FACTOR ANALYSIS: A NEW METHOD FOR CLASSIFYING NEW TESTAMENT GREEK MANUSCRIPTS

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The task of classifying NT Greek manuscripts is an important function in the practice of NT textual criticism because none of the approximately 5,746[1] manuscripts of the Greek NT is an autograph. Collectively, these manuscripts contain approximately 300,000[2] variant readings, amounting to more variants than there are words in the NT. Although most of these are insignificant, the percentage that are significant pose a challenge to textual critics in determining the earliest form of the text.[3] In an effort to deal with this problem, textual critics since the eighteenth century[4] have classified manuscripts into groups

[1]According to the official register kept by the Institut für neutestamentliche Textforschung in Münster, Germany, as of May 2006, there are 118 Papyri, 318 Uncials, 2,877 Minuscules, and 2,433 Lectionary manuscripts (Kurt Aland, *Kurzgefasste Liste der Griechischen Handschriften des Neuen Testaments* [New York: Walter De Gruyter, 1994], 7:16, 44, 370). For updates, see <http://www.unimuenster.de/ NTTextforschung/ KgLSGII06_03>.

[2]Eldon Epp, "The Multivalence of the Term 'Original Text' in New Testament Textual Criticism," *HTR* 92 (1999): 277.

[3]Most textual scholars no longer speak of finding "the definitive original text" of the NT, but of uncovering the earliest form(s) of the text. For substantial discussions on this extensive issue, see Epp, 245-281; Bart D. Ehrman, *The Orthodox Corruption of Scripture: The Effects of Early Christological Controversies on the Text of the New Testament* (New York: Oxford University Press, 1993), xii, 188-194, 275, 280; idem, "The Text as a Window: New Testament Manuscripts and Social History of Early Christianity," in *The Text of the New Testament in Contemporary Research: Essays on the* Status Quaestionis, ed. Bart Ehrman and Michael W. Holmes (Grand Rapids: Eerdmans, 1995), 365; D. C. Parker, *The Living Text of the Gospels* (Cambridge: Cambridge University Press, 1997), 1-213; idem, "Scripture Is Tradition," *Theology* 94 (1991): 11-17; Helmut Koester, "The Text of the Synoptic Gospel in the Second Century," in *Gospel Traditions in the Second Century: Origins, Recensions, Text, and Transmission*, ed. William L. Peterson (Notre Dame: Notre Dame University Press, 1989), 19-37. For a sweeping discussion of scholars prior to these, see Peter Head, "Christological and Textual Transmission: Reverential Alterations in the Synoptic Gospels," *NovT* 35/2 (1993): 105-109.

[4]According to Bruce M. Metzger, Johann Albrecht Bengel (1687-1752) was the first textual critic to have divided the majority of NT manuscripts into text-types. Before Bengel, scholars merely counted the number of Greek and versional witnesses supporting a particular variant reading, thereby allowing the majority of witnesses to dictate the reading of the text. For a survey of the history of NT textual criticism, see Bruce M. Metzger, "The Lucianic Recension of the Greek Bible," in *Chapters in the*

called text-types, "a text-type being the largest identifiable group of related New Testament manuscripts"[5] that serve as the basis for determining the earliest original.[6] Almost all textual critics recognize three main text types: Alexandrian, Western, and Byzantine, with the Alexandrian and Byzantine further divided into subgroups.[7]

By assembling manuscripts into text-types, the task of dealing with variants is made more manageable as one needs contend primarily only with those that are representative of a particular group or groups. These significant variants are usually derived from the leading manuscripts of particular text-types.[8] Therefore, the task of classifying manuscripts into groups is fundamental to the process of NT textual criticism

History of New Testament Textual Criticism: New Testament Tools and Studies (Leiden: Brill, 1963), 4:15-24; Rodney Reeves, "Methodology for Determining Text Types of New Testament Manuscripts" (Ph.D. dissertation, Southern Baptist Theological Seminary, Fort Worth, Texas, 1986), 15-72; Kirsopp Lake, *The Text of the New Testament*, 4th ed. (London: Rivingtons, 1908), 62-72.

[5]Ernest Cadman Colwell, *Studies in Methodology in Textual Criticism of the New Testament*, New Testament Tools and Studies, 9, ed. Bruce Metzger (Leiden: Brill, 1969), 45.

[6]J. K. Elliott writes: "Only by classifying collations and comparing alternative texts can one build up a thesaurus of readings from which editors can then try to establish the original texts" ("Why the International Greek New Testament Project Is Necessary," *Restoration Quarterly* 30 [1988]: 202). Eckhard Schnabel, "Textual Criticism: Recent Developments," in *The Face of New Testament Studies: A Survey of Recent Research*, ed. Scot McKnight and Grant R. Osborne (Grand Rapids: Baker, 2004), 69-70.

[7]For a general discussion on text-types, see Keith Elliott and Ian Moir, *Manuscripts and the Text of the New Testament: An Introduction for English Readers* (Edinburgh: T. & T. Clark, 1995), 24; Kurt Aland and Barbara Aland, *The Text of the New Testament: An Introduction to the Critical Editions and to the Theory and Practice of Modern Textual Criticism*, 2d rev. ed. (Grand Rapids: Eerdmans, 1995), 50-52; Bruce M. Metzger, *The Text of the New Testament: Its Transmission, Corruption and Restoration*, 3d ed. (Oxford: Oxford University Press, 1992), 213-216.

[8]Bart D. Ehrman summarizes the purpose of classification into text-types: (1) the avoiding of the "impossible task of consulting each and every NT document before coming to a textual decision;" (2) "readings attested to by groups of witnesses can be ascertained simply by consulting the group's best representatives;" (3) "textual alignments naturally lead to an assessment of the relative quality of each group text. That is to say, the kinds of variant readings that characterize textual groups are frequently those that are judged, on other grounds, to be more likely authentic or corrupt." (4) "The combined support of certain textual groupings frequently indicates true rather than corrupt readings (e.g., when Western and early Alexandrian witnesses agree against all others)" ("Methodological Development in the Analysis and Classification of New Testament Documentary Evidence," *NovT* 29 [1987]: 22).

Three methods of manuscript classification are currently in use: quantitative analysis, profiles, and test passages (*Teststellen*):

1. Quantitative Analysis, as advanced by Ernest C. Colwell and Ernest W. Tune, stipulates that manuscripts belong to the same group if they agree seventy percent of the time, with a ten-percent difference from other groups of manuscripts.[9]

2. The Claremont Profile Method, developed by Paul McReynolds and Frederik Wisse in 1968, classifies manuscripts based on the profile of their unique and shared readings.[10] Manuscripts belong to the same group when they share two-thirds of certain readings of whatever tentative group one begins with.

3. The *Teststellen* Method, created in the 1960s and 1970s by Kurt Aland and Barbara Aland at the Institut für neutestamentliche Textforschung in Münster, Germany, by which a previously unexamined manuscript could be examined in only a few "carefully selected" test passages (*Teststellen*). By this process, the value or category of the manuscript is determined.[11]

A number of scholars have demonstrated that there are weaknesses with these methods and have made valuable contributions toward their improvement.[12] For example, Quantitative Analysis and the Claremont

[9]Ernest C. Colwell, "Method in Locating a Newly-Discovered Manuscript," in *Studies in Methodology in Textual Criticism of the Testament* (Leiden: Brill, 1969), 26-44. See also Ernest C. Colwell and Ernest W. Tune, "Method in Established Quantitative Relationships Between Text-types of New Testament Manuscripts," in *Studies in Methodology in Textual Criticism of the New Testament*, ed. Bruce M. Metzger (Leiden: Brill, 1969), 56-62.

[10]Their method is outlined in their respective dissertations: Paul R. McReynolds, "The Claremont Profile Method and the Grouping of Byzantine New Testament Manuscripts" (Ph.D. dissertation, Claremont Graduate School, 1968); Frederik Wisse, "The Claremont Profile Method for the Classification of Byzantine New Testament Manuscripts: A Study in Method" (Ph.D. dissertation, Claremont Graduate School, 1968).

[11]The results of their work is summarized in Aland and Aland, 159-162, 317-337. These passages can also be found in Kurt Aland, *Text und Textwert der Griechischen Handschriften des Neuen Testaments: die Katholischen Briefe. Arbeiten zur neutestamentlichen Textforschung*, vols. 9–11 (New York: Walter De Gruyter, 1987). The Alands claim that their primary objective is not to classify manuscripts, but simply to identify the Byzantine manuscripts so as to eliminate most of them from consideration in the critical apparatus. Their work, however, is unavoidably a form of classification.

[12]See, e.g., W. Larry Richards, "The Textual Relationships of the Greek Manuscripts of the Johannine Epistles: Establishment and Classification of the Manuscript Groupings" (Ph.D. dissertation, Northwestern University, 1974), 43; Bart D. Ehrman, "A Problem of Textual Circularity: The Alands on the Classification of New Testament Manuscripts," *Bib* 70 (1989): 377-388; Eldon Epp, "New Testament Textual Criticism Past, Present and Future: Reflections on the Aland's Text of the

Profile Method continue to be practiced in a modified form, particularly as reformulated by W. Larry Richards and Bart D. Ehrman.[13] However, the situation regarding *Teststellen* is largely unknown, as its founders have held key aspects of its methodology from inclusion in the debate/discussion on classification methods.

In response to the perceived weakness of current classification methods, a fourth method, referred to as Factor Analysis, has been developed.

Factor Analysis: A New Method of Classification

Factor Analysis is a data-reduction technique that groups variables into clusters and seeks to detect structure in the relationships among variables.[14] These clusters are formed based on the shared commonality of variables, called a factor. The formation of factors represents the linear combinations of the original variables. For example, if a thousand people comprise a population, some would have red hair, others black, and some would be blond; some would have blue eyes, others brown, and still others black. It is then possible to group these people based on factors of hair or eye color. Thus, based on these two factors, different combinations (clusters or groups) of people could be formed.

Factors will be formed by the variables that are most highly correlated on a particular characteristic. The most dominant factor will be selected out first, to be followed by the second most dominant factor, and so on down to the least dominant factor until there is no longer any correlational residue.[15] Usually the most dominant factor will attract the largest number of variables and each successive factor will have more variables in its group than the next in line.

Factor Analysis is of two basic types:

1. Exploratory Factor Analysis refers to the formulation of factors from a given data set without any restrictions on the number of factors to be extracted in the initial solution output.[16] In this stage, a scree plot (Figure 1) is

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New Testament," *HTR* 82 (1989): 226.

[13]W. Larry Richards, "A Critique of a New Testament Text-Critical Methodology—The Claremont Profile Method," *JBL* 96 (1977): 555-556; Bart Ehrman, "The Use of Group Profiles for the Classification of New Testament Documentary Evidence," *JBL* (1987): 447-468.

[14]For a discussion of Factor Analysis, see <http://marketing.byu.edu/htmlpages/books/pcmds/FACTOR.html>. This technique is made more efficient with the use of the computer program SPSS.

[15]"Principal Components and Factor Analysis," *Electronic Textbook Statsoft*, 1984-2003 (<www.statsoft.com/textbook/ stfacan.html>).

[16]L. R. Fabrigar et al., "Evaluating the Use of Exploratory Factor Analysis in

created. The scree plot provides a graphical representation of the number of factors in which the data set can be grouped.

2. With the indicators provided by the scree plot, the Confirmatory Factor Analysis is done. In this process, the exact number of factors to which the data is to be restricted is indicated.[17]

Factor Analysis employs two primary operations for arriving at data-output results: extraction and rotation.[18] There are several methods of extraction, namely, the principal-components method, unweighted least squares, generalized least squares, maximum likelihood, principal-axis factoring, alpha factoring, and image factoring.[19] The method of extraction selected for this study is the principal-components method, which was selected because it analyzes the total variance in the data set, a practice that is of primary importance to textual criticism. In this process, 100 percent of the variance[20] is treated as common or shared among the variables, without distinguishing between similar and dissimilar variances.[21]

As in a Cartesian coordinate system, there are axes and points in Factor Analysis. The axes represent the factors and the points represent the variables. The variables are held constant and the factors are rotated around the axis to achieve the highest level of correlation possible in the factor output.[22]

As the term suggests, rotation refers to turning around on an axis.[23] There are five methods of rotation: Direct Oblimin, Promax, Varimax, Quartimax, and Equamax.[24] The Direct Oblimin and Promax methods of rotation are regarded as the best methods for computing factor solutions where the extracted factors are correlated (oblique).[25] These methods are most applicable to the classification process in textual criticism. The methods of Varimax, Quartimax, and Equamax compute factor solutions in which the

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Psychological Research," *Psychological Methods*, 1999 (<http://core.ecu.edu/psyc/wuenschk/StatHelp/EFA.html>).

[17]G. David Garson, "Confirmatory Factor Analysis," *Factor Analysis*, 1 October 2006, (<www2.chass.ncsu.edu/garson/pa765/ factor.html>).

[18]G. David Garson, "Topics in Multivariate Analysis: Factor Analysis," North Carolina State University, Raleigh, NC (<www2.chass.ncsu.edu/garson/pa765/statnote.htm>).

[19]*SPSS 12.0 Software Help* (Chicago: SPSS, 2003).

[20]Which, in the case of textual criticism, equals the individual variant readings.

[21]"Factor Analysis: Definitions" (<http://marketing.byu.edu/htmlpages/books/pcmds/FACTOR.html>).

[22]Ibid.

[23]Garson, "Topics in Multivariate Analysis."

[24]*SPSS 12.0 Software Help*.

[25]Ibid.

extracted factors are independent of each other (orthogonal) and the degree of correlation between factors is zero and is synonymous to a 90-degree angle in a Cartesian coordinate system.[26]

Application to Textual Criticism

When Factor Analysis is applied to Greek manuscripts, the manuscripts become the variables. The variant readings of each manuscript are the data items (variants) from which the factors are formed with the results arranged in a matrix suitable for the computer program, Statistical Package for Social Scientists (SPSS) (Table 1). SPSS compares every single variant reading of each manuscript with every variant of all other manuscripts (rotation) and by this process determines the factors, that is, the shared commonality of these variant readings.

Once the factors have been determined, all manuscripts are compared with each factor, and the manuscripts that have the highest correlation coefficients are clustered or grouped together around these factors. Once a factor and its accompanying manuscripts are clustered, SPSS automatically removes it from further iterations, and the next highest factor is selected with its accompanying manuscripts. The process continues until there is no longer any correlation residue (i.e., no more factors to be processed).

The strength of the principal of component-based Factor Analysis as a technique for classifying manuscripts lies in the fact that all variability in the data set is considered in the analysis. Since the factors around which the manuscripts are grouped are determined from the individual variant readings, and since these variants are both similar and dissimilar, then the manuscripts are grouped on the basis of both the similarity and dissimilarity of actual variant readings. As is well known in the field of textual criticism, this is a critical criterion for grouping manuscripts.

Richards and Ehrman[27] have recognized that it is beneficial first to form tentative groups by a thoroughgoing method of quantitative analysis so as to ascertain the proportional relationships of manuscripts to one another in their total amount of variation, and manuscripts with highest level of relationship to each other, not just in some areas where they show a two-thirds agreement. McReynolds and Wisse, on the other hand, did not do this in their application of

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[26]"Principal Components and Factor Analysis." The principle of rotation is applied to textual criticism in the ensuing discussion.

[27]Richards, "A Critique of a New Testament Text-Criticial Methodology," 555-566; Erhman, "The Use of Group Profiles," 465-468. In Richards's words, "merely having some group readings that are supported by two thirds of manuscripts that have been bunched together is not enough. We must look for the combination of manuscripts that yield the highest number of group readings" (Richards, "A Critique of a New Testament Text-Critical Methodology," 564).

the Claremont Profile Method, but rather relied on the previous groups formed by von Soden. The reliance on von Soden's groups, however, was demonstrated by Richards as a shortcoming of the method. One of the Claremont Profile Method's criteria is the elimination of the readings found in one-third of the manuscripts of a tentative group. However, according to Richards, when these one-third readings are placed in combination with the readings of other manuscripts, they could alter the classification of manuscripts. While a reading may be found in one-third of a particular group of manuscripts, the same reading could also be a two-thirds reading (or more) when placed in combination with still other readings of other manuscripts, which thus alters the groups of those manuscripts. Therefore, to overcome this shortcoming, manuscripts are first grouped quantitatively in a scientific manner (Factor Analysis) that places them into groups based on their total amount of variation and their highest proportion of agreement with each other.

Once the factors have been determined, all manuscripts are compared with each factor and the manuscripts that have the highest correlation coefficients are clustered, or grouped together, around these factors. As noted above, once a factor and its accompanying manuscripts are clustered, SPSS automatically removes it from further iterations, and the next highest factor is elected (with its accompanying manuscripts), and the process continues until there is no longer any correlation residue; in other words, until there are no more factors (with accompanying manuscripts) to be so processed.

The strength of Factor Analysis (particularly the principal-components method) as a technique for classifying manuscripts lies in the fact that every variable in the data set is used in the analysis. The factors (around which the manuscripts are grouped) are determined from the individual variant readings. Since these variants are both similar and dissimilar, the manuscripts are grouped based on both the similarity and dissimilarity of actual variant readings. As is well known in the field of textual criticism, this is a critical criterion for grouping manuscripts. An additional strength of Factor Analysis is that it is extremely fast and accurate. Once the data is entered into the computer, it takes only seconds to classify any number of manuscripts. This is unprecedented.

Classification of James by Factor Analysis

In order to test the principal-components method, the collation of 86 manuscripts of James were arranged according to the matrix illustrated in Table 1 and then subjected to the process of Factor Analysis. Table 1 illustrates the arrangement of the variant readings for the factor-analysis process within the SPSS program. The "Units" column displays the units of variation. "MS" (for manuscript) is prefaced to each Gregory number. A "1" indicates the reading of the *Textus Receptus*,[28] while a "2," "3," or "4" shows

[28]The 1873 Oxford ed. of the *Textus Receptus* was used as the collating base.

the different non-TR readings and "0" indicates where (for one reason or another) a reading has to be neutralized.[29] First, the exploratory step was done in which a scree plot was produced.

According to the scree plot[30] (Figure 1), between one and eight factors could be used to classify the manuscripts of James. This is indicated on the scree plot by the distinguishing points that range from "1" to "8" on the X-axis. As is illustrated in the scree plot, after point "8" on the X-axis, the remainder of the data points/factors are hardly distinguishable. This undefined portion is called the scree or rubble. After experimenting with a number of factors (between one and eight), it was seen that eight factors best classify the manuscripts of James. The number of formed groups is equivalent to the number of factors used to classify the total data set.

The composition of all the groups is displayed in a pattern matrix as illustrated in Table 2. In addition to the physical layout of the different groups, the pattern matrix also displays the coefficient of agreement between manuscripts. Therefore, with this physical display of how the manuscripts cluster, based on the number of factors used, along with the coefficient of agreement between each manuscript, it can easily be determined how many groups are realistic and practical for classifying the total data set. The computer is then programmed to produce the required number of groups/factors. Once the data is coded into the computer, the entire process of forming these eight groups occurs in a matter of nanoseconds.

One Alexandrian (factor 3), six Byzantine (factors 1, 4, 5, 6, 7, 8), and one mixed group[31] (factor 2) resulted from the process. Having formed these groups, it becomes necessary to test their validity. This was done by applying a modified version of the Claremont Profile Method. The Claremont Profile Method, as used by McReynolds and Wisse, groups manuscripts based on the

[29]Richards labels such readings with the acronym SOUL: "S" stands for singular readings and "O" for omissions. These are singular omissions as opposed to omissions found in four or more mss. The latter are used as legitimate variants. "U" stands for "unavailable," that is, whenever a reading cannot be determined. "L" stands for "lacunae," which signify a missing portion of the ms due to deterioration or because that portion of the text is no longer extant (*Classification*, 28).

[30]Note, the scree plot is the graphical representation of the number of factors in which the data set can be grouped. This is formed automatically by SPSS once the data is supplied and this function is selected. My use of Factor Analysis was guided by Jerry Thayer, Andrews University.

[31]This group was described as "mixed" as further examination revealed that these manuscripts did not fit the profile exactly for either the Alexandrian or Byzantine, but displayed characteristics of both. For a detailed analysis of this group, see my "The So-called Mixed Text: An Examination of the Non-Alexandrian and Non-Byzantine Text-type in the Catholic Epistles" (Ph.D. dissertation, Andrews University Seventh-day Adventist Theological Seminary, Berrien Springs, Michigan, 2007).

profile of certain readings found only in sample chapters of the book(s) being classified. For example, in order to classify manuscripts of Luke, McReynolds and Wisse created their profiles from Luke 1, 10, and 20. Ehrman observed that this practice of creating profiles only from certain chapters constituted a fundamental weakness of the Claremont Profile Method in that it minimizes the prospect of detecting a possible shift in a manuscript's text-type due to "block mixture." Therefore, failure to recognize block mixture can allow manuscripts to be classified in the wrong groups. In my study, I eliminated this potential weakness by using a modified version of the Claremont Profile Method as described by W. Larry Richards. In this adapted method, the profiles were formed from all chapters of the books being studied, instead of only from selected chapters. This eliminated the weaknesses associated with block mixture, as all manuscripts were collated in their entirety and all sections of the books being analyzed were involved in the process.

Using all chapters of the book being studied (not just the sample chapters) also gives another advantage over the Claremont Profile Method as used by Reynolds and Wisse. The advantage is that both the unique readings of each tentative group and, in Ehrman's words, "the total amount of agreement of group witnesses in all units of genetically significant variation" are used. It is well established in the field that the unique readings of a group need to be considered in establishing groups as they highlight the distinguishing features of each group.

This refinement of Factor Analysis by the Claremont Profile Method is necessary, for, as was mentioned earlier, the intent of Factor Analysis is only to form tentative groups. Factor Analysis is a quantitative method that groups manuscripts based on their percentage of relationships. On the other hand, the Claremont Profile Method groups manuscripts based on actual readings and, therefore, is more precise.[32] Table 3 illustrates the status of the groups before and after the Claremont Profile Method process. The results show that five of the eight groups formed by Factor Analysis (groups 2, 5, 6, 7, and 8) remained exactly the same after they were reclassified by Claremont Profile Method. Group 1 lost one manuscript, and groups 3 and 4 lost two manuscripts respectively. Thus only a total of five manuscripts changed groups after the Claremont Profile Method was applied to manuscripts grouped by Factor Analysis.[33] This registers a 94-percent accuracy of the Factor Analysis

[32]Bart D. Ehrman, "The Use of Group Profiles for the Classification of New Testament Documentary Evidence," *JBL* (1987): 447-468; Richards, "Classification," 43-71, 131-38, 206-209.

[33]The formula for the Claremont Profile Method process indicates that manuscripts belong to the same group by sharing two-thirds of the primary readings of the group. The primary readings are the readings found in two thirds of all the manuscripts of the initial tentative group. Based on this principle, the manuscripts that did not qualify for their initial groups were 491 from Group 1/Factor 1; mss 323 and

process. It should be noted that no Alexandrian manuscript was classified as Byzantine; neither was any Byzantine manuscript grouped as Alexandrian.

Thus the validity of Factor Analysis for classifying manuscripts is confirmed by the Claremont Profile Method. Certainly, this method deserves to be tried with other parts of the NT, for it presents a quick and accurate alternative for classifying NT Greek manuscripts.

2298 from Group 3/Factor 3; and mss 226 and 2423 from Group 4/Factor 4. Group 1/Factor 1 has 7 primary readings. Manuscript 491 has only 4 of these 7 readings. Group 3/Factor 3 has 28 primary readings. Manuscript 323 had only 9 of those 28 readings, while 2298 has 17 of those 28 readings. Group 4/Factor 4 has 16 primary readings. Manuscript 226 has 8, while manuscript 2423 has 9 of those 16 primary readings. All these manuscripts, therefore, were placed in other groups, the details of which can be found in my doctoral dissertation.

Table 1. Sample Data Set for Factor Analysis of James

Units	MS 01	MS 02	MS 020	MS 044	MS 5
7	1	2	1	1	1
10	4	0	1	1	0
20	2	1	2	2	2
30	1	2	4	4	1
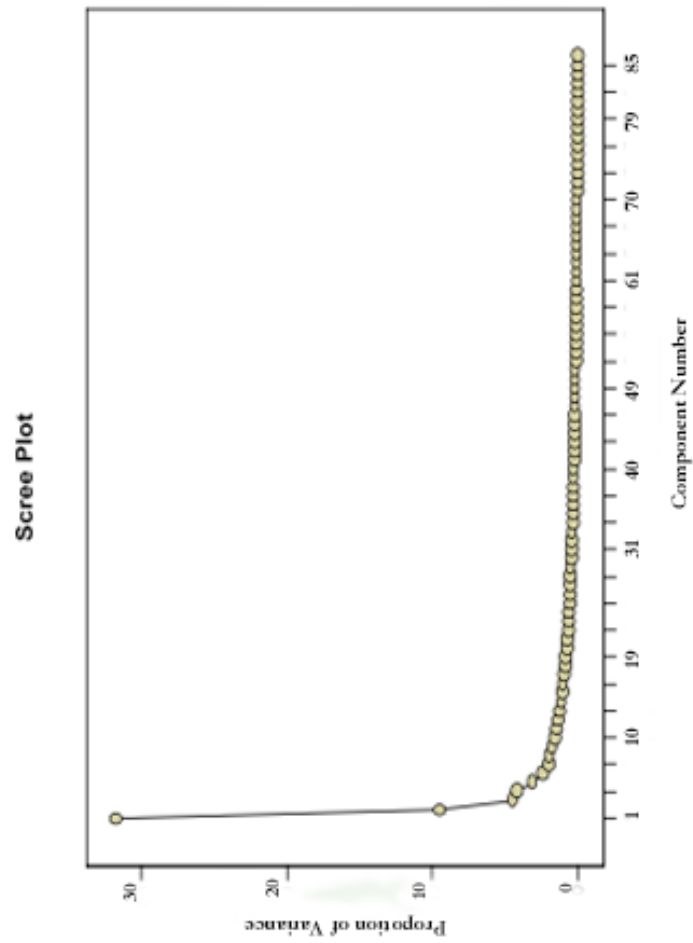
Figure 1. Scree plot of James.

Table 2. Patten Matrix of James to Show Tentative Groups Using Factor Analysis

MSS	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8
337	0.804							
177	0.804							
1738	0.752							
491	0.720							
2143	0.600							
263	0.591				-0.304			

MSS	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8
203	0.579							
020	0.550							
1424	0.536							
6	0.492			-0.376				
917	0.475							
209	0.466							
1827	0.440							

MSS	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8
927	0.425							
1240	0.424				-0.351			
1597	0.418				-0.322			
383	0.394				-0.311			
38	0.391				-0.387			
489	0.377							
319	0.363							

MSS	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8
104	0.355							
378	0.342						-0.335	
642	0.335						-0.308	
1610	0.326							
2412		0.885						
1505		0.872						
1799		0.859						

MSS	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8
522		0.856						
614		0.833						
1611		0.812						
206		0.800						
1522		0.779						
1890		0.778						
876								

MSS	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8
1739			0.892					
1241			0.858					
2298			0.711					
1243			0.706					
1175			0.687					
03			0.651					
1735			0.506					-0.375

MSS	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8
01			0.506					
02			0.472					-0.397
323			0.389					
044			0.365			0.326		-0.316
479				-0.985				
1248				-0.971				
1249				-0.938				

MSS	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8
1503				-0.935				
201				-0.933				
1892				-0.927				
1876				-0.851				
1247				-0.671				
2423				-.0511	-0.369			0.316
226				-.380	-0.370			

MSS	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8
1245					-0.786			
1022					-0.703			
385					-0.599			
547					-0.543			
1854	0.384				-0.530			
049	0.389				-0.526			
1889				-0.413	-0.514			

MSS	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8
1874	0.317				-0.491			
483					-0.486			
1829					-0.485			
467					-0.454			
1898					-0.438			
920	0.407				-0.427			
424					-0.426		-0.418	

MSS	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8
1891	0.408				-0.421			
1888					-0.420			
1319	0.356				-0.389			
1845						1.009		
623						1.007		
5						0.953		
1315							-0.811	

MSS	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8
440							-0.804	
216							-0.761	
307							-0.435	
69						0.303	-0.378	
643	0.355						-0368	
2401								0.512
999	0.372							0.487

MSS	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8
51					-0.403			0.467
223					- 0.403			0.467
959								0.380