Answers to additional health exercise

Chapter 13 Multiple Regression

Q1. Conduct a standard multiple regression to explore factors that impact on people's level of daytime sleepiness. For your dependent variable use the Sleepiness and Associated Sensations Scale total score (*totSAS*). For independent variables use *sex*, *age*, physical fitness rating (*fitrate*), and scores on the HADS Depression scale (*depress*).

Descriptive Statistics

	Mean	Std. Deviation	N
sleepy & assoc sensations scale	26.04	10.520	251
age	43.87	12.684	248
gender	.45	.498	271
physical fitness	6.42	1.717	266
HADS Depression	3.50	2.993	269

Correlations

		sleepy & assoc sensations scale	age	gender	physical fitness	HADS Depression
Pearson Correlation	sleepy & assoc sensations scale	1.000	-.141	-.199	-.267	.482
	age	-.141	1.000	-.017	-.039	-.004
	gender	-.199	-.017	1.000	.110	-.071
	physical fitness	-.267	-.039	.110	1.000	-.314
	HADS Depression	.482	-.004	-.071	-.314	1.000
Sig. (1-tailed)	sleepy & assoc sensations scale	.	.017	.001	.000	.000
	age	.017	.	.393	.271	.473
	gender	.001	.393	.	.037	.124
	physical fitness	.000	.271	.037	.	.000
	HADS Depression	.000	.473	.124	.000	.
N	sleepy & assoc sensations scale	251	230	251	247	249
	age	230	248	248	243	246
	gender	251	248	271	266	269
	physical fitness	247	243	266	266	265
	HADS Depression	249	246	269	265	269

Variables Entered/Removed [b]

Model	Variables Entered	Variables Removed	Method
1	HADS Depression, age, gender[a], physical fitness	.	Enter

a. All requested variables entered.

b. Dependent Variable: sleepy & assoc sensations scale

Model Summary [b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.541[a]	.293	.280	8.927	.293	23.258	4	225	.000	1.549

a. Predictors: (Constant), HADS Depression, age, gender, physical fitness

b. Dependent Variable: sleepy & assoc sensations scale

ANOVA [b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7413.343	4	1853.336	23.258	.000[a]
	Residual	17929.187	225	79.685		
	Total	25342.530	229			

a. Predictors: (Constant), HADS Depression, age, gender, physical fitness

b. Dependent Variable: sleepy & assoc sensations scale

Coefficients [a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B		Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	32.211	3.481		9.255	.000	25.352	39.069					
	age	-.121	.047	-.146	-2.604	.010	-.213	-.029	-.141	-.171	-.146	.998	1.002
	gender	-3.323	1.193	-.157	-2.786	.006	-5.673	-.973	-.199	-.183	-.156	.986	1.014
	physical fitness	-.731	.364	-.119	-2.008	.046	-1.447	-.014	-.267	-.133	-.113	.892	1.121
	HADS Depression	1.522	.208	.433	7.329	.000	1.113	1.932	.482	.439	.411	.900	1.111

a. Dependent Variable: sleepy & assoc sensations scale

Collinearity Diagnostics [a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions				
				(Constant)	age	gender	physical fitness	HADS Depression
1	1	4.027	1.000	.00	.00	.02	.00	.02
	2	.539	2.734	.00	.00	.69	.00	.21
	3	.343	3.424	.00	.02	.28	.03	.58
	4	.071	7.509	.00	.62	.01	.34	.03
	5	.020	14.235	.99	.35	.00	.63	.16

a. Dependent Variable: sleepy & assoc sensations scale

Residuals Statistics [a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	15.04	42.28	26.15	5.653	242
Residual	-24.781	19.438	.178	8.839	225
Std. Predicted Value	-1.933	2.853	.018	.993	242
Std. Residual	-2.776	2.178	.020	.990	225

a. Dependent Variable: sleepy & assoc sensations scale

Assess how much of the variance in total sleepiness scores is explained by the set of variables (check your R squared value).

A total of 29.3% (R squared=.293) of the variance is explained by the set of variables.

Which of the variables make a unique significant contribution? (check your beta values).

Inspection of the standardized coefficients (beta values) indicates that age, gender, physical fitness and HADS Depression scores all made a significant contribution to the equation.

Q2. Repeat the above analysis, but this time use a hierarchical multiple regression procedure entering sex and age in the first block of variables, and physical fitness and depression scores in the second block.

Descriptive Statistics

	Mean	Std. Deviation	N
sleepy & assoc sensations scale	26.04	10.520	251
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HADS Depression	3.50	2.993	269

Correlations

		sleepy & assoc sensations scale	age	gender	physical fitness	HADS Depression
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	age	-.141	1.000	-.017	-.039	-.004
	gender	-.199	-.017	1.000	.110	-.071
	physical fitness	-.267	-.039	.110	1.000	-.314
	HADS Depression	.482	-.004	-.071	-.314	1.000
Sig. (1-tailed)	sleepy & assoc sensations scale	.	.017	.001	.000	.000
	age	.017	.	.393	.271	.473
	gender	.001	.393	.	.037	.124
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	HADS Depression	.000	.473	.124	.000	.
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	gender	251	248	271	266	269
	physical fitness	247	243	266	266	265
	HADS Depression	249	246	269	265	269

Variables Entered/Removed [b]

Model	Variables Entered	Variables Removed	Method
1	gender, age [a]	.	Enter
2	HADS Depression, physical fitness [a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: sleepy & assoc sensations scale

Model Summary [c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.245[a]	.060	.052	10.243	.060	7.267	2	227	.001	
2	.541[b]	.293	.280	8.927	.232	36.948	2	225	.000	1.549

a. Predictors: (Constant), gender, age

b. Predictors: (Constant), gender, age, HADS Depression, physical fitness

c. Dependent Variable: sleepy & assoc sensations scale

ANOVA [c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1524.909	2	762.455	7.267	.001[a]
	Residual	23817.621	227	104.923		
	Total	25342.530	229			
2	Regression	7413.343	4	1853.336	23.258	.000[b]
	Residual	17929.187	225	79.685		
	Total	25342.530	229			

a. Predictors: (Constant), gender, age

b. Predictors: (Constant), gender, age, HADS Depression, physical fitness

c. Dependent Variable: sleepy & assoc sensations scale

Coefficients [a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B		Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	33.184	2.521		13.162	.000	28.216	38.152					
	age	-.120	.053	-.144	-2.240	.026	-.225	-.014	-.141	-.147	-.144	1.000	1.000
	gender	-4.246	1.359	-.201	-3.123	.002	-6.924	-1.567	-.199	-.203	-.201	1.000	1.000
	physical fitness												
	HADS Depression												
2	(Constant)	32.211	3.481		9.255	.000	25.352	39.069					
	age	-.121	.047	-.146	-2.604	.010	-.213	-.029	-.141	-.171	-.146	.998	1.002
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	physical fitness	-.731	.364	-.119	-2.008	.046	-1.447	-.014	-.267	-.133	-.113	.892	1.121
	HADS Depression	1.522	.208	.433	7.329	.000	1.113	1.932	.482	.439	.411	.900	1.111

a. Dependent Variable: sleepy & assoc sensations scale

Excluded Variables [b]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics		
						Tolerance	VIF	Minimum Tolerance
1	physical fitness	-.254[a]	-4.046	.000	-.260	.987	1.014	.987
	HADS Depression	.470[a]	8.303	.000	.483	.995	1.005	.995

a. Predictors in the Model: (Constant), gender, age

b. Dependent Variable: sleepy & assoc sensations scale

Collinearity Diagnostics [a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions				
				(Constant)	age	gender	physical fitness	HADS Depression
1	1	2.522	1.000	.01	.01	.06		
	2	.440	2.395	.02	.03	.92		
	3	.038	8.112	.97	.96	.02		
	4							
	5							
2	1	4.027	1.000	.00	.00	.02	.00	.02
	2	.539	2.734	.00	.00	.69	.00	.21
	3	.343	3.424	.00	.02	.28	.03	.58
	4	.071	7.509	.00	.62	.01	.34	.03
	5	.020	14.235	.99	.35	.00	.63	.16

a. Dependent Variable: sleepy & assoc sensations scale

Residuals Statistics [a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	15.04	42.28	26.15	5.653	242
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a. Dependent Variable: sleepy & assoc sensations scale

After controlling for the demographic variables of sex and age, do the other two predictor variables make a significant contribution to explaining variance in sleepiness scores?

From the model summary table we can see that the R square change value of .232 is significant (Sig F Change: p<.0005). This indicates that after controlling for the demographic variables HADS Depression and physical fitness still make a significant contribution to the explanation of sleepiness scores.

How much additional variance in sleepiness is explained by physical fitness and depression, after controlling for sex and age?

Physical fitness and depression explain an addition 23.2% of variance in sleepiness, after controlling for sex and age.