5-3-07 / Two groups repeated / No Interaction / Significant time effect

The Mixed Procedure

Model Information

VC Covariance structure

Data Set	WORK.BIO2_REP2GRP
Dependent Variable	Vent
Covariance Structure	Variance Components
Subject Effect	Subject
Estimation Method	REML
Residual Variance Method	Parameter
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Between-Within

→ Number of ventricular events

Simpliest covariance structure

Class Level Information

Class	Levels	Values
Subject	24	10g 10x 11g 11x 12g 12x 1g 1x 2g 2x 3g 3x 4g 4x 5g 5x 6g 6x 7g 7x 8g 8x 9g 9x
Supp	2	G X
Time	3	0 1 2

The circled subjects were on supp = g and were measured at baseline, right after, and quite a bit after. "Longitudinal" or "repeated measure"

Dimensions

Covariance Parameters	1
Columns in X	12
Columns in Z	0
Subjects	24
Max Obs Per Subject	3

This comes into play testing covariance structures.

Number of Observations

Number of Observations Read	72
Number of Observations Used	72
Number of Observations Not Used	0

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	496.61064185	
1	1	496.61064185	0.00000000

Convergence criteria met.

VC covariance structure

The Mixed Procedure

Correlation and covariance = 0

Estimated R Matrix for Subject 10g

Row	Col1	Col2	Col3
1	86.5417	0	0
2	0	86.5417	0
3	0	0	86.5417

$\begin{bmatrix} \sigma^2 & 0 & 0 \\ 0 & \sigma^2 & 0 \\ 0 & 0 & \sigma^2 \end{bmatrix}$

"No info gained from repeated measure"

Estimated R Correlation Matrix for Subject 10g

Row	Col1	Col2	Col3
1	1.0000	0	0
2	0	1.0000	0
3	0	0	1.0000

Covariance Parameter Estimates

Cov Parm	Subject	Estimate
Residual	Subject	86.5417

Fit Statistics

-2 Res Log Likelihood	496.6
AIC (smaller is better)	498.6
AICC (smaller is better)	498.7
BIC (smaller is better)	499.8

Comes up later

Null Model Likelihood Ratio Test

DF	Chi-Square	Pr > ChiSq
0	0.00	1.0000

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Supp	1	22	0.86	0.3651
Time	2	44	2.05	0.1412
Supp*Time	2	44	0.08	0.9214

Notice how this changes depending on covariance structure.

The Mixed Procedure

Model Information

CS structure

Data Set	WORK.BIO2_REP2GRP
Dependent Variable	Vent
Covariance Structure	Compound Symmetry
Subject Effect	Subject
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Between-Within

The second covariance structure we fit "Compound Symmetry"

Class Level Information

Class	Levels	Values
Subject	24	10g 10x 11g 11x 12g 12x 1g 1x 2g 2x 3g 3x 4g 4x 5g 5x 6g 6x 7g 7x 8g 8x 9g 9x
Supp	2	G X
Time	3	0 1 2

1st test of covariance structures

Compares VC vs CS

Dimensions

Covariance Parameters	2
Columns in X	12
Columns in Z	0
Subjects	24
Max Obs Per Subject	3

This comes into play testing covariance structures.

Ho: No additional benefit of CS over VC

HA: CS has benefit over VC

Number of Observations

Number of Observations Read	72
Number of Observations Used	72
Number of Observations Not Used	0

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	496.61064185	
1	1	482.47937617	0.00000000

Convergence criteria met.

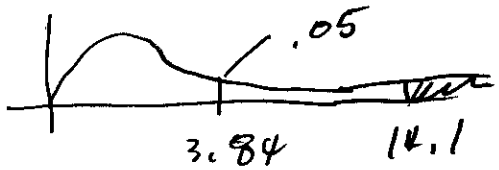
Likelihood Ratio test

$-2\ln\hat{L}(\text{less complex}) - [-2\ln\hat{L}(\text{more complex})] = 496.6 - 482.5 = 14.1$

follows χ^2, $df = [\#\text{ cov parameters (more complex)}] - [\text{cov pars (less complex)}]$

$= 2 - 1 = 1\ df$

Conclude: Evid. to supp. CS provides addition information as compared to VC.

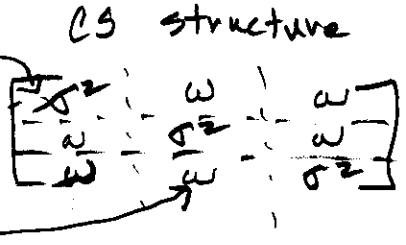


The Mixed Procedure

Estimated R Matrix for Subject 10g

Row	Col1	Col2	Col3
1	86.5417	41.7664	41.7664
2	41.7664	86.5417	41.7664
3	41.7664	41.7664	86.5417

CS structure



Estimated R Correlation Matrix for Subject 10g

Row	Col1	Col2	Col3
1	1.0000	0.4826	0.4826
2	0.4826	1.0000	0.4826
3	0.4826	0.4826	1.0000

Covariance Parameter Estimates

Cov Parm	Subject	Estimate
CS	Subject	41.7664
Residual		44.7753

Fit Statistics

-2 Res Log Likelihood	482.5
AIC (smaller is better)	486.5
AICC (smaller is better)	486.7
BIC (smaller is better)	488.8

Null Model Likelihood Ratio Test

DF	Chi-Square	Pr > ChiSq
1	14.13	0.0002

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Supp	1	22	0.44	0.5163
Time	2	44	3.96	0.0263
Supp*Time	2	44	0.16	0.8539

vs .9214 (VC)

The Mixed Procedure

Unstructured cov structure

Model Information

Data Set	WORK.BIO2_REP2GRP
Dependent Variable	Vent
Covariance Structure	Unstructured
Subject Effect	Subject
Estimation Method	REML
Residual Variance Method	None
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Between-Within

Class Level Information

Class	Levels	Values
Subject	24	10g 10x 11g 11x 12g 12x 1g 1x 2g 2x 3g 3x 4g 4x 5g 5x 6g 6x 7g 7x 8g 8x 9g 9x
Supp	2	G X
Time	3	0 1 2

Dimensions

Covariance Parameters	6
Columns in X	12
Columns in Z	0
Subjects	24
Max Obs Per Subject	3

6 covariance parameters details next page

Number of Observations

Number of Observations Read	72
Number of Observations Used	72
Number of Observations Not Used	0

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	496.61064185	
1	1	425.77608502	0.00000000

Convergence criteria met.

The Mixed Procedure

Estimated R Matrix for Subject 10g

Row	Col1	Col2	Col3
1	8.8939	28.6742	17.2045
2	28.6742	134.45	79.4205
3	17.2045	79.4205	116.28

UN structure

σ_1^2 ω_4 σ_2^2 ω_6 ω_5 σ_3^2

Estimated R Correlation Matrix for Subject 10g

Row	Col1	Col2	Col3
1	1.0000	0.8292	0.5350
2	0.8292	1.0000	0.6352
3	0.5350	0.6352	1.0000

Ho: UN does not provide additional info compared to CS.

HA: UN does provide additional info over CS

Covariance Parameter Estimates

Cov Parm	Subject	Estimate
UN(1,1)	Subject	8.8939
UN(2,1)	Subject	28.6742
UN(2,2)	Subject	134.45
UN(3,1)	Subject	17.2045
UN(3,2)	Subject	79.4205
UN(3,3)	Subject	116.28

Likelihood ratio stat = 482.5 − 425.8 = 56.7

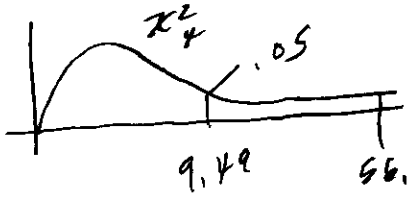
Fit Statistics

-2 Res Log Likelihood	425.8
AIC (smaller is better)	437.8
AICC (smaller is better)	439.2
BIC (smaller is better)	444.8

df = 6 − 2 = 4

Null Model Likelihood Ratio Test ⇒ Automatically calculates test to compare vs VC (the simplest)

DF	Chi-Square	Pr > ChiSq
5	70.83	<.0001



Conclude UN provides additional info compared to CS.

Sometimes useful here its not because we will be comparing UN vs CS.

We will use UN covariance structure to compare means (our primary goal). See following pages

Supp	time 0	1	2
G	1.00	5.92	4.00
X	2.17	7.58	7.25
	1.58	6.75	5.63

The Mixed Procedure

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Supp	1	22	0.44	0.5163
Time	2	22	4.11	0.0305
Supp*Time	2	22	0.15	0.8585

2B No main effect of Supp
2A significant main effect time
D No interaction, look at main effects

Effect	Time	Estimate	Error	DF	t Value	Pr > |t|	Alpha	Lower	Upper
Time	0	1.5833	0.6088	22	2.60	0.0163	0.05	0.3209	2.8458
Time	1	6.7500	2.3668	22	2.85	0.0093	0.05	1.8415	11.6585
Time	2	5.6250	2.2012	22	2.56	0.0180	0.05	1.0600	10.1900

Differences of Least Squares Means

We decide to make 2 comparisons 1 vs 0, 2 vs 0

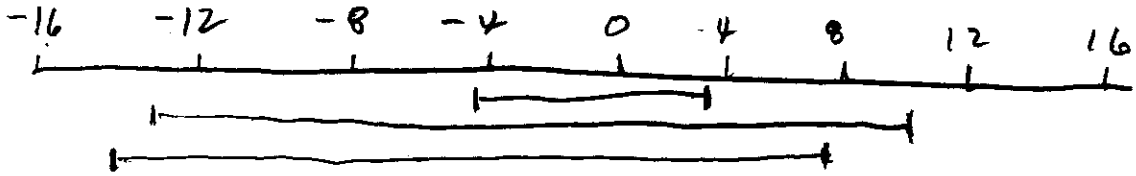
Effect	Time	_Time	Estimate	Standard Error	DF	t Value	Pr > |t|	Adjustment	Adj P	Alpha
Time	1	0	5.1667	1.8929	22	2.73	0.0122	Bonferroni	0.0245 *	0.025
Time	2	0	4.0417	1.9447	22	2.08	0.0496	Bonferroni	0.0991	0.025

Differences of Least Squares Means

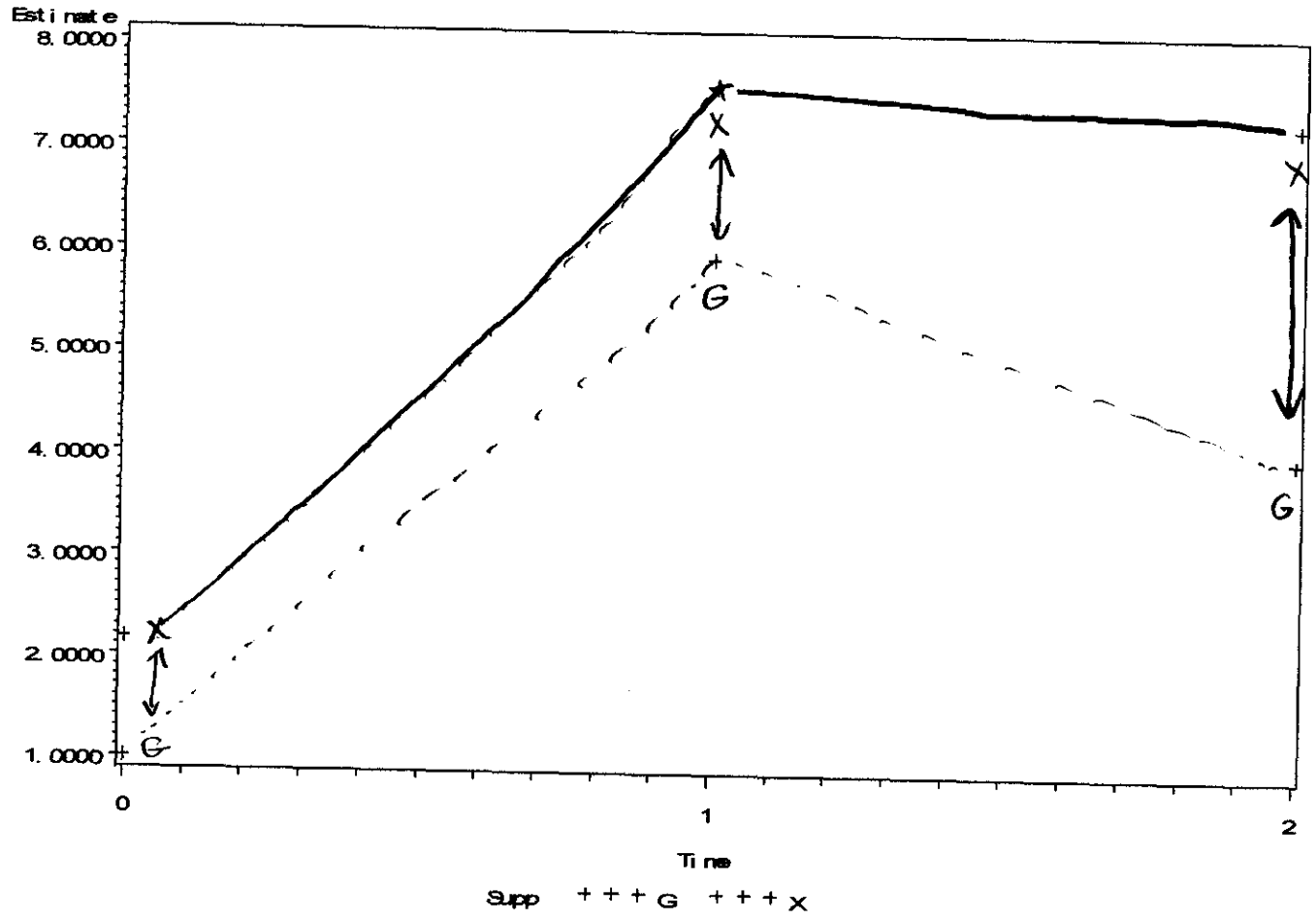
Effect	Time	_Time	Lower	Upper	Adj Lower	Adj Upper
Time	1	0	0.6134	9.7200	0.01775	10.3156 *
Time	2	0	-0.6364	8.7197	-1.2483	9.3316

Effect	Supp	Time	Estimate	Error	DF	t Value	Pr > |t|	Alpha	Lower	Upper
Supp*Time	G	0	1.0000	0.8609	22	1.16	0.2579	0.05	-0.7854	2.7854
Supp*Time	G	1	5.9167	3.3472	22	1.77	0.0910	0.05	-1.0251	12.8584
Supp*Time	G	2	4.0000	3.1129	22	1.28	0.2122	0.05	-2.4558	10.4558
Supp*Time	X	0	2.1667	0.8609	22	2.52	0.0196	0.05	0.3813	3.9521
Supp*Time	X	1	7.5833	3.3472	22	2.27	0.0337	0.05	0.6416	14.5251
Supp*Time	X	2	7.2500	3.1129	22	2.33	0.0294	0.05	0.7942	13.7058

Obs	Effect	Supp	Time	_Supp	_Time	Estimate	StdErr	DF	tValue	Probt	Alpha	Lower	Upper
1	Supp*Time	G	0	X	0	-1.1667	1.2175	22	-0.96	0.3484	0.02	-4.2206	1.8872
2	Supp*Time	G	1	X	1	-1.6667	4.7337	22	-0.35	0.7281	0.02	-13.5403	10.2070
3	Supp*Time	G	2	X	2	-3.2500	4.4023	22	-0.74	0.4682	0.02	-14.2925	7.7925



Notice these simple effect CIs overlap each other. They are 'consistent' differences (statistically speaking) => No interaction



The differences of the distance between X & G at times 0, 1, 2 are (statistically) consistent. Implies there shouldn't be an interaction effect. See CI comparisons on number line prev page.