

```
1776 0 OUTPUT ACTIVATE ParallelAnalysisOutput.  
1776 0 M> OUTPUT ACTIVATE ParallelAnalysisOutput.  
1777 0 TITLE 'PCA Parallel Analysis'.  
1777 0 M> TITLE 'PCA Parallel Analysis'.
```

PCA Parallel Analysis

```
1778 0
1778 0 M>
1779 0 GET DATA
1779 0 M> GET DATA
1780 0 /TYPE=TXT /FILE='D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Parallel Analysis\dataset.csv' /ENCODING='UTF8' /DELCASE=LINE /DELIMITERS=', ' /QUALIFIER=''
1780 0 M> /TYPE=TXT /FILE='D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Parallel Analysis\dataset.csv' /ENCODING='UTF8' /DELCASE=LINE /DELIMITERS=', ' /QUALIFIER=''
1781 0 /ARRANGEMENT=DELIMITED /FIRSTCASE=2
1781 0 M> /ARRANGEMENT=DELIMITED /FIRSTCASE=2
1782 0 /VARIABLES=
1782 0 M> /VARIABLES=
1783 0 school A8 sex A8 age F8.0 address A8 famsize A8 Pstatus A8 Medu F8.0 Fedu F8.0
1783 0 M> school A8 sex A8 age F8.0 address A8 famsize A8 Pstatus A8 Medu F8.0 Fedu F8.0
1784 0 Mjob A16 Fjob A16 reason A16 guardian A16 traveltime F8.0 studytime F8.0 failures F8.0
1784 0 M> Mjob A16 Fjob A16 reason A16 guardian A16 traveltime F8.0 studytime F8.0 failures F8.0
1785 0 schoolsup A8 famsup A8 paid A8 activities A8 nursery A8 higher A8 internet A8 romantic A8
1785 0 M> schoolsup A8 famsup A8 paid A8 activities A8 nursery A8 higher A8 internet A8 romantic A8
1786 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.
1786 0 M> 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.
1787 0 DATASET NAME ParallelAnalysisData.
1787 0 M> DATASET NAME ParallelAnalysisData.
1788 0 COMPUTE subject_id=$CASENUM.
1788 0 M> COMPUTE subject_id=$CASENUM.
1789 0 COMPUTE Dalc_R=6-Dalc.
1789 0 M> COMPUTE Dalc_R=6-Dalc.
1790 0 COMPUTE Walc_R=6-Walc.
1790 0 M> COMPUTE Walc_R=6-Walc.
```

PCA Parallel Analysis

```
1791  0  RECODE schoolsup famsup paid activities higher internet ('no'=0) ('yes'=1)
1791  0 M> RECODE schoolsup famsup paid activities higher internet ('no'=0) ('yes'=1)
1792  0  INTO schoolsup_b famsup_b paid_b activities_b higher_b internet_b.
1792  0 M> INTO schoolsup_b famsup_b paid_b activities_b higher_b internet_b
.
1793  0  EXECUTE.
1793  0 M> EXECUTE.
1794  0
1794  0 M>
1795  0  * BEGIN METHOD-SPECIFIC SPSS WORKFLOW.
1795  0 M> * BEGIN METHOD-SPECIFIC SPSS WORKFLOW.
1796  0  TITLE 'PCA Parallel Analysis'.
1796  0 M> TITLE 'PCA Parallel Analysis'.
```

PCA Parallel Analysis

```
1797 0 SUBTITLE 'Observed full-correlation roots versus random 95th percenti  
les'.
```

```
1797 0 M> SUBTITLE 'Observed full-correlation roots versus random 95th perce  
ntiles'.
```

```
>Warning # 2004 on line 1797. Command name: SUBTITLE
```

```
>The subtitle given exceeds 60 characters in length. The first 60 characters  
>will be used.
```

PCA Parallel Analysis
Observed full-correlation roots versus random 95th percentil

```

1798  0  FACTOR /VARIABLES=G1 G2 G3 famrel freetime goout /MISSING=LISTWISE /A
NALYSIS=G1 G2 G3 famrel freetime goout
1798  0 M>  FACTOR /VARIABLES=G1 G2 G3 famrel freetime goout /MISSING=LISTWISE
 /ANALYSIS=G1 G2 G3 famrel freetime goout
1799  0  /PRINT=INITIAL EXTRACTION KMO CORRELATION /PLOT=EIGEN
1799  0 M>  /PRINT=INITIAL EXTRACTION KMO CORRELATION /PLOT=EIGEN
1800  0  /CRITERIA=FACTORS(6) ITERATE(500) /EXTRACTION=PC /ROTATION=NOROTATE
/METHOD=CORRELATION.
1800  0 M>  /CRITERIA=FACTORS(6) ITERATE(500) /EXTRACTION=PC /ROTATION=NOROTA
TE /METHOD=CORRELATION.

```

Factor Analysis

Notes

Output Created		18-JUL-2026 10:57:11
Comments		
Input	Data	D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Parallel Analysis\dataset.csv
	Active Dataset	ParallelAnalysisData
	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.

PCA Parallel Analysis
Observed full-correlation roots versus random 95th percentil

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(6) ITERATE(500) /EXTRACTION=PC /ROTATION=NOROTATE /METHOD=CORRELATIO N.
Resources	Processor Time	00:00:00.45
	Elapsed Time	00:00:00.39
	Maximum Memory Required	5704 (5.570K) bytes

[ParallelAnalysisData]

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

PCA Parallel Analysis
Observed full-correlation roots versus random 95th percentil

Communalities

	Initial	Extraction
G1	1.000	1.000
G2	1.000	1.000
G3	1.000	1.000
famrel	1.000	1.000
freetime	1.000	1.000
goout	1.000	1.000

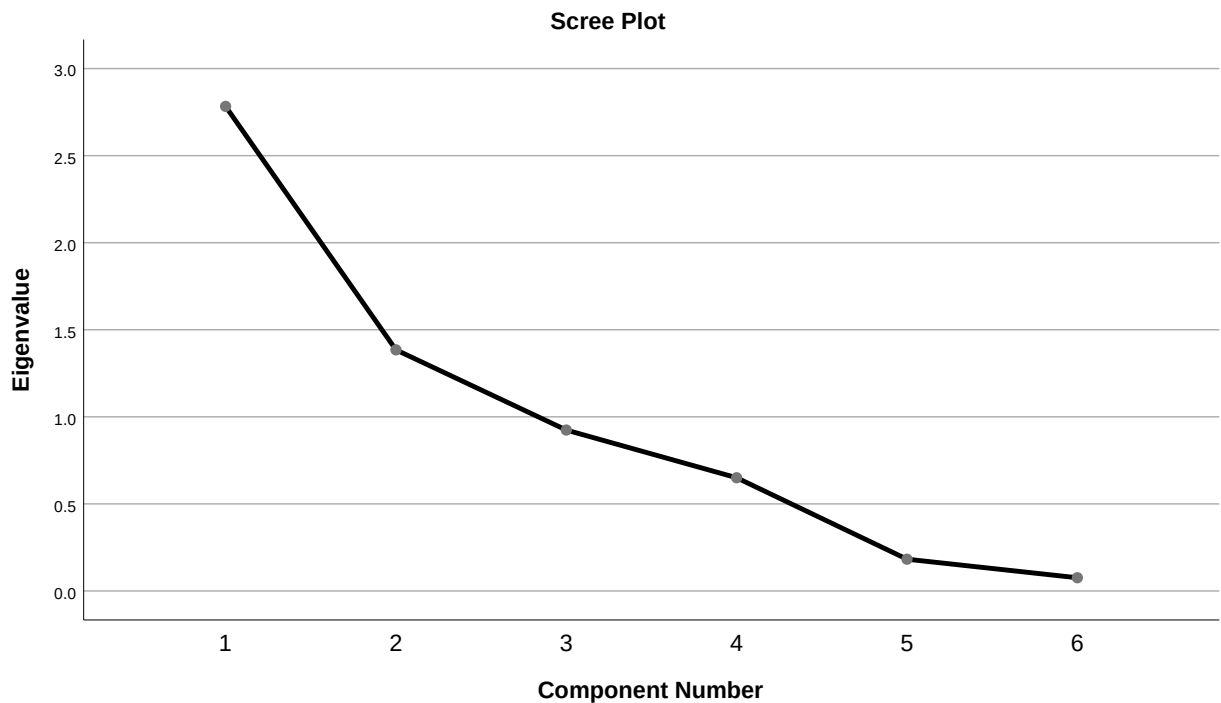
Extraction Method: Principal Component Analysis.

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	.924	15.402	84.863
4	.650	10.835	95.698	.650	10.835	95.698
5	.182	3.038	98.736	.182	3.038	98.736
6	.076	1.264	100.000	.076	1.264	100.000

Extraction Method: Principal Component Analysis.

PCA Parallel Analysis
Observed full-correlation roots versus random 95th percentil



Component Matrix^a

	Component					
	1	2	3	4	5	6
G1	.931	.084	-.083	-.023	.342	.050
G2	.966	.093	-.039	-.009	-.102	-.213
G3	.954	.067	-.055	-.003	-.234	.167
famrel	.085	.474	.873	.081	.011	.006
freetime	-.198	.763	-.193	-.584	-.010	.002
goout	-.163	.747	-.338	.550	-.001	.000

Extraction Method: Principal Component Analysis.

a. 6 components extracted.

```
1801  0  SET SEED=20260716.
1801  0 M> SET SEED=20260716.
1802  0  ECHO 'PCA parallel analysis uses unit diagonals and 200 deterministic
        replications'.
1802  0 M> ECHO 'PCA parallel analysis uses unit diagonals and 200 determinis
        tic replications'.
```


PCA Parallel Analysis
Observed full-correlation roots versus random 95th percentil

PCA parallel analysis uses unit diagonals and 200 deterministic replications
 1803 0 DESCRIPTIVES VARIABLES=G1 G2 G3 famrel freetime goout /STATISTICS=MEAN STDDEV MIN MAX.
 1803 0 M> DESCRIPTIVES VARIABLES=G1 G2 G3 famrel freetime goout /STATISTICS=MEAN STDDEV MIN MAX.

Descriptives

Notes

Output Created		18-JUL-2026 10:57:11
Comments		
Input	Data	D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Parallel Analysis\dataset.csv
	Active Dataset	ParallelAnalysisData
	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	00:00:00.08

PCA Parallel Analysis
Observed full-correlation roots versus random 95th percentil

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				

```

1804 0 * END METHOD-SPECIFIC SPSS WORKFLOW.
1804 0 M> * END METHOD-SPECIFIC SPSS WORKFLOW.
1805 0
1805 0 M>
1806 0 SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis and Scale T
esting\Parallel Analysis\SPSS_Output\sav\parallel-anal
ysis_spss_ready_data.sav' /COMPRESSED.
1806 0 M> SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis and Scal
e Testing\Parallel Analysis\SPSS_Output\sav\parallel-a
nalysis_spss_ready_data.sav' /COMPRESSED.

1807 0
1807 0 M>
1808 0 ECHO '=====
====='.
1808 0 M> ECHO '=====
====='.

=====
1809 0 ECHO 'PCA PARALLEL ANALYSIS'.
1809 0 M> ECHO 'PCA PARALLEL ANALYSIS'.
PCA PARALLEL ANALYSIS
1810 0 ECHO 'Design: Full-correlation PCA eigenvalues compared with determin
istic 95th-percentile random eigenvalues.'.
1810 0 M> ECHO 'Design: Full-correlation PCA eigenvalues compared with deter
ministic 95th-percentile random eigenvalues.'.
Design: Full-correlation PCA eigenvalues compared with deterministic 95th-perc
entile random eigenvalues.

```

PCA Parallel Analysis
Observed full-correlation roots versus random 95th percentil

```
1811 0 ECHO 'Null hypothesis: No observed PCA eigenvalue exceeds its random
95th-percentile counterpart.'.
1811 0 M> ECHO 'Null hypothesis: No observed PCA eigenvalue exceeds its rand
om 95th-percentile counterpart.'.
Null hypothesis: No observed PCA eigenvalue exceeds its random 95th-percentile
counterpart.
1812 0 ECHO 'Formula: Retain component j when lambda_j(R)>Q_.95[lambda_j(R_r
andom)].'.
1812 0 M> ECHO 'Formula: Retain component j when lambda_j(R)>Q_.95[lambda_j(
R_random)].'.
Formula: Retain component j when lambda_j(R)>Q_.95[lambda_j(R_random)].
1813 0 ECHO 'Variables: G1, G2, G3, famrel, freetime, goout'.
1813 0 M> ECHO 'Variables: G1, G2, G3, famrel, freetime, goout'.
Variables: G1, G2, G3, famrel, freetime, goout
1814 0 ECHO 'Rows analyzed: 649'.
1814 0 M> ECHO 'Rows analyzed: 649'.
Rows analyzed: 649
1815 0 ECHO 'first_observed_eigenvalue = 2.7828698961540006'.
1815 0 M> ECHO 'first_observed_eigenvalue = 2.7828698961540006'.
first_observed_eigenvalue = 2.7828698961540006
1816 0 ECHO 'first_random_threshold = 1.1894837041690534'.
1816 0 M> ECHO 'first_random_threshold = 1.1894837041690534'.
first_random_threshold = 1.1894837041690534
1817 0 ECHO 'replications = 200'.
1817 0 M> ECHO 'replications = 200'.
replications = 200
1818 0 ECHO 'retained_components = 2'.
1818 0 M> ECHO 'retained_components = 2'.
retained_components = 2
1819 0 ECHO 'variables = 6'.
1819 0 M> ECHO 'variables = 6'.
variables = 6
1820 0 ECHO 'Cross-check status: pass'.
1820 0 M> ECHO 'Cross-check status: pass'.
Cross-check status: pass
1821 0 ECHO '=====
====='.
1821 0 M> ECHO '=====
====='.
=====
```

PCA Parallel Analysis
Observed full-correlation roots versus random 95th percentil

```
=====
1822  0
1822  0 M>
1823  0  OUTPUT SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis and
Scale Testing\Parallel Analysis\SPSS_Output\spv\parall
      el-analysis_spss_output.spv'.
1823  0 M>  OUTPUT SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis a
nd Scale Testing\Parallel Analysis\SPSS_Output\spv\par
      allel-analysis_spss_output.spv'.
1824  0  OUTPUT EXPORT /CONTENTS EXPORT=ALL LAYERS=PRINTSETTING MODELVIEWS=PRI
NTSETTING
1824  0 M>  OUTPUT EXPORT /CONTENTS EXPORT=ALL LAYERS=PRINTSETTING MODELVIEWS=
PRINTSETTING
```