

```
1357 0 OUTPUT ACTIVATE HornsParallelAnalysisOutput.  
1357 0 M> OUTPUT ACTIVATE HornsParallelAnalysisOutput.  
1358 0 TITLE 'Horn''s Common-Factor Parallel Analysis'.  
1358 0 M> TITLE 'Horn''s Common-Factor Parallel Analysis'.
```

Horn's Common-Factor Parallel Analysis

```
1359 0
1359 0 M>
1360 0 GET DATA
1360 0 M> GET DATA
1361 0 /TYPE=TXT /FILE='D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Horns Parallel Analysis\dataset.csv' /ENCOD
      ING='UTF8' /DELCASE=LINE /DELIMITERS=', ' /QUALIFIER='''
1361 0 M> /TYPE=TXT /FILE='D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Horns Parallel Analysis\dataset.csv' /EN
      CODING='UTF8' /DELCASE=LINE /DELIMITERS=', ' /QUALIFIER='''
1362 0 /ARRANGEMENT=DELIMITED /FIRSTCASE=2
1362 0 M> /ARRANGEMENT=DELIMITED /FIRSTCASE=2
1363 0 /VARIABLES=
1363 0 M> /VARIABLES=
1364 0 school A8 sex A8 age F8.0 address A8 famsize A8 Pstatus A8 Medu F8.0
      Fedu F8.0
1364 0 M> school A8 sex A8 age F8.0 address A8 famsize A8 Pstatus A8 Medu F
      8.0 Fedu F8.0
1365 0 Mjob A16 Fjob A16 reason A16 guardian A16 traveltime F8.0 studytime
      F8.0 failures F8.0
1365 0 M> Mjob A16 Fjob A16 reason A16 guardian A16 traveltime F8.0 studyti
      me F8.0 failures F8.0
1366 0 schoolsup A8 famsup A8 paid A8 activities A8 nursery A8 higher A8 in
      ternet A8 romantic A8
1366 0 M> schoolsup A8 famsup A8 paid A8 activities A8 nursery A8 higher A8
      internet A8 romantic A8
1367 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.
1367 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.
1368 0 DATASET NAME HornsParallelAnalysisData.
1368 0 M> DATASET NAME HornsParallelAnalysisData.
1369 0 COMPUTE subject_id=$CASENUM.
1369 0 M> COMPUTE subject_id=$CASENUM.
1370 0 COMPUTE Dalc_R=6-Dalc.
1370 0 M> COMPUTE Dalc_R=6-Dalc.
1371 0 COMPUTE Walc_R=6-Walc.
1371 0 M> COMPUTE Walc_R=6-Walc.
```

Horn's Common-Factor Parallel Analysis

```
1372 0 RECODE schoolsup famsup paid activities higher internet ('no'=0) ('yes'=1)
1372 0 M> RECODE schoolsup famsup paid activities higher internet ('no'=0) ('yes'=1)
1373 0 INTO schoolsup_b famsup_b paid_b activities_b higher_b internet_b.
1373 0 M> INTO schoolsup_b famsup_b paid_b activities_b higher_b internet_b
.
1374 0 EXECUTE.
1374 0 M> EXECUTE.
1375 0
1375 0 M>
1376 0 * BEGIN METHOD-SPECIFIC SPSS WORKFLOW.
1376 0 M> * BEGIN METHOD-SPECIFIC SPSS WORKFLOW.
1377 0 TITLE 'Horns Common Factor Parallel Analysis'.
1377 0 M> TITLE 'Horns Common Factor Parallel Analysis'.
```

Horns Common Factor Parallel Analysis

```
1378 0 SUBTITLE 'Reduced-correlation roots versus random 95th percentiles'.  
1378 0 M> SUBTITLE 'Reduced-correlation roots versus random 95th percentiles  
'.
```

Horns Common Factor Parallel Analysis
Reduced-correlation roots versus random 95th percentiles

```

1379  0  FACTOR /VARIABLES=G1 G2 G3 famrel freetime goout /MISSING=LISTWISE /A
NALYSIS=G1 G2 G3 famrel freetime goout
1379  0 M>  FACTOR /VARIABLES=G1 G2 G3 famrel freetime goout /MISSING=LISTWISE
 /ANALYSIS=G1 G2 G3 famrel freetime goout
1380  0  /PRINT=INITIAL EXTRACTION KMO CORRELATION /PLOT=EIGEN
1380  0 M>  /PRINT=INITIAL EXTRACTION KMO CORRELATION /PLOT=EIGEN
1381  0  /CRITERIA=FACTORS(2) ITERATE(500) /EXTRACTION=PAF /ROTATION=NOROTATE
 /METHOD=CORRELATION.
1381  0 M>  /CRITERIA=FACTORS(2) ITERATE(500) /EXTRACTION=PAF /ROTATION=NOROT
ATE /METHOD=CORRELATION.

```

Factor Analysis

Notes

Output Created		18-JUL-2026 10:56:20
Comments		
Input	Data	D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Horns Parallel Analysis\dataset. csv
	Active Dataset	HornsParallelAnalysisData
	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.

Horns Common Factor Parallel Analysis
Reduced-correlation roots versus random 95th percentiles

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	00:00:00.34
	Elapsed Time	00:00:00.40
	Maximum Memory Required	5704 (5.570K) bytes

[HornsParallelAnalysisData]

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

Horns Common Factor Parallel Analysis
Reduced-correlation roots versus random 95th percentiles

Communalities

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

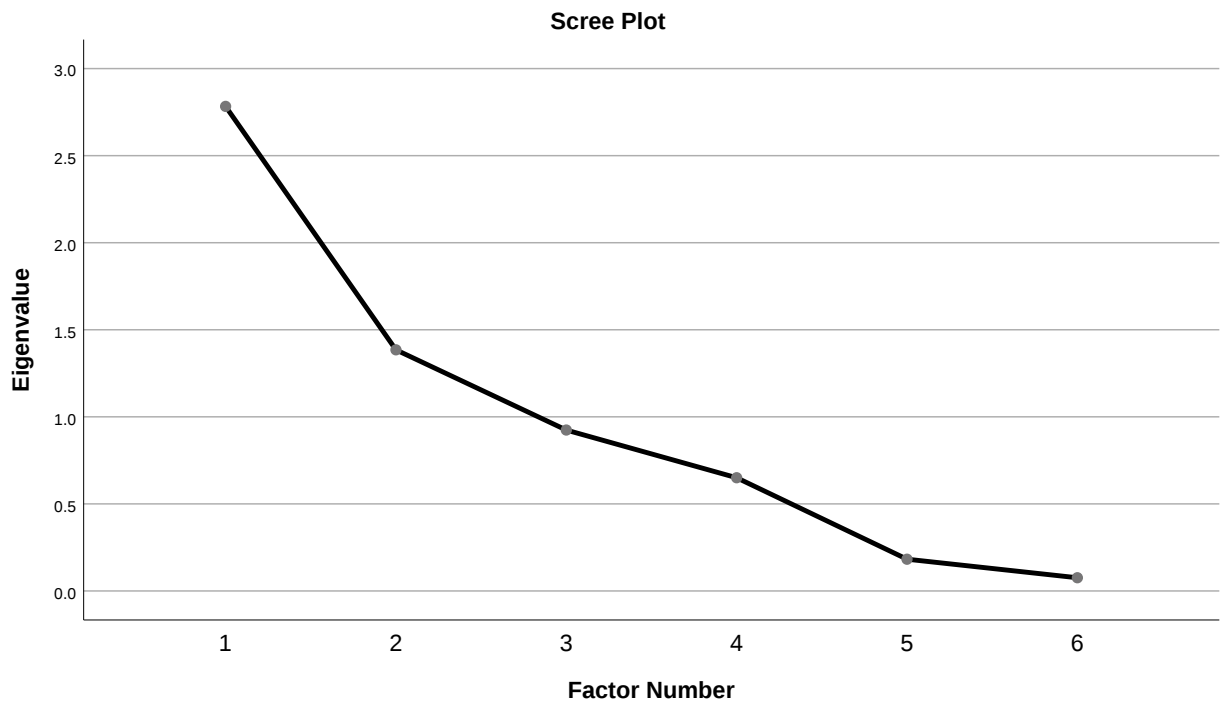
Extraction Method: Principal Axis Factoring.

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.

Horns Common Factor Parallel Analysis
Reduced-correlation roots versus random 95th percentiles



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.

```
1382  0  SET SEED=20260716.
1382  0  M> SET SEED=20260716.
1383  0  ECHO 'Horn analysis uses SMC diagonals and 200 deterministic random r
eplications in the verified scripts'.
```

Horns Common Factor Parallel Analysis

Reduced-correlation roots versus random 95th percentiles

1383 0 M> ECHO 'Horn analysis uses SMC diagonals and 200 deterministic random replications in the verified scripts'.

Horn analysis uses SMC diagonals and 200 deterministic random replications in the verified scripts

1384 0 DESCRIPTIVES VARIABLES=G1 G2 G3 famrel freetime goout /STATISTICS=MEAN STDDEV MIN MAX.

1384 0 M> DESCRIPTIVES VARIABLES=G1 G2 G3 famrel freetime goout /STATISTICS=MEAN STDDEV MIN MAX.

Descriptives

Notes

Output Created		18-JUL-2026 10:56:21
Comments		
Input	Data	D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Horns Parallel Analysis\dataset. csv
	Active Dataset	HornsParallelAnalysisData
	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	00:00:00.03
	Elapsed Time	00:00:00.05

Horns Common Factor Parallel Analysis
Reduced-correlation roots versus random 95th percentiles

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				

```

1385  0  * END METHOD-SPECIFIC SPSS WORKFLOW.
1385  0 M> * END METHOD-SPECIFIC SPSS WORKFLOW.
1386  0
1386  0 M>
1387  0  SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis and Scale T
esting\Horns Parallel Analysis\SPSS_Output\sav\horns-p
        arallel-analysis_spss_ready_data.sav' /COMPRESSED.
1387  0 M> SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis and Scal
e Testing\Horns Parallel Analysis\SPSS_Output\sav\horn
        s-parallel-analysis_spss_ready_data.sav' /COMPRESSED.
1388  0
1388  0 M>
1389  0  ECHO '=====
====='.
1389  0 M> ECHO '=====
====='.
=====
1390  0  ECHO 'HORN'S COMMON-FACTOR PARALLEL ANALYSIS'.
1390  0 M> ECHO 'HORN'S COMMON-FACTOR PARALLEL ANALYSIS'.
HORN'S COMMON-FACTOR PARALLEL ANALYSIS
1391  0  ECHO 'Design: Principal-axis reduced-correlation eigenvalues compared
        with 95th-percentile random common eigenvalues.'.
1391  0 M> ECHO 'Design: Principal-axis reduced-correlation eigenvalues compa
red with 95th-percentile random common eigenvalues.'.
Design: Principal-axis reduced-correlation eigenvalues compared with 95th-perc
entile random common eigenvalues.

```

Horns Common Factor Parallel Analysis
Reduced-correlation roots versus random 95th percentiles

```
1392 0 ECHO 'Null hypothesis: No observed common-factor eigenvalue exceeds i
ts random 95th-percentile counterpart.'.
1392 0 M> ECHO 'Null hypothesis: No observed common-factor eigenvalue exceed
s its random 95th-percentile counterpart.'.
Null hypothesis: No observed common-factor eigenvalue exceeds its random 95th-
percentile counterpart.
1393 0 ECHO 'Formula: Retain factor j when lambda_j(R with SMC diagonal)>Q_.
95[lambda_j(random reduced R)].'.
1393 0 M> ECHO 'Formula: Retain factor j when lambda_j(R with SMC diagonal)>
Q_.95[lambda_j(random reduced R)].'.
Formula: Retain factor j when lambda_j(R with SMC diagonal)>Q_.95[lambda_j(ran
dom reduced R)].
1394 0 ECHO 'Variables: G1, G2, G3, famrel, freetime, goout'.
1394 0 M> ECHO 'Variables: G1, G2, G3, famrel, freetime, goout'.
Variables: G1, G2, G3, famrel, freetime, goout
1395 0 ECHO 'Rows analyzed: 649'.
1395 0 M> ECHO 'Rows analyzed: 649'.
Rows analyzed: 649
1396 0 ECHO 'first_observed_common_eigenvalue = 2.60059316685748'.
1396 0 M> ECHO 'first_observed_common_eigenvalue = 2.60059316685748'.
first_observed_common_eigenvalue = 2.60059316685748
1397 0 ECHO 'first_random_threshold = 0.20755363834842272'.
1397 0 M> ECHO 'first_random_threshold = 0.20755363834842272'.
first_random_threshold = 0.20755363834842272
1398 0 ECHO 'replications = 200'.
1398 0 M> ECHO 'replications = 200'.
replications = 200
1399 0 ECHO 'retained_factors = 2'.
1399 0 M> ECHO 'retained_factors = 2'.
retained_factors = 2
1400 0 ECHO 'variables = 6'.
1400 0 M> ECHO 'variables = 6'.
variables = 6
1401 0 ECHO 'Cross-check status: pass'.
1401 0 M> ECHO 'Cross-check status: pass'.
Cross-check status: pass
1402 0 ECHO '=====
====='
```

Horns Common Factor Parallel Analysis
Reduced-correlation roots versus random 95th percentiles

```
1402  0 M> ECHO '=====
====='.
=====
1403  0
1403  0 M>
1404  0 OUTPUT SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis and
Scale Testing\Horns Parallel Analysis\SPSS_Output\spv\
        horns-parallel-analysis_spss_output.spv'.
1404  0 M> OUTPUT SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis a
nd Scale Testing\Horns Parallel Analysis\SPSS_Output\s
        pv\horns-parallel-analysis_spss_output.spv'.
1405  0 OUTPUT EXPORT /CONTENTS EXPORT=ALL LAYERS=PRINTSETTING MODELVIEWS=PRI
NTSETTING
1405  0 M> OUTPUT EXPORT /CONTENTS EXPORT=ALL LAYERS=PRINTSETTING MODELVIEWS=
PRINTSETTING
```