Example of factor analysis method section reporting

The method followed here was to first examine the personal characteristics of the participants with a view to selecting a subset of characteristics that might influence further responses. Then, survey responses were analysed at the item level, using figures, tables, or text alone, to provide a first impression.

These item level responses were scrutinised for underlying patterns via factor analytic procedures (Note that all procedures reported here utilise SPSS). A prerequisite for including an item was that responses were not too badly skewed (i.e., 90% or more of responses clustered in single cell) and that more generally, the level of response to that item was not insufficient (<15-20%) to destabilise analysis. The factors identified in this fashion correspond to the primary topics or latent variables to which correspondents seem to be responding in terms of various related items.

The protocol adopted here for factor analysis was to use default settings initially (Principal Axis Factor - PAF) and to rotate the matrix of loadings to obtain orthogonal (independent) factors (Varimax rotation). The prime goal of factor analysis is to identity simple (items loadings >0.30 on only one factor) that are interpretable, assuming that items are factorable (The Kaiser-Meyer-Olkin measure of sampling adequacy tests whether the partial correlations among variables are small. Bartlett's test of sphericity tests whether the correlation matrix is an identity matrix, indicating that the factor model is inappropriate).

Once clearly defined and interpretable factors had been identified (Factor loadings =>.10 were illustrated via an included table even though only item loadings >0.30 were considered relevant to factor loadings), and responses related to these factors were saved in the form of factor scores. These Bartlett factor scores are equivalent to sub-scale or scale scores with means of zero and standard deviations of one (z-scores), and with participants credited with separate scores in relation to each identified factor.

Since these factor scores translate the ordinal responses to individual items into standardised z-scores with interval properties, the relationship between responses to these factors and personal/demographic characteristics were probed via multivariate (MANOVA) or univariate (ANOVA) parametric tests.

Where significant main effects or interaction effects were observed, the locus of these was determined via nonparametric tests of significance, usually Chi-Square contingency tables or Kruskal-Wallis nonparametric analyses of variance.

The rationale for the analytic approach outlined here is that it parallels the commonly accepted protocol for examining univariate and multivariate ANOVA, which typically proceeds by testing for significance at the most general level of association and then, once that is established, tests for significance at specific levels of the independent variable/s (e.g., via pairwise comparisons).

A positive aspect of the protocol outlined above is that it is conservative in so much as significance at the scale level is a prerequisite to examining significant associations at the item level. This methodology minimises noise due to individual difference, etc.

The alternative is an item-by-item approach where every questionnaire response is crossed with every variable representing personal characteristic, a shotgun process that increases the

number of reports of significance at the cost of exponentially increasing the number of required analyses while missing the insight provided via procedures that identify deeper patterns of responses to items. The other downside of mass item analysis is that the acceptable level of significance per item has to be adjusted to take account of the sheer number of individual tests of significance, an adjustment that excludes all but the most extreme outcomes (i.e., p<.001), thus nullifying the effect of the initial increase in the number of hits.

Example of factor analysis result section reporting

A Principal Axis Factor (PAF) with a Varimax (orthogonal) rotation of 22 of the 24 Likert scale questions from this attitude survey questionnaire was conducted on data gathered from 316 participants. An examination of the Kaiser-Meyer Olkin measure of sampling adequacy suggested that the sample was factorable (KMO=.698).

Table 1. Obliquely rotated component loadings for 22 survey items*

Component	1	2	3	4	5	6	7	8
Understanding	.801							.121
Interpreting	.790							.209
Understanding questions	.646	.151			.167	-.214		-.199
Lecturers want...	.543	.253	-.114	-.246		-.205	-.110	-.278
Writing assignment	.444	.287	.176	.202	-.235			.192
Researching	.420	.111		.179	-.331	.119		.275
Writing genre		.895		.136	-.120	.134		.126
Writing academic		.819			.128	-.102		
Knowing how	.194	.516		-.197		-.233		
Write friends			.891					
Friends	-.108		.869			-.105		
Write tutorials	.121			.862	.169	-.117		
Tutorials	-140	.112		.809				-.277
Write text books				.126	.845	.142		.255
Text books					.789			-.139
Answer confidently		.124				.912		
Write confidently		-.141				.826		-.152
Write lectures							.942	.127
Lectures		.113					.817	-.175
Using criteria sheet to write	.128					.146	.103	-.763
Criteria sheets to understand	-.182		.101			.105		-.755
Ease of using criteria sheets	.207	.105						.694
Eigenvalues	4.949	2.684	1.869	1.608	1.493	1.314	1.049	1.009
Percentage of total variance	3.595	2.831	1.796	1.800	1.984	2.268	2.079	2.880
Number of test measures	6	3	2	2	2	2	2	3

*Loadings =>.10

The results of an orthogonal rotation of the solution are shown in Table 1. When loadings less than 0.30 were excluded, the analysis yielded an eight-factor solution with a simple structure (factor loadings =>.30).

The eight topic factors

Six items loaded onto Factor 1. It is clear from Table 1 that these six items all relate to difficulty students reported in knowing what to write. This factor loads onto reported level of difficulty in understanding and interpreting assignment questions, understanding and researching assignment topics, knowing what lecturers wanted them to write and writing the assignment. This factor was labelled, “Positive perceptions about one’s declarative knowledge”.

Three items load onto a second factor related to students’ reported perceptions about knowing how to write. This related to students knowing how to write in an academic way and in an academic genre, and knowing how lecturers want them to write. This factor was labelled, “Positive perceptions about one’s procedural knowledge”.

The two items that load onto Factor 3 relate to the usefulness of information shared with friends in helping students understand assignment questions and write the assignment. This factor was labelled, “Friends as sources of declarative and procedural knowledge”.

The two items that load onto Factor 4 identify the usefulness of tutorials in helping students understand and write assignments. This was labelled, “Tutorials as sources of declarative and procedural knowledge”.

Items loaded for Factor 5 related to textbooks in helping students understand and write assignments. This was labelled, “Textbooks as sources of declarative and procedural knowledge”.

Items for Factor 6 related to students’ reported level of confidence in answering questions and writing assignments. This factor was labelled, “The influence of positive affect on assignment writing”.

Items for Factor 7 identified the usefulness of lectures in helping students understand assignment questions and write assignments. This was labelled, “Lectures as a source of declarative and procedural knowledge”.

Items for Factor 8 represented difficulty students had related to criteria sheets. Students reported difficulty in using criteria and a negative perception related to usefulness of information on the criteria sheets in helping them understand assignment questions and write assignments. This factor was labelled, “Negative perceptions of one’s ability to use of criteria sheets their usefulness as sources of declarative and procedural knowledge”.

Factor scores

As outlined previously, factor scores were saved for each identified factor.

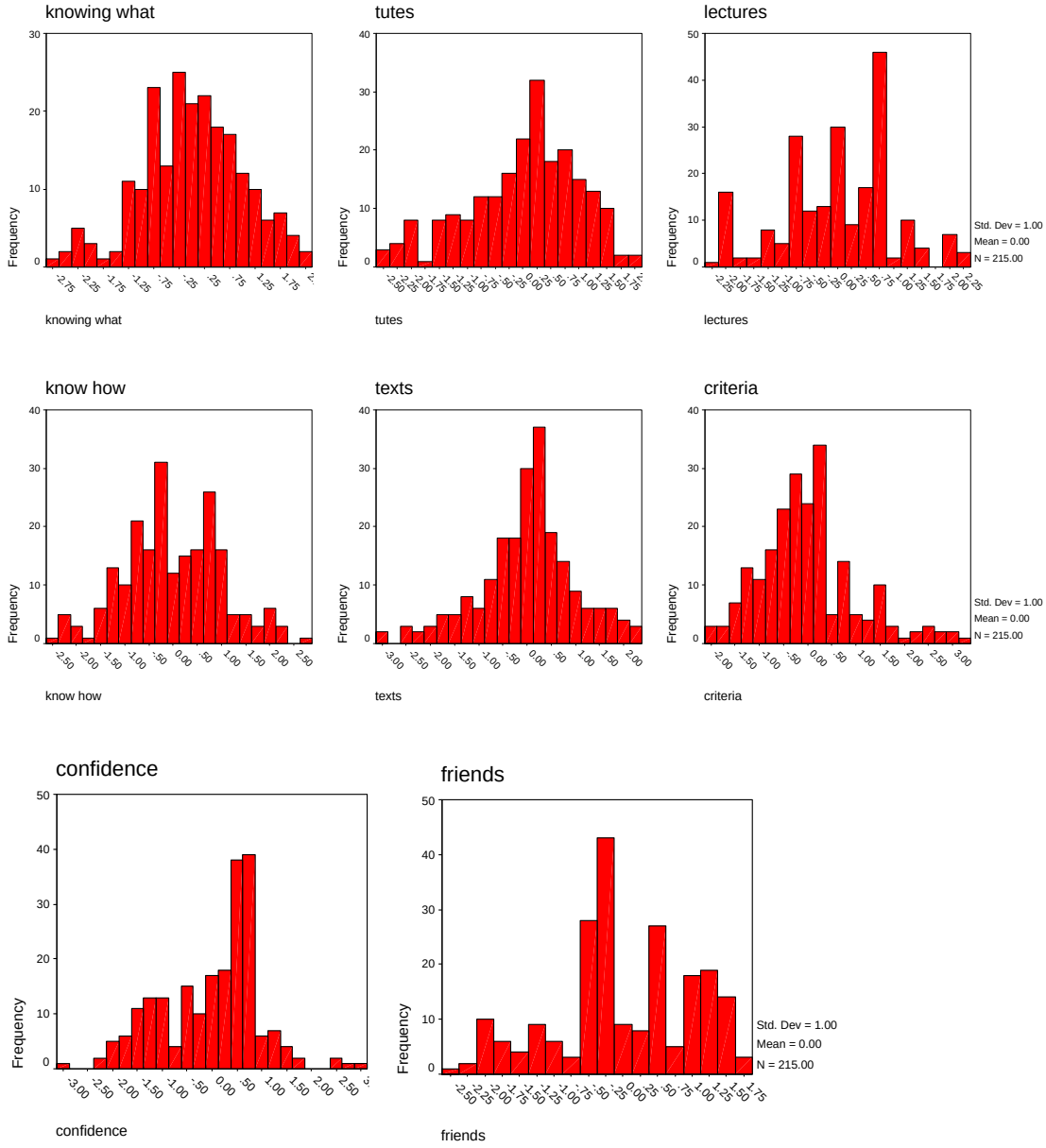

Figure 1. Histograms of eight topic factors

As shown in Figure 1, each of the eight topic factors were approximately normally distributed, with a mean of zero and standard deviation of 1.