

```
1958 0 OUTPUT ACTIVATE PrincipalComponentAnalysisOutput.  
1958 0 M> OUTPUT ACTIVATE PrincipalComponentAnalysisOutput.  
1959 0 TITLE 'Principal Component Analysis'.  
1959 0 M> TITLE 'Principal Component Analysis'.
```

Principal Component Analysis

```
1960 0
1960 0 M>
1961 0 GET DATA
1961 0 M> GET DATA
1962 0 /TYPE=TXT /FILE='D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Principal Component Analysis\dataset.csv' /
      ENCODING='UTF8' /DELCASE=LINE /DELIMITERS=', ' /QUALIFIER=''
1962 0 M> /TYPE=TXT /FILE='D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Principal Component Analysis\dataset.csv'
      /ENCODING='UTF8' /DELCASE=LINE /DELIMITERS=', ' /QUALIFIER=''
1963 0 /ARRANGEMENT=DELIMITED /FIRSTCASE=2
1963 0 M> /ARRANGEMENT=DELIMITED /FIRSTCASE=2
1964 0 /VARIABLES=
1964 0 M> /VARIABLES=
1965 0 school A8 sex A8 age F8.0 address A8 famsize A8 Pstatus A8 Medu F8.0
      Fedu F8.0
1965 0 M> school A8 sex A8 age F8.0 address A8 famsize A8 Pstatus A8 Medu F
      8.0 Fedu F8.0
1966 0 Mjob A16 Fjob A16 reason A16 guardian A16 traveltime F8.0 studytime
      F8.0 failures F8.0
1966 0 M> Mjob A16 Fjob A16 reason A16 guardian A16 traveltime F8.0 studyti
      me F8.0 failures F8.0
1967 0 schoolsup A8 famsup A8 paid A8 activities A8 nursery A8 higher A8 in
      ternet A8 romantic A8
1967 0 M> schoolsup A8 famsup A8 paid A8 activities A8 nursery A8 higher A8
      internet A8 romantic A8
1968 0 famrel F8.0 freetime F8.0 goout F8.0 Dalc F8.0 Walc F8.0 health F8.0
      absences F8.0 G1 F8.0 G2 F8.0 G3 F8.0.
1968 0 M> famrel F8.0 freetime F8.0 goout F8.0 Dalc F8.0 Walc F8.0 health F
      8.0 absences F8.0 G1 F8.0 G2 F8.0 G3 F8.0.
1969 0 DATASET NAME PrincipalComponentAnalysisData.
1969 0 M> DATASET NAME PrincipalComponentAnalysisData.
1970 0 COMPUTE subject_id=$CASENUM.
1970 0 M> COMPUTE subject_id=$CASENUM.
1971 0 COMPUTE Dalc_R=6-Dalc.
1971 0 M> COMPUTE Dalc_R=6-Dalc.
1972 0 COMPUTE Walc_R=6-Walc.
1972 0 M> COMPUTE Walc_R=6-Walc.
```

Principal Component Analysis

```
1973  0  RECODE schoolsup famsup paid activities higher internet ('no'=0) ('yes'=1)
1973  0 M> RECODE schoolsup famsup paid activities higher internet ('no'=0) ('yes'=1)
1974  0  INTO schoolsup_b famsup_b paid_b activities_b higher_b internet_b.
1974  0 M> INTO schoolsup_b famsup_b paid_b activities_b higher_b internet_b
.
1975  0  EXECUTE.
1975  0 M> EXECUTE.
1976  0
1976  0 M>
1977  0  * BEGIN METHOD-SPECIFIC SPSS WORKFLOW.
1977  0 M> * BEGIN METHOD-SPECIFIC SPSS WORKFLOW.
1978  0  TITLE 'Principal Component Analysis'.
1978  0 M> TITLE 'Principal Component Analysis'.
```

Principal Component Analysis

```
1979 0 SUBTITLE 'Orthogonal total-variance decomposition'.  
1979 0 M> SUBTITLE 'Orthogonal total-variance decomposition'.
```

Principal Component Analysis
Orthogonal total-variance decomposition

```

1980  0  FACTOR /VARIABLES=G1 G2 G3 famrel freetime goout /MISSING=LISTWISE /A
NALYSIS=G1 G2 G3 famrel freetime goout
1980  0 M>  FACTOR /VARIABLES=G1 G2 G3 famrel freetime goout /MISSING=LISTWISE
 /ANALYSIS=G1 G2 G3 famrel freetime goout
1981  0  /PRINT=INITIAL EXTRACTION KMO CORRELATION /PLOT=EIGEN
1981  0 M>  /PRINT=INITIAL EXTRACTION KMO CORRELATION /PLOT=EIGEN
1982  0  /CRITERIA=FACTORS(2) ITERATE(500) /EXTRACTION=PC /ROTATION=NOROTATE
/METHOD=CORRELATION.
1982  0 M>  /CRITERIA=FACTORS(2) ITERATE(500) /EXTRACTION=PC /ROTATION=NOROTA
TE /METHOD=CORRELATION.

```

Factor Analysis

Notes

Output Created		18-JUL-2026 10:57:25
Comments		
Input	Data	D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Principal Component Analysis\dataset.csv
	Active Dataset	PrincipalComponentAnaly sisData
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	649
Missing Value Handling	Definition of Missing	MISSING=EXCLUDE: User-defined missing values are treated as missing.
	Cases Used	LISTWISE: Statistics are based on cases with no missing values for any variable used.

Principal Component Analysis
Orthogonal total-variance decomposition

Notes

Syntax		FACTOR /VARIABLES=G1 G2 G3 famrel freetime goout /MISSING=LISTWISE /ANALYSIS=G1 G2 G3 famrel freetime goout /PRINT=INITIAL EXTRACTION KMO CORRELATION /PLOT=EIGEN /CRITERIA=FACTORS(2) ITERATE(500) /EXTRACTION=PC /ROTATION=NOROTATE /METHOD=CORRELATIO N.
Resources	Processor Time	00:00:00.30
	Elapsed Time	00:00:00.30
	Maximum Memory Required	5704 (5.570K) bytes

[PrincipalComponentAnalysisData]

Correlation Matrix

		G1	G2	G3	famrel	freetime	goout
Correlation	G1	1.000	.865	.826	.049	-.094	-.074
	G2	.865	1.000	.919	.090	-.107	-.079
	G3	.826	.919	1.000	.063	-.123	-.088
	famrel	.049	.090	.063	1.000	.129	.090
	freetime	-.094	-.107	-.123	.129	1.000	.346
	goout	-.074	-.079	-.088	.090	.346	1.000

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.732
Bartlett's Test of Sphericity	Approx. Chi-Square	2220.632
	df	15
	Sig.	.000

Principal Component Analysis
Orthogonal total-variance decomposition

Communalities

	Initial	Extraction
G1	1.000	.873
G2	1.000	.943
G3	1.000	.914
famrel	1.000	.232
freetime	1.000	.622
goout	1.000	.584

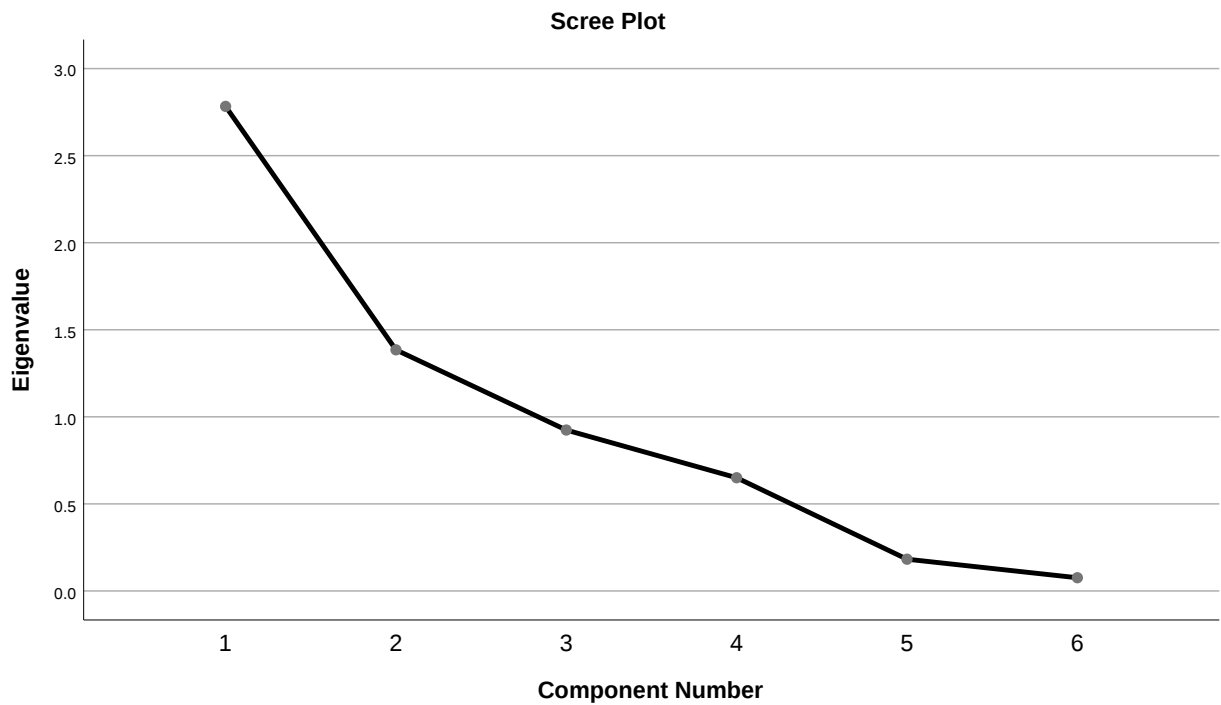
Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Total	Initial Eigenvalues		Extraction Sums of Squared Loadings		
		% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.783	46.381	46.381	2.783	46.381	46.381
2	1.385	23.080	69.461	1.385	23.080	69.461
3	.924	15.402	84.863			
4	.650	10.835	95.698			
5	.182	3.038	98.736			
6	.076	1.264	100.000			

Extraction Method: Principal Component Analysis.

Principal Component Analysis
Orthogonal total-variance decomposition



Component Matrix^a

	Component	
	1	2
G1	.931	.084
G2	.966	.093
G3	.954	.067
famrel	.085	.474
freetime	-.198	.763
goout	-.163	.747

Extraction Method: Principal
Component Analysis.

a. 2 components extracted.

```
1983 0 ECHO 'PCA explains total variance and does not estimate uniqueness'.
1983 0 M> ECHO 'PCA explains total variance and does not estimate uniqueness'.
```

PCA explains total variance and does not estimate uniqueness

Principal Component Analysis
Orthogonal total-variance decomposition

1984 0 DESCRIPTIVES VARIABLES=G1 G2 G3 famrel freetime goout /STATISTICS=MEAN STDDEV MIN MAX.

1984 0 M> DESCRIPTIVES VARIABLES=G1 G2 G3 famrel freetime goout /STATISTICS=MEAN STDDEV MIN MAX.

Descriptives

Notes

Output Created		18-JUL-2026 10:57:25
Comments		
Input	Data	D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Principal Component Analysis\dataset.csv
	Active Dataset	PrincipalComponentAnaly sisData
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	649
Missing Value Handling	Definition of Missing	User defined missing values are treated as missing.
	Cases Used	All non-missing data are used.
Syntax		DESCRIPTIVES VARIABLES=G1 G2 G3 famrel freetime goout /STATISTICS=MEAN STDDEV MIN MAX.
Resources	Processor Time	00:00:00.05
	Elapsed Time	00:00:00.04

Principal Component Analysis
Orthogonal total-variance decomposition

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
G1	649	0	19	11.40	2.745
G2	649	0	19	11.57	2.914
G3	649	0	19	11.91	3.231
famrel	649	1	5	3.93	.956
freetime	649	1	5	3.18	1.051
goout	649	1	5	3.18	1.176
Valid N (listwise)	649				

```

1985  0  * END METHOD-SPECIFIC SPSS WORKFLOW.
1985  0 M> * END METHOD-SPECIFIC SPSS WORKFLOW.
1986  0
1986  0 M>
1987  0  SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis and Scale T
esting\Principal Component Analysis\SPSS_Output\sav\pr
      incipal-component-analysis_spss_ready_data.sav' /COMPRESSED.
1987  0 M> SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis and Scal
e Testing\Principal Component Analysis\SPSS_Output\sav
      \principal-component-analysis_spss_ready_data.sav' /COMPRESSED.
1988  0
1988  0 M>
1989  0  ECHO '=====
====='.
1989  0 M> ECHO '=====
====='.
=====
1990  0  ECHO 'PRINCIPAL COMPONENT ANALYSIS'.
1990  0 M> ECHO 'PRINCIPAL COMPONENT ANALYSIS'.
PRINCIPAL COMPONENT ANALYSIS
1991  0  ECHO 'Design: Orthogonal variance-maximizing decomposition of the six
standardized variables.'.
1991  0 M> ECHO 'Design: Orthogonal variance-maximizing decomposition of the
six standardized variables.'.
Design: Orthogonal variance-maximizing decomposition of the six standardized v
ariables.

```

Principal Component Analysis
Orthogonal total-variance decomposition

```
1992 0 ECHO 'Null hypothesis: The retained components explain no more variance than individual standardized variables.'.
1992 0 M> ECHO 'Null hypothesis: The retained components explain no more variance than individual standardized variables.'.
Null hypothesis: The retained components explain no more variance than individual standardized variables.
1993 0 ECHO 'Formula: PC_j=X v_j with R v_j=lambda_j v_j; explained proportion=lambda_j/p.'.
1993 0 M> ECHO 'Formula: PC_j=X v_j with R v_j=lambda_j v_j; explained proportion=lambda_j/p.'.
Formula: PC_j=X v_j with R v_j=lambda_j v_j; explained proportion=lambda_j/p.
1994 0 ECHO 'Variables: G1, G2, G3, famrel, freetime, goout'.
1994 0 M> ECHO 'Variables: G1, G2, G3, famrel, freetime, goout'.
Variables: G1, G2, G3, famrel, freetime, goout
1995 0 ECHO 'Rows analyzed: 649'.
1995 0 M> ECHO 'Rows analyzed: 649'.
Rows analyzed: 649
1996 0 ECHO 'components = 2'.
1996 0 M> ECHO 'components = 2'.
components = 2
1997 0 ECHO 'first_component_variance = 0.4638116493590001'.
1997 0 M> ECHO 'first_component_variance = 0.4638116493590001'.
first_component_variance = 0.4638116493590001
1998 0 ECHO 'first_eigenvalue = 2.7828698961540006'.
1998 0 M> ECHO 'first_eigenvalue = 2.7828698961540006'.
first_eigenvalue = 2.7828698961540006
1999 0 ECHO 'first_two_cumulative_variance = 0.694612262636963'.
1999 0 M> ECHO 'first_two_cumulative_variance = 0.694612262636963'.
first_two_cumulative_variance = 0.694612262636963
2000 0 ECHO 'second_eigenvalue = 1.3848036796677767'.
2000 0 M> ECHO 'second_eigenvalue = 1.3848036796677767'.
second_eigenvalue = 1.3848036796677767
2001 0 ECHO 'Cross-check status: pass'.
2001 0 M> ECHO 'Cross-check status: pass'.
Cross-check status: pass
2002 0 ECHO '=====
====='.
2002 0 M> ECHO '=====
====='.
=====
```

Principal Component Analysis
Orthogonal total-variance decomposition

```
=====
2003  0
2003  0 M>
2004  0  OUTPUT SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis and
Scale Testing\Principal Component Analysis\SPSS_Output
        \spv\principal-component-analysis_spss_output.spv'.
2004  0 M>  OUTPUT SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis a
nd Scale Testing\Principal Component Analysis\SPSS_Out
        put\spv\principal-component-analysis_spss_output.spv'.
2005  0  OUTPUT EXPORT /CONTENTS EXPORT=ALL LAYERS=PRINTSETTING MODELVIEWS=PRI
NTSETTING
2005  0 M>  OUTPUT EXPORT /CONTENTS EXPORT=ALL LAYERS=PRINTSETTING MODELVIEWS=
PRINTSETTING
```