

Supplementary Exercise 11.15 of IPS7e

Data: The CONCEPT data was collected at the Purdue University School of Education. The data comprise 78 eventh-grade students in a rural midwestern school. The research concerned the relationship between the students' "self-concept" and their academic performance. The outcome of interest is GPA, the grade point average. The predictor variables (i.e., of interest for predicting the outcome) are:

- IQ: score on an IQ test;
- AGE in years, and SEX coded as female (1) and male (2);
- SC: overall score on the Piers-Harris Children's Self-Concept Scale;
- C1 to C6: scores for specific aspects of self-concept,
 - * C1: behavior,
 - * C2: school status,
 - * C3: physical appearance,
 - * C4: anxiety,
 - * C5: popularity,
 - * C6: happiness.

Analysis: All variables can be considered as response variables, because they are sampled from the population of grade seven children. Except for the categorical variable SEX, all variables are quantitative or can at least be considered as quantitative (whether the scale for C1-C6 is ordered categorical or quantitative is not clear from the description). The question requests correlations between GPA and each of the predictor variables. Strictly speaking, both variables involved in a correlation should be quantitative, so this is unnatural for SEX and perhaps also for several of the other variables (see slide 10L–16 for possible interpretation of a correlation in other situations than when it is properly defined). We display all correlations in a correlation matrix from the Correlation menu in Minitab (note that Minitab cannot handle variables named C1, C2 etc., so the columns need to be renamed).

(see Minitab output on next page)

Comments:

The correlations with GPA are given in the first column of the matrix above. IQ has the strongest correlation with GPA and would therefore have the strongest association with GPA in a simple linear regression (recall that the tests for zero correlation and zero slope are identical!). The R^2 for the simple linear regression with IQ would be: $R^2 = 0.634^2 = 0.402 = 40.2\%$.

EX11_015.MTW

Correlation: GPA, IQ, Age, Sex, SC, SC1, SC2, SC3, SC4, SC5, SC6

Method

Correlation type Pearson
Number of rows used 78

Correlations

	GPA	IQ	Age	Sex	SC	SC1	SC2	SC3	SC4	SC5
IQ	0.634									
Age	-0.389	-0.382								
Sex	-0.097	0.191	0.002							
SC	0.542	0.493	-0.178	0.095						
SC1	0.441	0.222	-0.212	-0.187	0.697					
SC2	0.601	0.547	-0.248	0.067	0.846	0.624				
SC3	0.495	0.441	-0.111	0.127	0.800	0.368	0.692			
SC4	0.267	0.234	0.006	0.248	0.781	0.382	0.592	0.609		
SC5	0.472	0.347	-0.123	-0.037	0.778	0.404	0.614	0.736	0.689	
SC6	0.401	0.360	-0.041	0.127	0.839	0.516	0.623	0.732	0.727	0.716