

```
1003 0 OUTPUT ACTIVATE KuderRichardsonFormula21Output.  
1003 0 M> OUTPUT ACTIVATE KuderRichardsonFormula21Output.  
1004 0 TITLE 'Kuder-Richardson Formula 21'.  
1004 0 M> TITLE 'Kuder-Richardson Formula 21'.
```

Kuder-Richardson Formula 21

```

1005 0
1005 0 M>
1006 0 GET DATA
1006 0 M> GET DATA
1007 0 /TYPE=TXT
1007 0 M> /TYPE=TXT
1008 0 /FILE='D:\DATA ANALYSIS\K Reliability and Agreement Tests\Kuder Ric
hardson Formula 21\dataset.csv'
1008 0 M> /FILE='D:\DATA ANALYSIS\K Reliability and Agreement Tests\Kuder
Richardson Formula 21\dataset.csv'
1009 0 /ENCODING='UTF8'
1009 0 M> /ENCODING='UTF8'
1010 0 /DELCASE=LINE
1010 0 M> /DELCASE=LINE
1011 0 /DELIMITERS=', '
1011 0 M> /DELIMITERS=', '
1012 0 /QUALIFIER='''
1012 0 M> /QUALIFIER='''
1013 0 /ARRANGEMENT=DELIMITED
1013 0 M> /ARRANGEMENT=DELIMITED
1014 0 /FIRSTCASE=2
1014 0 M> /FIRSTCASE=2
1015 0 /VARIABLES=
1015 0 M> /VARIABLES=
1016 0 school A8 sex A8 age F8.0 address A8 famsize A8 Pstatus A8
1016 0 M> school A8 sex A8 age F8.0 address A8 famsize A8 Pstatus A8
1017 0 Medu F8.0 Fedu F8.0 Mjob A16 Fjob A16 reason A16 guardian A16
1017 0 M> Medu F8.0 Fedu F8.0 Mjob A16 Fjob A16 reason A16 guardian A16
1018 0 traveltime F8.0 studytime F8.0 failures F8.0 schoolsup A8 famsup
A8
1018 0 M> traveltime F8.0 studytime F8.0 failures F8.0 schoolsup A8 fams
up A8
1019 0 paid A8 activities A8 nursery A8 higher A8 internet A8 romantic A
8
1019 0 M> paid A8 activities A8 nursery A8 higher A8 internet A8 romanti
c A8
1020 0 famrel F8.0 freetime F8.0 goout F8.0 Dalc F8.0 Walc F8.0 health F
8.0

```

Kuder-Richardson Formula 21

```

1020 0 M>      famrel F8.0 freetime F8.0 goout F8.0 Dalc F8.0 Walc F8.0 health F8.0
1021 0      absences F8.0 G1 F8.0 G2 F8.0 G3 F8.0.
1021 0 M>      absences F8.0 G1 F8.0 G2 F8.0 G3 F8.0.
1022 0 DATASET NAME KuderRichardsonFormula21Data.
1022 0 M> DATASET NAME KuderRichardsonFormula21Data.
1023 0 EXECUTE.
1023 0 M> EXECUTE.
1024 0
1024 0 M>
1025 0 COMPUTE subject_id=$CASENUM.
1025 0 M> COMPUTE subject_id=$CASENUM.
1026 0 COMPUTE Dalc_R=6-Dalc.
1026 0 M> COMPUTE Dalc_R=6-Dalc.
1027 0 COMPUTE Walc_R=6-Walc.
1027 0 M> COMPUTE Walc_R=6-Walc.
1028 0 RECODE schoolsup famsup paid activities higher internet ('no'=0) ('yes'=1)
1028 0 M> RECODE schoolsup famsup paid activities higher internet ('no'=0) ('yes'=1)
1029 0 INTO schoolsup_b famsup_b paid_b activities_b higher_b internet_b.
1029 0 M> INTO schoolsup_b famsup_b paid_b activities_b higher_b internet_b.
1030 0 RECODE G1 G2 G3 (LO THRU 9=1) (10 THRU 13=2) (14 THRU HI=3)
1030 0 M> RECODE G1 G2 G3 (LO THRU 9=1) (10 THRU 13=2) (14 THRU HI=3)
1031 0 INTO G1_cat3 G2_cat3 G3_cat3.
1031 0 M> INTO G1_cat3 G2_cat3 G3_cat3.
1032 0 RECODE G1 G3 (LO THRU 8=1) (9 THRU 10=2) (11 THRU 12=3) (13 THRU 14=4) (15 THRU HI=5)
1032 0 M> RECODE G1 G3 (LO THRU 8=1) (9 THRU 10=2) (11 THRU 12=3) (13 THRU 14=4) (15 THRU HI=5)
1033 0 INTO G1_cat5 G3_cat5.
1033 0 M> INTO G1_cat5 G3_cat5.
1034 0 VARIABLE LEVEL schoolsup_b famsup_b paid_b activities_b higher_b internet_b G1_cat3 G2_cat3 G3_cat3 G1_cat5 G3_cat5 (NOMINAL).
1034 0 M> VARIABLE LEVEL schoolsup_b famsup_b paid_b activities_b higher_b internet_b G1_cat3 G2_cat3 G3_cat3 G1_cat5 G3_cat5 (NOMINAL).

```

Kuder-Richardson Formula 21

```
1035 0 FORMATS subject_id schoolsup_b famsup_b paid_b activities_b higher_b
internet_b G1_cat3 G2_cat3 G3_cat3 G1_cat5 G3_cat5 (F5
      .0).
1035 0 M> FORMATS subject_id schoolsup_b famsup_b paid_b activities_b higher
_b internet_b G1_cat3 G2_cat3 G3_cat3 G1_cat5 G3_cat5
      (F5.0).
1036 0 EXECUTE.
1036 0 M> EXECUTE.
1037 0
1037 0 M>
1038 0 * BEGIN METHOD-SPECIFIC SPSS WORKFLOW.
1038 0 M> * BEGIN METHOD-SPECIFIC SPSS WORKFLOW.
1039 0 TITLE 'Kuder Richardson Formula Twenty One'.
1039 0 M> TITLE 'Kuder Richardson Formula Twenty One'.
```

Kuder Richardson Formula Twenty One

```
1040 0 SUBTITLE 'Equal-difficulty approximation based on total-score mean and variance'.
```

```
1040 0 M> SUBTITLE 'Equal-difficulty approximation based on total-score mean and variance'.
```

```
>Warning # 2004 on line 1040. Command name: SUBTITLE
```

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

Kuder Richardson Formula Twenty One
Equal-difficulty approximation based on total-score mean and

```
1041  0  COMPUTE kr21_score=SUM(schoolsup_b,famsup_b,paid_b,activities_b,high
r_b,internet_b).
1041  0 M> COMPUTE kr21_score=SUM(schoolsup_b,famsup_b,paid_b,activities_b,hi
gher_b,internet_b).
1042  0  FREQUENCIES VARIABLES=kr21_score /STATISTICS=MEAN MEDIAN STDDEV VARIA
NCE MINIMUM MAXIMUM /HISTOGRAM.
1042  0 M> FREQUENCIES VARIABLES=kr21_score /STATISTICS=MEAN MEDIAN STDDEV VA
RIANCE MINIMUM MAXIMUM /HISTOGRAM.
```

Frequencies

Notes

Output Created		16-JUL-2026 21:10:04
Comments		
Input	Data	D:\DATA ANALYSIS\K Reliability and Agreement Tests\Kuder Richardson Formula 21\dataset.csv
	Active Dataset	KuderRichardsonFormula 21Data
	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	Statistics are based on all cases with valid data.
Syntax		FREQUENCIES VARIABLES=kr21_score /STATISTICS=MEAN MEDIAN STDDEV VARIANCE MINIMUM MAXIMUM /HISTOGRAM.
Resources	Processor Time	00:00:00.47
	Elapsed Time	00:00:00.37

[KuderRichardsonFormula21Data]

Kuder Richardson Formula Twenty One
Equal-difficulty approximation based on total-score mean and

Statistics

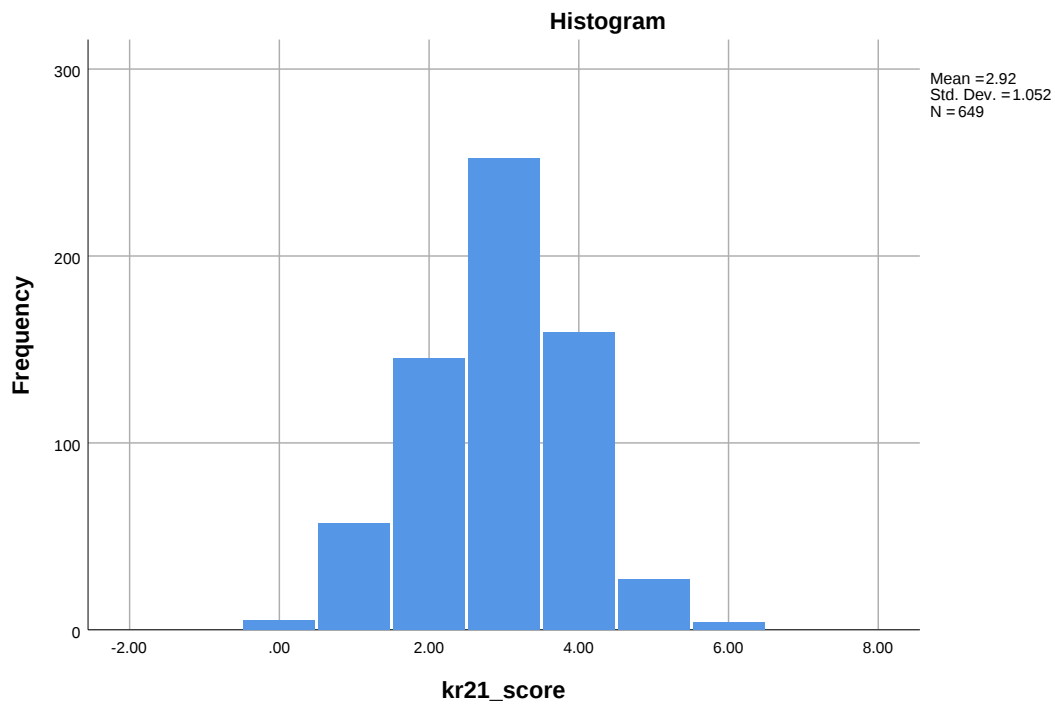
kr21_score

N	Valid	649
	Missing	0
Mean		2.9245
Median		3.0000
Std. Deviation		1.05211
Variance		1.107
Minimum		.00
Maximum		6.00

kr21_score

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	5	.8	.8	.8
	1.00	57	8.8	8.8	9.6
	2.00	145	22.3	22.3	31.9
	3.00	252	38.8	38.8	70.7
	4.00	159	24.5	24.5	95.2
	5.00	27	4.2	4.2	99.4
	6.00	4	.6	.6	100.0
	Total	649	100.0	100.0	

Kuder Richardson Formula Twenty One
Equal-difficulty approximation based on total-score mean and



```
1043 0 DESCRIPTIVES VARIABLES=kr21_score /STATISTICS=MEAN STDDEV VARIANCE MI  
N MAX.  
1043 0 M> DESCRIPTIVES VARIABLES=kr21_score /STATISTICS=MEAN STDDEV VARIANCE  
MIN MAX.
```

Descriptives

Kuder Richardson Formula Twenty One
Equal-difficulty approximation based on total-score mean and

Notes

Output Created		16-JUL-2026 21:10:04
Comments		
Input	Data	D:\DATA ANALYSIS\K Reliability and Agreement Tests\Kuder Richardson Formula 21\dataset.csv
	Active Dataset	KuderRichardsonFormula 21Data
	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=kr21_score /STATISTICS=MEAN STDDEV VARIANCE MIN MAX.
Resources	Processor Time	00:00:00.03
	Elapsed Time	00:00:00.05

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
kr21_score	649	.00	6.00	2.9245	1.05211	1.107
Valid N (listwise)	649					

```

1044  0  RELIABILITY /VARIABLES=schoolsup_b famsup_b paid_b activities_b highe
r_b internet_b /SCALE('KR21 comparison') ALL /MODEL=AL
PHA /STATISTICS=DESCRIPTIVE SCALE.
1044  0 M> RELIABILITY /VARIABLES=schoolsup_b famsup_b paid_b activities_b hi
gher_b internet_b /SCALE('KR21 comparison') ALL /MODEL
=ALPHA /STATISTICS=DESCRIPTIVE SCALE.

```

Kuder Richardson Formula Twenty One
Equal-difficulty approximation based on total-score mean and

Reliability

Notes

Output Created		16-JUL-2026 21:10:04
Comments		
Input	Data	D:\DATA ANALYSIS\K Reliability and Agreement Tests\Kuder Richardson Formula 21\dataset.csv
	Active Dataset	KuderRichardsonFormula 21Data
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	649
	Matrix Input	D:\DATA ANALYSIS\K Reliability and Agreement Tests\Kuder Richardson Formula 21\kuder_richardson_form ula_21_spss_syntax.sps
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.
Syntax		RELIABILITY /VARIABLES=schoolsup_ b famsup_b paid_b activities_b higher_b internet_b /SCALE('KR21 comparison') ALL /MODEL=ALPHA /STATISTICS=DESCRIPT IVE SCALE.
Resources	Processor Time	00:00:00.06
	Elapsed Time	00:00:00.05

Scale: KR21 comparison

Kuder Richardson Formula Twenty One
Equal-difficulty approximation based on total-score mean and

Case Processing Summary

		N	%
Cases	Valid	649	100.0
	Excluded ^a	0	.0
	Total	649	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.211	6

Item Statistics

	Mean	Std. Deviation	N
schoolsup_b	.10	.307	649
famsup_b	.61	.487	649
paid_b	.06	.238	649
activities_b	.49	.500	649
higher_b	.89	.308	649
internet_b	.77	.423	649

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
2.92	1.107	1.052	6

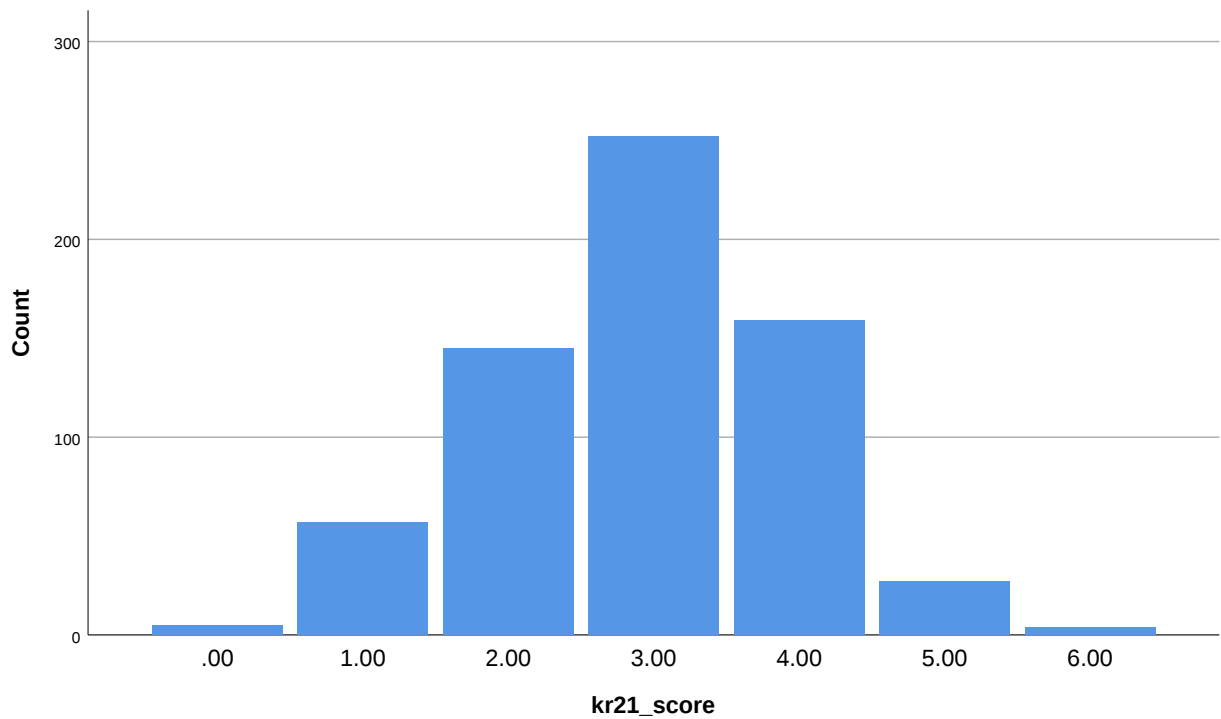
```
1045 0 GRAPH /BAR(SIMPLE)=COUNT BY kr21_score.
1045 0 M> GRAPH /BAR(SIMPLE)=COUNT BY kr21_score.
```

Graph

Kuder Richardson Formula Twenty One
Equal-difficulty approximation based on total-score mean and

Notes

Output Created		16-JUL-2026 21:10:04
Comments		
Input	Data	D:\DATA ANALYSIS\K Reliability and Agreement Tests\Kuder Richardson Formula 21\dataset.csv
	Active Dataset	KuderRichardsonFormula 21Data
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	649
Syntax		GRAPH /BAR(SIMPLE) =COUNT BY kr21_score.
Resources	Processor Time	00:00:00.41
	Elapsed Time	00:00:00.38



Kuder Richardson Formula Twenty One
Equal-difficulty approximation based on total-score mean and

```

1046 0 * END METHOD-SPECIFIC SPSS WORKFLOW.
1046 0 M> * END METHOD-SPECIFIC SPSS WORKFLOW.
1047 0
1047 0 M>
1048 0 SAVE OUTFILE='D:\DATA ANALYSIS\K Reliability and Agreement Tests\Kude
r Richardson Formula 21\SPSS_Output\sav\kuder-richards
on-formula-21_spss_ready_data.sav' /COMPRESSED.
1048 0 M> SAVE OUTFILE='D:\DATA ANALYSIS\K Reliability and Agreement Tests\K
uder Richardson Formula 21\SPSS_Output\sav\kuder-richa
rdson-formula-21_spss_ready_data.sav' /COMPRESSED.

1049 0
1049 0 M>
1050 0 ECHO '=====
====='.
1050 0 M> ECHO '=====
====='.
=====
1051 0 ECHO 'KUDER-RICHARDSON FORMULA 21'.
1051 0 M> ECHO 'KUDER-RICHARDSON FORMULA 21'.
KUDER-RICHARDSON FORMULA 21
1052 0 ECHO 'Design: Equal-difficulty approximation for the same six binary
support/intention items.'.
1052 0 M> ECHO 'Design: Equal-difficulty approximation for the same six bina
ry support/intention items.'.
Design: Equal-difficulty approximation for the same six binary support/intenti
on items.
1053 0 ECHO 'Null hypothesis: The equal-difficulty binary composite has no i
nternal-consistency reliability.'.
1053 0 M> ECHO 'Null hypothesis: The equal-difficulty binary composite has n
o internal-consistency reliability.'.
Null hypothesis: The equal-difficulty binary composite has no internal-consist
ency reliability.
1054 0 ECHO 'Formula:  $KR-21 = k / (k-1) [1 - M(k-M) / (k s_{total}^2)]$ .'.
1054 0 M> ECHO 'Formula:  $KR-21 = k / (k-1) [1 - M(k-M) / (k s_{total}^2)]$ .'.
Formula:  $KR-21 = k / (k-1) [1 - M(k-M) / (k s_{total}^2)]$ .
1055 0 ECHO 'Variables: schoolsup, famsup, paid, activities, higher, interne
t'.
1055 0 M> ECHO 'Variables: schoolsup, famsup, paid, activities, higher, inte
rnet'.

```

Kuder Richardson Formula Twenty One
Equal-difficulty approximation based on total-score mean and

Variables: schoolsup, famsup, paid, activities, higher, internet

1056 0 ECHO 'Rows analyzed: 649'.

1056 0 M> ECHO 'Rows analyzed: 649'.

Rows analyzed: 649

1057 0 ECHO 'items = 6'.

1057 0 M> ECHO 'items = 6'.

items = 6

1058 0 ECHO 'kr21 = -0.42506689158879823'.

1058 0 M> ECHO 'kr21 = -0.42506689158879823'.

kr21 = -0.42506689158879823

1059 0 ECHO 'mean_test_score = 2.9244992295839753'.

1059 0 M> ECHO 'mean_test_score = 2.9244992295839753'.

mean_test_score = 2.9244992295839753

1060 0 ECHO 'n_cases = 649'.

1060 0 M> ECHO 'n_cases = 649'.

n_cases = 649

1061 0 ECHO 'total_score_variance = 1.1069451577926155'.

1061 0 M> ECHO 'total_score_variance = 1.1069451577926155'.

total_score_variance = 1.1069451577926155

1062 0 ECHO 'items = 6'.

1062 0 M> ECHO 'items = 6'.

items = 6

1063 0 ECHO 'kr21 = -0.42506689158879823'.

1063 0 M> ECHO 'kr21 = -0.42506689158879823'.

kr21 = -0.42506689158879823

1064 0 ECHO 'mean_test_score = 2.9244992295839753'.

1064 0 M> ECHO 'mean_test_score = 2.9244992295839753'.

mean_test_score = 2.9244992295839753

1065 0 ECHO 'n_cases = 649'.

1065 0 M> ECHO 'n_cases = 649'.

n_cases = 649

1066 0 ECHO 'total_score_variance = 1.1069451577926155'.

1066 0 M> ECHO 'total_score_variance = 1.1069451577926155'.

total_score_variance = 1.1069451577926155

1067 0 ECHO 'Cross-check status: pass'.

1067 0 M> ECHO 'Cross-check status: pass'.

Cross-check status: pass

1068 0 ECHO '=====
====='

Kuder Richardson Formula Twenty One
Equal-difficulty approximation based on total-score mean and

```
1068  0 M>  ECHO '=====
====='.
=====
1069  0
1069  0 M>
1070  0  OUTPUT SAVE OUTFILE='D:\DATA ANALYSIS\K Reliability and Agreement Tes
ts\Kuder Richardson Formula 21\SPSS_Output\spv\kuder-r
      ichardson-formula-21_spss_output.spv'.
1070  0 M>  OUTPUT SAVE OUTFILE='D:\DATA ANALYSIS\K Reliability and Agreement
Tests\Kuder Richardson Formula 21\SPSS_Output\spv\kude
      r-richardson-formula-21_spss_output.spv'.
1071  0  OUTPUT EXPORT /CONTENTS EXPORT=ALL LAYERS=PRINTSETTING MODELVIEWS=PRI
NTSETTING
1071  0 M>  OUTPUT EXPORT /CONTENTS EXPORT=ALL LAYERS=PRINTSETTING MODELVIEWS=
PRINTSETTING
```