

Chapter 9: The linear model (regression)

Labcoat Leni's Real Research

I want to be loved (on Facebook)

Problem



Ong, E. Y. L., et al. (2011). *Personality and Individual Differences*, 50(2), 180–185.

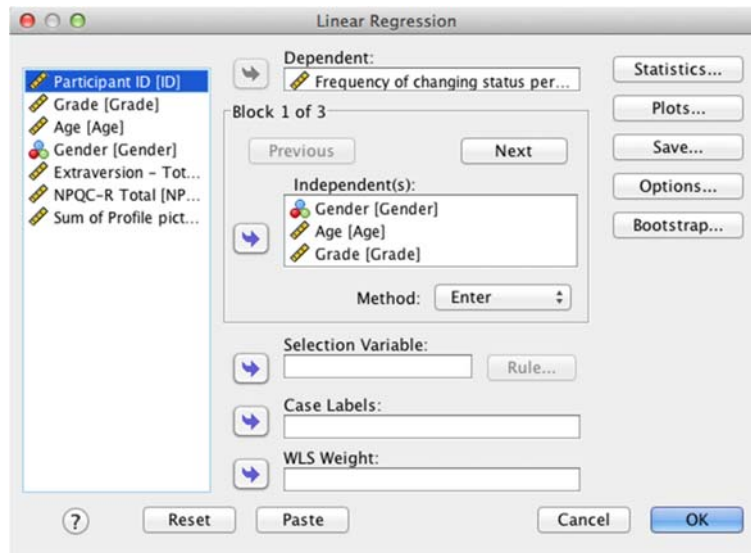
Social media websites such as Facebook seem to have taken over the world. These websites offer an unusual opportunity to carefully manage your self-presentation to others (i.e., you can try to appear to be cool when in fact you write statistics books, appear attractive when you have huge pustules all over your face, fashionable when you wear 1980s heavy metal band T-shirts, and so on). Ong et al. (2011) conducted an interesting study that examined the relationship between narcissism and behaviour on Facebook in 275 adolescents. They measured the **Age**, **Gender** and **Grade** (at school), as well as extroversion and narcissism. They also measured how often (per week) these people updated their Facebook status (**FB_Status**), and also how they rated their own profile picture on each of four dimensions: coolness, glamour, fashionableness and attractiveness. These ratings were summed as an indicator of how positively they perceived the profile picture they had selected for their page (**FB_Profile_TOT**). They hypothesized that narcissism would predict, above and beyond the other variables, the frequency of status updates, and how positive a profile picture the person chose. To test this, they conducted two hierarchical regressions: one with **FB_Status** as the outcome and one with **FB_Profile_TOT** as the outcome. In both models they entered **Age**, **Gender** and **Grade** in the first block, then added extroversion (**NEO_FFI**) in a second block, and finally narcissism (**NPQC_R**) in a third block. The data from this study are in the file **Ong et al. (2011).sav**. Labcoat Leni wants you to replicate their two hierarchical regressions and create a table of the results for each.

Solution

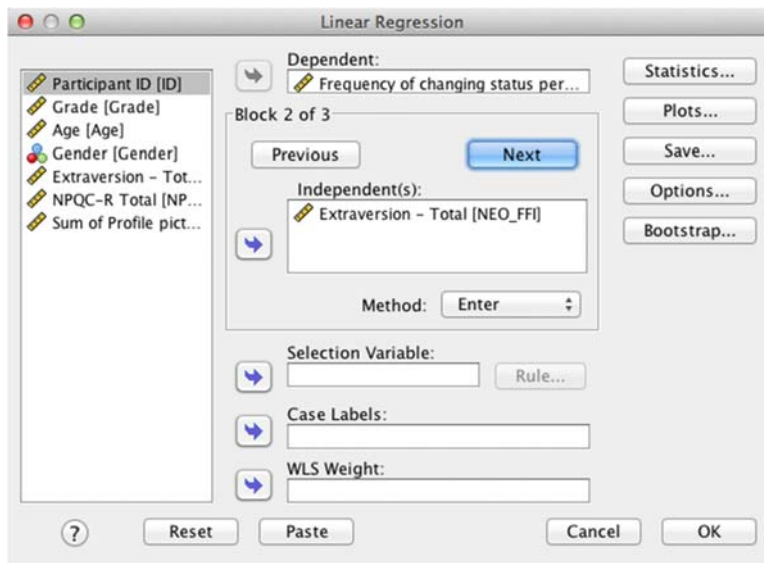
Frequency of Changing Status Per Week (**FB_Status**)

The first regression we'll do is whether narcissism predicts, above and beyond the other variables, the frequency of status updates. To do this, first put the outcome variable **Frequency of changing status per week** in the *Dependent* box, then define the three blocks as follows (I ran this regression on a Mac, so the screenshots will look a little different from the rest of the book, but they are basically the same):

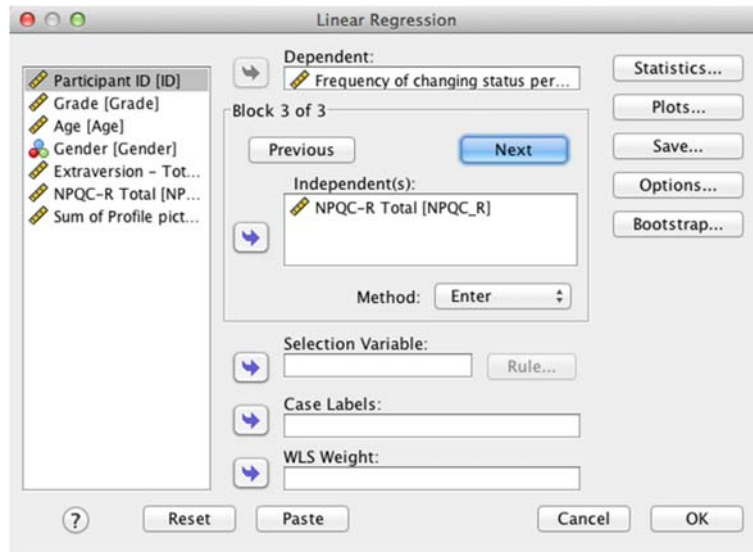
In the first block put **Age**, **Gender** and **Grade**:



In the second block, put extraversion (**NEO_FFI**):



And in the third block put narcissism (**NPQC_R**):



The main output is as follows:

Model Summary^d

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.200 ^a	.040	.028	2.45090	.040	3.426	3	247	.018
2	.236 ^b	.056	.040	2.43550	.016	4.133	1	246	.043
3	.299 ^c	.090	.071	2.39648	.034	9.078	1	245	.003

- a. Predictors: (Constant), Grade, Gender, Age
- b. Predictors: (Constant), Grade, Gender, Age, Extraversion - Total
- c. Predictors: (Constant), Grade, Gender, Age, Extraversion - Total, NPQC-R Total
- d. Dependent Variable: Frequency of changing status per week

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	3.383	3.674		.921	.358	-3.852	10.619
	Gender	-.775	.327	-.153	-2.370	.019	-1.420	-.131
	Age	-.033	.309	-.014	-.107	.915	-.642	.576
	Grade	-.444	.388	-.149	-1.145	.253	-1.208	.320
2	(Constant)	.830	3.861		.215	.830	-6.775	8.434
	Gender	-.691	.328	-.136	-2.110	.036	-1.337	-.046
	Age	-.006	.308	-.002	-.019	.985	-.612	.600
	Grade	-.486	.386	-.163	-1.259	.209	-1.246	.274
	Extraversion - Total	.052	.025	.127	2.033	.043	.002	.101
3	(Constant)	.650	3.799		.171	.864	-6.833	8.134
	Gender	-.943	.333	-.186	-2.831	.005	-1.599	-.287
	Age	-.010	.303	-.004	-.033	.974	-.606	.586
	Grade	-.522	.380	-.175	-1.375	.170	-1.271	.226
	Extraversion - Total	.011	.028	.028	.394	.694	-.045	.067
	NPQC-R Total	.066	.022	.212	3.013	.003	.023	.110

a. Dependent Variable: Frequency of changing status per week

Excluded Variables^a

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics
						Tolerance
1	Extraversion - Total	.127 ^b	2.033	.043	.129	.977
	NPQC-R Total	.225 ^b	3.638	.000	.226	.970
2	NPQC-R Total	.212 ^c	3.013	.003	.189	.752

a. Dependent Variable: Frequency of changing status per week

b. Predictors in the Model: (Constant), Grade, Gender, Age

c. Predictors in the Model: (Constant), Grade, Gender, Age, Extraversion - Total

You could report these results as follows:

Predictor and Step	β	R^2	ΔR^2	ΔF
Frequency of Facebook Status updates				
Step 1				
Gender	-.15*	.04	.04	3.43*
Age	-.01			
Grade	-.15			
Step 2				
Gender	-.14*	.06	.02	4.13*
Age	-.00			
Grade	-.16			
NEO-FFI (Extraversion)	.13*			
Step 3				

Gender	-.19**	.09	.03	9.08**
Age	-.00			
Grade	-.18			
NEO-FFI (Extraversion)	.03			
NPQC-R	.21**			

Note: NPQC-R = Total score of the Narcissistic Personality Questionnaire for Children Revised. NEO-FFI (Extraversion) = Extraversion subscale score of the NEO Five-Factor Inventory. * $p < .05$. ** $p < .01$.

If you want to report the confidence intervals it is a good idea to report the bootstrapped confidence intervals because they are robust (see Chapter 6). If you look at the bootstrapped confidence intervals for this regression (table below), you will see that they don't change the results as reported in Ong et al. (2011). The main benefit of the bootstrap confidence intervals and significance values is that they do not rely on assumptions of normality or homoscedasticity, so they give us an accurate estimate of the true population value of b for each predictor.

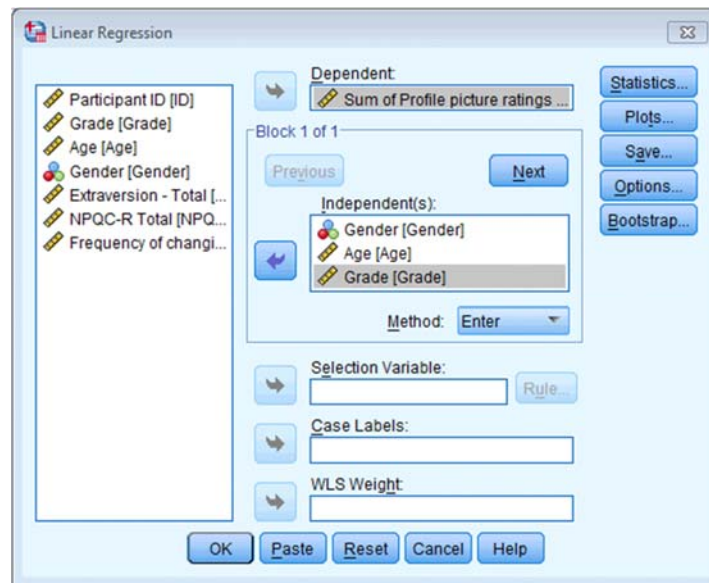
Bootstrap for Coefficients

Model	B	Bootstrap ^a				
		Bias	Std. Error	Sig. (2-tailed)	BCa 95% Confidence Interval	
					Lower	Upper
1 (Constant)	3.383	-.176	1.993	.084		6.652
Gender	-.775	-.010	.320	.023		-.183
Age	-.033	.016	.172	.826		.372
Grade	-.444	-.022	.282	.107		.031
2 (Constant)	.830	-.226	2.480	.710		5.008
Gender	-.691	-.009	.307	.027		-.115
Age	-.006	.018	.177	.968		.428
Grade	-.486	-.022	.281	.079		.011
Extraversion - Total	.052	.000	.029	.076		.113
3 (Constant)	.650	-.127	2.418	.775		5.198
Gender	-.943	-.009	.312	.004		-.321
Age	-.010	.010	.173	.944		.357
Grade	-.522	-.012	.274	.054		-.034
Extraversion - Total	.011	.000	.029	.716		.072
NPQC-R Total	.066	3.575E-005	.020	.002		.107

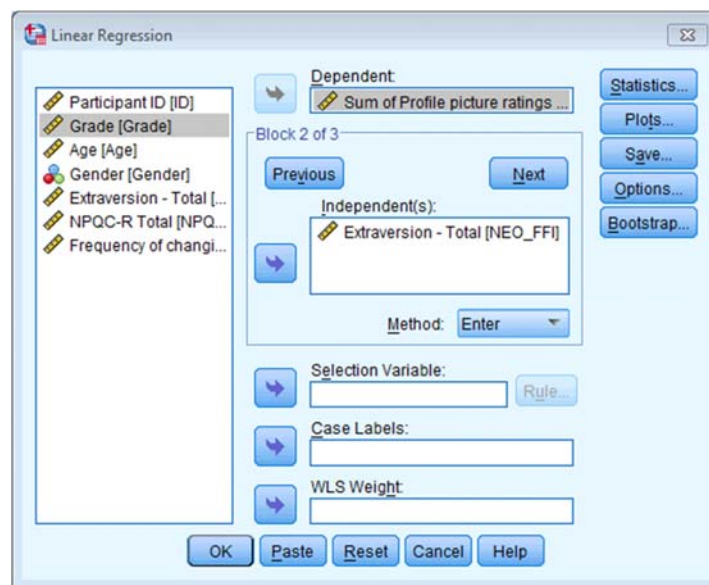
a. Unless otherwise noted, bootstrap results are based on 1000 bootstrap samples

So basically, Ong et al.'s prediction was supported in that after controlling for age, grade and gender, narcissism significantly predicted the frequency of Facebook status updates over and above extroversion. The positive standardized beta value (.21) indicates a positive relationship between frequency of Facebook updates and narcissism, in that more narcissistic adolescents updated their Facebook status more frequently than their less narcissistic peers did. Compare these results to the results reported in Ong et al. (2011). The Table 2 from their paper is reproduced at the end of this task below.

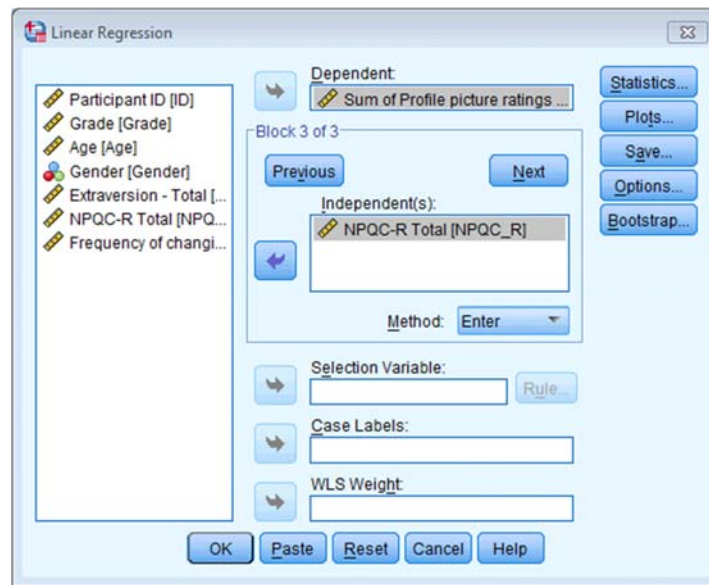
OK, now let's do the second regression to investigate whether narcissism predicts, above and beyond the other variables, the Facebook profile picture ratings. Put the outcome variable **Sum of Profile picture ratings** in the Dependent box, then define the three blocks as follows. In the first block put **Age, Gender** and **Grade**:



In the second block, put extraversion (**NEO_FF1**):



And in the third block put narcissism (**NPQC_R**):



The main output is as follows:

Model Summary^d

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.177 ^a	.031	.016	3.574	.031	2.047	3	189	.109
2	.395 ^b	.156	.138	3.346	.124	27.648	1	188	.000
3	.493 ^c	.243	.223	3.177	.087	21.562	1	187	.000

a. Predictors: (Constant), Grade, Gender, Age

b. Predictors: (Constant), Grade, Gender, Age, Extraversion - Total

c. Predictors: (Constant), Grade, Gender, Age, Extraversion - Total, NPQC-R Total

d. Dependent Variable: Sum of Profile picture ratings

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	8.782	5.689		1.544	.124	-2.439	20.003
	Gender	1.290	.550	.170	2.348	.020	.206	2.375
	Age	.150	.475	.043	.317	.752	-.787	1.088
	Grade	.099	.603	.023	.163	.870	-1.091	1.289
2	(Constant)	-3.461	5.812		-.596	.552	-14.927	8.004
	Gender	1.475	.516	.194	2.860	.005	.458	2.493
	Age	.365	.447	.106	.818	.415	-.516	1.246
	Grade	-.245	.569	-.056	-.430	.668	-1.366	.877
	Extraversion - Total	.224	.043	.356	5.258	.000	.140	.307
3	(Constant)	-3.169	5.519		-.574	.566	-14.056	7.718
	Gender	.582	.526	.076	1.106	.270	-.456	1.620
	Age	.337	.424	.097	.794	.428	-.500	1.174
	Grade	-.258	.540	-.059	-.478	.633	-1.323	.807
	Extraversion - Total	.104	.048	.166	2.176	.031	.010	.199
	NPQC-R Total	.173	.037	.366	4.643	.000	.099	.246

a. Dependent Variable: Sum of Profile picture ratings

Excluded Variables^a

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics
						Tolerance
1	Extraversion - Total	.356 ^b	5.258	.000	.358	.980
	NPQC-R Total	.458 ^b	6.824	.000	.446	.918
2	NPQC-R Total	.366 ^c	4.643	.000	.322	.653

a. Dependent Variable: Sum of Profile picture ratings

b. Predictors in the Model: (Constant), Grade, Gender, Age

c. Predictors in the Model: (Constant), Grade, Gender, Age, Extraversion - Total

If you wanted to report the confidence intervals, it is a good idea to report the bootstrapped confidence intervals because they are robust (see Chapter 6). If you look at my output below, you can see that bootstrapping the confidence intervals in this example doesn't change the results as reported in Ong et al. (2011).

Bootstrap for Coefficients

Model	B	Bootstrap ^a				
		Bias	Std. Error	Sig. (2-tailed)	BCa 95% Confidence Interval	
					Lower	Upper
1 (Constant)	8.782	-.932	6.564	.155	-5.025	18.392
Gender	1.290	-.021	.592	.037	.218	2.336
Age	.150	.081	.542	.767	-.766	1.559
Grade	.099	-.095	.618	.865	-1.053	1.044
2 (Constant)	-3.461	-1.179	7.883	.652	-19.048	7.992
Gender	1.475	-.018	.551	.007	.473	2.447
Age	.365	.091	.594	.527	-.690	1.810
Grade	-.245	-.105	.658	.711	-1.429	.706
Extraversion - Total	.224	.003	.042	.001	.141	.325
3 (Constant)	-3.169	-.923	6.674	.622	-16.335	6.456
Gender	.582	-.012	.609	.335	-.554	1.706
Age	.337	.071	.504	.493	-.521	1.542
Grade	-.258	-.085	.578	.662	-1.262	.610
Extraversion - Total	.104	.005	.047	.031	.014	.211
NPQC-R Total	.173	-.003	.036	.001	.105	.231

a. Unless otherwise noted, bootstrap results are based on 1000 bootstrap samples

You could report these results as follows:

Predictor and Step	β	R^2	ΔR^2	ΔF
Facebook profile picture ratings				
Step 1				
Gender	.17*	.03	.03	2.05
Age	.04			
Grade	.02			
Step 2				
Gender	.19**			
Age	.11			
Grade	-.06			
NEO-FFI (Extraversion)	.36**	.16	.12	27.65**
Step 3				
Gender	.08			
Age	.10			
Grade	-.06			
NEO-FFI (Extraversion)	.17*	.24	.09	21.56**
NPQC-R	.37**			

Note: NPQC-R = Total score of the Narcissistic Personality Questionnaire for Children Revised. NEO-FFI (Extraversion) = Extraversion subscale score of the NEO Five-Factor Inventory. * $p < .05$. ** $p < .01$.

These results show that after controlling for age, grade and gender, narcissism significantly predicted the Facebook profile picture ratings over and above extroversion. The positive beta value (.37) indicates a positive relationship between profile picture ratings and narcissism, in that more narcissistic adolescents rated their Facebook profile pictures more positively than their less narcissistic peers did. Compare these results to the results reported in Table 2 of Ong et al. (2011) below.

Table 2

Summary of hierarchical multiple regression analyses for extraversion and narcissism predicting Facebook profile picture ratings, frequency of Facebook status updates, number of Facebook friends and number of Facebook photos.

Predictor and step	β	R^2	ΔR^2	ΔF
Facebook profile picture ratings				
Step 1				
Gender	.17*	.03	.03	2.05
Age	.04			
Grade	.02			
Step 2				
Gender	.19**			
Age	.02			
Grade	-.06			
NEO-FFI (Extraversion)	.36**	.16	.12	27.65**
Step 3				
Gender	.08			
Age	.10			
Grade	-.06			
NEO-FFI (Extraversion)	.17*	.24	.09	21.56**
NPQC-R	.37**			
Frequency of Facebook status updates				
Step 1				
Gender	-.15*	.04	.04	3.43*
Age	-.01			
Grade	-.15			
Step 2				
Gender	-.14*	.06	.02	4.13*
Age	-.00			
Grade	-.16			
NEO-FFI (Extraversion)	.13*			
Step 3				
Gender	-.19**	.09	.03	9.08**
Age	-.00			
Grade	-.18			
NEO-FFI (Extraversion)	.03			
NPQC-R	.21**			

Table 2 from Ong et al. (2011)