

```
164 0 OUTPUT ACTIVATE BartlettsTestofSphericityOutput.  
164 0 M> OUTPUT ACTIVATE BartlettsTestofSphericityOutput.  
165 0 TITLE 'Bartlett''s Test of Sphericity'.  
165 0 M> TITLE 'Bartlett''s Test of Sphericity'.
```

Bartlett's Test of Sphericity

```
166 0
166 0 M>
167 0 GET DATA
167 0 M> GET DATA
168 0 /TYPE=TXT /FILE='D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Bartletts Test of Sphericity\dataset.csv' /
    ENCODING='UTF8' /DELCASE=LINE /DELIMITERS=', ' /QUALIFIER='"'
168 0 M> /TYPE=TXT /FILE='D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Bartletts Test of Sphericity\dataset.csv'
    ' /ENCODING='UTF8' /DELCASE=LINE /DELIMITERS=', ' /QUALIFIER='"'
169 0 /ARRANGEMENT=DELIMITED /FIRSTCASE=2
169 0 M> /ARRANGEMENT=DELIMITED /FIRSTCASE=2
170 0 /VARIABLES=
170 0 M> /VARIABLES=
171 0 school A8 sex A8 age F8.0 address A8 famsize A8 Pstatus A8 Medu F8.0
    Fedu F8.0
171 0 M> school A8 sex A8 age F8.0 address A8 famsize A8 Pstatus A8 Medu F
    8.0 Fedu F8.0
172 0 Mjob A16 Fjob A16 reason A16 guardian A16 traveltime F8.0 studytime
    F8.0 failures F8.0
172 0 M> Mjob A16 Fjob A16 reason A16 guardian A16 traveltime F8.0 studyti
    me F8.0 failures F8.0
173 0 schoolsup A8 famsup A8 paid A8 activities A8 nursery A8 higher A8 in
    ternet A8 romantic A8
173 0 M> schoolsup A8 famsup A8 paid A8 activities A8 nursery A8 higher A8
    internet A8 romantic A8
174 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.
174 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.
175 0 DATASET NAME BartlettsTestofSphericityData.
175 0 M> DATASET NAME BartlettsTestofSphericityData.
176 0 COMPUTE subject_id=$CASENUM.
176 0 M> COMPUTE subject_id=$CASENUM.
177 0 COMPUTE Dalc_R=6-Dalc.
177 0 M> COMPUTE Dalc_R=6-Dalc.
178 0 COMPUTE Walc_R=6-Walc.
178 0 M> COMPUTE Walc_R=6-Walc.
```

Bartlett's Test of Sphericity

```
179 0 RECODE schoolsup famsup paid activities higher internet ('no'=0) ('yes'=1)
179 0 M> RECODE schoolsup famsup paid activities higher internet ('no'=0) ('yes'=1)
180 0 INTO schoolsup_b famsup_b paid_b activities_b higher_b internet_b.
180 0 M> INTO schoolsup_b famsup_b paid_b activities_b higher_b internet_b
.
181 0 EXECUTE.
181 0 M> EXECUTE.
182 0
182 0 M>
183 0 * BEGIN METHOD-SPECIFIC SPSS WORKFLOW.
183 0 M> * BEGIN METHOD-SPECIFIC SPSS WORKFLOW.
184 0 TITLE 'Bartlett's Test of Sphericity'.
184 0 M> TITLE 'Bartlett's Test of Sphericity'.
```

Bartlett's Test of Sphericity

```
185 0 SUBTITLE 'Identity-correlation likelihood-ratio factorability test'.  
185 0 M> SUBTITLE 'Identity-correlation likelihood-ratio factorability test'  
'.
```

Bartlett's Test of Sphericity
Identity-correlation likelihood-ratio factorability test

```

186  0  FACTOR /VARIABLES=G1 G2 G3 famrel freetime goout /MISSING=LISTWISE /A
NALYSIS=G1 G2 G3 famrel freetime goout
186  0 M>  FACTOR /VARIABLES=G1 G2 G3 famrel freetime goout /MISSING=LISTWISE
/ANALYSIS=G1 G2 G3 famrel freetime goout
187  0    /PRINT=INITIAL EXTRACTION KMO CORRELATION /PLOT=EIGEN
187  0 M>    /PRINT=INITIAL EXTRACTION KMO CORRELATION /PLOT=EIGEN
188  0    /CRITERIA=FACTORS(2) ITERATE(500) /EXTRACTION=PAF /ROTATION=NOROTATE
/METHOD=CORRELATION.
188  0 M>    /CRITERIA=FACTORS(2) ITERATE(500) /EXTRACTION=PAF /ROTATION=NOROT
ATE /METHOD=CORRELATION.

```

Factor Analysis

Notes

Output Created		18-JUL-2026 10:54:05
Comments		
Input	Data	D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Bartlett's Test of Sphericity\dataset.csv
	Active Dataset	Bartlett's Test of Sphericity Data
	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.

Bartlett's Test of Sphericity
Identity-correlation likelihood-ratio factorability test

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=PAF /ROTATION=NOROTATE /METHOD=CORRELATIO N.
Resources	Processor Time	00:00:01.53
	Elapsed Time	00:00:00.52
	Maximum Memory Required	5704 (5.570K) bytes

[Bartlett's Test of Sphericity Data]

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

Bartlett's Test of Sphericity
Identity-correlation likelihood-ratio factorability test

Communalities

	Initial	Extraction
G1	.755	.775
G2	.880	.966
G3	.849	.878
famrel	.034	.045
freetime	.140	.474
goout	.125	.252

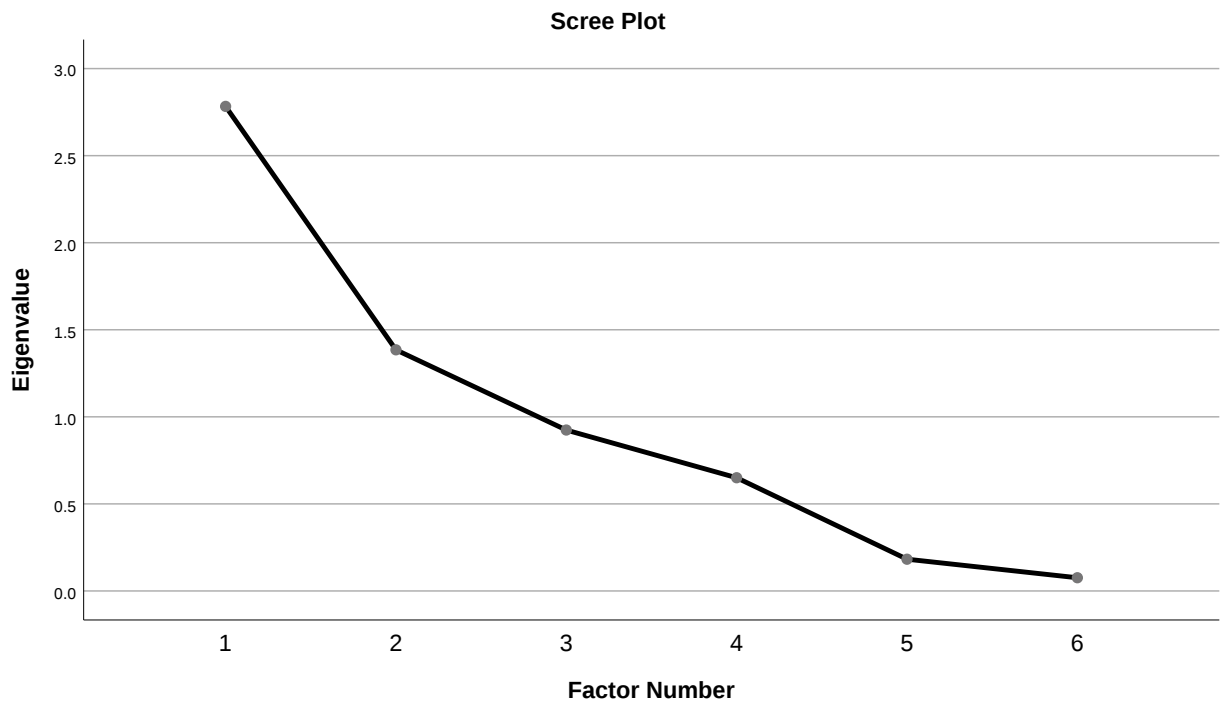
Extraction Method: Principal Axis Factoring.

Total Variance Explained

Factor	Total	Initial Eigenvalues		Extraction Sums of Squared Loadings		
		% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.783	46.381	46.381	2.650	44.166	44.166
2	1.385	23.080	69.461	.740	12.337	56.503
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 Axis Factoring.

Bartlett's Test of Sphericity
Identity-correlation likelihood-ratio factorability test



Factor Matrix^a

	Factor	
	1	2
G1	.879	.053
G2	.980	.070
G3	.936	.033
famrel	.061	.204
freetime	-.153	.671
goout	-.114	.489

Extraction Method: Principal Axis Factoring.

a. 2 factors extracted. 41 iterations required.

```
189 0 ECHO 'Bartlett chi-square uses the determinant of the six-variable co
relation matrix'.
```

```
189 0 M> ECHO 'Bartlett chi-square uses the determinant of the six-variable
correlation matrix'.
```

Bartlett's Test of Sphericity
Identity-correlation likelihood-ratio factorability test

Bartlett chi-square uses the determinant of the six-variable correlation matrix

```
190 0 DESCRIPTIVES VARIABLES=G1 G2 G3 famrel freetime goout /STATISTICS=MEAN STDDEV MIN MAX.
```

```
190 0 M> DESCRIPTIVES VARIABLES=G1 G2 G3 famrel freetime goout /STATISTICS=MEAN STDDEV MIN MAX.
```

Descriptives

Notes

Output Created		18-JUL-2026 10:54:05
Comments		
Input	Data	D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Bartlett's Test of Sphericity\dataset.csv
	Active Dataset	Bartlett's Test of Sphericity Data
	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	00:00:00.03

Bartlett's Test of Sphericity
Identity-correlation likelihood-ratio factorability test

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				

```

191 0 * END METHOD-SPECIFIC SPSS WORKFLOW.
191 0 M> * END METHOD-SPECIFIC SPSS WORKFLOW.
192 0
192 0 M>
193 0 SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis and Scale T
esting\Bartlett's Test of Sphericity\SPSS_Output\sav\ba
rtlett's-test-of-sphericity_spss_ready_data.sav' /COMPRESSED.
193 0 M> SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis and Scal
e Testing\Bartlett's Test of Sphericity\SPSS_Output\sav
\bartlett's-test-of-sphericity_spss_ready_data.sav' /COMPRESSED.

194 0
194 0 M>
195 0 ECHO '=====
====='.
195 0 M> ECHO '=====
====='.

=====
196 0 ECHO 'BARTLETT'S TEST OF SPHERICITY'.
196 0 M> ECHO 'BARTLETT'S TEST OF SPHERICITY'.
BARTLETT'S TEST OF SPHERICITY
197 0 ECHO 'Design: Likelihood-ratio test that the six-variable population
correlation matrix is identity.'.
197 0 M> ECHO 'Design: Likelihood-ratio test that the six-variable populati
on correlation matrix is identity.'.
Design: Likelihood-ratio test that the six-variable population correlation mat
rix is identity.

```

Bartlett's Test of Sphericity
Identity-correlation likelihood-ratio factorability test

```
198 0 ECHO 'Null hypothesis: The population correlation matrix is the identity matrix.'.
198 0 M> ECHO 'Null hypothesis: The population correlation matrix is the identity matrix.'.
Null hypothesis: The population correlation matrix is the identity matrix.
199 0 ECHO 'Formula: chi2=-[n-1-(2p+5)/6] ln|R|; df=p(p-1)/2.'.
199 0 M> ECHO 'Formula: chi2=-[n-1-(2p+5)/6] ln|R|; df=p(p-1)/2.'.
Formula: chi2=-[n-1-(2p+5)/6] ln|R|; df=p(p-1)/2.
200 0 ECHO 'Variables: G1, G2, G3, famrel, freetime, goout'.
200 0 M> ECHO 'Variables: G1, G2, G3, famrel, freetime, goout'.
Variables: G1, G2, G3, famrel, freetime, goout
201 0 ECHO 'Rows analyzed: 649'.
201 0 M> ECHO 'Rows analyzed: 649'.
Rows analyzed: 649
202 0 ECHO 'chi_square = 2220.6317415901754'.
202 0 M> ECHO 'chi_square = 2220.6317415901754'.
chi_square = 2220.6317415901754
203 0 ECHO 'determinant = 0.03200220358430366'.
203 0 M> ECHO 'determinant = 0.03200220358430366'.
determinant = 0.03200220358430366
204 0 ECHO 'df = 15'.
204 0 M> ECHO 'df = 15'.
df = 15
205 0 ECHO 'n_cases = 649'.
205 0 M> ECHO 'n_cases = 649'.
n_cases = 649
206 0 ECHO 'p_value = 0.0'.
206 0 M> ECHO 'p_value = 0.0'.
p_value = 0.0
207 0 ECHO 'Cross-check status: pass'.
207 0 M> ECHO 'Cross-check status: pass'.
Cross-check status: pass
208 0 ECHO '=====
====='.
208 0 M> ECHO '=====
====='.
=====
209 0
209 0 M>
```

Bartlett's Test of Sphericity
Identity-correlation likelihood-ratio factorability test

```
210 0 OUTPUT SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis and
Scale Testing\Bartlett's Test of Sphericity\SPSS_Output
      \spv\bartlett's-test-of-sphericity_spss_output.spv'.
210 0 M> OUTPUT SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis a
nd Scale Testing\Bartlett's Test of Sphericity\SPSS_Out
      put\spv\bartlett's-test-of-sphericity_spss_output.spv'.
211 0 OUTPUT EXPORT /CONTENTS EXPORT=ALL LAYERS=PRINTSETTING MODELVIEWS=PRI
NTSETTING
211 0 M> OUTPUT EXPORT /CONTENTS EXPORT=ALL LAYERS=PRINTSETTING MODELVIEWS=
PRINTSETTING
```