MANCOVA

COM 631/731

Spring 2017

SHANTALE D. ROBERTS

I. MODEL

From Film and TV Usage data set (Jeffres & Neuendorf, 2015)

COVARIATES

Q29a. "I love the options at my fingertips today..."

Q29e. "I can hardly wait to see what technology comes next."

Q29o. "I generally think of myself as a happy person."

INDEPENDENT VARIABLES

X1: "GENDER"

X2: Q7. "How did you watch this movie 1?"

INTERACTION OF X1 AND X2:

DEPENDENT VARIABLES

Q23a. I often watch a favorite film again and again. Q23d. I don't like to watch films at home that I've seen before in a theater. Q23f. I watch TV programs with my family that we've seen before, often several times. Q23I. I like playing/listening to a movie I'm familiar with as background while I do other things.

Independent Variables:

Q7. How did you watch this movie 1? – Nominal (4 Categories) 1 = In a theater, 2 = On TV/cable, 3= DVD/Blu-ray, 4 = Online

Gender - Nominal (2 Categories) 1= Male, 2= Female

Dependent Variables:

(all measured on a 1-7 response scale, where 1=not like me at all and 7=very much like me)

Q23a. I often watch a favorite film again and again.

Q23d. I don't like to watch films at home that I've seen before in a theater.

Q23f. I watch TV programs with my family that we've seen before, often several times.

Q23I. I like playing/listening to a movie I'm familiar with as background while I do other things.

Covariates:

(all measured on a 1-7 response scale, where 1=completely disagree and 7=completely agree)

Q29a.I love the options at my fingertips today, watching videos on my phone, texting, streaming films.

Q29e. I can hardly wait to see what technology comes next.

Q290.I generally think of myself as a happy person.

II. RUNNING SPSS

ANALYZE > GENERAL LINEAR MODEL > MULTIVARIATE

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> ADD DEPENDENT AND ("FIXED FACTOR") INDEPENDENT VARIABLES BY CLICKING THE ARROW

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PLOTS > FACTORS > MOVE IV'S INTO RIGHT BOXES USING ARROW KEYS

> $\sqrt{\text{SEPARATE LINES}}$

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> ONCE IV'S ARE IN THE BOXES, \checkmark ADD TO CREATE A GRAPH SHOWING THE INTERACTION OF THE IVS

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> OPTIONS

> HIGHLIGHT ALL IVs AND THE INTERACTION IN THE LEFT

$\sqrt{\rm ARROW}$ TO MOVE IVs TO THE RIGHT BOX

DISPLAY

- $\sqrt{\text{DESCRIPTIVE STATISTICS}}$
- $\sqrt{\text{ESTIMATES OF EFFECT SIZE}}$
- $\sqrt{\text{OBSERVED POWER}}$
- √ HOMOGENEITY TESTS

> CONTINUE



>To add COVARIATES, simply insert variables into the "covariate" box. Everything else is the same EXCEPT there are not any post hoc! >Hit RUN for MANCOVA!!!! (OR PASTE TO SAVE SYNTAX AND THEN RUN)

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3	1 24				Multivanate			~			
4	1	3	2	1			Dependent Variables	Madal	1	1	2
5	1.04		-		🚜 Q4c. Prefer	red ge 🛌	🖂 Q23a. I often wat.			-	
6	1 14	-	-		Q4d. Prefer	redg. 🖌 🐳	Q23f. I watch TV .	Contrasts		-	
7	1.14				Q4e. Preter	red g	💑 Q23I. 1 like playin.	Plots.			
8	1.1+				G5b. Prefer	red g.	Eixed Factor(s):	File Hoc			
9	3 64		+)		🔒 Q5c. Prefer	red ge	🔒 Gender [Gender	Save.		-	
10					🖧 Qốd. Prefer	red g	a?. How did you i	wat			
11					GGe. Prefer	red g		20thone			
12					CO Film wa	atched	Covariate(s):			-	
13	5	5	5	1	Q9. How di	d you	🔬 Q29a. I love the o		2	3	3
14	1				🖧 Q10. Film v	vatche	al 029e. I can hardl	-			
15	2	5	2	1	🖧 Q11. How a	did you	OC 0290.1 generally		2	2	5
6			-		Q12a. Favo	rite fil	WLS Weight			-	
7	3	3	4	1	C120. Favo				3	2	3
8	4	3	2	1		OK Paste	Reset Cancel H	elp	1	1	4
9	· · ·	-								-	
0	1	1	1	1	1	1	1	1	1	2 1 (1
1	3	4	2	31	2	1	10	1	3	4	4
22	2	1	1	1	1	1	1	1	1	1	1
3	2	1	1	21	1	1	(1)	1	1	1	2
	1								Neve		

III. SPSS OUTPUT

```
DATASET NAME DataSet1 WINDOW=FRONT.

GLM Q23d Q23a Q23f Q23l BY Gender Q7 WITH Q29a Q29e Q29o

/METHOD=SSTYPE(3)

/INTERCEPT=INCLUDE

/PLOT=PROFILE(Gender*Q7)

/EMMEANS=TABLES(Gender) WITH(Q29a=MEAN Q29e=MEAN Q29o=MEAN)

/EMMEANS=TABLES(Q7) WITH(Q29a=MEAN Q29e=MEAN Q29o=MEAN)

/EMMEANS=TABLES(Gender*Q7) WITH(Q29a=MEAN Q29e=MEAN Q29o=MEAN)

/PRINT=DESCRIPTIVE ETASQ OPOWER HOMOGENEITY

/CRITERIA=ALPHA(.05)

/DESIGN=Q29a Q29e Q29o Gender Q7 Gender*Q7.
```

Between	-Subje	cts Factors	
		Value Label	N
Gender	1	1-Male	141
	2	2-Female	222
Q7. How did you watch this movie 1	1	1-In theater	85
	2	2-On TV/cable	84
	3	3-DVD or BluRay	90
	4	4-Online	104

General Linear Model

		Descriptive Statistics			
	Gender	Q7. How did you watch this movie 1	Mean	Std. Deviation	N
Q23d. I don't like to watch films at	1-Male	1-In theater	3.07	1.772	42
home that I've seen before in a theater		2-On TV/cable	2.05	1.433	19
in contern		3-DVD or BluRay	2.70	1.928	33
		4-Online	3.28	2.018	47
		Total	2.91	1.880	141
	2-Female	1-In theater	2.95	2.138	43
		2-On TV/cable	2.06	1.657	65
		3-DVD or BluRay	2.32	1.947	57
		4-Online	2.25	1.562	57
	-	Total	2.35	1.828	222
	Total	1-In theater	3.01	1.955	85
		2-On TV/cable	2.06	1.601	84
		3-DVD or BluRay	2.46	1.938	90
		4-Online	2.71	1.847	104
		Total	2.57	1.866	363
Q23a. I often watch a favorite film	1-Male	1-In theater	4.29	1.954	42
again and again.		2-On TV/cable	5.58	1.539	19
		3-DVD or BluRay	4.85	1.955	33
		4-Online	4.74	1.916	47
		Total	4.74	1.914	141
	2-Female	1-In theater	4.81	1.955	43
		2-On TV/cable	5.52	1.640	65
		3-DVD or BluRay	5.70	1.546	57
		4-Online	5.12	1.937	57
		Total	5.33	1.781	222
	Total	1-In theater	4.55	1.961	85
		2-On TV/cable	5.54	1.609	84
		3-DVD or BluRay	5.39	1.746	90
		4-Online	4.95	1.928	104
		Total	5.10	1.853	363
Q23f. I watch TV programs with my	1-Male	1-In theater	3.48	1.941	42
family that we've seen before, often several times.		2-On TV/cable	4.32	1.916	19
		3-DVD or BluRay	3.73	1.842	33
		4-Online	2.81	1.569	47
		Total	3.43	1.849	141
	2-Female	1-In theater	3.86	2.088	43
		2-On TV/cable	4.32	1.937	65
		3-DVD or BluRay	4.58	1.963	57
		4-Online	4.14	1.959	57
		Total	4.25	1.982	222
	Total	1-In theater	3.67	2.014	85
		2-On TV/cable	4.32	1.921	84
		3-DVD or BluRay	4.27	1.953	90
		4-Online	3.54	1.905	104
		Total	3.93	1.970	363

Q23I. I like playing/listening to a	1-Male	1-In theater	3.76	1.948	42
movie I'm familiar with as background while I do other things		2-On TV/cable	4.42	2.009	19
buergiouna minor ao outor amigo.		3-DVD or BluRay	3.27	2.020	33
		4-Online	3.98	2.212	47
		Total	3.81	2.073	141
	2-Female	ale 1-In theater 4.07 2.37			43
		2-On TV/cable	4.75	2.243	65
		3-DVD or BluRay	4.77	2.105	57
		4-Online	4.12	2.330	57
		Total	4.46	2.266	222
	Total	1-In theater	3.92	2.167	85
		2-On TV/cable	4.68	2.185	84
		3-DVD or BluRay	4.22	2.187	90
		4-Online	4.06	2.268	104
		Total	4.21	2.214	363

Box's Equa Cova Mat	Test of ality of rriance rices ^a								
Box's M	122.453								
F	1.674								
df1	70								
df2	68591.989								
df2 68591.989 Sig. .000 Tests the null									
Tests the hypothesis observed dependen equal acro a. Desi Intero + Q2 + Ge Geno	null s that the covariance of the t variables are oss groups. gn: gn: cept + Q29a 9e + Q29o nder + Q7 + der * Q7								

				Multiv	ariate Tests ^a				
Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared	Noncent Parameter	Observed Power ^d
Intercept	Pillai's Trace	.402	58.572 ^b	4.000	349.000	.000	.402	234.290	1.000
	Wilks' Lambda	.598	58.572 ^b	4.000	349.000	.000	.402	234.290	1.000
	Hotelling's Trace	.671	58.572 ^b	4.000	349.000	.000	.402	234.290	1.000
	Roy's Largest Root	.671	58.572 ^b	4.000	349.000	.000	.402	234.290	1.000
Q29a	Pillai's Trace	.028	2.527 ^b	4.000	349.000	.041	.029	10.107	.715
	Wilks'Lambda	.972	2.527 ^b	4.000	349.000	.041	.028	10.107	.715
	Hotelling's Trace	.029	2.527 ^b	4.000	349.000	.041	.028	10.107	.715
	Roy's Largest Root	.029	2.527 ^b	4.000	349.000	.041	.028	10.107	.715
Q29e	Pillai's Trace	.031	2.770 ^b	4.000	349.000	.027	.031	11.081	.759
	Wilks'Lambda	.969	2.770 ^b	4.000	349.000	.027	.031	11.081	.759
	Hotelling's Trace	.032	2.770 ^b	4.000	349.000	.027	.031	11.081	.759
	Roy's Largest Root	.032	2.770 ^b	4.000	349.000	.027	.031	11.081	.759
Q290	Pillai's Trace	.018	1.608 ^b	4.000	349.000	172	.018	6,434	.495
	Wilks' Lambda	.982	1.608 ⁶	4.000	349.000	.172	.018	б.434	.495
	Hotelling's Trace	.018	1.608 ^b	4.000	349.000	.172	.018	6.434	.495
	Rov's Largest Root	.018	1.608 ^b	4.000	349.000	172	.018	6.434	.495
Gender	Pillai's Trace	.031	2.762 ^b	4.000	349.000	.028	.031	11.050	.758
	Wilks'Lambda	.969	2.762 ^b	4.000	349.000	028	.031	11.050	.758
	Hotelling's Trace	.032	2.762 ^b	4.000	349.000	.028	.031	11.050	.758
	Roy's Largest Root	.032	2.762 ^b	4.000	349.000	.028	.031	11.050	.758
Q7	Pillai's Trace	.071	2.140	12.000	1053.000	.013	.024	25.682	.946
	Wilks' Lambda	.929	2.162	12.000	923.659	.012	.024	22.841	.912
	Hotelling's Trace	.075	2.179	12.000	1043.000	.011	.024	26.150	.950
	Roy's Largest Root	.063	5.508°	4.000	351.000	.000	.059	22.033	.976
Gender * Q7	Pillai's Trace	.055	1.647	12.000	1053.000	.073	.018	19.769	.857
	Wilks' Lambda	.945	1.649	12.000	923.659	.073	.019	17.428	.797
	Hotelling's Trace	.057	1.648	12.000	1043.000	.073	.019	19.779	.857
	Roy's Largest Root	.037	3.217°	4.000	351.000	.013	.035	12.869	.827

b. Exact statistic

c. The statistic is an upper bound on F that yields a lower bound on the significance level.

d. Computed using alpha = .05

Levene's Test of Equality of Error Variances ^a										
	F	df1	df2	Sig.						
Q23d. I don't like to watch films at home that I've seen before in a theater.	2.618	7	355	.012						
Q23a. I often watch a favorite film again and again.	.971	7	355	.452						
Q23f. I watch TV programs with my family that we've seen before, often several times.	1.058	7	355	.390						
Q23I. I like playing/listening to a movie I'm familiar with as background while I do other things.	2.034	7	355	.050						
Tests the null hypothesis that the error variance of the dependent variable is equal across groups. a. Design: Intercept + Q29a + Q29e + Q29o + Gender + Q7 + Gender * Q7										

Tests of Between-Subjects Effects												
Source	Dependent Variable	Type III Sum of Squares	d1	Mean Square	F	Sig.	Partial Eta Squared	Noncent Parameter	Observed Power ^e			
Corrected Model	Q23d. I don't like to watch films at home that i've seen before in a the ster	85.839 ^a	10	8 584	2.571	.005	068	25 710	956			
	023a I ofien watch a favorite film	113.729 ^b	10	11.373	3.544	.000	.091	35.443	.994			
	Q23f. I watch TV programs with my family that we've seen before, often several times	142.765°	10	14.276	3.980	.000	.102	39 804	998			
	Q231.1 like playing/listening to a movie I'm familiar with as background while I do attact tunner	199.832 ⁴	10	19.983	4.468	.000	.113	44.682	.999			
intercept	Q23d. I don't like to watch films at home that I've seen before in a transfer that I've seen before in a	131.495	1	131.495	39.384	.000	.101	39.384	1.000			
1	Q23a. I offen watch a favorite film	299.661	1	299.661	93.387	.000	.21 D	93 387	1 000			
	Q231.1 watch TV programs with my family that we've seen before, often several times	150.102	1	150.102	41.850	.000	.106	41.850	1.000			
	Q231. Like playing/listening to a movie i'm familiar with as background while I do other things	113.175	1	113.175	25.306	.000	067	25 306	999			
0299	Q23d. I don't like to watch films at home that I've seen before in a theater.	.012	٦	.012	.004	.953	.000	004	.050			
	Q23a. I often watch a favorite film agein and again.	6.931	1	6.931	2.160	.143	.006	2.160	:311			
	Q231. I watch TV programs with my family that we've seen before, often several times	.508	1	.608	.170	.681	000.	.170	.070			
	Q231.1 like playing/listening to a movie I'm familiar with as background while I do other things	38.856	1	38.856	9.699	.003	.024	9.689	.836			
Q29e	O23d I don't like to watch films at home that I've seen before in a thester	8.577	1	8.577	2.569	.110	007	2 569	359			
	023a Lofien watch a favorite film	2.694	1	2.694	.839	.360	.002	.839	.150			
	Q23f. I watch TV programs with my family that we've seen before, often several times	7.680	1	7.680	2.141	.144	006	2.141	309			
	Q231 Hike playing/listening to a movie I'm familiar with as background while I do other things.	23.375	1	23.375	5.227	.023	.015	5.227	.625			
Q290	Q23d. I don't like to watch films at home that I've seen before in a theater	4.426	10	4.426	1.326	.250	.004	1.326	.209			
	Q23a. I often watch a favorite film again and again	10.636	1	10.636	3.315	.070	.009	3.315	.443			
	Q231. I watch TV programs with my family that we've seen before, often several times.	13.342	1	13.342	3.720	.055	.010	3.720	.485			
	Q231. I like playing/listening to a movie I'm tamiliar with as background while I do other things.	.101	t	.101	.023	.860	000	023	053			
Gender	023d. I don't like to watch films at home that I've seen before in a theater	7.338	1	7.338	2.198	.139	.006	2.198	.315			
	Q23a. I often watch a favorite film again and again	10.236	1	10.236	3.190	.075	.009	3.190	.429			
	Q231. I watch TV programs with my family that we've seen before, often several times.	29.450	đo	29,450	8.211	.004	.023	B.211	.815			
	0231. Like playing/listening to a movie I'm familiar with as background while I do other things.	22.197	1	22.197	4.963	.027	.014	4.963	.603			
07	Q23d. I don't like to watch films at home that I've seen before in a theater.	36.367	3	12.122	3.631	.013	.030	10.892	795			
	G23a. Loften watch a favorite film	47.361	3	15.784	4.919	.002	.040	14.756	.909			
	Q231.1 watch TV programs with my family that we've seen before, often several times	39.049	3	13.016	3.629	.013	030	10.887	795			
	O231.1 like playing/listening to a movie I'm familiar with as background while I do other things	19.041	3	6.347	1.419	.237	.012	4.258	.376			
Gender * Q7	Q23d, I don't like to watch films at home that I've seen before in a theore	14.454	3	4.818	1.443	.230	.012	4.329	382			
	Q23a. Lotten watch a favorite film	8.190	3	2.730	.851	.467	.007	2.653	.235			
	Q231. I watch TV programs with my family that we've seen before, often several times	22.160	3	7.387	2.059	.105	.017	6178	.526			
	C231. Like playing/listening to a movie I'm familiar with as background while I do other things.	31.094	3	10.365	2.318	.075	.019	6.953	.581			

Error	Q23d. I don't like to watch films at home that I ve seen before in a theater	1175.267	362	3.339		
	Q23a. I often watch a favorite film again and again.	1129.499	362	3.209		
	Q23f I watch TV programs with my family that we've seen before, often several times.	1262.514	352	3.587		
	Q23I. Like playing/listening to a movie I'm familiar with as background while I do other things.	1574.257	352	4.472		
Total	Q23d. I don't like to watch films at home that I've seen before in a theater.	3654.000	363			
	Q23a. I often watch a favorite film again and again.	10692.000	363			
	Q23f. I watch TV programs with my family that we've seen before, often several times.	7015.000	363			
	Q23I, Hike playing/listening to a movie I'm familiar with as background while I do other things	8206.000	363			
Corrected Total	0.23d. I don't like to watch films at home that I ve seen before in a theater.	1261.096	362			
	Q23a. I often watch a favorite film again and again	1243.229	362			
	Q23f. I watch TV programs with my family that we've seen before, often several times.	1405.278	362			
	Q23I Tilke playing/listening to a movie I'm familiar with as background while I do other things.	1774.088	362			
a. R Squared	= .068 (Adjusted R Squared = .042)					41.
b. R Squared	= .091 (Adjusted R Squared = .066)					
c. R Squared =	= .102 (Adjusted R Squared = .076)					
d. R Squared :	= .113 (Adjusted R Squared = .087)					
e. Computed i	using alpha = .05					

Estimated Marginal Means

	1. Gender										
95% Confidence Interval											
Dependent Variable	Gender	Mean	Std. Error	Lower Bound	Upper Bound						
Q23d. I don't like to watch films at home that I've seen before in a theater.	1-Male	2.729 ^a	.167	2.401	3.058						
	2-Female	2.417 ^a	.125	2.171	2.662						
Q23a. I often watch a favorite film	1-Male	4.900 ^a	.164	4.579	5.222						
again and again.	2-Female	5.270 ^a	.123	5.029	5.511						
Q23f. I watch TV programs with my	1-Male	3.590ª	.173	3.250	3.930						
family that we've seen before, often several times.	2-Female	4.217 ^a	.130	3.962	4.471						
Q23I. I like playing/listening to a	1-Male	3.877ª	.193	3.497	4.257						
background while I do other things.	2-Female	4.421 ^a	.145	4.136	4.705						

a. Covariates appearing in the model are evaluated at the following values: Q29a. Hove the options at my finger tips today, watching videos on my phone, texting, streaming films. = 5.15, Q29e. I can hardly wait to see what technology comes next. = 4.41, Q29o. I generally think of myself as a happy person. = 5.23.

				95% Confide	ence Interval
Dependent Variable	Q7. How did you watch this movie 1	Mean	Std. Error	Lower Bound	Upper Bound
Q23d. I don't like to watch films at	1-In theater	2.992ª	.200	2.599	3.385
home that I've seen before in a theater.	2-On TV/cable	2.019 ^a	.240	1.547	2.490
	3-DVD or BluRay	2.503ª	.201	2.107	2.899
	4-Online	2.778 ^a	.183	2.419	3.137
Q23a. I often watch a favorite film	1-In theater	4.526 ^a	.196	4.141	4.911
again and again.	2-On TV/cable	5.583ª	.235	5.120	6.045
	3-DVD or BluRay	5.316 ^a	.197	4.928	5.704
	4-Online	4.916 ^a	.179	4.564	5.268
Q23f. I watch TV programs with my	1-In theater	3.623ª	.207	3.215	4.030
family that we've seen before, often several times.	2-On TV/cable	4.333 ^a	.248	3.844	4.821
	3-DVD or BluRay	4.170 ^a	.209	3.760	4.580
	4-Online	3.488 ^a	.189	3.116	3.860
Q23I. I like playing/listening to a	1-In theater	3.887ª	.231	3.432	4.342
movie I'm familiar with as background while I do other things.	2-On TV/cable	4.596 ^a	.277	4.051	5.142
wasnyreana while rae outer tillings.	3-DVD or BluRay	4.104 ^a	.233	3.646	4.562
	4-Online	4.008 ^a	.211	3.592	4.424

generally think of myself as a happy person. = 5.23.

			Maan	Otd Error	95% Confid	Upper Pound
Dependent Variable	Gender	Q7. How did you watch this movie 1	Mean	Std. Error	Lower Bound	Opper Bound
home that I've seen before in a	1-Male	1-In theater	3.040**	.284	2.480	3.599
theater.		2-On IV/cable	1.9/4*	.424	1.140	2.809
		3-DVD or BluRay	2.635*	.321	2.003	3.267
	-	4-Online	3.268*	.267	2.743	3.794
	2-Female	1-In theater	2.944	.280	2.393	3.495
		2-On TV/cable	2.063ª	.228	1.616	2.511
		3-DVD or BluRay	2.371 ^a	.244	1.892	2.851
		4-Online	2.287 ^a	.246	1.804	2.771
Q23a. I often watch a favorite film	1-Male	1-In theater	4.318 ^a	.279	3.770	4.866
ayanı anu ayanı.		2-On TV/cable	5.657 ^a	.416	4.839	6.475
		3-DVD or BluRay	4.902 ^a	.315	4.282	5.522
		4-Online	4.726 ^a	.262	4.210	5.241
	2-Female	1-In theater	4.734 ^a	.275	4.194	5.275
		2-On TV/cable	5.508 ^a	.223	5.069	5.947
		3-DVD or BluRay	5.730 ^a	.239	5.259	6.200
		4-Online	5.107 ^a	.241	4.633	5.581
Q23f. I watch TV programs with my	1-Male	1-In theater	3.473 ^a	.295	2.893	4.052
family that we've seen before, often several times.		2-On TV/cable	4.335 ^a	.440	3.470	5.200
		3-DVD or BluRay	3.743 ^a	.333	3.088	4.398
		4-Online	2.810 ^a	.277	2.265	3.354
	2-Female	1-In theater	3.772 ^a	.290	3.201	4.343
		2-On TV/cable	4.330 ^a	.236	3.866	4.794
		3-DVD or BluRay	4.597 ^a	.253	4.100	5.095
		4-Online	4.167 ^a	.255	3.665	4.668
Q23I. I like playing/listening to a	1-Male	1-In theater	3.806 ^a	.329	3.159	4.453
movie I'm familiar with as background while I do other things		2-On TV/cable	4.487 ^a	.491	3.521	5.453
paoligioana wine i ae onici amigo.		3-DVD or BluRay	3.302 ^a	.372	2.571	4.034
		4-Online	3.912 ^a	.309	3.304	4.521
	2-Female	1-In theater	3.968 ^a	.324	3.331	4.606
		2-On TV/cable	4.706 ^a	.263	4.187	5.224
		3-DVD or BluRay	4.906 ^a	.282	4.350	5.461
		4-Online	4.104 ^a	.285	3.544	4.664

Profile Plots







Q23a. I often watch a favorite film again and again.



Q23f. I watch TV programs with my family that we've seen before, often several times.



Q23I. I like playing/listening to a movie I'm familiar with as background while I do other things.

IV. TABLING RESULTS

Table 1. Multivariate Tests for MANCOVA

Effect		Value	F-Value	Sig.	Observed Power	
Covariate: Q29a. I love the options at my finger tips	Pillai's Trace	.402	58.572 ^b	.041	.715	
	Wilk's Lambda	.598	58.572 ^b	.041	.715	
	Hotelling's Trace	.671	58.572 ^b	.041	.715	
	Roy's Largest Root	.671	58.572 ^b	.041	.715	
Covariate: Q29e. I can hardly wait to see what technology comes next	Pillai's Trace	.031	2.770 ^b	.027	.759	
	Wilk's Lambda	.969	2.770 ^b	.027	.759	
	Hotelling's Trace	.032	2.770 ^b	.027	.759	
	Roy's Largest Root	.032	2.770 ^b	.027	.759	
Covariate: Q29o. I generally think of myself as a happy person	Pillai's Trace	.018	1.608 ^b	.172	.495	
•	Wilk's Lambda	.982	1.608 ^b	.172	.495	
	Hotelling's Trace	.018	1.608 ^b	.172	.495	
	Roy's Largest Root	.018	1.608 ^b	.172	.495	
Main Effect: GENDER	Pillai's Trace	.031	. 031 ^b	.028	.758	
	Wilk's Lambda	.969	. 969 ^b	.028	.758	
	Hotelling's Trace	.032	. 032 ^b	.028	.758	
	Roy's Largest Root	.032	. 032 ^b	.028	.758	
Main Effect: Q7. "How do I watch this movie?"	Pillai's Trace	.071	. 071 ^b	.013	.946	
	Wilk's Lambda	.929	. 929 ^b	.012	.912	
	Hotelling's Trace	.075	. 075 ^b	.011	.950	

	Roy's Largest Root	.063	. 063 ^b	.000	.976
Interaction: Gender X Q7	Pillai's Trace	.055	. 055 ^b	.073	.857
	Wilk's Lambda	.945	. 945 ^b	.073	.797
	Hotelling's Trace	.057	. 057 ^b	.073	.857
	Roy's Largest Root	.037	. 037 ^b	.013	.827
	20.020.020.00	* 0.7			

a. Design:Intercept +Q29+Q29e+Q29o+Gender*Q7

b. Exact statistics

c. The statistic is an upper on F that yields a lower bound on the significance level

d. Computed using alpha=.05

	Mean	n	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta. ²
Covariates:								
COV- Q29a			6.931	1	6.931	2.160	.143	.006
COV- Q29e			2.694	1	2.694	.839	.360	.002
COV- Q290			10.636	1	10.636	3.315	.070	.009
Main Effect: Gender			10.236	1	10.236	3.190	.075	.009
2-Female	5.33	222						
1-Male	4.74	141						
Main Effect: Q7. How did you watch this movie 1?			47.351	3	15.784	4.919	.002	.040
1- In theater	4.55	85						
2- On TV/cable	5.54	84						
3- DVD or Blu-ray	5.39	90						
4- Online	4.95	104						
Interaction: Gender X Q7. How did you watch this movie 1?			8.190	3	2.730	.851	.467	.007
Error			1129.499	352	3.209			

Table 2. Two-factor ANCOVA predicting Q23a. "I often watch a favorite film again and again" From Gender and Q7. "How did you watch this movie 1?"

	Mean	n	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta. ²
Covariates:								
COV- Q29a			.012	1	.012	.004	.953	.000
COV- Q29e			8.577	1	8.577	2.569	.110	.007
COV- Q290			4.426	1	4.426	1.326	.250	.004
Main Effect: Gender			7.338	1	7.338	2.198	.139	.006
2-Female	2.35	222						
1-Male	2.95	141						
Main Effect: Q7. How did you watch this movie 1?			36.367	3	12.122	3.631	.013	.030
1- In theater	3.01	85						
2- On TV/cable	2.06	84						
3- DVD or Blu-ray	2.46	90						
4- Online	2.71	104						
Interaction: Gender X Q7. How did you watch this movie 1?			14.454	3	4.818	1.443	.230	.012
Error			1175.257	352	3.339			

Table 3. Two-factor ANCOVA predicting Q23d. "I don't like to watch films at home that I've seen before in a theater" From Gender and Q7. "How did you watch this movie 1?"

	Mean	n	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta. ²
Covariates:								
COV- Q29a			.608	1	.608	.170	.681	.000
COV- Q29e			7.680	1	7.680	2.141	.144	.006
COV- Q290			13.342	1	13.342	3.720	.055	.010
Main Effect: Gender			29.450	1	29.450	8.211	.004	.023
2-Female	4.25	222						
1-Male	3.43	141						
Main Effect: Q7. How did you watch this movie 1?			39.049	3	13.016	3.629	.013	.030
1- In theater	3.67	85						
2- On TV/cable	4.32	84						
3- DVD or Blu-ray	4.27	90						
4- Online	3.54	104						
Interaction: Gender X Q7. How did you watch this movie 1?			22.160	3	7.387	2.059	.105	.017
Error			1262.515	352	3.587			

Table 4. Two-factor ANCOVA predicting Q23f. "I watch TV programs with my family that we've seen before, often several times" From Gender and Q7. "How did you watch this movie 1?"

Table 5. Two-factor ANCOVA predicting Q23I. "I like playing/listening to a movie I'm familiar with as a background while I do other things" From Gender and Q7. "How did you watch this movie 1?"

	Mean	n	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta. ²
Covariates:								
COV- Q29a			38.856	1	38.856	8.688	.003	.024
COV- Q29e			23.375	1	23.375	5.227	.023	.015
COV- Q290			.101	1	.101	.023	.880	.000
Main Effect: Gender			22.197	1	22.197	4.963	.027	.014
2-Female	4.46	222						
1-Male	3.81	141						
Main Effect: Q7. How did you watch this movie 1?			19.041	3	6.347	1.419	.237	.012
1- In theater	3.92	85						
2- On TV/cable	4.68	84						
3- DVD or Blu-ray	4.22	90						
4- Online	4.06	104						
Interaction: Gender X Q7. How did you watch this movie 1?			31.094	3	10.365	2.318	.075	.019
Error			1574.257	352	4.472			

V. Write Up

This model was analyzed using MANCOVA and followed the same basic model as this class' MANOVA example. All variables in MANOVA remained the same, but to further test covariates were used. "I love the options at my fingertips", "I can hardly wait to see what technology comes next…", and "I general think of myself as a happy person" were used in the MANCOVA data set as covariates to test statistics of the original MANOVA model after controlling for these three variables. For MANOVA, intercorrelations were run among the dependent variables, to make sure they were all significantly correlated with each other (to justify the use of MANOVA; see the MANOVA example handout).

Covariates Q29a "I love the options at my fingertips" and Q29e "I can hardly wait to see what technology comes next" resulted in significance once added to the overall MANOVA model (p = .041 for Q29a and p = .027 for Q29e). There was no significant relationship between covariate Q29o "I generally think of myself as a happy person" and the set of dependent variables (p = .172). However, the two significant covariates proved to be significant in only one of the individual ANOVAs—the one for Q231 ("I like playing/listening to a movie I'm familiar with as background while I do other things").

Further, the inclusion of the three covariates did *not* change the overall results of the original MANOVA. That is, when controlling for Q29a, Q29e, and Q29o, the findings from the MANOVA still held. And, the results for the four individual ANCOVAs showed that the original results for the four ANOVAs also held after controlling for Q29a, Q29e, and Q29o (although the main effect of Gender on Q23a was reduced to near-significance (p = .075)).

There was a surprising finding regarding the interaction of Gender and "How do you watch this movie 1?" as related to the dependent variable Q23a ("I often watch a favorite

film again and again"). In the original MANOVA model there was a significance of .124 for Pillai's Trace, but when covariates were added the ANCOVA resulted in a significance level of .073 (which is near significant).