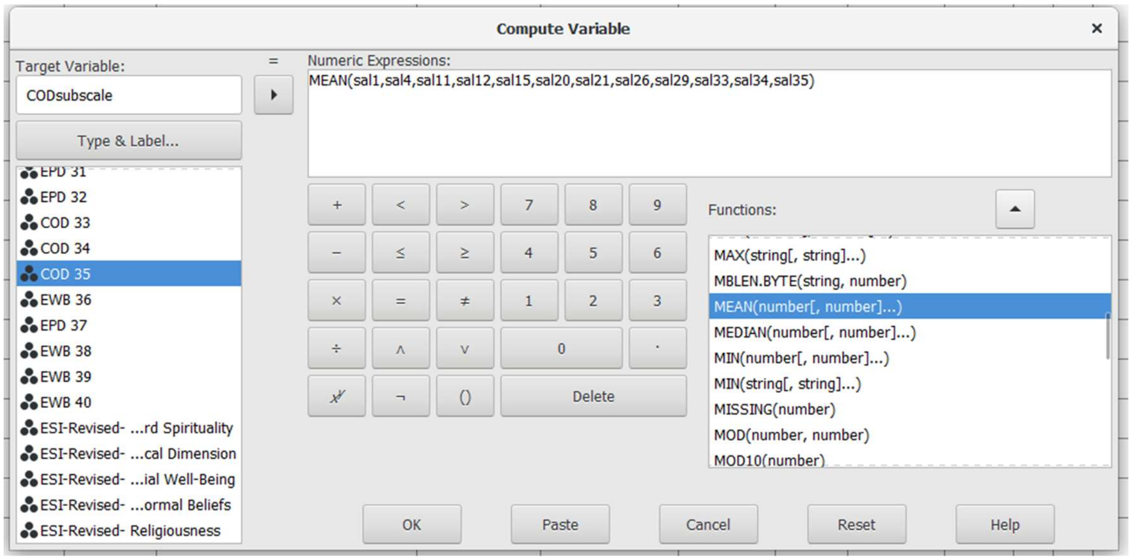
subscales as grouping the items into one general item. For instance, we can use all COD variables as a subscale and compute them with mean because the items belong to each aspect as reflected in factor rotation component matrix (output in Appendix [IV]), here is the screenshot of the computation by using Transform Tool:



The result that arrives is the mean of the COD variables, namely COD subscale for a Target Variable and the rest of the subscales, below:

11 : esirepd 12.00

Case	esirepd	esirewb	esirpar	esirrel	CODsubscale	EWBsubscale	RELsubscale	PARsubscale	EPDsubscale
1	12.00	18.00	15.00	19.00	3.00	2.55	3.40	2.83	3.00
2	13.00	15.00	13.00	19.00	3.00	2.73	2.60	2.67	2.60
3	9.00	23.00	6.00	11.00	3.42	3.00	2.00	2.33	2.20
4	2.00	22.00	5.00	24.00	3.58	3.27	3.40	2.50	3.60
5	3.00	23.00	8.00	4.00	3.25	2.82	1.60	2.00	2.00
6	9.00	18.00	11.00	11.00	3.00	2.55	1.60	2.17	2.40
7	11.00	20.00	13.00	5.00	3.67	3.18	1.00	2.50	1.20
8	15.00	12.00	18.00	21.00	3.17	3.00	3.20	3.33	3.40
9	1.00	21.00	13.00	19.00	2.58	2.55	2.80	2.50	2.60
10	13.00	21.00	8.00	23.00	3.50	3.45	3.60	3.00	3.80
11	12.00	18.00	15.00	23.00	3.58	3.45	3.00	3.67	3.40
12	12.00	21.00	9.00	20.00	3.00	2.64	3.40	3.17	3.20
13	13.00	18.00	15.00	16.00	2.75	2.82	2.20	2.83	2.40
14	12.00	10.00	13.00	9.00	3.08	2.82	1.40	2.50	2.20
15	11.00	6.00	10.00	17.00	1.83	1.64	2.00	2.50	2.00

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[ ] The square bracket refers to Appendix.

Consequently, we can use other SAL items for creating subscales such as EWB, EPD, PAR, and REL and the descriptive statistics of all subscales are displayed after running Desriptives in PSPP below:

Valid cases = 1422; cases with missing value(s) = 0.

Variable	N	Mean	Std Dev	Kurtosis	S.E. Kurt	Skewness	S.E. Skew	Minimum	Maximum
COD subscale	1422	2.95	.44	.09	.13	-.02	.06	1.42	4.00
EWB subscale	1422	2.82	.44	.40	.13	.04	.06	.91	4.00
REL subscale	1422	2.71	.71	1.17	.13	-.87	.06	.00	4.00
PAR subscale	1422	2.41	.70	-.31	.13	-.09	.06	.50	4.00
EPD subscale	1422	2.81	.64	-.01	.13	-.38	.06	.80	4.00

Interpretation of the figure above: the mean of the subscales is in a certain range of about .30 difference, the standard deviation seems to be good for the subscales since they are supposed to be spread out as it indicates a strong reliability (we will run the reliability analysis of subscales later). If the values for skewness and kurtosis are less than +1.0, then it is within the range of normality. By looking at the values in skewness and kurtosis, we can tell that there is one subscale that is outside the range of normality for kurtosis, and that's is REL subscale. It is called leptokurtic. However, it should be acceptable for the analysis.

<u>3.3 Reliability for subscale SAL variables:</u> we are measuring the subscales for reliability analysis; we obtained the reliability score of 0.82 which is above the threshold of 0.8 according to Cronbach's Alpha table. Though, the reliability score of items is higher than that of items, it is still acceptable. Therefore, we can conclude that the subscales that were used for spirituality is reliable.

Reliability Statistics

Cronbach's Alpha	N of Items
.82	5

<u>3.4 Product moment correlation to evaluate the convergent and discriminant validity of the SAL subscales:</u> as for convergent validity of the SAL subscales, we notice that while the high intercorrelations demonstrate that the five subscales are probably related to the same construct which tells us that the participants have a spiritual notion in general. Based on the significant level (Sig. 2-tailed) in the output below, all values are obtained by significant level of 0.000 which is less than 0.05, so it can be established that subscales are valid since there is a statistically significant difference between two variables.

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[ ] The square bracket refers to Appendix.

Correlations

		age	EPD subscale	PAR subscale	REL subscale	EWB subscale	COD subscale
age	Pearson Correlation	1.00	.10	.15	.09	.09	.12
	Sig. (2-tailed)		.000	.000	.001	.001	.000
	N	1405	1405	1405	1405	1405	1405
EPD subscale	Pearson Correlation	.10	1.00	.50	.71	.63	.53
	Sig. (2-tailed)	.000		.000	.000	.000	.000
	N	1405	1422	1422	1422	1422	1422
PAR subscale	Pearson Correlation	.15	.50	1.00	.46	.37	.35
	Sig. (2-tailed)	.000	.000		.000	.000	.000
	N	1405	1422	1422	1422	1422	1422
REL subscale	Pearson Correlation	.09	.71	.46	1.00	.47	.34
	Sig. (2-tailed)	.001	.000	.000		.000	.000
	N	1405	1422	1422	1422	1422	1422
EWB subscale	Pearson Correlation	.09	.63	.37	.47	1.00	.70
	Sig. (2-tailed)	.001	.000	.000	.000		.000
	N	1405	1422	1422	1422	1422	1422
COD subscale	Pearson Correlation	.12	.53	.35	.34	.70	1.00
	Sig. (2-tailed)	.000	.000	.000	.000	.000	
	N	1405	1422	1422	1422	1422	1422

(Note: I couldn't find the guide about convergent and discriminant validity in textbook*, so I couldn't understand this part)

Other than the correlation between COD subscale and EWB subscale, there are relatively low correlations between the subscales. The correlations above seem to be right, because if the correlations are too high, say 0.9 or higher, then there is a chance that we have to remove the variable from the analysis. We continue with our analysis.

3.5 PCA for subscales:

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.06	61.14	61.14	3.06	61.14	61.14	3.06	61.14	61.14
2	.82	16.49	77.63						
3	.59	11.75	89.38						
4	.28	5.55	94.93						
5	.25	5.07	100.00						

Now, we have one factor to extract from running PCA on subscales. There is no need to rotate the components. In other words, we use the unrotated component loading. This suggests that all of the SAL subscales fit onto a single theoretical construct which is one general spiritual notion that all of participants have.

From the PCA for items, the cumulative value for the 8 factor is 52.07 tells us 52.07% of the variance in the items is accounted for by all 8 components. As a comparison to the subscales,

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[ ] The square bracket refers to Appendix.

the cumulative value for the first factor is 61.14 is accounted for by just one component, we have grouped the items into subscales, reduced the number of components, and yet have improved the amount of variance accounted for in the items by PCA.

3.6 ANOVA-

We are going to compute one-way Analysis of Variance by using Analyze Tool in PSPP with the "Compare means" option on subscales by country variable, and the following output is the result:

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
COD subscale	Between Groups	28.26	2	14.13	81.88	.000
	Within Groups	244.90	1419	.17		
	Total	273.16	1421			
EWB subscale	Between Groups	13.86	2	6.93	36.92	.000
	Within Groups	266.42	1419	.19		
	Total	280.28	1421			
REL subscale	Between Groups	44.55	2	22.27	46.93	.000
	Within Groups	673.50	1419	.47		
	Total	718.05	1421			
PAR subscale	Between Groups	110.97	2	55.48	133.50	.000
	Within Groups	589.76	1419	.42		
	Total	700.73	1421			
EPD subscale	Between Groups	32.18	2	16.09	41.97	.000
	Within Groups	543.90	1419	.38		
	Total	576.08	1421			

The output illustrates that all sig in the columns is 0.000 which is lower than 0.05, and therefore there is a statistically significant differences in the mean scale of the country variable.

The next computation would be subscales by sex variable, and the following output is the result:

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[ ] The square bracket refers to Appendix.

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
COD subscale	Between Groups	2.08	1	2.08	10.90	.001
	Within Groups	270.72	1416	.19		
	Total	272.80	1417			
EWB subscale	Between Groups	1.83	1	1.83	9.34	.002
	Within Groups	277.38	1416	.20		
	Total	279.21	1417			
REL subscale	Between Groups	26.60	1	26.60	54.67	.000
	Within Groups	689.12	1416	.49		
	Total	715.72	1417			
PAR subscale	Between Groups	1.14	1	1.14	2.31	.129
	Within Groups	695.92	1416	.49		
	Total	697.06	1417			
EPD subscale	Between Groups	10.19	1	10.19	25.62	.000
	Within Groups	563.14	1416	.40		
	Total	573.32	1417			

The output illustrates that PAR subscale has 0.129 level of significance which is higher than 0.05, and therefore there is not a statistically significant difference in the mean scale of the sex variable, but this doesn't automatically mean that there is not a significant difference between PAR subscale and sex variables.

Between groups in each subscale is lesser than within groups which means that the mean is equal or close to each other.

4 Results:

Prior to starting the analysis, the data was proved to be reliable, absence of multicollinearity and some evidence of response bias (such as participants could do survey half-heartedly). Principal component extraction with varimax rotation was performed through PSPP on 40 items from the ESI for a sample of 1422 participants, to estimate the number of factors, no presence of multicollinearity and factorability of the correlation matrices. 8 factors were extracted, factors were consistent and well defined by the variables, accounting for 52.07% of the variance. They were proved to be orthogonal which indicates that they were uncorrelated. However, there might be underlying processes that were almost independent. Subscales were created so that we can draw a conclusion from the items of different characteristics in a similar concept. For instance, we created a COD subscale from all COD items which would mean that it is a construct to minimize the reification of spirituality as an item to a general notion of an expression of spirituality. We run PCA again on subscales and we get one factor for extraction

* Refers to the textbook provided by Dr. MacDonald in Blackboard named Primer on Factor Analysis.
[ ] The square bracket refers to Appendix.

which makes sense since this would indicate that the subscale is in general spirituality category. This study provides realistic evidence to support the validity and reliability of the items and subscales since it measures what it is supposed to measure regarding spirituality. ANOVA was computed between ESI-Revised dimensions in country and sex variables. For country, statistically significant difference for all subscales was p-value = 0.000 which is less than the 0.05 alpha level. For sex variable, PAR subscale is not statistically significant for p-value = 0.129 which is greater than alpha level.

<u>Conclusion:</u>

In this paper, we made the use of factor analysis in spirituality scales. We carried out the PCA using varimax rotation. This resulted into 8 extracted factors, consisting several aspects of spirituality. Unlike principal factors, principal component analysis is not commonly used to identify the latent variables; therefore, loading onto the factors are not interpreted as factors in a factor analysis would be. It is also noteworthy that all factors extracted from correlation were being measured by all one subscale factor extracted from correlation between subscales which indicates that all participants are generally a part of spirituality including REL and PAR characteristics.

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[ ] The square bracket refers to Appendix.

Appendix:

I. Cronbach's table for reliability analysis

Cronbach's Alpha	Internal consistency
$0.9 \leq \alpha$	Excellent
$0.8 \leq \alpha < 0.9$	Good
$0.7 \leq \alpha < 0.8$	Acceptable
$0.6 \leq \alpha < 0.7$	Questionable
$0.5 \leq \alpha < 0.6$	Poor
$\alpha < 0.5$	Unacceptable

II. Missing values output

Sex

N	Valid	1418
	Missing	4
Mean		.54
Std Dev		.50

age

N	Valid	1405
	Missing	17
Mean		23.49
Std Dev		4.97

COD 1

N	Valid	1422
	Missing	0
Mean		2.82
Std Dev		.95

EWB 2

N	Valid	1422
	Missing	0
Mean		3.10
Std Dev		.77

EWB 3

N	Valid	1422
	Missing	0
Mean		2.84
Std Dev		.78

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ESI-Revised- Experiential-Phenomenological Dimension		
N	Valid	1422
	Missing	0
Mean		11.52
Std Dev		4.28

ESI-Revised- Existential Well-Being		
N	Valid	1422
	Missing	0
Mean		15.46
Std Dev		4.19

(Note: all Sal variables have no missing values just like the COD 1, EWB 2, EWB 3, so no need to display all output for that)

III. Frequencies (Sal variable and its chosen variable for the most selected in the survey in scale)

sal 1	3	sal 11	3	sal 21	3	sal 31	3
sal 2	3	sal 12	3	sal 22	3	sal 32	3
sal 3	3	sal 13	2	sal 23	3	sal 33	3
sal 4	3	sal 14	3	sal 24	3	sal 34	3
sal 5	3	sal 15	3	sal 25	3	sal 35	3
sal 6	3	sal 16	3	sal 26	3	sal 36	3
sal 7	2	sal 17	3	sal 27	3	sal 37	4
sal 8	3	sal 18	3	sal 28	3	sal 38	3
sal 9	3	sal 19	4	sal 29	3	sal 39	3
sal 10	4	sal 20	3	sal 30	3	sal 40	3

IV. Corrected item-to-scale correlation (the correlation between each item and a scale score that excludes that item.

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[ ] The square bracket refers to Appendix.

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
COD 1	108.04	270.33	.45	.90
EWB 2	107.76	273.15	.46	.90
EWB 3	108.01	276.51	.32	.90
COD 4	107.91	273.27	.44	.90
EWB 5	107.88	275.64	.33	.90
EWB 6	108.57	268.61	.42	.90
REL 7	108.65	271.03	.41	.90
REL 8	108.21	269.76	.46	.90
REL 9	107.74	270.19	.50	.90
REL 10	107.66	267.57	.53	.90
COD 11	107.98	272.88	.42	.90
COD 12	107.98	274.02	.38	.90
PAR 13	109.29	278.09	.13	.90
EWB 14	107.93	276.16	.29	.90
COD 15	107.94	272.92	.44	.90
PAR 16	108.58	262.64	.47	.90
EWB 17	108.47	268.33	.54	.90
PAR 18	108.45	269.60	.46	.90
PAR 19	107.45	280.52	.21	.90
COD 20	107.64	277.86	.36	.90
COD 21	108.08	273.99	.36	.90
EPD 22	108.47	264.91	.54	.90
REL 23	108.47	267.67	.41	.90
PAR 24	108.45	270.33	.34	.90
EWB 25	107.87	274.50	.47	.90
COD 26	108.05	274.73	.34	.90
PAR 27	108.48	263.09	.49	.90
EWB 28	108.38	276.59	.20	.90
COD 29	107.82	278.29	.24	.90
EPD 30	108.33	268.04	.57	.90
EPD 31	107.96	269.10	.55	.90
EPD 32	107.96	271.15	.50	.90
COD 33	107.76	274.34	.43	.90
COD 34	107.87	274.41	.42	.90
COD 35	107.85	273.99	.42	.90
EWB 36	108.01	273.63	.42	.90
EPD 37	107.53	268.70	.52	.90
EWB 38	108.09	271.61	.46	.90
EWB 39	108.16	271.83	.46	.90
EWB 40	107.74	270.26	.50	.90

For subscales:

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
COD subscale	10.75	4.04	.56	.80
EWB subscale	10.88	3.87	.66	.78
REL subscale	10.99	3.11	.64	.78
PAR subscale	11.29	3.37	.53	.82
EPD subscale	10.89	3.08	.78	.73

V. KMO Syntax

```
FACTOR
        /VARIABLES= sal1 sal2 sal4 sal5 sal6 sal7 sal8
sal26 sal28 sal29 sal31 sal35 sal36
        /CRITERIA = MINEIGEN (1) ITERATE (25)
        /EXTRACTION =PC
        /METHOD = CORRELATION
        /PRINT = INITIAL EXTRACTION ROTATION KMO
        /CRITERIA = ITERATE (25)
        /ROTATION = VARIMAX.
```

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[ ] The square bracket refers to Appendix.

VI. Communality: the first column is the SAL variables, and second column is initial and third column is extraction.

Communalities

	Initial	Extraction
COD	1.00	.62
EWB	1.00	.62
EWB	1.00	.38
COD	1.00	.42
EWB	1.00	.48
EWB	1.00	.49
REL	1.00	.49
REL	1.00	.56
REL	1.00	.66
REL	1.00	.68
COD	1.00	.55
COD	1.00	.54
PAR	1.00	.65
EWB	1.00	.47
COD	1.00	.46
PAR	1.00	.67
EWB	1.00	.49
PAR	1.00	.43
PAR	1.00	.57
COD	1.00	.48
COD	1.00	.42
EPD	1.00	.53
REL	1.00	.47
PAR	1.00	.57
EWB	1.00	.47
COD	1.00	.37
PAR	1.00	.66
EWB	1.00	.20
COD	1.00	.44
EPD	1.00	.52
EPD	1.00	.52
EPD	1.00	.57
COD	1.00	.61
COD	1.00	.59
COD	1.00	.57
EWB	1.00	.49
EPD	1.00	.71
EWB	1.00	.51
EWB	1.00	.47
EWB	1.00	.46

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