Lab #9: 2-way ANOVA

Problem A:
Age & Intelligence

		Task	
		Fluid	Crystalized
Age	65	105 100 95 100	100 95 110 100
	75	85 90 95 85	105 95 100 105
	85	85 80 75 80	105 95 100 100

SPSS Data Entry

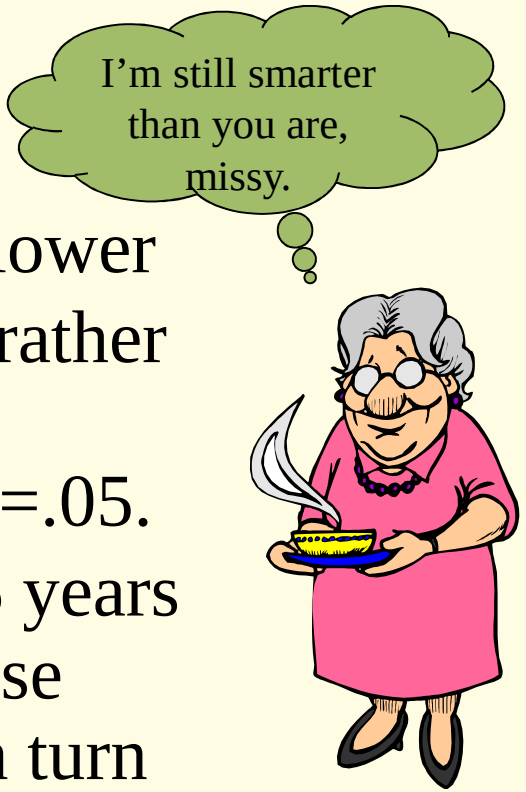
Null Hypotheses

- Task H_0: $\mu_{Fluid} = \mu_{Crystallized}$
- Age H_0: $\mu_{65} = \mu_{75} = \mu_{85}$
- Interaction H_0: No interaction

1 : task | 1

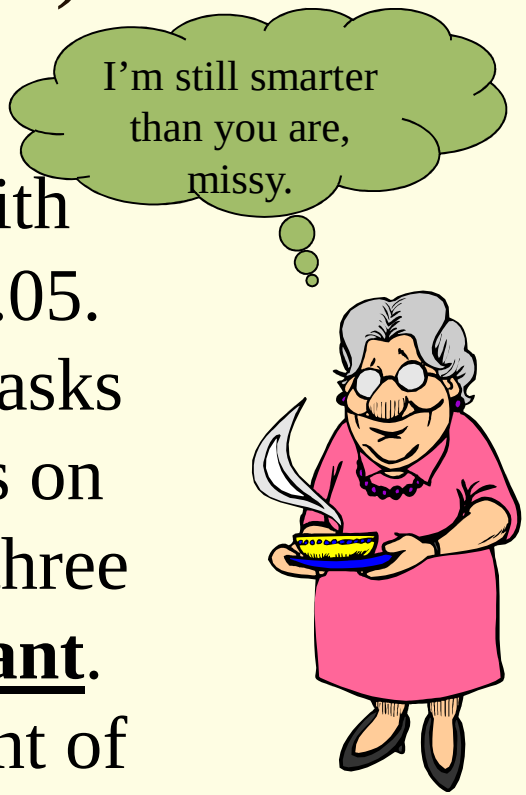
	task	age	score
1	1	1	105
2	1	1	100
3	1	1	95
4	1	1	100
5	1	2	85
6	1	2	90
7	1	2	95
8	1	2	85
9	1	3	85
10	1	3	80
11	1	3	75
12	1	3	80
13	2	1	100
14	2	1	95
15	2	1	110
16	2	1	100
17	2	2	105
18	2	2	95
19	2	2	100
20	2	2	105
21	2	3	105
22	2	3	95
23	2	3	100
24	2	3	100
25			

Write-up



- The hypotheses were supported.
- Participants scored significantly lower on **tasks** using fluid (M=89.58) rather than crystallized intelligence (M=100.83), F(1,18) = 33.65, p<=.05. In addition, participants **aged** 85 years scored lower (M=90.00) than those aged 75 years (M=95.00), who in turn scored lower than those aged 65 years (M=100.63), F(2,18)=10.015, p<=.05.

Write-up (continued)



- Additionally, age **<u>interacted</u>** with type of task, $F(2,18)=7.812$, $p<=.05$. Although scores on crystallized tasks remain relatively constant, scores on fluid tasks decline with age. All three effects were **<u>practically significant</u>**. Task accounted for a large amount of variance in scores, $\eta^2 = .3847$, while Age and the interaction accounted for moderate amounts, $\eta^2 = .2290$ and $\eta^2 = .1805$.

Problem B: Problem solving persistence

- Some people view failure as a learning opportunity (Mastery orientation) whereas others view failure as evidence of incompetence (Performance orientation). You subject both types to 5, 10, or 15 minutes of problem solving failure and then ask them how many more puzzles they would like to try.

	Orientation	
	Mastery	Perform.
5 min	9 8 10 9 8	8 8 10 9 8
10 min	8 8 8 7 5	7 4 7 7 8
15 min	6 6 7 6 7	4 3 4 3 4

B2. SPSS Entry

	orient	ftime	numbprob
1	1	1	9
2	1	1	8

H_0: $\mu_{performance} = \mu_{mastery}$

H_0: $\mu_{5min} = \mu_{10min} = \mu_{15min}$

H_0: No Interaction

	orient	ftime	numbprob
1	1	1	9
2	1	1	8
3	1	1	10
4	1	1	9
5	1	1	8
6	1	2	8
7	1	2	8
8	1	2	8
9	1	2	7
10	1	2	5
11	1	3	6
12	1	3	6
13	1	3	7
14	1	3	6
15	1	3	7
16	2	1	8
17	2	1	8
18	2	1	10
19	2	1	9
20	2	1	8
21	2	2	7
22	2	2	4
23	2	2	7
24	2	2	7
25	2	2	8
26	2	3	4
27	2	3	3
28	2	3	4
29	2	3	3
30	2	3	4
31			

Data View | Variable View

SPSS Output

Dependent Variable: numbprob

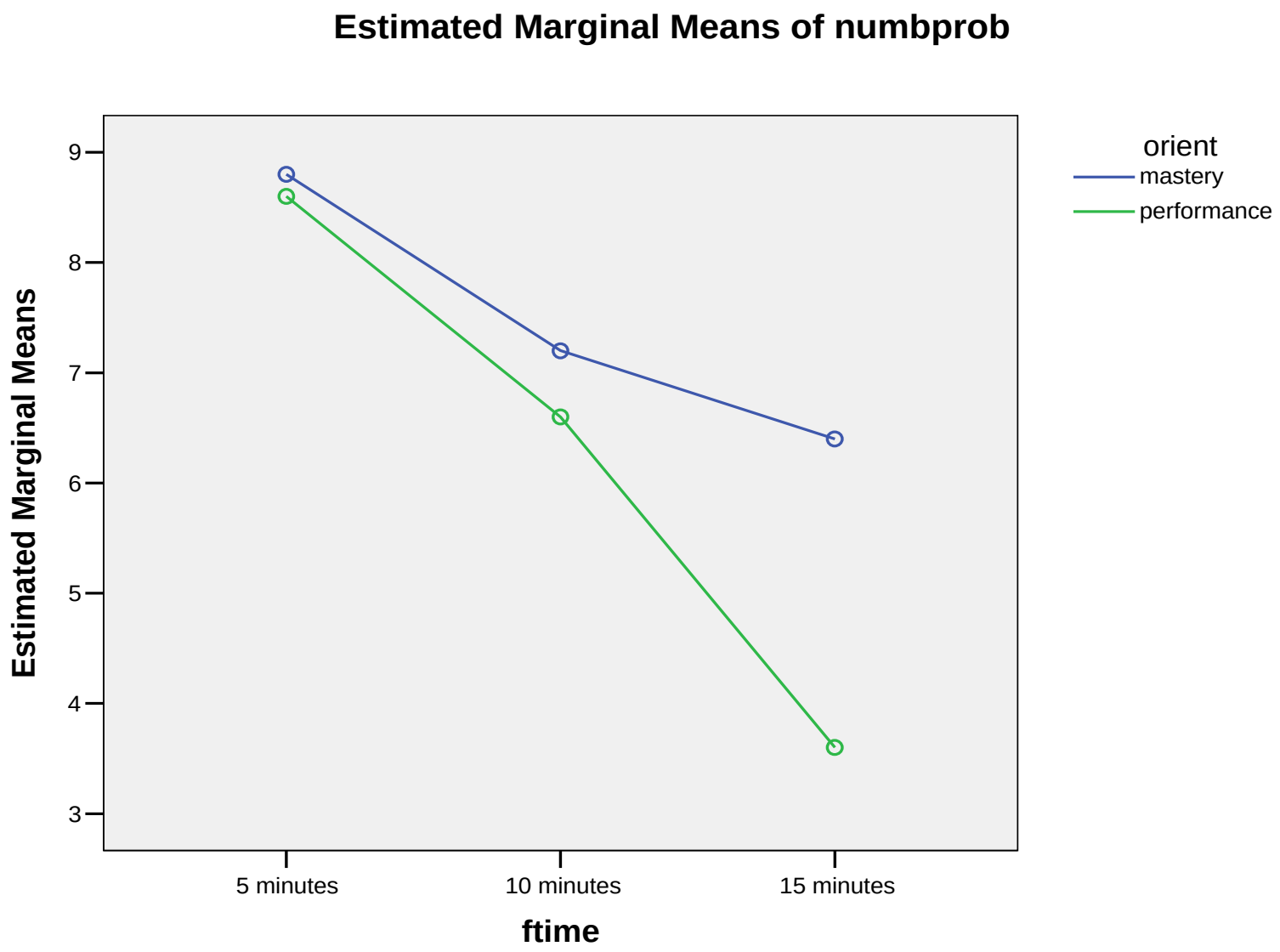
orient	ftime	Mean	Std. Deviation	N
mastery	5 minutes	8.80	.837	5
	10 minutes	7.20	1.304	5
	15 minutes	6.40	.548	5
	Total	7.47	1.356	15
performance	5 minutes	8.60	.894	5
	10 minutes	6.60	1.517	5
	15 minutes	3.60	.548	5
	Total	6.27	2.344	15
Total	5 minutes	8.70	.823	10
	10 minutes	6.90	1.370	10
	15 minutes	5.00	1.563	10
	Total	6.87	1.978	30

Student-Newman-Keuls[a,b]

ftime	N	Subset 1	Subset 2	Subset 3
15 minutes	10	5.00		
10 minutes	10		6.90	
5 minutes	10			8.70
Sig.		1.000	1.000	1.00

Dependent Variable: numbprob

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	89.067[a]	5	17.813	17.521	.000
Intercept	1414.533	1	1414.533	1391.344	.000
orient	10.800	1	10.800	10.623	.003
ftime	68.467	2	34.233	33.672	.000
orient * ftime	9.800	2	4.900	4.820	.017
Error	24.400	24	1.017		
Total	1528.000	30			
Corrected Total	113.467	29			


Estimated Marginal Means of numbprob
Estimated Marginal Means
9
8
7
6
5
4
3
5 minutes
10 minutes
15 minutes
ftime
orient
mastery
performance

B3: Write-up

- **The hypotheses were supported.**
  Participants with a mastery orientation persisted longer (M=7.47) than those with a performance orientation (M=6.27), $F(1,24)=10.623$, $p \leq .05$. Additionally, participants who failed for only 5 minutes persisted longer (M=8.7) than those failing for 10 minutes (M=6.90), who persisted longer than those failing for 15 minutes (M=5.00), $F(2,24)=33.672$, $p \leq .05$.

- *(continued…)* The interaction was also significant, $F(2,24)=4.820$, $p \leq .05$. As failure time increases, both orientations persist less, but performance orientation drops more than mastery orientation. Minutes of failure accounted a large amount of variance in persistence, $\eta^2=.6034$, orientation for a moderate amount, $\eta^2=.0952$, and interaction for a small amount, $\eta^2=.0864$.