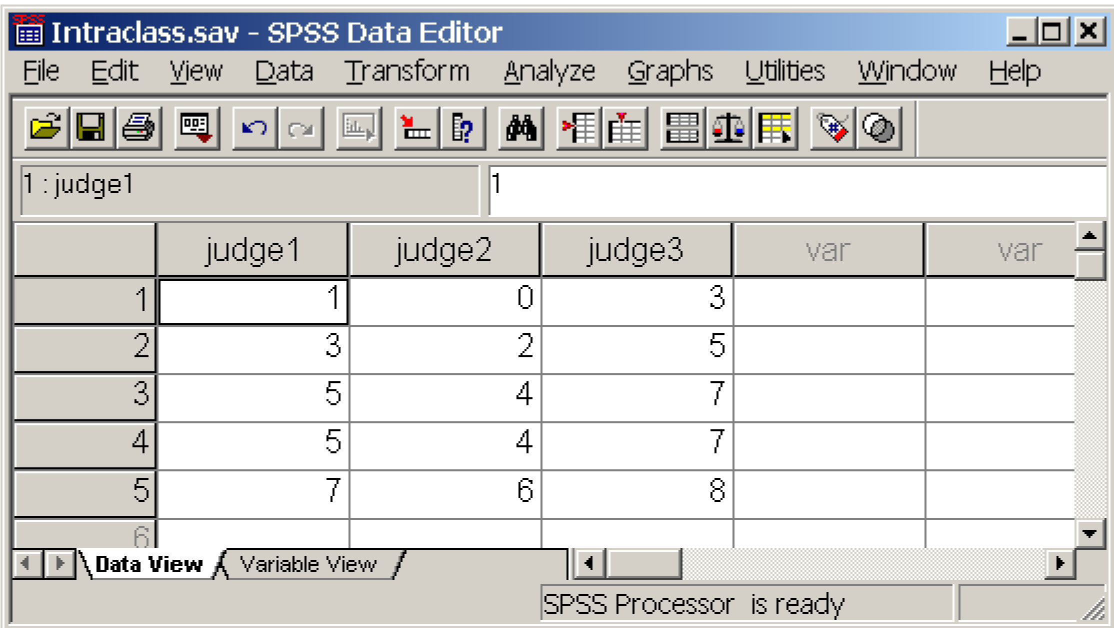
East Carolina University
Department of Psychology

The Intraclass Correlation Coefficient©

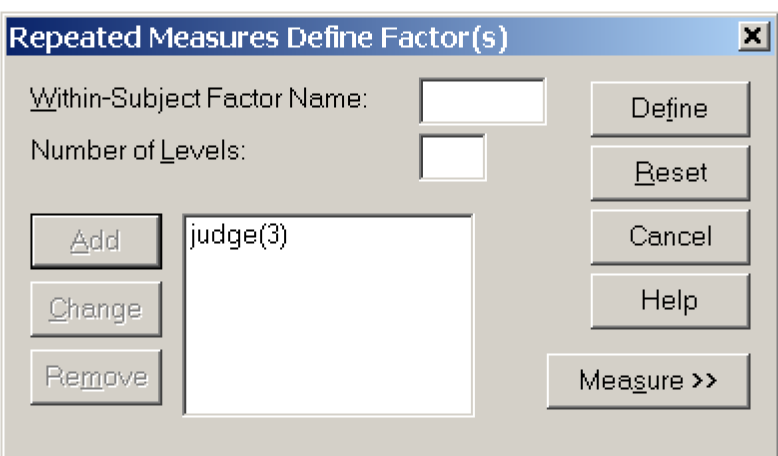
Read pages 489 through 491 in David Howell's *Statistical Methods for Psychology*, 8th edition.

Here I shall compute the same intraclass correlation coefficient that Howell did (Example b), treating judges as a random (rather than fixed) variable. The basic analysis is a Judges x Subjects repeated measures ANOVA. Here are the data, within SPSS:

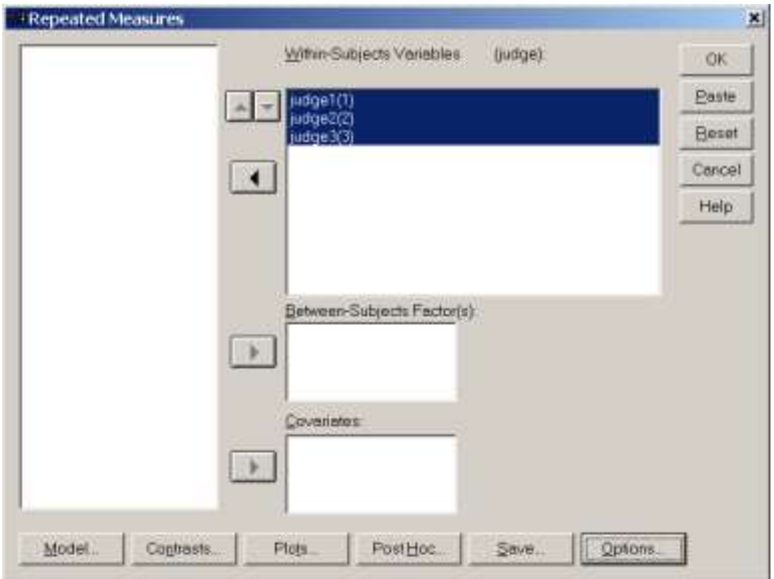


Click Analyze, General Linear Model, Repeated Measures.

Name the Factor "judge," indicate 3 levels, click Add.



Click Define and scoot all three judges into the Within-Subjects variables box.



Click OK.

Here are the parts of the output that we need.

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
JUDGE	Sphericity Assumed	20.133	2	10.067	151.000	.000
	Greenhouse-Geisser	20.133	1.000	20.133	151.000	.000
	Huynh-Feldt	20.133	1.000	20.133	151.000	.000
	Lower-bound	20.133	1.000	20.133	151.000	.000
Error(JUDGE)	Sphericity Assumed	.533	8	6.667E-02		
	Greenhouse-Geisser	.533	4.000	.133		
	Huynh-Feldt	.533	4.000	.133		
	Lower-bound	.533	4.000	.133		

Tests of Between-Subjects Effects

Measure: MEASURE_1
Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	299.267	1	299.267	20.977	.010
Error	57.067	4	14.267		

The intraclass correlation coefficient is an omega-squared like statistic that estimates the proportion of variance in the data that is due to differences in the subjects rather than differences in the judges, Judge x Subject interaction, or error. We shall compute it this way:

$$\frac{MS_{Subjects} - MS_{JxS}}{MS_{Subjects} + (df_{Judges})MS_{JxS} + \frac{n_{Judges}(MS_{Judges} - MS_{JxS})}{n_{Subjects}}}.$$

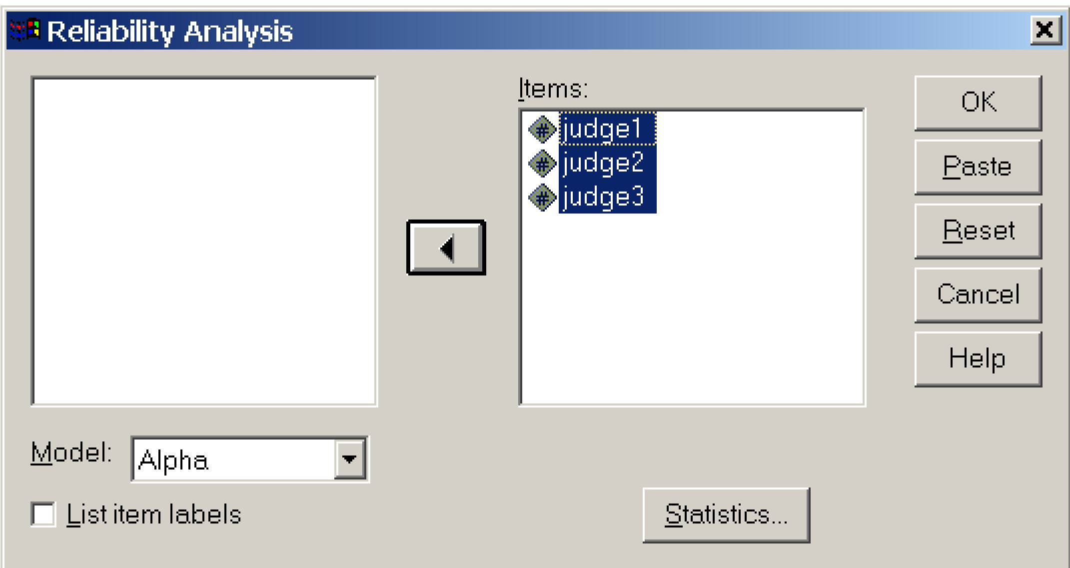
Substituting the appropriate numbers, we get

$$\frac{14.2\overline{6} - 0.0\overline{6}}{14.2\overline{6} + (2)0.0\overline{6} + \frac{3(10.0\overline{6} - 0.0\overline{6})}{5}} = \frac{14.2}{20.4} = .6961.$$

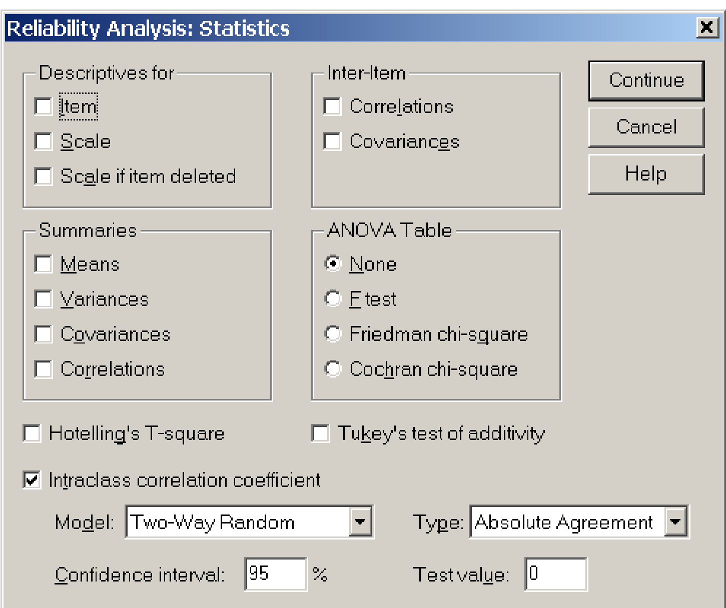
Howell has more rounding error in his calculations than do I.

Doing the analysis as described above has pedagogical value, but if you just want to get the intraclass correlation coefficient with little fuss, do it this way:

Click Analyze, Scale, Reliability Analysis. Scoot all three judges into the Items box.



Click Statistics. Ask for an Intraclass correlation coefficient, Two-Way Random model, Type = Absolute Agreement.



Continue, OK.

Here is the output. I have set the intraclass correlation coefficient in bold font and highlighted it.

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 ****** Method 1 (space saver) will be used for this analysis ******

                         Intraclass Correlation Coefficient

Two-way Random Effect Model (Absolute Agreement Definition):
People and Measure Effect Random
 Single Measure Intraclass Correlation =    .6961*
    95.00% C.I.:            Lower =    .0558          Upper =    .9604
 F = 214.0000   DF = (     4,     8.0)   Sig. = .0000  (Test Value = .0000 )
 Average Measure Intraclass Correlation =    .8730
    95.00% C.I.:            Lower =    .1480          Upper =    .9864
 F = 214.0000   DF = (     4,     8.0)   Sig. = .0000  (Test Value = .0000 )
*: Notice that the same estimator is used whether the interaction effect
   is present or not.


Reliability Coefficients

N of Cases =      5.0                    N of Items =  3

Alpha =    .9953
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Addendum

A correspondent at SUNY, Albany, provided me with data on the grades given by faculty grading comprehensive examinations for doctoral students in his unit and asked if I could provide assistance in estimating the inter-rater reliability. I computed the ICC as well as simple Pearson *r* between each rater and each other rater. The single measure ICC was exactly equal to the mean of the Pearson *r* coefficients. Interesting, and probably not mere coincidence.

See Also:

- Enhancement of Reliability Analysis -- Robert A. Yaffee
- Choosing an Intraclass Correlation Coefficient -- David P. Nichols

Return to Wuensch's Statistics Lessons Page

Revised December, 2013.