Ch7-Lab: Cognitive Performance & Aging

```
*1. Examine the pattern of correlations among the variables. Anything surprising?.
CORR cog TO health /STAT.
```

SS_{TOTAL}

	Mean	Std. Deviation	N
cog	99.63500	11.907169	200
age	48.74500	14.593314	200
exer	24.57500	3.923179	200
health	4.00350	.346610	200

	cog	age	exer
age	-.170		
	.016		
exer	.179	.748	
	.011	.000	
health	.352	-.240	.194
	.000	.001	.006

```
*2. Determine the best-fit regression equation using all three predictors.
REGRESS /DEP = cog /ENTER health exer age  /SAVE PRED(prdc.hea) RESID(resc.hea).
```

Model	R	R Square
1	.496	.246

SS_{Reg}/SS_{TOTAL}

$1-R^2 = .754$

$\sqrt{} = .868$

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6930.910	3	2310.303	21.276	.000
	Residual	21283.445	196	108.589		
	Total	28214.355	199			

p

$n-p-1$

$H_0: \rho_{C \cdot AEH} = 0$

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	66.246	9.872		6.711	.000
	health	2.839	2.698	.083	1.052	.294
	exer	1.895	.349	.624	5.436	.000
	age	-.504	.095	-.617	-5.318	.000

	Mean	Std. Deviation	N
Predicted Value	99.63500	5.901584	200
Residual	.000000	10.341759	200

SS_{Reg}

SS_{Res}

$\Sigma(y-\hat{y})=0$

```
LIST /CASES = FROM 1 TO 2.
 o cog age exer health    prdc.hea    resc.hea
```

	C	A	E	H	$\hat{Y}$	$Y-\hat{Y}$
1	101	40	20	3.7	94.50764	6.49236
2	100	26	20	4.0	102.41067	-2.41067

```
*4. Strength and significance of unique contribution of health.
REGRESS /STAT = DEFAU ZPP CHANGE /DEP = cog /ENTER age exer /ENTER health.
```

$H_0: \rho_{C(H.AE)} = 0$

$>, <, \neq$

Model	R	R Square	R Square Change	F Change	df1	df2	Sig. F Change
			Change Statistics				
1	.491	.241	.241	31.342	2	197	.000
2	.496	.246	.004	1.108	1	196	.294

$= .246 - .241$

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6810.622	2	3405.311	31.342	.000
	Residual	21403.733	197	108.648		
2	Regression	6930.910	3	2310.303	21.276	.000
	Residual	21283.445	196	108.589		
	Total	28214.355	199			

$SS_{\hat{C}\cdot AEH}$ 6930.910

$SS_{\hat{C}\cdot AE}$ 6810.622

$SS_{\hat{C}H.AE}$ 120.288

$r^2_{C(H.AE)} = \frac{120.288}{28214...} = .00426$

$\sqrt{} = .065$

Model		B	Std. Error	t	Sig.	Zero-order	Partial	Part
		Unstandardized Coefficients				Correlations		
1	(Constant)	75.255	4.921	15.294	.000			
	age	-.563	.076	-7.375	.000	-.170	-.465	-.458
	exer	2.108	.284	7.428	.000	.179	.468	.461
2	(Constant)	66.246	9.872	6.711	.000			
	age	-.504	.095	-5.318	.000	-.170	-.355	-.330
	exer	1.895	.349	5.436	.000	.179	.362	.337
	health	2.839	2.698	1.052	.294	.352	.075	.065

$H_0: \beta_{CH.AE} = 0$

$>, <, \neq ?$

$t_{CH.AE} = \frac{2.839 - 0}{2.698} = 1.052$

$\sqrt{F}$

$\sqrt{\frac{108.589}{14.921}}$

$p_{F_{CH}}$

```
*5. Calculate a residual health predictor to compute part r.
REGRESS /DEP = health /ENTER age exer /SAVE RESI(resh.ae).
```

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8.987	2	4.493	59.324	.000
	Residual	14.921	197	.076		
	Total	23.908	199			

$(1-R^2_{H.AE})SS_H$ $\quad SS_H$

```
VARI LABEL resh.ae ''.
CORR resh.ae WITH cog age exer.
```

	cog	age	exer
resh.ae	.065	.000	.000

A,E → H

$r_s = 0$

$H - \hat{H}$

.065

C

```
*6. Use the /FORWARD procedure to obtain a final equation.
REGRESS /VARI = cog TO health /DEP = cog /FORWARD.
```

See Corr Matrix Pg 1

Model	Variables Entered	Variables Removed	Method
1	health	.	Forward (Criterion: Probability-of-F-to-enter <= .050)

Model	R	R Square
1	.352	.124

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3504.520	1	3504.520	28.082	.000
	Residual	24709.835	198	124.797		
	Total	28214.355	199			

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	51.163	9.181		5.573	.000
	health	12.107	2.285	.352	5.299	.000

Model		Beta In	t	Sig.	Partial Correlation
1	age	-.091	-1.324	h+a .187	-.094
	exer	.114	1.697	h+e .091	.120

> .05

```
 *7. Use the /BACKWARD procedure to obtain a final equation.
*    Do the /FORWARD and /BACKWARD options produce the same final equation? Why?.
REGRESS /VARI = cog TO health /DEP = cog /BACKWARD.
```

Model	Variables Entered	Variables Removed	Method
1	health, exer, age	.	Enter
2	.	health	Backward (criterion: Probability of F-to-remove >= .100).

Model	R	R Square
1	.496	.246
2	.491	.241

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6930.910	3	2310.303	21.276	.000
	Residual	21283.445	196	108.589		
2	Regression	6810.622	2	3405.311	31.342	.000
	Residual	21403.733	197	108.648		
	Total	28214.355	199			

Model		Unstandardized Coefficients		Standardized Coefficients			
		B	Std. Error	Beta	t	Sig.	
1	(Constant)	66.246	9.872		6.711	.000	
	age	-.504	.095	-.617	-5.318	.000	
	exer	1.895	.349	.624	5.436	.000	
	health	2.839	2.698	.083	1.052	.294	>.10
2	(Constant)	75.255	4.921		15.294	.000	
	age	-.563	.076	-.690	-7.375	.000	
	exer	2.108	.284	.695	7.428	.000	

Model		Beta In	t	Sig.	Partial Correlation
2	health	.083	1.052	.294	.075

```
 *8. What do you think will happen with /STEPWISE? Why?
*    Perform the /STEPWISE analysis and compare to your expected outcome.
*    Change PIN and POUT to modify the outcome.
REGRESS /VARI = cog TO health /DEP = cog /STEPWISE.
```

Model	Variables Entered	Variables Removed	Method
1	health	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

```
REGRESS /VARI = cog TO health /CRIT = PIN(.10) POUT(.11) /DEP = cog /STEPWISE.
```

Model	Variables Entered	Variables Removed	Method
1	health	.	Stepwise (Criteria: Probability-of-F-to-enter <= .100, Probability-of-F-to-remove >= .110).
2	exer	.	Stepwise (Criteria: Probability-of-F-to-enter <= .100, Probability-of-F-to-remove >= .110).
3	age	.	Stepwise (Criteria: Probability-of-F-to-enter <= .100, Probability-of-F-to-remove >= .110).
4	.	health	Stepwise (Criteria: Probability-of-F-to-enter <= .100, Probability-of-F-to-remove >= .110).

Model	R	R Square
1	.352	.124
2	.370	.137
3	.496	.246
4	.491	.241

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3504.520	1	3504.520	28.082	.000
	Residual	24709.835	198	124.797		
2	Regression	3860.425	2	1930.212	15.614	.000
	Residual	24353.930	197	123.624		
3	Regression	6930.910	3	2310.303	21.276	.000
	Residual	21283.445	196	108.589		
4	Regression	6810.622	2	3405.311	31.342	.000
	Residual	21403.733	197	108.648		
		28214.355	199			

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	51.163	9.181		5.573	.000
	health	12.107	2.285	.352	5.299	.000
2	(Constant)	45.684	9.692		4.714	.000
	health	11.343	2.318	.330	4.893	.000
	exer	.348	.205	.114	1.697	.091
3	(Constant)	66.246	9.872		6.711	.000
	health	2.839	2.698	.083	1.052	.294 >.11
	exer	1.895	.349	.624	5.436	.000
	age	-.504	.095	-.617	-5.318	.000
4	(Constant)	75.255	4.921		15.294	.000
	exer	2.108	.284	.695	7.428	.000
	age	-.563	.076	-.690	-7.375	.000

Model		Beta In	t	Sig.	Partial Correlation
1	age	-.091	-1.324	h+a .187	-.094
	exer	.114	1.697	h+e .091 <.10	.120
2	age	-.617	-5.318	h+e+a .000	-.355
4	health	.083	1.052	.294	.075

#2 - Best Fit regression equation using all 3 predictors.

Extension of line 13 equation: $\hat{Y} = b_0 + b_1x_1 + b_2x_2 + b_3x_3$

let

x_1 = health x_2 = exer x_3 = age Y = cog

get slopes from printout (unstandardized coefficients)

$b_1 = 2.839$ $b_2 = 1.895$ $b_3 = -.504$ $b_0 = 66.246$

So, $\hat{Y} = 66.246 + 2.839x_1 + 1.895x_2 - .504x_3$

try with first numbers: $\hat{Y} = 66.246 + (2.839)(3.70) + (1.895)(20) - (.504)(40)$

$= 66.246 + 10.5043 + 37.9 - 20.16$

$= 94.49$

$Y - \hat{Y} = 101 - 94.5 = 6.5 \rightarrow$ squared $= 42.25$

$\hat{Y} - \bar{Y} = 94.5 - 99.635 = -5.135 \Rightarrow$ squared $= 26.368$

Second numbers: $\hat{Y} = 66.246 + (2.839)(4) + (1.895)(20) + (-.504)(26)$

$= 66.246 + 11.356 + 37.9 - 13.104$

$= 102.398$

$Y - \hat{Y} = 100 - 102.398 = -2.398$

$\hat{Y} - \bar{Y} = 102.398 - 99.135 = 2.763$

#3 - Strength + Significance of overall

Get values from printout

Line 14 - $R^2 = \frac{SS_{\hat{Y}}}{SS_Y} = \frac{6930.910}{28214.355} = .2456 \approx .246$

Line 17 - $F = \frac{MS_{reg}}{MS_{res}} = \frac{2310.303}{108.589} = 21.276$

#4 - strength and significance of unique contribution of health in predicting cog

Formulas - Line 19-22

$SS_{change} = SS_{\hat{Y}.123} - SS_{\hat{Y}.23} = 6930.910 - 6810.622 = 120.288$

or

$SS_{\hat{E}.hae} - SS_{\hat{E}.ae}$

$r^2_{change} = r^2_{Y(1.23)} = \frac{SS_{change}}{SS_Y} = \frac{120.288}{28214.355} = 0.00426$

or

$R^2_{Y.123} - R^2_{Y.23} = .246 - .241 = .005$ (rounding)

r_{change} or r_{part} $= \sqrt{.00426} = +/- .065$

$F_{change} = \frac{MS_{change}}{MS_{res}} = \frac{SS_{change}/1}{MS_{res}} = \frac{120.288}{108.589} = 1.1077$

Could also do $tb_{Y1.23}$ and $r^2_{Y1.23}$ calculations, but would need to run a regression with age and exer as predictors of health, then use residuals

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#5 - residual health predictor to demonstrate part r.

We want the part of health that is unique; ie. doesn't overlap with age or exer. Then we want to correlate that unique part of health with cog.

So, we get unique part of health by using the other 2 predictors (age and exer), and using residuals from that regression.