```
1059  0  OUTPUT ACTIVATE FactorAnalysisinROutput.
1059  0 M>  OUTPUT ACTIVATE FactorAnalysisinROutput.
1060  0  TITLE 'Minimum-Residual Factor Analysis'.
1060  0 M>  TITLE 'Minimum-Residual Factor Analysis'.
```

```
1061  0
1061  0 M>
1062  0  GET DATA
1062  0 M>  GET DATA
1063  0   /TYPE=TXT /FILE='D:\DATA ANALYSIS\L Validity Factor Analysis and Sca
le Testing\Factor Analysis in R\dataset.csv' /ENCODING
            ='UTF8' /DELCASE=LINE /DELIMITERS=',' /QUALIFIER='"'
1063  0 M>   /TYPE=TXT /FILE='D:\DATA ANALYSIS\L Validity Factor Analysis and
Scale Testing\Factor Analysis in R\dataset.csv' /ENCOD
              ING='UTF8' /DELCASE=LINE /DELIMITERS=',' /QUALIFIER='"'
1064  0   /ARRANGEMENT=DELIMITED /FIRSTCASE=2
1064  0 M>   /ARRANGEMENT=DELIMITED /FIRSTCASE=2
1065  0   /VARIABLES=
1065  0 M>   /VARIABLES=
1066  0   school A8 sex A8 age F8.0 address A8 famsize A8 Pstatus A8 Medu F8.0
 Fedu F8.0
1066  0 M>   school A8 sex A8 age F8.0 address A8 famsize A8 Pstatus A8 Medu F
8.0 Fedu F8.0
1067  0   Mjob A16 Fjob A16 reason A16 guardian A16 traveltime F8.0 studytime
F8.0 failures F8.0
1067  0 M>   Mjob A16 Fjob A16 reason A16 guardian A16 traveltime F8.0 studyti
me F8.0 failures F8.0
1068  0   schoolsup A8 famsup A8 paid A8 activities A8 nursery A8 higher A8 in
ternet A8 romantic A8
1068  0 M>   schoolsup A8 famsup A8 paid A8 activities A8 nursery A8 higher A8
 internet A8 romantic A8
1069  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.
1069  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.
1070  0  DATASET NAME FactorAnalysisinRData.
1070  0 M>  DATASET NAME FactorAnalysisinRData.
1071  0  COMPUTE subject_id=$CASENUM.
1071  0 M>  COMPUTE subject_id=$CASENUM.
1072  0  COMPUTE Dalc_R=6-Dalc.
1072  0 M>  COMPUTE Dalc_R=6-Dalc.
1073  0  COMPUTE Walc_R=6-Walc.
1073  0 M>  COMPUTE Walc_R=6-Walc.
```

```
1074  0  RECODE schoolsup famsup paid activities higher internet ('no'=0) ('ye
s'=1)
1074  0 M>  RECODE schoolsup famsup paid activities higher internet ('no'=0) (
'yes'=1)
1075  0   INTO schoolsup_b famsup_b paid_b activities_b higher_b internet_b.
1075  0 M>   INTO schoolsup_b famsup_b paid_b activities_b higher_b internet_b
.
1076  0  EXECUTE.
1076  0 M>  EXECUTE.
1077  0
1077  0 M>
1078  0  * BEGIN METHOD-SPECIFIC SPSS WORKFLOW.
1078  0 M>  * BEGIN METHOD-SPECIFIC SPSS WORKFLOW.
1079  0  TITLE 'R Style Minimum Residual Factor Analysis'.
1079  0 M>  TITLE 'R Style Minimum Residual Factor Analysis'.
```

```
1080  0  SUBTITLE 'MINRES target with oblique simple structure'.
1080  0 M>  SUBTITLE 'MINRES target with oblique simple structure'.
```

```
1081  0  FACTOR /VARIABLES=G1 G2 G3 famrel freetime goout /MISSING=LISTWISE /A
NALYSIS=G1 G2 G3 famrel freetime goout
1081  0 M>  FACTOR /VARIABLES=G1 G2 G3 famrel freetime goout /MISSING=LISTWISE
 /ANALYSIS=G1 G2 G3 famrel freetime goout
1082  0   /PRINT=INITIAL EXTRACTION KMO CORRELATION ROTATION /PLOT=EIGEN ROTAT
ION
1082  0 M>   /PRINT=INITIAL EXTRACTION KMO CORRELATION ROTATION /PLOT=EIGEN RO
TATION
1083  0   /CRITERIA=FACTORS(2) ITERATE(500) /EXTRACTION=PAF /ROTATION=OBLIMIN
/METHOD=CORRELATION.
1083  0 M>   /CRITERIA=FACTORS(2) ITERATE(500) /EXTRACTION=PAF /ROTATION=OBLIM
IN /METHOD=CORRELATION.
```

Factor Analysis

Notes

Output Created		18-JUL-2026 10:55:47
Comments		
Input	Data	D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Factor Analysis in R\dataset.csv
	Active Dataset	FactorAnalysisinRData
	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.

R Style Minimum Residual Factor Analysis
MINRESTarget with oblique simple structure

Notes

Syntax		FACTOR /VARIABLES=G1 G2 G3 famrel freetime goout /MISSING=LISTWISE /ANALYSIS=G1 G2 G3 famrel freetime goout /PRINT=INITIAL EXTRACTION KMO CORRELATION ROTATION /PLOT=EIGEN ROTATION /CRITERIA=FACTORS(2) ITERATE(500) /EXTRACTION=PAF /ROTATION=OBLIMIN /METHOD=CORRELATIO...
Resources	Processor Time	00:00:00.73
	Elapsed Time	00:00:00.62
	Maximum Memory Required	5704 (5.570K) bytes

[FactorAnalysisinRData]

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

R Style Minimum Residual Factor Analysis
MINRESTarget with oblique simple structure

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

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Factor	Total	% 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			

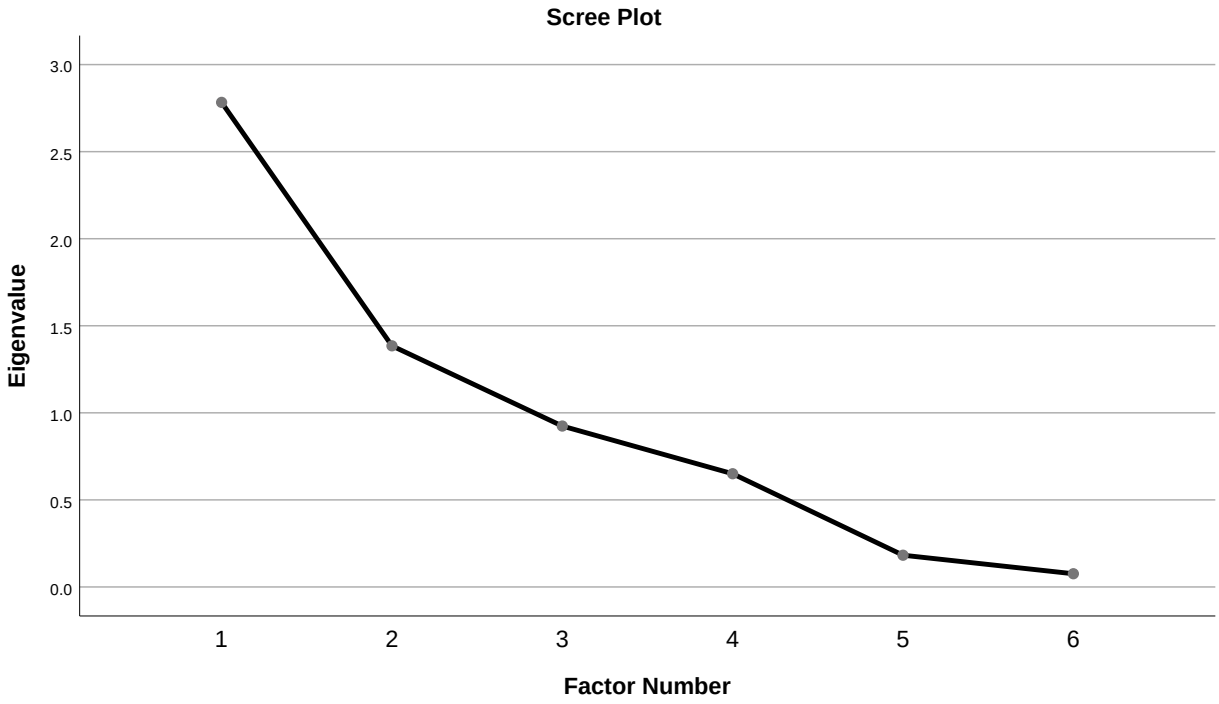
Total Variance Explained

	Rotation Sums of Squared Loadings[a]
Factor	Total
1	2.641
2	.750
3	
4	
5	
6	

R Style Minimum Residual Factor Analysis
MINRESTarget with oblique simple structure

Extraction Method: Principal Axis Factoring.

a. When factors are correlated, sums of squared loadings cannot be added to obtain a total variance.



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.

R Style Minimum Residual Factor Analysis
MINRESTarget with oblique simple structure

Pattern Matrix[a]

	Factor	
	1	2
G1	.880	-.007
G2	.983	.003
G3	.936	-.030
famrel	.076	.199
freetime	-.104	.680
goout	-.078	.495

Extraction Method: Principal Axis Factoring.
Rotation Method: Oblimin with Kaiser Normalization.

a. Rotation converged in 3 iterations.

Structure Matrix

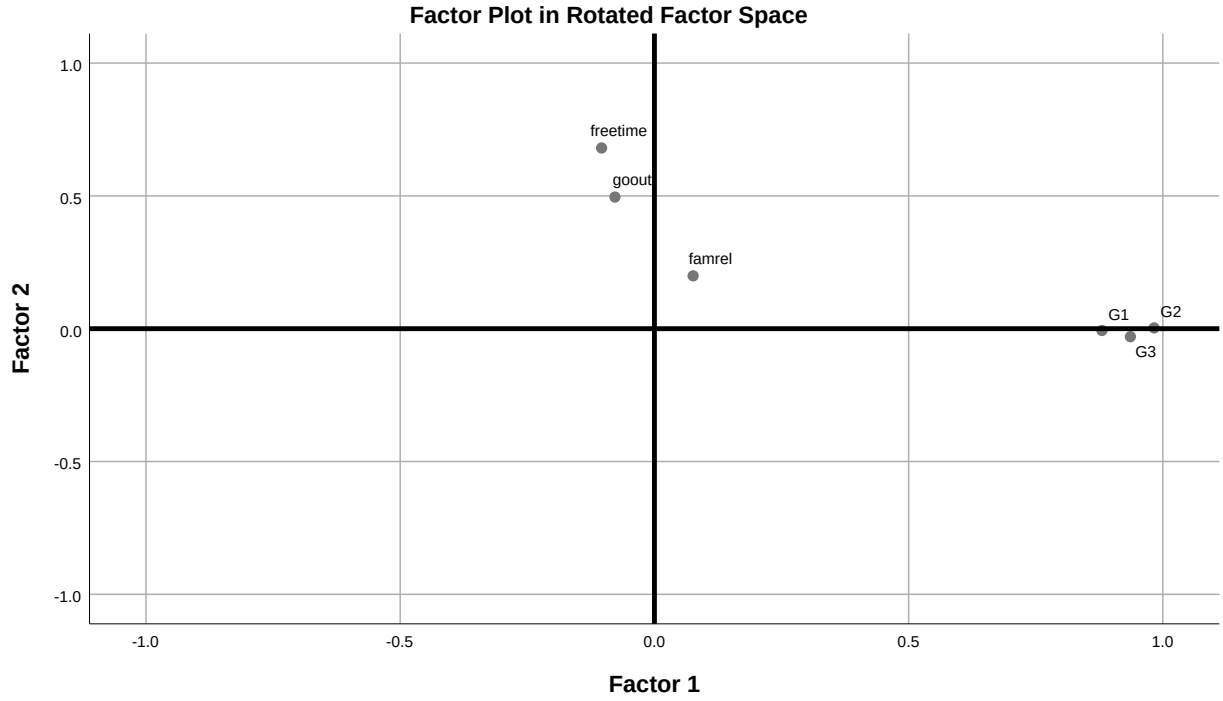
	Factor	
	1	2
G1	.880	-.012
G2	.983	-.002
G3	.936	-.035
famrel	.075	.199
freetime	-.108	.681
goout	-.080	.496

Extraction Method: Principal Axis Factoring.
Rotation Method: Oblimin with Kaiser Normalization.

Factor Correlation Matrix

Factor	1	2
1	1.000	-.005
2	-.005	1.000

Extraction Method: Principal Axis Factoring.
Rotation Method: Oblimin with Kaiser Normalization.




```
1084  0  ECHO 'Verified R transcript minimizes off-diagonal residual correlati
ons'.
1084  0 M>  ECHO 'Verified R transcript minimizes off-diagonal residual correl
ations'.
Verified R transcript minimizes off-diagonal residual correlations
1085  0  DESCRIPTIVES VARIABLES=G1 G2 G3 famrel freetime goout /STATISTICS=MEA
N STDDEV MIN MAX.
1085  0 M>  DESCRIPTIVES VARIABLES=G1 G2 G3 famrel freetime goout /STATISTICS=
MEAN STDDEV MIN MAX.
```

R Style Minimum Residual Factor Analysis
MINRESTarget with oblique simple structure

Descriptives

Notes

Output Created		18-JUL-2026 10:55:48
Comments		
Input	Data	D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Factor Analysis in R\dataset.csv
	Active Dataset	FactorAnalysisinRData
	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	00:00:00.06
	Elapsed Time	00:00:00.04

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				

```
1086  0  * END METHOD-SPECIFIC SPSS WORKFLOW.
1086  0 M>  * END METHOD-SPECIFIC SPSS WORKFLOW.
1087  0
1087  0 M>
1088  0  SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis and Scale T
esting\Factor Analysis in R\SPSS_Output\sav\factor-ana
            lysis-in-r_spss_ready_data.sav' /COMPRESSED.
1088  0 M>  SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis and Scal
e Testing\Factor Analysis in R\SPSS_Output\sav\factor-
               analysis-in-r_spss_ready_data.sav' /COMPRESSED.
1089  0
1089  0 M>
1090  0  ECHO '============================================================
=========='.
1090  0 M>  ECHO '============================================================
============'.
==========================================================================
1091  0  ECHO 'MINIMUM-RESIDUAL FACTOR ANALYSIS'.
1091  0 M>  ECHO 'MINIMUM-RESIDUAL FACTOR ANALYSIS'.
MINIMUM-RESIDUAL FACTOR ANALYSIS
1092  0  ECHO 'Design: Two-factor MINRES solution with oblimin rotation, match
ing a common R psych workflow.'.
1092  0 M>  ECHO 'Design: Two-factor MINRES solution with oblimin rotation, ma
tching a common R psych workflow.'.
Design: Two-factor MINRES solution with oblimin rotation, matching a common R
psych workflow.
1093  0  ECHO 'Null hypothesis: The off-diagonal residual objective is not imp
roved by two common factors.'.
1093  0 M>  ECHO 'Null hypothesis: The off-diagonal residual objective is not
improved by two common factors.'.
Null hypothesis: The off-diagonal residual objective is not improved by two co
mmon factors.
1094  0  ECHO 'Formula: Minimize sum_{i<j}(r_ij-[Lambda Lambda'']_ij)^2, then
oblimin rotate.'.
1094  0 M>  ECHO 'Formula: Minimize sum_{i<j}(r_ij-[Lambda Lambda'']_ij)^2, th
en oblimin rotate.'.
Formula: Minimize sum_{i<j}(r_ij-[Lambda Lambda']_ij)^2, then oblimin rotate.
1095  0  ECHO 'Variables: G1, G2, G3, famrel, freetime, goout'.
1095  0 M>  ECHO 'Variables: G1, G2, G3, famrel, freetime, goout'.
```

```
Variables: G1, G2, G3, famrel, freetime, goout
1096  0  ECHO 'Rows analyzed: 649'.
1096  0 M>  ECHO 'Rows analyzed: 649'.
Rows analyzed: 649
1097  0  ECHO 'factors = 2'.
1097  0 M>  ECHO 'factors = 2'.
factors = 2
1098  0  ECHO 'maximum_loading = 0.980285066663166'.
1098  0 M>  ECHO 'maximum_loading = 0.980285066663166'.
maximum_loading = 0.980285066663166
1099  0  ECHO 'mean_communality = 0.5668425200674877'.
1099  0 M>  ECHO 'mean_communality = 0.5668425200674877'.
mean_communality = 0.5668425200674877
1100  0  ECHO 'minres_residual_sum_squares = 0.0005363145352556464'.
1100  0 M>  ECHO 'minres_residual_sum_squares = 0.0005363145352556464'.
minres_residual_sum_squares = 0.0005363145352556464
1101  0  ECHO 'optimizer_evaluations = 24'.
1101  0 M>  ECHO 'optimizer_evaluations = 24'.
optimizer_evaluations = 24
1102  0  ECHO 'Cross-check status: pass'.
1102  0 M>  ECHO 'Cross-check status: pass'.
Cross-check status: pass
1103  0  ECHO '================================================================
=========='.
1103  0 M>  ECHO '================================================================
============'.
================================================================================
1104  0
1104  0 M>
1105  0  OUTPUT SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis and
Scale Testing\Factor Analysis in R\SPSS_Output\spv\fac
            tor-analysis-in-r_spss_output.spv'.
1105  0 M>  OUTPUT SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis a
nd Scale Testing\Factor Analysis in R\SPSS_Output\spv\
               factor-analysis-in-r_spss_output.spv'.
1106  0  OUTPUT EXPORT /CONTENTS EXPORT=ALL LAYERS=PRINTSETTING MODELVIEWS=PRI
NTSETTING
1106  0 M>  OUTPUT EXPORT /CONTENTS EXPORT=ALL LAYERS=PRINTSETTING MODELVIEWS=
PRINTSETTING
```

R Style Minimum Residual Factor Analysis
MINRESTarget with oblique simple structure