Another Example of Factor Analysis

- To determine benefits from toothpaste
- Responses were obtained on 6 variables:
  V1: It is impossible to buy toothpaste to prevent cavities
  V2: I like a toothpaste that gives shiny teeth
  V3: A toothpaste should strengthen your gums
  V4: I prefer a toothpaste that freshens breath
  V5: Prevention of tooth decay is possible
  V6: The most difficult consideration is attractive teeth
- Responses on a 7-pt scale (1=strongly disagree; 7=strongly agree)

Correlation Matrix (from n=30 respondents)

Variables	V1	V2	V3	V4	V5	V6
V1	1.000					
V2	-0.530	1.000				
V3	0.873	-0.155	1.000			
V4	-0.086	0.572	-0.248	1.000		
V5	-0.858	0.020	-0.778	-0.007	1.000	
V6	0.004	0.640	-0.018	0.640	-0.136	1.000

Results of Principal Components Analysis

Communalities

Variables	Initial	Extraction
V1	1.000	0.926
V2	1.000	0.723
V3	1.000	0.894
V4	1.000	0.739
V5	1.000	0.878
V6	1.000	0.790

Initial Eigen values

Factor	Eigen value	% of variance	Cumulat. %
1	2.731	45.520	45.520
2	2.218	36.969	82.488
3	0.442	7.360	89.848
4	0.341	5.688	95.536
5	0.183	3.044	98.580
6	0.085	1.420	100.000

Extraction Sums of Squared Loadings

Factor	Eigen value	% of variance	Cumulat. %
1	2.731	45.520	45.520
2	2.218	36.969	82.488

Factor Matrix

Variables	Factor 1	Factor 2
V1	0.928	0.253
V2	-0.301	0.795
V3	0.936	0.131
V4	-0.342	0.789
V5	-0.869	-0.351
V6	-0.177	0.871

Rotation Sums of Squared Loadings

Factor	Eigenvalue	% of variance	Cumulat. %
1	2.688	44.802	44.802
2	2.261	37.687	82.488

Rotated Factor Matrix

Variables	Factor 1	Factor 2
V1	0.962	-0.027
V2	-0.057	0.848
V3	0.934	-0.146
V4	-0.098	0.845
V5	-0.933	-0.084
V6	0.083	0.885

Factor Score Coefficient Matrix

Variables	Factor 1	Factor 2
V1	0.358	0.011
V2	-0.001	0.375
V3	0.345	-0.043
V4	-0.017	0.377
V5	-0.350	-0.059
V6	0.052	0.395

Factor Score Coefficient Matrix

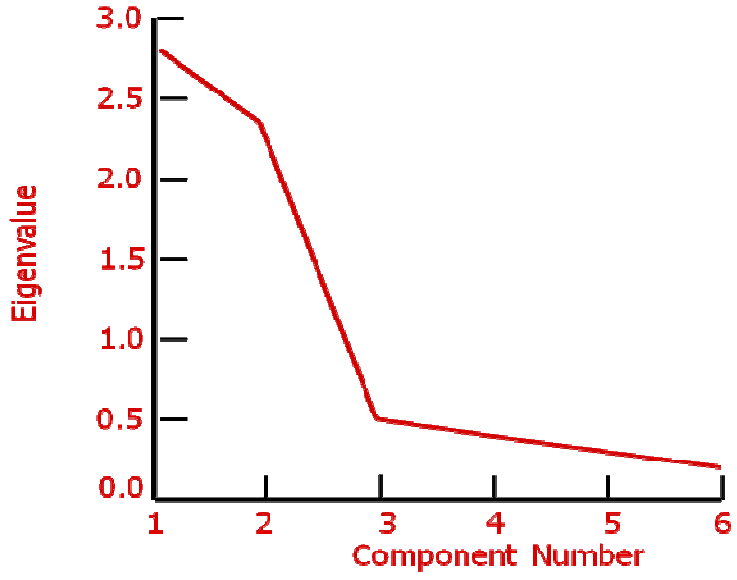
Variables	V1	V2	V3	V4	V5	V6
V1	0.926	0.024	-0.029	0.031	0.038	-0.053
V2	-0.078	0.723	0.022	-0.158	0.038	-0.105
V3	0.902	-0.177	0.894	-0.031	0.081	0.033
V4	-0.117	0.730	-0.217	0.739	-0.027	-0.107
V5	-0.895	-0.018	-0.859	0.020	0.878	0.016
V6	0.057	0.746	-0.051	0.748	-0.152	0.790

The lower-left triangle is correlation matrix;

-The diagonal has the communalities;

-The upper-right triangle has the residuals between the observed correlations and the reproduced correlations.

Scree Plot



Factor Matrix Before and After Rotation

Fig. 19.4

Factors

Variables	1	2
1	X	
2	X	X
3	X	
4	X	X
5	X	X
6		X

(a)

High Loadings
Before Rotation

Factors

Variables	1	2
1	X	
2		X
3	X	
4		X
5	X	
6		X

(b)

High Loadings
After Rotation