Purpose in Life Questionnaire for High School Populations: A Unidimensional Factor Structure for High School Students

Abdulaziz M. Alshaikh *

Abstract

This study examines the Purpose in Life (PIL) questionnaire and attempts to find the most appropriate factor matrix structure when it is applied to a high school population. The goal of the study is to find a simple structure factor matrix with high reliability as measured by Cronbach's alpha. Participants (N = 659) were randomly selected from all four grades of Washington State metropolitan area high schools. Findings indicate that while various multidimensional matrix structures exist for the instrument when used with an adult population, when used with a high school population, there emerges a strong unidimensional factor matrix with a simple structure; it both fits the data well and results in very strong reliability (Cronbach's $\alpha = .900$). This analysis suggests that revising the PIL from 20 to 14 questions for high schoolers results in a unidimensional instrument, strongly supported by all 14 questions and measuring with a very high reliability.

Keywords: Purpose in Life questionnaire, high school, students, unidimensional factor structure

Introduction

It is crucial for high school students to have a clear understanding of the sense of purpose of life and how it is related to their professional motivation. Zavodchikov and others (2016) identified the specific features of the interrelation and effects of meaning of life to the professional values and motivation. The results of their research helped them in "developing programs for correcting and increasing professional motivation, as well as for developing technologies of psychology-pedagogical assistance to sense-making and professional self-identification in projecting and implementing individual educational trajectories in the continuous vocational education system" (p.8264).

The PIL questionnaire might be a useful tool for teachers, psychologists and administrators in schools for helping students in personal development. Martin Sanz and others (2017) found an indirect negative association between students' purpose in life and self-reported engagement in academic misconduct when they intended to study the role of emotional intelligence in management, facilitation, understanding and perception dimensions associated to personality traits (emotional impulsiveness, respect for others, sociability, negotiating skills, openness to experience, self-confidence), and the meaning of life, in the learning process and development of students. Nonetheless, the PIL questionnaire could help specialists in professiology, teachers of technical subjects and professional consultants for forecasting the professional development of a person (Martin Sanz et al., 2017).

* Assist. Prof. Dr. Imam Abdulrahman bin Faisal University, Saudi Arabia
E-mail: amalshaikh@iau.edu.sa

Literature Review

The Purpose in Life inventory (PIL) is an instrument designed "to measure the degree to which an individual experiences a sense of meaning and purpose in life" (Reker & Cousins, 1979). It consists of three parts with answers that vary in format from Likert scale responses, to sentence completions, to written paragraphs. The first section is the focus of this analysis, and it uses 20 selected questions to measure purpose in life. In this section, all questions are answered using a 7-point Likert scale (see Appendix A).

This instrument has been the focus of many studies and much analysis. It has been studied, for instance, with different cultural populations, genders, and age groups (Meier & Edwards, 1974). It has been analyzed with a focus on reliability and validity (Sink, van Keppel, & Purcell, 1998). And, over time, through all of these studies, it repeatedly has been found to be "a psychometrically sound instrument" (Reker & Cousins, 1979).

However, this plethora of analysis has not clarified an important structural characteristic: namely, what is the best underlying factor structure for the PIL? This structure, whether unidimensional or multidimensional, must exhibit simple structure, have multiple supporting questions and strong loadings for each found factor, and be one that retains the instrument's historically high reliability. This factor structure debate seems fueled, in part, by the different statistical methods easily available to researchers: PCA, PFA, and PA to name only a few, and the differing results they may present (Steger, 2006).

In addition, the instrument is being used on differing populations, a situation which may or may not influence the ideal matrix structure. This study attempts to use Principal Factor Analysis to find the ideal factor structure for the PIL when it is administered to a high school population. It then attempts to replicate the findings using a different means of extraction (Principal Component Analysis) with the hope of obtaining solutions that are similar. Similarity in results will indicate a clear dimensionality, with variables that load strongly on one primary factors (Tabachnick & Fidell, 2013). This analysis attempts to answer the following two research questions:

1. What is the most appropriate factor matrix structure for the PIL when it is applied to a high school population?
2. Is the determined factor structure reliable?

Methods

Participants

The participants for this study were high school students from Washington State metropolitan area high schools. Students ranged from 14 to 19 years of age, with 16 years old being the most common age (M = 16.1). All four years of high school were represented by participants. Sophomores (27.9%) and Juniors (27.8%) accounted for the greatest number of survey responses, while Seniors (17.5%) accounted for the least. Although the demographic data were missing for some participants, the assumption was made that because the instrument was administered to students in classes during a school day, all scores came from students who fit in some way within this demographic. In all, there were 659 students who comprised the sample used in this study. In terms of racial demographic, 65% were "Euro-American" (Sink et al., 1998) (see Table 1).

Table 1. Summary of participant demographic data

		Frequency	Percent
Gender	Male	301	45.7
	Female	338	51.3
Grade in school	9	154	23.4
	10	184	27.9
	11	183	27.8
	12	115	17.5
Age (years)	14	62	9.4
	15	156	23.7
	16	183	27.8
	17	163	24.7
	18	68	10.3
	19	7	1.1

Results

This analysis focuses on the first of three sections of the Purpose in Life (PIL) questionnaire, an instrument designed to measure the amount of meaning an adult has discovered in life (see Appendix A). The first section consists of 20 questions, with answers for each of the 20 questions measured using a 7-item Likert scale. Verbal responses for each scale increment varied by question; included instead of the standard "totally agree," for instance, phrases such as "enthusiastic," "clear goals and aims," and "a source of pleasure and satisfaction." The reliability of this first section of the PIL instrument, 20 questions, is very high when used on adults, $\text{Cronbach's } \alpha = .885$.

Descriptive statistics, histograms, boxplots, and Q-Q plots run on the initial 20 questions asked of high school students to show slightly varying degrees of normality, although most questions present as relatively normal, with only slight deviations, if any, in skewness and kurtosis. Question 7, however, had a miscoding of a Likert scale value of 76; this was changed to 7. Question 7 also was the only that showed troubling values for skew (-1.60) and kurtosis (2.60). On further examination, Question 7 concerned retirement interests, and while possibly relevant to adults, it was not an effective variable for high school students and was deleted. Boxplots from the initial data screening also revealed three questions with outliers: Question 3 (two outliers), Question 4 (four outliers), and Question 13 (four outliers). These questions were marked for careful study during the analysis, but the decision was made to include them in the initial factor analysis.

The participants providing the data were randomly sampled, and the data for each of the variables is independent from one another. In addition, all Kolmogorov-Smirnov (K-S) statistics for each variable were significant (p < .001). Finally, the sample size was large, N = 659, and meets the recommended general parameter of 10 to 15 participants per variable (Field, 2013). The Kaiser-Meyer-Olkin measure (KMO) verified the sampling size was appropriate, KMO = .95, with a value considered "Marvellous" by the Hutcheson and Sofroniou guideline and well above the recommended/acceptable level of .5 (Field, 2013). The means, standard deviations, and variances for the 19 included variables can be found in Table 2.

Table 2. Descriptive Statistics for PIL questions for high schoolers

					Skewness		*Kurtosis*	
	n	*M*	*SD*	*Var.*	*stat.*	*SE*	*stat.*	*SE*
pila#1	659	4.84	1.12	1.26	-0.64	0.10	0.81	0.19
pila#2	659	4.60	1.37	1.87	-0.56	0.10	0.12	0.19
pila#3	659	5.70	1.17	1.36	-0.79	0.10	0.33	0.19
pila#4	659	5.54	1.39	1.93	-0.79	0.10	0.12	0.19
pila#5	659	4.49	1.57	2.47	-0.34	0.10	-0.57	0.19
pila#6	659	5.00	1.38	1.91	-0.37	0.10	0.00	0.19
pila#8	659	4.97	1.21	1.46	-0.63	0.10	0.72	0.19
pila#9	659	5.00	1.27	1.60	-0.59	0.10	0.35	0.19
pila#10	659	5.01	1.62	2.61	-0.61	0.10	-0.21	0.19
pila#11	659	4.92	1.70	2.88	-0.55	0.10	-0.44	0.19
pila#12	659	4.24	1.50	2.24	-0.32	0.10	-0.15	0.19
pila#13	659	5.53	1.29	1.67	-0.81	0.10	0.29	0.19
pila#14	659	5.32	1.51	2.28	-0.70	0.10	-0.02	0.19
pila#15	659	4.85	1.88	3.55	-0.57	0.10	-0.66	0.19
pila#16	659	5.34	1.91	3.65	-0.81	0.10	-0.63	0.19
pila#17	659	5.28	1.34	1.79	-0.51	0.10	0.05	0.19
pila#18	659	4.99	1.66	2.75	-0.59	0.10	-0.33	0.19
pila#19	659	4.52	1.43	2.05	-0.46	0.10	-0.19	0.19

pila#20	659	5.23	1.32	1.75	-0.71	0.10	0.49	0.19
Valid *N* (listwise)	659							

Correlations between all 19 variables were checked to ensure both adequate correlation ($r > .3$) as well as no over-correlation ($r > .8$), and to determine the factorability of the items. Most correlations fell between these parameters, suggesting good correlations and factorability. The correlation matrix revealed that Question 15 did not meet the significance criteria ($p < .01$) for 13 of the 18 variables. This question was marked for deletion. A significant Bartlett's Test of sphericity ($p < .001$) reinforced that the data are correlated, and the determinate of the |R| matrix is .001, greater than the recommended .00001, supporting the idea that the variables are correlated but not singular (Field, 2013). The diagonals of the anti-image matrix reveal no values below .5. With this preliminary analysis of 19 variables, the reliability remained very high, Cronbach's $\alpha = .882$.

A Principal Factor Analysis (PFA) identified initial eigenvalues for each factor for review. Four factors had eigenvalues over Kaiser's criterion of 1; together these four explained 55.08% of the variance. The scree plot had a first inflection at approximately 2 and suggests fewer than four factors might be retained. Upon review of the factor matrix, four variables were found to load heavily on multiple factors and were considered for elimination. Variable 3 loaded on three factors, variable 14 loaded on 4 factors, and variable 18 loaded on 4 factors. In reviewing these questions, all seemed to share a sense of control that high school students might not yet have been required to consider, possibly because of their age or continued dependency on family. Because of this, these questions were marked for deletion. Given these changes, another analysis was run.

This next analysis showed an improvement in the correlation matrix; all variables correlated significantly ($p < .01$) with the exception of Question 13 with Question 5 ($p = .02$). The deletions reduced the number of factors to 2, and there were two factors with eigenvalues greater than 1 that explained 50.65 % of the variance. There were no major changes to the scree plot, which still suggested 2 factors. After marking the two factors to determine how many variables loaded on each, it became clear that only one variable was loading primarily on factor 2. Question 13 was the only to be marked for factor two, with a loading of .78; all other factors were marked for factor 1. Question 13 concerned a self-report on how responsible the subject considered him/herself. This question might have been too difficult for high school students to self-reflect on, or there may have been multiple interpretations of what the question was asking, given the still-dependent status of students (e.g., "*I* think I am responsible, but my parents say I'm not," or "My teacher thinks I am responsible, but I don't," etc.). This question was marked for deletion. A final analysis of 16 questions was run (see Appendix B).

In this analysis of 14 items, all showed correlations between .3 and .8, the KMO value was .95, and Bartlett's Test for sphericity was significant, $p < .001$. The analysis revealed only one factor with an eigenvalue over 1, and this factor accounted for 41.72% of all variance. All 14 questions loaded well on this one factor, with all loadings between .40 and .80 (see Table 3).

Table 3. Final factor loadings for 14 PIL; questions for high schoolers (N =659)

Factor Matrix	
	Factor 1
pila#9	0.80
pila#4	0.74
pila#20	0.73
pila#10	0.73
pila#11	0.68
pila#2	0.68
pila#6	0.67
pila#17	0.63
pila#19	0.62
pila#5	0.60
pila#1	0.57
pila#8	0.55
pila#12	0.54
pila#16	0.40
Extraction Method: Principal Axis Factoring	

The scree plot still showed a first inflection at 2 factors. A final reliability analysis of these final 14 questions showed a very high reliability, Cronbach's α = .900, better than the beginning reliability of the 20 question PIL instrument of .885. A Principal Components Analysis (PCA) was also run to ensure strength of these interpretations, and similar results confirmed the initial findings (see Appendix C).

The process above was repeated using PCA. While the Cronbach's α remained the same, the percentage of variance accounted for by the single factor rose from 41.72% (using PFA) to 45.65% (using PCA). This rise in variance accounted for is a result consistent with the fact that PCA includes all variance in the model, while PFA includes only the variance shared (common variance).

Discussion and Conclusion

Multiple analyses were run by choosing different variable combinations based on theories of the underlying structures of the variables. These analyses resulted in scree plots that consistently suggested two factors might compose the best structure for the PIL for high school students. However, every combination of variables that resulted in a multidimensional factor matrix, although accounting for slightly more variance, had troublesome weights for the second factor. This second factor was supported at best by only two variables or fewer weighting on it. In addition, the marked weights for the second factor routinely were heavy for both factors, which suggested that they were only weak indicators of the factor, at best. None of these patterns of factor loading was consistent with simple structure. For this reason, the results more strongly suggest that the PIL for high school students is a unidimensional model. Although the one factor model accounted for slightly less total variance than two factors, the patterns of loadings on this single factor revealed simple structure. This suggests that for high schoolers, the current 20 item PIL questionnaire consists of one dimension strongly supported by 14 questions, with the remaining questions measuring alternate concepts.

Moving from theory to the questionnaire itself, a unidimensional model resulted from the removal of various questions that, while appropriate for adults, might prove less relevant for high school students. Question 7 regarding life after retirement is one such example. In addition, some topics appropriate for adults might not be well-suited for high schoolers who remain still dependent on their families. High schoolers straddle two worlds, stretching for independence and doing many things such as work independently, and yet still reliant on family for many things. This unique place in the world renders other PIL questions less appropriate for high schoolers. The conclusion that the PIL has a unidimensional structure that would be clearer with the removal of a few lesser supporting variables is supported by Steger (2006), after multiple analyses of the dimensionality of the PIL using different methods of extraction.

With this in mind, this analysis has answered both of the driving research questions.

1. A one-factor matrix is the most effective structure of the PIL when applied to a high school population and results in simple structure.
2. All questions on the revised PIL for high schoolers load strongly on this single factor, with a median factor loading of .65 and 41.72% of the variance explained. The derived factor structure is very reliable, Cronbach's α = .900.

Revising the original PIL for adults from 20 questions to 14 resulted in a number of improvements. First, it improved the structure of the factor matrix, from four factors to one simple structure factor. Second, it improved the reliability of the instrument, from .885 to .900. Third, it resulted in fewer questions overall, which is more appropriate for a younger audience. And finally, it resulted in questions that seemed to more accurately measure the construct of purpose in life in a younger population.

The questionnaire was effectively used by different researches and for various purposes. Tomioka, Kurumatani and Hosoi (2016) used the PIL questionnaire to look for the relationship of having hobbies and a purpose in life with mortality and a decline in the activities of daily living, and they found that having hobbies and purpose in life may extend not only longevity, but also healthy life expectancy among community-dwelling older adults. Shek (1997) used the PIL questionnaire to examine the relation of family functioning to adolescent psychological well-being, school adjustment, and problem behavior. The researcher found that parent-adolescent conflict based on ratings obtained from different sources were significantly related to the measures of psychological well-being (general psychiatric morbidity, life satisfaction, purpose in life, hopelessness, and self-esteem), school adjustment (perceived academic performance and school conduct) and problem behavior (smoking and psychotropic drug abuse). DuRant, Getts, Cadenhead, and Woods (1995) also used the PIL questionnaire to examined social and psychological factors

associated with the frequency of weapon-carrying by black adolescents living in a community where there is extensive poverty and a high level of violent crime. They found that carrying a weapon during the previous 30 days was significantly associated with the previous exposure to violence and victimization, age, corporal punishment scale, depression, family conflict, purpose in life, and the self-appraised probability of being alive at age 25, and was higher among males. Minehan, Newcomb, and Galaif (2000) used the PIL questionnaire and found that the relationship between crystallized intelligence and alcohol use was mediated by purpose in life. Moreover, older age predicted higher cognitive abilities, stronger coping strategies, more poly drug use, and less purpose in life. They also found that Cognitive abilities predicted less cigarette and illicit drug use; existential confusion predicted more illicit drug use; and cognitive approach skills predicted more poly drug use.

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Appendix A

PIL Questionnaire

Your Name: _____ Personality, Dr. Brian Burke

PURPOSE IN LIFE TEST (Crumbaugh & Maholick, 1964)

Instructions: Write the number (1 to 5) next to each statement that is most true for you right now.

1.	I am usually:	1 bored	2	3	4	5 enthusiastic
2.	Life to me seems:	1 completely routine	2	3	4	5 always exciting
3.	In life, I have:	1 no goals or aims	2	3	4	5 clear goals and aims
4.	My personal existence is:	1 utterly meaningless, without purpose	2	3	4	5 purposeful and meaningful
5.	Every day is:	1 exactly the same	2	3	4	5 constantly new and different
6.	If I could choose, I would:	1 prefer never to have been born	2	3	4	5 want 9 more lives just like this one
7.	After retiring, I would:	1 loaf completely the rest of my life	2	3	4	5 do some of the exciting things I`ve always wanted to
8.	In achieving life goals, I've:	1 made no progress whatever	2	3	4	5 progressed to complete fulfillment
9.	My life is:	1 empty, filled only with despair	2	3	4	5 running over with exciting things
10.	If I should die today, I'd feel that my life has been:	1 completely worthless	2	3	4	5 very worthwhile
11.	In thinking of my life, I:	1 often wonder why I exist	2	3	4	5 always see reasons for being here
12.	As I view the world in relation to my life, the world:	1 completely confuses me	2	3	4	5 fits meaningfully with my life
13.	I am a:	1 very irresponsible person	2	3	4	5 very responsible person
14.	Concerning freedom to choose, I believe humans are:	1 completely bound by limitations of heredity and environment	2	3	4	5 totally free to make all life choices
15.	With regard to death, I am:	1 unprepared and frightened	2	3	4	5 prepared and unafraid
16.	Regarding suicide, I have:	1 thought of it seriously as a way out	2	3	4	5 never given it a second thought
17.	I regard my ability to find a purpose or mission in life as:	1 practically none	2	3	4	5 very great
18.	My life is:	1 out of my hands and controlled by external factors	2	3	4	5 in my hands and I`m in control of it
19.	Facing my daily tasks is:	1 a painful and boring experience	2	3	4	5 a source of pleasure and satisfaction
20.	I have discovered:	1 no mission or purpose in life	2	3	4	5 a satisfying life purpose

SCORING: Add up all the numbers you wrote down (20-100). A score of less than 50 may indicate that you are experiencing an "existential void," a lack of meaning or purpose in your life right now…

Appendix B

Principal Factor Analysis Results

Factor Analysis

Descriptive Statistics

	Mean	Std. Deviation	Analysis N
pila#1	4.84	1.124	659
pila#2	4.60	1.366	659
pila#4	5.54	1.390	659
pila#5	4.49	1.570	659
pila#6	5.00	1.382	659
pila#8	4.97	1.208	659
pila#9	5.00	1.266	659
pila#10	5.01	1.616	659
pila#11	4.92	1.696	659
pila#12	4.24	1.496	659
pila#16	5.34	1.911	659
pila#17	5.28	1.338	659
pila#19	4.52	1.433	659
pila#20	5.23	1.323	659

Anti-image Matrices

		pila#1	pila#2	pila#4	pila#5	pila#6	pila#8	pila#9	pila#10	pila#11	pila#12	pila#16	pila#17	pila#19	pila#20
Anti-image Covariance	pila#1	.674	-.105	-.035	-.049	-.049	-.044	-.058	-.021	.006	-.011	.009	.005	-.017	-.025
	pila#2	-.105	.524	-.046	-.156	-.073	-.011	-.045	-.030	.001	-.032	.021	-.033	-.038	.004
	pila#4	-.035	-.046	.466	-.093	-.063	-.020	-.047	-.075	-.083	-.008	-.026	.023	.056	-.101
	pila#5	-.049	-.156	-.093	.597	.041	.016	-.045	-.040	-.037	.027	.020	-.047	-.072	.036
	pila#6	-.049	-.073	-.063	.041	.557	-.008	-.055	-.004	-.025	-.101	-.114	-.032	-.078	-.015
	pila#8	-.044	-.011	-.020	.016	-.008	.675	-.043	-.042	-.014	-.032	.067	-.029	-.042	-.133
	pila#9	-.058	-.045	-.047	-.045	-.055	-.043	.413	-.109	-.043	-.042	-.050	-.020	-.053	-.033
	pila#10	-.021	-.030	-.075	-.040	-.004	-.042	-.109	.496	-.035	-.003	-.018	-.050	-.022	-.047
	pila#11	.006	.001	-.083	-.037	-.025	-.014	-.043	-.035	.551	-.113	-.066	-.090	-.032	-.023
	pila#12	-.011	-.032	-.008	.027	-.101	-.032	-.042	-.003	-.113	.694	.015	.028	-.071	-.034
	pila#16	.009	.021	-.026	.020	-.114	.067	-.050	-.018	-.066	.015	.806	-.051	-.037	-.014
	pila#17	.005	-.033	.023	-.047	-.032	-.029	-.020	-.050	-.090	.028	-.051	.602	-.031	-.133
	pila#19	-.017	-.038	.056	-.072	-.078	-.042	-.053	-.022	-.032	-.071	-.037	-.031	.630	-.066
	pila#20	-.025	.004	-.101	.036	-.015	-.133	-.033	-.047	-.023	-.034	-.014	-.133	-.066	.463
Anti-image Correlation	pila#1	.964[a]	-.177	-.063	-.078	-.079	-.065	-.110	-.036	.010	-.016	.012	.008	-.026	-.045
	pila#2	-.177	.940[a]	-.092	-.279	-.134	-.018	-.097	-.059	.001	-.053	.033	-.059	-.065	.008
	pila#4	-.063	-.092	.940[a]	-.177	-.124	-.036	-.106	-.156	-.164	-.014	-.042	.044	.103	-.217
	pila#5	-.078	-.279	-.177	.923[a]	.072	.026	-.090	-.074	-.065	.042	.028	-.078	-.117	.068
	pila#6	-.079	-.134	-.124	.072	.947[a]	-.013	-.114	-.007	-.045	-.163	-.170	-.055	-.131	-.029
	pila#8	-.065	-.018	-.036	.026	-.013	.949[a]	-.081	-.073	-.022	-.046	.091	-.046	-.065	-.238
	pila#9	-.110	-.097	-.106	-.090	-.114	-.081	.955[a]	-.240	-.091	-.079	-.087	-.039	-.104	-.076
	pila#10	-.036	-.059	-.156	-.074	-.007	-.073	-.240	.958[a]	-.067	-.006	-.029	-.092	-.040	-.098
	pila#11	.010	.001	-.164	-.065	-.045	-.022	-.091	-.067	.955[a]	-.183	-.099	-.156	-.054	-.046
	pila#12	-.016	-.053	-.014	.042	-.163	-.046	-.079	-.006	-.183	.947[a]	.019	.043	-.108	-.059
	pila#16	.012	.033	-.042	.028	-.170	.091	-.087	-.029	-.099	.019	.933[a]	-.073	-.052	-.024
	pila#17	.008	-.059	.044	-.078	-.055	-.046	-.039	-.092	-.156	.043	-.073	.946[a]	-.050	-.251
	pila#19	-.026	-.065	.103	-.117	-.131	-.065	-.104	-.040	-.054	-.108	-.052	-.050	.955[a]	-.123
	pila#20	-.045	.008	-.217	.068	-.029	-.238	-.076	-.098	-.046	-.059	-.024	-.251	-.123	.931[a]

a. Measures of Sampling Adequacy(MSA)

Communalities

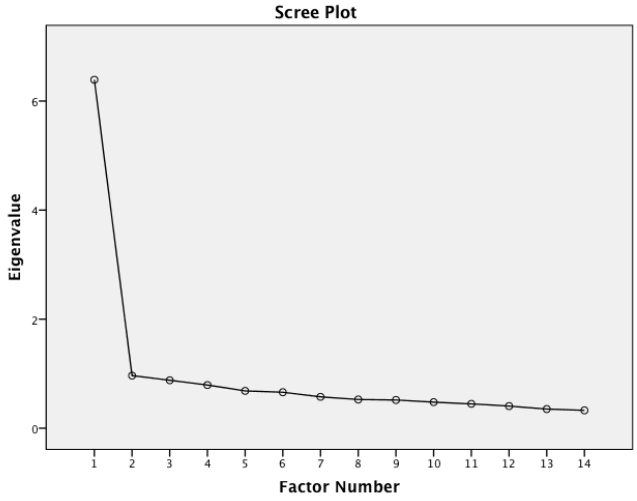
	Initial	Extraction
pila#1	.326	.329
pila#2	.476	.465
pila#4	.534	.546
pila#5	.403	.354
pila#6	.443	.449
pila#8	.325	.303
pila#9	.587	.640
pila#10	.504	.531
pila#11	.449	.467
pila#12	.306	.291
pila#16	.194	.162
pila#17	.398	.393
pila#19	.370	.379
pila#20	.537	.531

Extraction Method: Principal Axis Factoring.

Total Variance Explained

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.391	45.647	45.647	5.841	41.721	41.721
2	.965	6.893	52.540			
3	.880	6.283	58.823			
4	.792	5.657	64.480			
5	.684	4.885	69.366			
6	.660	4.714	74.080			
7	.575	4.110	78.190			
8	.527	3.762	81.952			
9	.518	3.696	85.648			
10	.478	3.412	89.060			
11	.447	3.190	92.250			
12	.406	2.899	95.149			
13	.351	2.509	97.658			
14	.328	2.342	100.000			

Extraction Method: Principal Axis Factoring.



Factor Matrix[a]

	Factor
	1
pila#9	.800
pila#4	.739
pila#20	.729
pila#10	.729
pila#11	.683
pila#2	.682
pila#6	.670
pila#17	.627
pila#19	.616
pila#5	.595
pila#1	.574
pila#8	.551
pila#12	.539
pila#16	.402

Extraction Method: Principal Axis Factoring.

a. 1 factors extracted. 4 iterations required.

Case Processing Summary

		N	%
Cases	Valid	659	100.0
	Excluded[a]	0	.0
	Total	659	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.900	.906	14

Inter-Item Correlation Matrix

	pila#1	pila#2	pila#4	pila#5	pila#6	pila#8	pila#10	pila#11	pila#12	pila#17	pila#19	pila#20	pila#9	pila#16
pila#1	1.000	.475	.429	.387	.396	.330	.408	.343	.293	.318	.342	.395	.473	.194
pila#2	.475	1.000	.511	.544	.473	.343	.485	.420	.356	.405	.421	.431	.542	.225
pila#4	.429	.511	1.000	.491	.496	.399	.568	.533	.373	.421	.369	.570	.586	.298
pila#5	.387	.544	.491	1.000	.332	.276	.449	.400	.259	.372	.385	.357	.483	.191
pila#6	.396	.473	.496	.332	1.000	.340	.446	.452	.436	.404	.449	.461	.536	.364
pila#8	.330	.343	.399	.276	.340	1.000	.416	.356	.308	.365	.355	.512	.440	.138
pila#10	.408	.485	.568	.449	.446	.416	1.000	.491	.358	.467	.425	.538	.625	.287
pila#11	.343	.420	.533	.400	.452	.356	.491	1.000	.439	.471	.412	.490	.535	.325
pila#12	.293	.356	.373	.259	.436	.308	.358	.439	1.000	.291	.380	.390	.431	.209
pila#17	.318	.405	.421	.372	.404	.365	.467	.471	.291	1.000	.393	.544	.475	.287
pila#19	.342	.421	.369	.385	.449	.355	.425	.412	.380	.393	1.000	.461	.494	.266
pila#20	.395	.431	.570	.357	.461	.512	.538	.490	.390	.544	.461	1.000	.559	.283
pila#9	.473	.542	.586	.483	.536	.440	.625	.535	.431	.475	.494	.559	1.000	.340
pila#16	.194	.225	.298	.191	.364	.138	.287	.325	.209	.287	.266	.283	.340	1.000

Appendix C

Principal Components Analysis Results

Factor Analysis

Descriptive Statistics

	Mean	Std. Deviation	Analysis N
pila#1	4.84	1.124	659
pila#2	4.60	1.366	659
pila#4	5.54	1.390	659
pila#5	4.49	1.570	659
pila#6	5.00	1.382	659
pila#8	4.97	1.208	659
pila#9	5.00	1.266	659
pila#10	5.01	1.616	659
pila#11	4.92	1.696	659
pila#12	4.24	1.496	659
pila#16	5.34	1.911	659
pila#17	5.28	1.338	659
pila#19	4.52	1.433	659
pila#20	5.23	1.323	659

Correlation Matrix[a]

		pila#1	pila#2	pila#4	pila#5	pila#6	pila#8	pila#9	pila#10	pila#11	pila#12	pila#16	pila#17	pila#19	pila#20
Sig. (1-tailed)	pila#1		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	pila#2	.000		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	pila#4	.000	.000		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	pila#5	.000	.000	.000		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	pila#6	.000	.000	.000	.000		.000	.000	.000	.000	.000	.000	.000	.000	.000
	pila#8	.000	.000	.000	.000	.000		.000	.000	.000	.000	.000	.000	.000	.000
	pila#9	.000	.000	.000	.000	.000	.000		.000	.000	.000	.000	.000	.000	.000
	pila#10	.000	.000	.000	.000	.000	.000	.000		.000	.000	.000	.000	.000	.000
	pila#11	.000	.000	.000	.000	.000	.000	.000	.000		.000	.000	.000	.000	.000
	pila#12	.000	.000	.000	.000	.000	.000	.000	.000	.000		.000	.000	.000	.000
	pila#16	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000		.000	.000	.000
	pila#17	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000		.000	.000
	pila#19	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000		.000
	pila#20	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	

a. Determinant = .003

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.946
Bartlett's Test of Sphericity	Approx. Chi-Square	3783.430
	df	91
	Sig.	.000

Anti-image Matrices

		pila#1	pila#2	pila#4	pila#5	pila#6	pila#8	pila#9	pila#10	pila#11	pila#12	pila#16	pila#17	pila#19	pila#20
Anti-image Covariance	pila#1	.674	-.105	-.035	-.049	-.049	-.044	-.058	-.021	.006	-.011	.009	.005	-.017	-.025
	pila#2	-.105	.524	-.046	-.156	-.073	-.011	-.045	-.030	.001	-.032	.021	-.033	-.038	.004
	pila#4	-.035	-.046	.466	-.093	-.063	-.020	-.047	-.075	-.083	-.008	-.026	.023	.056	-.101
	pila#5	-.049	-.156	-.093	.597	.041	.016	-.045	-.040	-.037	.027	.020	-.047	-.072	.036
	pila#6	-.049	-.073	-.063	.041	.557	-.008	-.055	-.004	-.025	-.101	-.114	-.032	-.078	-.015
	pila#8	-.044	-.011	-.020	.016	-.008	.675	-.043	-.042	-.014	-.032	.067	-.029	-.042	-.133
	pila#9	-.058	-.045	-.047	-.045	-.055	-.043	.413	-.109	-.043	-.042	-.050	-.020	-.053	-.033
	pila#10	-.021	-.030	-.075	-.040	-.004	-.042	-.109	.496	-.035	-.003	-.018	-.050	-.022	-.047
	pila#11	.006	.001	-.083	-.037	-.025	-.014	-.043	-.035	.551	-.113	-.066	-.090	-.032	-.023
	pila#12	-.011	-.032	-.008	.027	-.101	-.032	-.042	-.003	-.113	.694	.015	.028	-.071	-.034
	pila#16	.009	.021	-.026	.020	-.114	.067	-.050	-.018	-.066	.015	.806	-.051	-.037	-.014
	pila#17	.005	-.033	.023	-.047	-.032	-.029	-.020	-.050	-.090	.028	-.051	.602	-.031	-.133
	pila#19	-.017	-.038	.056	-.072	-.078	-.042	-.053	-.022	-.032	-.071	-.037	-.031	.630	-.066
	pila#20	-.025	.004	-.101	.036	-.015	-.133	-.033	-.047	-.023	-.034	-.014	-.133	-.066	.463
Anti-image Correlation	pila#1	.964[a]	-.177	-.063	-.078	-.079	-.065	-.110	-.036	.010	-.016	.012	.008	-.026	-.045
	pila#2	-.177	.940[a]	-.092	-.279	-.134	-.018	-.097	-.059	.001	-.053	.033	-.059	-.065	.008
	pila#4	-.063	-.092	.940[a]	-.177	-.124	-.036	-.106	-.156	-.164	-.014	-.042	.044	.103	-.217
	pila#5	-.078	-.279	-.177	.923[a]	.072	.026	-.090	-.074	-.065	.042	.028	-.078	-.117	.068
	pila#6	-.079	-.134	-.124	.072	.947[a]	-.013	-.114	-.007	-.045	-.163	-.170	-.055	-.131	-.029
	pila#8	-.065	-.018	-.036	.026	-.013	.949[a]	-.081	-.073	-.022	-.046	.091	-.046	-.065	-.238
	pila#9	-.110	-.097	-.106	-.090	-.114	-.081	.955[a]	-.240	-.091	-.079	-.087	-.039	-.104	-.076
	pila#10	-.036	-.059	-.156	-.074	-.007	-.073	-.240	.958[a]	-.067	-.006	-.029	-.092	-.040	-.098
	pila#11	.010	.001	-.164	-.065	-.045	-.022	-.091	-.067	.955[a]	-.183	-.099	-.156	-.054	-.046
	pila#12	-.016	-.053	-.014	.042	-.163	-.046	-.079	-.006	-.183	.947[a]	.019	.043	-.108	-.059
	pila#16	.012	.033	-.042	.028	-.170	.091	-.087	-.029	-.099	.019	.933[a]	-.073	-.052	-.024
	pila#17	.008	-.059	.044	-.078	-.055	-.046	-.039	-.092	-.156	.043	-.073	.946[a]	-.050	-.251
	pila#19	-.026	-.065	.103	-.117	-.131	-.065	-.104	-.040	-.054	-.108	-.052	-.050	.955[a]	-.123
	pila#20	-.045	.008	-.217	.068	-.029	-.238	-.076	-.098	-.046	-.059	-.024	-.251	-.123	.931[a]

a. Measures of Sampling Adequacy(MSA)

Communalities

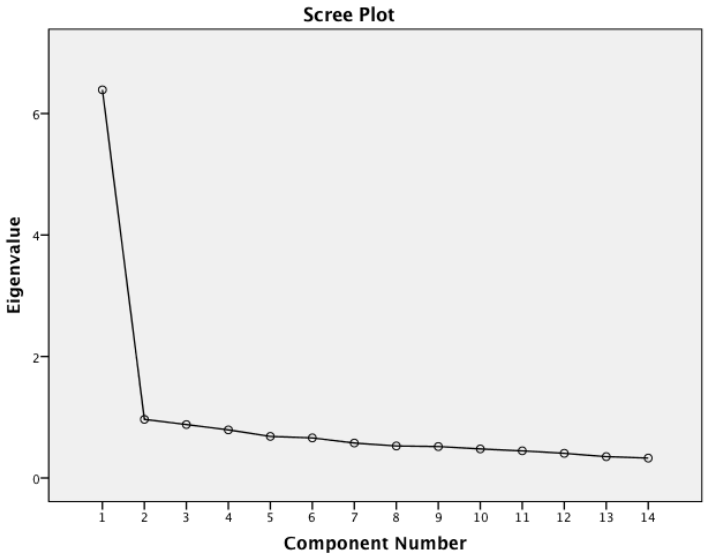
	Initial	Extraction
pila#1	1.000	.375
pila#2	1.000	.506
pila#4	1.000	.578
pila#5	1.000	.400
pila#6	1.000	.492
pila#8	1.000	.349
pila#9	1.000	.657
pila#10	1.000	.565
pila#11	1.000	.508
pila#12	1.000	.336
pila#16	1.000	.195
pila#17	1.000	.439
pila#19	1.000	.425
pila#20	1.000	.566

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.391	45.647	45.647	6.391	45.647	45.647
2	.965	6.893	52.540			
3	.880	6.283	58.823			
4	.792	5.657	64.480			
5	.684	4.885	69.366			
6	.660	4.714	74.080			
7	.575	4.110	78.190			
8	.527	3.762	81.952			
9	.518	3.696	85.648			
10	.478	3.412	89.060			
11	.447	3.190	92.250			
12	.406	2.899	95.149			
13	.351	2.509	97.658			
14	.328	2.342	100.000			

Extraction Method: Principal Component Analysis.



Component Matrix[a]

	Component
	1
pila#9	.811
pila#4	.760
pila#20	.752
pila#10	.751
pila#11	.713
pila#2	.711
pila#6	.701
pila#17	.662
pila#19	.652
pila#5	.632
pila#1	.612
pila#8	.590
pila#12	.580
pila#16	.442

Extraction Method: Principal Component Analysis.

a. 1 components extracted.