**Repeated measures ANOVA test; SAS procedure and results: Effect of bacteria on rate of decomposition.**

**SAS CODE all\_treatments\_n\_is30**

**data** all\_treatments\_n\_is30;

input Group ID$ TBS\_0 TBS\_1 TBS\_2 TBS\_3 TBS\_4 TBS\_5 TBS\_6 TBS\_7 TBS\_8 TBS\_9 TBS\_10 TBS\_11 TBS\_12 TBS\_13 TBS\_14 TBS\_15;

datalines;

1 A1 2 7 9 9 10 11 11 13 13 15 15 15 16 16 16 16

1 A2 2 5 6 8 8 10 10 12 12 14 14 14 15 15 15 16

1 A3 2 6 9 10 12 13 14 14 15 15 15 15 16 16 16 16

1 A4 2 4 6 7 10 10 11 11 13 13 13 13 15 16 16 16

1 A5 2 6 6 8 9 11 12 14 15 15 16 16 16 16 16 16

1 A6 2 5 7 9 9 10 11 12 13 13 14 14 15 15 15 16

1 A7 2 6 8 9 10 10 10 10 13 13 13 14 15 15 15 16

1 A8 2 6 8 9 9 9 11 11 13 13 13 14 15 15 15 16

1 A9 2 5 7 8 10 10 12 13 14 14 15 15 15 16 16 16

1 A10 2 6 9 9 11 13 13 15 15 16 16 16 16 16 16 16

2 B1 2 4 5 7 9 11 11 13 14 14 15 15 15 15 16 16

2 B2 2 5 6 8 8 8 12 12 13 14 14 14 16 16 16 16

2 B3 2 5 7 7 7 7 9 11 11 14 14 14 15 16 16 16

2 B4 2 6 7 8 9 10 12 13 14 15 15 15 15 15 15 15

2 B5 2 4 6 9 11 11 13 14 14 15 15 15 16 16 16 16

2 B6 2 5 7 9 10 10 11 12 14 14 15 15 16 16 16 16

2 B7 2 5 6 7 9 11 11 12 13 14 15 15 15 16 16 16

2 B8 2 4 6 7 8 9 9 11 11 12 13 14 15 15 16 16

2 B9 2 6 7 10 10 10 10 12 12 13 13 13 15 15 15 15

2 B10 2 6 7 8 10 11 13 13 15 15 15 15 16 16 16 16

3 C1 2 6 8 8 10 10 11 13 14 14 14 14 16 16 16 16

3 C2 2 4 6 7 9 9 10 11 12 12 13 13 14 15 15 15

3 C3 2 5 6 8 8 10 10 11 12 13 14 14 14 14 14 16

3 C4 2 4 6 8 8 9 10 10 12 13 13 14 14 15 16 16

3 C5 2 6 8 9 10 10 12 12 12 14 14 14 16 16 16 16

3 C6 2 5 7 8 8 9 10 12 12 13 13 13 14 14 16 16

3 C7 2 6 7 8 9 11 11 13 14 14 14 15 16 16 16 16

3 C8 2 6 7 8 10 10 11 12 13 14 15 15 16 16 16 16

3 C9 2 4 7 8 10 10 12 13 13 14 14 15 16 16 16 16

3 C10 2 6 8 10 10 12 12 14 15 15 15 15 16 16 16 16

4 D1 2 5 5 6 8 10 10 12 12 12 12 14 14 15 15 16

4 D2 2 4 6 8 10 10 11 11 13 13 14 14 15 16 16 16

4 D3 2 5 7 7 8 9 10 11 11 13 13 13 15 15 15 15

4 D4 2 6 8 8 9 10 12 12 13 14 14 14 15 16 16 16

4 D5 2 4 6 9 10 11 13 13 14 15 15 15 15 15 15 16

4 D6 2 6 7 8 10 10 12 12 13 14 14 14 14 14 14 16

4 D7 2 6 8 10 11 11 14 14 14 16 16 16 16 16 16 16

4 D8 2 5 7 8 9 10 11 12 13 14 14 14 15 16 16 16

4 D9 2 4 6 8 9 11 12 14 14 16 16 16 16 16 16 16

4 D10 2 6 8 10 10 11 12 14 14 15 15 15 16 16 16 16

5 BA1 2 5 7 9 10 10 12 13 13 14 14 15 16 16 16 16

5 BA2 2 5 8 9 10 10 10 12 12 12 14 15 15 15 15 16

5 BA3 2 6 8 9 9 9 10 11 11 13 13 14 14 16 16 16

5 BA4 2 4 6 8 8 9 11 12 13 13 14 15 15 16 16 16

5 BA5 2 7 8 10 10 12 12 12 13 14 14 14 15 15 16 16

5 BA6 2 6 7 8 9 11 11 13 13 14 14 14 14 15 16 16

5 BA7 2 5 7 8 9 9 10 11 11 13 13 14 15 16 16 16

5 BA8 2 5 7 8 8 9 11 11 12 13 13 13 14 14 14 14

5 BA9 2 6 7 8 9 9 11 11 12 13 13 13 14 14 15 16

5 BA10 2 7 9 9 10 10 11 13 13 14 14 15 16 16 16 16

6 CA1 2 6 8 9 10 12 12 13 13 14 15 15 16 16 16 16

6 CA2 2 6 7 9 9 11 11 11 13 13 14 14 16 16 16 16

6 CA3 2 5 7 8 9 10 11 11 12 13 14 14 16 16 16 16

6 CA4 2 5 6 8 10 11 12 14 14 14 14 14 16 16 16 16

6 CA5 2 3 5 9 10 12 12 14 14 15 15 15 16 16 16 16

6 CA6 2 6 8 8 9 11 12 13 13 15 15 16 16 16 16 16

6 CA7 2 6 7 8 10 10 11 12 13 14 15 15 16 16 16 16

6 CA8 2 7 10 11 12 13 14 15 16 16 16 16 16 16 16 16

6 CA9 2 6 7 9 9 9 12 12 13 14 14 15 15 15 16 16

6 CA10 2 6 8 9 10 10 12 12 12 14 14 14 15 15 16 16

7 DA1 2 6 8 8 10 11 12 13 13 13 14 16 16 16 16 16

7 DA2 2 4 5 7 6 10 10 12 12 14 15 15 16 16 16 16

7 DA3 2 4 7 8 10 10 12 12 12 14 15 14 14 14 16 16

7 DA4 2 5 7 8 9 11 11 11 11 13 13 13 15 15 16 16

7 DA5 2 4 6 8 8 10 12 12 14 14 15 15 15 16 16 16

7 DA6 2 5 7 8 10 11 11 12 12 14 14 14 14 15 16 16

7 DA7 2 5 6 8 9 10 10 12 12 14 14 14 16 16 16 16

7 DA8 2 5 6 8 10 10 11 12 12 14 15 15 16 16 16 16

7 DA9 2 3 5 7 8 10 11 12 12 14 14 14 15 16 16 16

7 DA10 2 6 8 10 11 12 12 14 14 15 15 16 16 16 16 16

8 NC1 2 3 5 6 7 9 10 11 11 12 13 13 12 15 16 16

8 NC2 2 6 8 9 10 10 12 12 12 14 14 14 16 16 16 16

8 NC3 2 6 8 9 10 11 12 12 13 14 14 14 15 15 16 16

8 NC4 2 6 7 9 11 12 12 12 13 14 14 14 14 15 15 16

8 NC5 2 6 8 8 10 10 11 11 12 13 12 14 15 15 16 16

8 NC6 2 6 8 8 10 10 12 12 12 14 14 14 14 15 15 15

8 NC7 2 6 8 10 10 12 12 14 13 14 15 15 16 16 16 16

8 NC8 2 5 6 8 10 10 12 12 12 14 14 14 15 16 16 16

8 NC9 2 6 8 10 12 12 13 14 13 15 15 15 16 16 16 16

8 NC10 2 7 9 9 10 10 10 12 12 14 14 15 16 16 16 16

9 PC1 2 5 6 7 9 10 11 13 13 14 15 15 15 15 16 16

9 PC2 2 4 6 8 11 11 13 13 13 15 15 15 15 16 16 16

9 PC3 2 6 8 8 10 10 11 12 12 14 14 14 14 15 16 16

9 PC4 2 5 6 8 9 10 11 11 13 13 15 15 15 15 15 16

9 PC5 2 7 8 9 10 11 12 14 14 14 15 15 16 16 16 16

9 PC6 2 6 6 8 10 10 12 12 14 14 14 15 16 16 16 16

9 PC7 2 4 8 9 10 12 12 13 14 15 15 15 15 15 15 16

9 PC8 2 7 9 11 12 12 12 15 15 15 15 15 15 15 15 15

9 PC9 2 6 7 9 13 13 14 14 15 15 15 15 15 15 15 15

9 PC10 2 7 10 10 12 14 14 14 14 15 15 16 16 16 16 16

1 A11 2 6 8 10 10 12 12 12 13 14 14 15 15 16 16 16

1 A12 2 4 6 8 9 8 10 10 11 12 12 13 14 15 15 15

1 A13 2 7 8 9 9 10 11 11 13 13 13 13 15 16 16 16

1 A14 2 7 8 10 10 11 12 13 13 14 14 14 15 16 16 16

1 A15 2 6 8 10 10 12 13 13 13 15 15 15 15 16 15 15

1 A16 2 4 5 7 7 8 9 11 11 12 12 12 12 13 13 14

1 A17 2 8 10 10 12 12 14 14 15 15 15 15 16 16 16 16

1 A18 2 6 8 10 11 12 14 14 14 14 15 15 16 16 16 16

1 A19 2 5 7 9 10 11 11 13 13 13 13 15 16 16 16 15

1 A20 2 7 8 10 10 11 13 14 15 15 15 15 15 16 16 16

2 B11 2 6 8 9 11 12 13 13 13 14 15 15 15 16 16 16

2 B12 2 3 5 5 7 7 9 10 11 12 12 13 13 15 15 15

2 B13 2 6 7 9 10 12 12 14 14 14 14 16 16 16 16 16

2 B14 2 7 9 9 11 12 12 13 14 14 15 15 16 16 16 16

2 B15 2 5 8 10 11 12 13 13 13 15 15 15 16 16 16 16

2 B16 2 7 9 10 11 12 12 14 14 15 15 15 16 16 16 16

2 B17 2 7 9 9 11 12 13 14 14 14 14 16 . 16 16 16

2 B18 2 7 9 10 11 12 14 14 14 15 15 16 . 16 16 16

2 B19 2 8 10 10 12 12 14 14 15 15 15 14 . 16 16 16

2 B20 2 7 9 10 12 12 14 14 14 15 15 14 . 16 16 16

3 C11 2 6 8 10 11 12 13 14 14 14 15 15 . 16 16 16

3 C12 2 7 8 9 10 12 12 12 14 14 15 15 . 16 16 16

3 C13 2 7 8 10 10 11 13 13 14 15 15 16 . 16 16 16

3 C14 2 7 9 10 12 12 13 13 14 15 15 16 . 16 16 16

3 C15 2 6 8 10 11 11 12 12 14 14 15 15 . 16 16 16

3 C16 2 6 8 8 10 11 12 12 13 14 14 14 . 16 16 16

3 C17 2 7 10 11 13 13 13 13 14 14 16 16 . 16 16 16

3 C18 2 5 8 9 9 11 11 12 13 14 15 15 . 16 16 16

3 C19 2 7 8 9 12 12 13 14 14 15 16 16 . 16 16 16

3 C20 2 7 9 10 12 12 13 15 15 15 16 16 . 16 16 16

4 D11 2 5 6 7 8 10 11 12 13 13 14 15 . 16 16 16

4 D12 2 7 8 11 12 13 11 15 15 15 15 15 . 16 16 16

4 D13 2 7 8 10 10 11 12 13 14 15 15 16 . 16 16 16

4 D14 2 5 7 9 9 11 13 13 14 14 15 16 . 16 16 16

4 D15 2 7 8 10 11 12 13 14 15 15 16 16 . 16 16 16

4 D16 2 7 8 9 10 12 13 13 14 14 14 16 . 16 16 16

4 D17 2 7 8 9 11 11 12 12 14 15 15 15 . 16 16 16

4 D18 2 7 9 11 12 13 14 14 15 16 16 16 . 16 16 16

4 D19 2 5 7 8 10 11 12 14 14 15 15 15 . 16 16 16

4 D20 2 5 7 8 9 11 12 12 14 14 14 15 . 16 16 16

5 BA11 2 4 6 7 8 8 9 10 12 12 12 14 . 14 16 16

5 BA12 2 5 7 8 9 9 11 11 13 13 13 15 . 15 16 16

5 BA13 2 6 7 8 10 11 12 12 12 12 14 14 . 15 16 16

5 BA14 2 5 7 8 10 10 12 12 12 14 14 14 . 16 16 16

5 BA15 2 8 10 10 11 11 13 14 14 14 14 16 . 16 16 16

5 BA16 2 7 8 10 10 10 12 12 13 13 14 14 . 16 16 16

5 BA17 2 6 8 9 10 10 12 13 15 15 15 16 . 16 16 16

5 BA18 2 7 8 10 10 12 12 12 14 14 14 14 . 16 16 16

5 BA19 2 4 7 8 10 11 12 12 13 14 14 14 . 16 16 16

5 BA20 2 6 8 8 9 9 11 11 12 13 13 15 . 15 16 16

6 CA11 2 6 8 9 9 11 11 11 13 13 14 15 . 16 16 16

6 CA12 2 6 8 9 11 11 12 13 13 14 16 16 . 16 16 16

6 CA13 2 6 8 8 10 11 12 12 13 14 14 15 . 16 16 16

6 CA14 2 5 7 8 10 10 10 12 12 12 13 14 . 16 16 16

6 CA15 2 5 7 8 10 11 11 13 13 14 14 15 . 15 15 15

6 CA16 2 7 8 9 11 12 13 14 14 15 15 16 . 16 16 16

6 CA17 2 5 7 8 10 10 12 12 13 14 13 13 . 15 16 16

6 CA18 2 7 8 10 11 13 13 14 15 15 15 15 . 16 16 16

6 CA19 2 5 7 9 10 11 11 12 14 14 14 14 16 16 16

6 CA20 2 5 7 9 11 12 13 14 14 14 16 16 . 16 16 16

7 DA11 2 5 6 8 8 9 11 12 12 14 14 16 . 16 16 16

7 DA12 2 5 6 7 8 8 10 10 12 12 14 14 . 16 16 16

7 DA13 2 4 6 8 9 10 11 12 12 13 14 14 . 16 16 16

7 DA14 2 5 6 8 8 10 10 12 12 14 14 15 . 16 16 16

7 DA15 2 4 6 7 9 9 10 12 12 14 14 14 . 16 16 16

7 DA16 2 6 8 9 11 12 13 13 13 14 14 15 . 16 16 16

7 DA17 2 5 7 8 10 10 12 12 14 14 14 15 . 16 16 16

7 DA18 2 5 7 8 9 11 11 13 14 14 14 15 . 16 16 16

7 DA19 2 9 10 11 11 12 13 13 14 15 15 16 . 16 16 16

7 DA20 2 6 7 8 9 11 12 12 14 14 14 15 . 16 16 16

8 NC11 2 6 8 9 10 12 13 13 14 14 15 16 . 16 16 16

8 NC12 2 6 7 8 9 11 11 13 14 15 15 15 . 16 16 16

8 NC13 2 7 7 8 9 10 11 12 14 15 15 15 . 16 16 16

8 NC14 2 5 7 9 10 13 13 15 15 15 15 15 . 16 16 16

8 NC15 2 6 7 7 9 10 11 12 14 14 14 14 . 16 16 16

8 NC16 2 4 6 8 9 10 11 12 13 14 15 15 . 16 16 16

8 NC17 2 5 7 8 9 11 11 13 15 15 15 15 . 16 16 16

8 NC18 2 5 7 10 11 12 13 15 15 15 15 15 . 16 16 16

8 NC19 2 6 8 10 11 12 13 14 15 15 16 16 . 16 16 16

8 NC20 2 6 7 9 11 11 12 13 14 15 15 15 . 16 16 16

9 PC11 2 5 7 7 9 10 10 12 12 13 14 15 . 16 16 16

9 PC12 2 5 7 8 9 10 11 11 13 13 15 15 . 16 16 16

9 PC13 2 8 8 9 10 11 12 13 13 15 15 15 . 16 16 16

9 PC14 2 6 7 9 9 11 13 13 14 15 16 16 . 16 16 16

9 PC15 2 6 8 9 10 11 13 13 14 15 15 15 . 16 16 16

9 PC16 2 7 8 9 10 12 12 13 14 15 15 16 . 16 16 16

9 PC17 2 8 9 10 11 12 13 14 15 15 16 16 . 16 16 16

9 PC18 2 5 7 8 8 10 11 12 13 13 15 15 . 16 16 16

9 PC19 2 6 8 9 9 11 11 13 13 14 14 15 . 15 16 16

9 PC20 2 6 8 9 9 10 11 12 13 14 15 15 . 16 16 16

1 A21 2 4 5 7 9 10 11 13 14 15 15 15 15 16 16 16

1 A22 2 4 7 8 10 12 13 14 15 15 15 16 16 16 16 16

1 A23 2 5 6 8 9 10 12 14 14 15 15 15 16 16 16 16

1 A24 2 5 7 8 10 10 12 14 14 15 15 16 16 16 16 16

1 A25 2 4 8 10 10 10 12 14 14 14 14 15 15 16 16 16

1 A26 2 4 6 7 10 10 12 13 13 14 14 15 15 15 16 16

1 A27 2 4 7 10 10 11 13 14 14 16 16 16 16 16 16 16

1 A28 2 5 8 10 10 13 14 14 15 15 16 16 16 16 16 16

1 A29 2 4 7 8 10 10 13 14 14 16 16 16 16 16 16 16

1 A30 2 4 7 9 10 10 11 13 13 15 15 15 16 16 16 16

2 B21 2 4 8 9 9 10 12 13 14 15 15 15 15 15 16 16

2 B22 2 4 8 9 9 9 11 14 14 14 14 14 14 15 16 16

2 B23 2 4 7 10 10 10 12 14 14 16 16 16 16 16 16 16

2 B24 2 5 8 9 10 10 12 14 14 16 16 16 16 16 16 16

2 B25 2 5 8 10 10 10 13 14 14 16 16 16 16 16 16 16

2 B26 2 5 7 10 10 10 12 14 14 15 16 16 16 16 16 16

2 B27 2 5 7 10 10 10 12 14 14 15 16 16 16 16 16 16

2 B28 2 5 7 9 10 10 11 14 14 14 15 15 16 16 16 16

2 B29 2 5 8 10 10 10 12 14 14 15 16 16 16 16 16 16

2 B30 2 5 8 10 10 10 13 14 15 15 16 16 16 16 16 16

3 C21 2 5 7 9 11 11 12 13 13 14 14 15 16 16 16 16

3 C22 2 5 8 9 10 10 12 13 13 15 15 15 15 15 16 16

3 C23 2 5 8 10 10 10 12 13 13 14 15 15 15 16 16 16

3 C24 2 5 7 10 11 13 14 15 16 16 16 16 16 16 16 16

3 C25 2 5 6 9 10 11 12 14 14 16 16 16 16 16 16 16

3 C26 2 5 7 9 10 10 12 13 13 14 15 15 15 16 16 16

3 C27 2 5 7 10 10 11 12 13 13 15 16 16 16 16 16 16

3 C28 2 5 8 10 10 11 12 14 15 16 16 16 16 16 16 16

3 C29 2 4 7 10 11 12 13 14 14 16 16 16 16 16 16 16

3 C30 2 5 8 10 11 12 13 14 14 16 16 16 16 16 16 16

4 D21 2 4 8 10 10 10 12 14 14 15 15 15 15 15 16 16

4 D22 2 4 7 9 9 10 13 14 14 14 14 15 15 15 16 16

4 D23 2 4 8 9 10 12 12 13 15 15 15 16 16 16 16 16

4 D24 2 4 7 10 10 10 11 13 14 14 14 15 15 15 16 16

4 D25 2 4 8 10 10 10 12 13 13 16 16 16 16 16 16 16

4 D26 2 4 7 10 10 11 12 14 14 16 16 16 16 16 16 16

4 D27 2 4 8 10 10 11 12 14 14 15 16 16 16 16 16 16

4 D28 2 4 8 10 11 12 13 14 15 15 15 16 16 16 16 16

4 D29 2 4 9 10 10 12 12 14 15 15 15 15 15 15 16 16

4 D30 2 4 7 10 10 11 12 14 15 16 16 16 16 16 16 16

5 BA21 2 4 8 10 10 10 12 14 14 15 15 16 16 16 16 16

5 BA22 2 5 7 9 10 10 13 14 16 16 16 16 16 16 16 16

5 BA23 2 4 8 9 10 10 13 14 14 15 15 16 16 16 16 16

5 BA24 2 5 7 9 10 10 12 14 14 14 15 16 16 16 16 16

5 BA25 2 4 8 10 11 10 12 14 14 14 15 16 16 16 16 16

5 BA26 2 5 7 10 9 12 14 16 16 16 16 16 16 16 16 16

5 BA27 2 5 7 10 10 11 12 14 14 14 15 16 16 16 16 16

5 BA28 2 4 7 9 9 11 12 15 15 15 16 16 16 16 16 16

5 BA29 2 7 8 9 10 10 12 14 14 16 16 16 16 16 16 16

5 BA30 2 5 6 9 10 10 12 14 14 15 16 16 16 16 16 16

6 CA21 2 4 8 9 11 11 12 14 14 15 15 15 16 16 16 16

6 CA22 2 4 7 10 10 10 12 14 14 15 15 16 16 16 16 16

6 CA23 2 4 8 9 10 10 12 14 14 15 15 16 16 16 16 16

6 CA24 2 5 6 10 11 11 12 14 14 15 15 15 16 16 16 16

6 CA25 2 5 7 10 10 11 12 14 14 15 16 16 16 16 16 16

6 CA26 2 5 8 10 11 11 12 14 15 16 16 16 16 16 16 16

6 CA27 2 5 7 10 11 11 11 14 15 15 15 16 16 16 16 16

6 CA28 2 4 9 10 10 11 12 14 15 15 15 16 16 16 16 16

6 CA29 2 4 7 10 10 11 12 14 15 15 15 16 16 16 16 16

6 CA30 2 4 9 10 10 11 12 14 14 15 15 16 16 16 16 16

7 DA21 2 5 7 9 11 11 12 14 15 15 16 16 16 16 16 16

7 DA22 2 4 7 9 10 10 12 14 14 15 15 15 15 15 16 16

7 DA23 2 6 7 9 11 12 14 14 15 15 15 15 15 16 16 16

7 DA24 2 5 8 10 11 11 12 14 14 14 15 16 16 16 16 16

7 DA25 2 6 7 10 10 11 12 14 14 14 15 16 16 16 16 16

7 DA26 2 5 8 10 10 10 12 14 14 15 15 16 16 16 16 16

7 DA27 2 5 9 10 11 11 12 14 14 16 16 16 16 16 16 16

7 DA28 2 6 7 10 10 11 13 15 16 16 16 16 16 16 16 16

7 DA29 2 5 7 10 12 12 14 14 15 15 16 16 16 16 16 16

7 DA30 2 4 8 10 11 11 12 14 14 15 15 16 16 16 16 16

8 NC21 2 4 5 9 11 12 12 14 14 15 15 16 16 16 16 16

8 NC22 2 4 7 10 11 11 12 13 13 14 14 16 16 16 16 16

8 NC23 2 5 8 9 11 11 12 14 14 14 14 15 15 16 16 16

8 NC24 2 5 6 8 10 10 12 14 14 14 14 15 15 16 16 16

8 NC25 2 5 8 10 11 12 12 14 14 15 15 16 16 16 16 16

8 NC26 2 5 8 10 11 12 12 13 14 16 16 16 16 16 16 16

8 NC27 2 5 7 10 10 10 10 13 13 15 16 16 16 16 16 16

8 NC28 2 4 9 10 11 12 12 14 14 14 16 16 16 16 16 16

8 NC29 2 4 7 9 10 12 12 14 14 15 15 15 16 16 16 16

8 NC30 2 4 9 9 10 12 12 14 14 15 15 16 16 16 16 16

9 PC21 2 4 7 10 11 11 11 14 14 14 14 15 15 15 15 15

9 PC22 2 5 7 10 10 11 12 14 14 14 14 15 16 16 16 16

9 PC23 2 4 6 10 11 11 12 14 14 14 14 15 16 16 16 16

9 PC24 2 6 8 10 11 11 12 14 14 15 15 16 16 16 16 16

9 PC25 2 5 7 11 11 11 12 15 15 16 16 16 16 16 16 16

9 PC26 2 5 7 9 9 9 12 14 14 15 16 16 16 16 16 16

9 PC27 2 5 6 10 11 11 12 14 14 15 15 15 16 16 16 16

9 PC28 2 5 7 9 9 10 11 12 14 15 15 15 16 16 16 16

9 PC29 2 5 7 9 11 11 12 16 16 16 16 16 16 16 16 16

9 PC30 2 4 9 10 10 10 11 14 15 15 15 15 16 16 16 16

;

**run**;

**proc** **print** data=all\_treatments\_n\_is30;

**run**;

**proc** **glm** data=all\_treatments\_n\_is30;

Class Group;

model TBS\_0-TBS\_15 = Group/nouni;

repeated logADD;

**run**;

**OUTPUT**

The GLM Procedure

| **Class Level Information** | | |
| --- | --- | --- |
| **Class** | **Levels** | **Values** |
| **Group** | 9 | 1 2 3 4 5 6 7 8 9 |

|  |  |
| --- | --- |
| **Number of Observations Read** | 269 |
| **Number of Observations Used** | 197 |

**The GLM Procedure**

**Repeated Measures Analysis of Variance**

| **Repeated Measures Level Information** | | | | | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Dependent**  **Variable** | **TBS\_0** | **TBS\_1** | **TBS\_2** | **TBS\_3** | **TBS\_4** | **TBS\_5** | **TBS\_6** | **TBS\_7** | **TBS\_8** | **TBS\_9** | **TBS\_10** | **TBS\_11** | **TBS\_12** | **TBS\_13** | **TBS\_14** | **TBS\_15** |
| **Level of logADD** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** |

| **MANOVA Test Criteria and Exact F Statistics for the Hypothesis of no logADD Effect H = Type III SSCP Matrix for logADD E = Error SSCP Matrix  S=1 M=6.5 N=86** | | | | | |
| --- | --- | --- | --- | --- | --- |
| **Statistic** | **Value** | **F Value** | **Num DF** | **Den DF** | **Pr > F** |
| **Wilks' Lambda** | 0.0008208 | 14121.1 | 15 | 174 | <.0001 |
| **Pillai's Trace** | 0.9991792 | 14121.1 | 15 | 174 | <.0001 |
| **Hotelling-Lawley Trace** | 1217.3333601 | 14121.1 | 15 | 174 | <.0001 |
| **Roy's Greatest Root** | 1217.3333601 | 14121.1 | 15 | 174 | <.0001 |

| **MANOVA Test Criteria and F Approximations for the Hypothesis of no logADD\*Group Effect H = Type III SSCP Matrix for logADD\*Group E = Error SSCP Matrix  S=8 M=3 N=86** | | | | | |
| --- | --- | --- | --- | --- | --- |
| **Statistic** | **Value** | **F Value** | **Num DF** | **Den DF** | **Pr > F** |
| **Wilks' Lambda** | 0.45161522 | 1.23 | 120 | 1251 | 0.0525 |
| **Pillai's Trace** | 0.74104529 | 1.23 | 120 | 1448 | 0.0510 |
| **Hotelling-Lawley Trace** | 0.85509907 | 1.23 | 120 | 848.24 | 0.0589 |
| **Roy's Greatest Root** | 0.24174472 | 2.92 | 15 | 181 | 0.0004 |
| **NOTE: F Statistic for Roy's Greatest Root is an upper bound.** | | | | | |

**The GLM Procedure**

**Repeated Measures Analysis of Variance**

**Tests of Hypotheses for Between Subjects Effects**

| **Source** | **DF** | **Type III SS** | **Mean Square** | **F Value** | **Pr > F** |
| --- | --- | --- | --- | --- | --- |
| **Group** | 8 | 27.855889 | 3.481986 | 0.58 | 0.7943 |
| **Error** | 188 | 1130.399187 | 6.012762 |  |  |

**The GLM Procedure**

**Repeated Measures Analysis of Variance**

**Univariate Tests of Hypotheses for Within Subject Effects**

| **Source** | **DF** | **Type III SS** | **Mean Square** | **F Value** | **Pr > F** | **Adj Pr > F** | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **G - G** | **H-F-L** |
| **logADD** | 15 | 51684.62693 | 3445.64180 | 6774.93 | <.0001 | <.0001 | <.0001 |
| **logADD\*Group** | 120 | 80.36213 | 0.66968 | 1.32 | 0.0133 | 0.0706 | 0.0672 |
| **Error(logADD)** | 2820 | 1434.21528 | 0.50859 |  |  |  |  |

|  |  |
| --- | --- |
| **Greenhouse-Geisser Epsilon** | 0.4193 |
| **Huynh-Feldt-Lecoutre Epsilon** | 0.4354 |

**SAS CODE Using Torso PBS only**

**data** all\_treatments\_n\_is30\_torso;

input Group ID$ PBS\_0 PBS\_1 PBS\_2 PBS\_3 PBS\_4 PBS\_5 PBS\_6 PBS\_7 PBS\_8 PBS\_9 PBS\_10 PBS\_11 PBS\_12 PBS\_13 PBS\_14 PBS\_15;

datalines;

1 A1 1 4 4 4 5 5 5 6 6 7 7 7 8 8 8 8

1 A2 1 2 3 4 4 5 5 6 6 7 7 7 7 7 7 8

1 A3 1 3 4 5 6 7 7 7 7 7 7 7 8 8 8 8

1 A4 1 2 3 4 5 5 6 6 7 7 7 7 8 8 8 8

1 A5 1 3 3 4 4 5 5 6 7 7 8 8 8 8 8 8

1 A6 1 2 3 4 4 4 5 5 6 6 6 6 7 7 7 7

1 A7 1 3 3 4 5 5 5 5 6 6 6 6 7 7 7 8

1 A8 1 3 4 4 4 4 5 5 6 6 6 6 7 7 7 8

1 A9 1 3 4 5 5 5 6 6 7 7 7 7 7 8 8 8

1 A10 1 3 4 4 5 6 6 7 7 8 8 8 8 8 8 8

2 B1 1 2 3 4 4 5 5 6 6 6 7 7 7 7 8 8

2 B2 1 4 4 5 5 5 6 6 7 7 7 7 8 8 8 8

2 B3 1 3 4 4 4 4 4 5 5 6 6 6 7 8 8 8

2 B4 1 3 4 4 4 5 6 6 7 7 7 7 7 7 7 7

2 B5 1 2 3 5 6 6 7 7 7 7 7 7 8 8 8 8

2 B6 1 3 4 5 5 5 5 6 7 7 7 7 8 8 8 8

2 B7 1 3 4 4 4 5 5 5 6 6 7 7 7 8 8 8

2 B8 1 2 3 4 4 5 5 6 6 6 7 7 8 8 8 8

2 B9 1 3 3 5 5 5 5 6 6 6 6 6 7 7 7 7

2 B10 1 3 4 4 5 5 6 6 7 7 7 7 8 8 8 8

3 C1 1 3 4 4 5 5 5 7 7 7 7 7 8 8 8 8

3 C2 1 3 4 4 5 5 5 6 6 6 6 6 7 7 7 7

3 C3 1 3 3 4 4 5 5 6 6 7 7 7 7 7 7 8

3 C4 1 2 3 4 4 4 5 5 6 7 7 7 7 8 8 8

3 C5 1 3 4 5 5 5 6 6 6 7 7 7 8 8 8 8

3 C6 1 3 4 4 4 5 5 6 6 7 7 7 7 7 8 8

3 C7 1 3 4 4 5 6 6 7 7 7 7 7 8 8 8 8

3 C8 1 3 4 4 5 5 6 6 7 7 7 7 8 8 8 8

3 C9 1 2 3 4 5 5 6 7 7 7 7 7 8 8 8 8

3 C10 1 3 4 5 5 6 6 7 7 7 7 7 8 8 8 8

4 D1 1 3 3 4 4 5 5 6 6 6 6 7 7 7 7 8

4 D2 1 2 3 4 5 5 6 6 7 7 7 7 8 8 8 8

4 D3 1 3 4 4 5 5 5 6 6 7 7 7 8 8 8 8

4 D4 1 3 4 4 4 5 6 6 7 7 7 7 7 8 8 8

4 D5 1 2 3 4 5 5 6 6 6 7 7 7 7 7 7 8

4 D6 1 3 3 4 5 5 6 6 7 7 7 7 7 7 7 8

4 D7 1 3 4 5 6 6 7 7 7 8 8 8 8 8 8 8

4 D8 1 3 4 4 4 5 6 6 7 7 7 7 8 8 8 8

4 D9 1 2 3 4 5 6 6 7 7 8 8 8 8 8 8 8

4 D10 1 3 4 5 5 5 6 7 7 7 7 7 8 8 8 8

5 BA1 1 3 4 4 5 5 6 6 6 7 7 8 8 8 8 8

5 BA2 1 2 4 4 5 5 5 6 6 6 7 7 7 7 7 8

5 BA3 1 3 4 5 5 5 5 6 6 7 7 7 7 8 8 8

5 BA4 1 2 3 4 4 5 6 6 7 7 7 7 7 8 8 8

5 BA5 1 4 4 5 5 6 6 6 7 7 7 7 7 7 8 8

5 BA6 1 3 4 4 5 6 6 7 7 7 7 7 7 7 8 8

5 BA7 1 2 4 4 5 5 5 6 6 7 7 7 8 8 8 8

5 BA8 1 3 4 4 4 4 5 5 6 6 6 6 7 7 7 7

5 BA9 1 3 4 4 5 5 6 6 7 7 7 7 7 7 8 8

5 BA10 1 4 5 5 6 6 6 7 7 7 7 8 8 8 8 8

6 CA1 1 3 4 5 5 6 6 7 7 7 8 8 8 8 8 8

6 CA2 1 3 4 5 5 6 6 6 7 7 7 7 7 8 8 8

6 CA3 1 2 3 4 4 5 6 6 6 7 7 7 8 8 8 8

6 CA4 1 2 3 4 5 6 6 7 7 7 7 7 8 8 8 8

6 CA5 1 2 3 4 5 6 6 7 7 7 7 7 8 8 8 8

6 CA6 1 3 4 4 5 5 6 6 6 7 7 8 8 8 8 8

6 CA7 1 3 4 4 5 5 6 6 6 6 7 7 8 8 8 8

6 CA8 1 4 5 5 6 6 7 7 8 8 8 8 8 8 8 8

6 CA9 1 3 4 5 5 5 6 6 7 7 7 7 7 7 8 8

6 CA10 1 3 4 4 5 5 6 6 6 7 7 7 7 8 8 8

7 DA1 1 3 4 4 5 6 7 7 7 7 7 8 8 8 8 8

7 DA2 1 2 3 4 4 5 5 6 6 7 7 7 8 8 8 8

7 DA3 1 3 4 4 5 5 6 6 6 7 8 7 7 7 8 8

7 DA4 1 2 3 4 4 5 5 5 5 6 6 6 7 7 8 8

7 DA5 1 2 3 4 4 5 6 6 7 7 7 7 7 8 8 8

7 DA6 1 2 3 4 5 6 6 6 6 7 7 7 7 7 8 8

7 DA7 1 2 3 4 4 5 5 6 7 7 7 7 8 8 8 8

7 DA8 1 2 3 4 5 5 6 7 7 8 8 8 8 8 8 8

7 DA9 1 2 3 4 4 5 5 6 6 7 7 7 8 8 8 8

7 DA10 1 3 4 5 6 6 6 7 7 7 7 8 8 8 8 8

8 NC1 1 2 3 4 4 5 5 6 6 6 7 7 7 8 8 8

8 NC2 1 3 4 4 5 5 6 6 6 7 7 7 8 8 8 8

8 NC3 1 3 4 5 5 6 6 6 7 7 7 7 7 7 8 8

8 NC4 1 3 3 4 5 6 6 6 7 7 7 7 7 7 7 8

8 NC5 1 3 4 4 5 5 6 6 6 7 7 7 8 8 8 8

8 NC6 1 3 4 4 5 5 6 6 6 7 7 7 7 7 7 7

8 NC7 1 3 4 5 5 6 6 7 7 7 7 7 8 8 8 8

8 NC8 1 2 3 4 5 5 6 6 6 7 7 7 7 8 8 8

8 NC9 1 3 4 5 6 6 7 7 7 7 7 7 8 8 8 8

8 NC10 1 4 5 5 5 5 5 6 6 7 7 7 8 8 8 8

9 PC1 1 2 3 3 4 4 5 6 6 7 7 7 7 7 8 8

9 PC2 1 2 3 4 5 5 6 6 6 7 7 7 7 8 8 8

9 PC3 1 3 4 4 5 5 6 6 7 7 7 7 7 7 8 8

9 PC4 1 3 3 4 4 5 5 5 6 6 7 7 7 7 7 8

9 PC5 1 4 4 4 5 6 6 7 7 7 7 7 8 8 8 8

9 PC6 1 3 3 4 5 5 6 6 7 7 7 7 8 8 8 8

9 PC7 1 2 3 4 5 6 6 6 7 7 7 7 7 7 7 8

9 PC8 1 4 5 6 6 6 6 7 7 7 7 7 7 7 7 7

9 PC9 1 3 3 4 5 5 6 6 7 7 7 7 7 7 7 7

9 PC10 1 4 5 5 6 7 7 7 7 8 8 8 8 8 8 8

1 A11 1 3 4 5 5 6 6 6 7 7 7 7 7 8 8 8

1 A12 1 2 3 4 4 5 5 5 5 6 6 6 7 7 7 7

1 A13 1 4 4 4 4 5 5 5 6 6 6 6 7 8 8 8

1 A14 1 4 4 5 5 5 6 6 6 7 7 7 7 8 8 8

1 A15 1 3 4 5 5 6 6 6 6 7 7 7 7 8 7 7

1 A16 1 2 3 4 4 4 5 5 5 6 6 6 6 7 7 7

1 A17 1 4 5 5 6 6 7 7 7 7 7 7 8 8 8 8

1 A18 1 3 4 5 6 6 7 7 7 7 7 7 8 8 8 8

1 A19 1 2 3 4 4 5 5 6 6 6 6 7 8 8 8 7

1 A20 1 4 4 5 5 5 6 6 7 7 7 7 7 8 8 8

2 B11 1 3 4 4 5 6 6 6 6 7 7 7 7 8 8 8

2 B12 1 2 3 3 4 4 5 5 6 6 6 7 7 7 7 7

2 B13 1 3 3 4 4 6 6 7 7 7 7 8 8 8 8 8

2 B14 1 4 5 5 6 6 6 6 7 7 7 7 8 8 8 8

2 B15 1 2 4 5 5 6 6 6 6 7 7 7 8 8 8 8

2 B16 1 4 5 5 6 6 6 7 7 7 7 7 8 8 8 8

2 B17 1 4 5 5 6 6 6 7 7 7 7 8 8 8 8 8

2 B18 1 4 5 5 5 6 7 7 7 7 7 8 8 8 8 8

2 B19 1 4 5 5 6 6 7 7 7 7 7 7 8 8 8 8

2 B20 1 4 5 5 6 6 7 7 7 7 7 7 7 8 8 8

3 C11 1 3 4 5 6 6 7 7 7 7 7 8 8 8 8 8

3 C12 1 4 4 5 5 6 6 6 7 7 7 7 8 8 8 8

3 C13 1 4 4 5 5 6 7 7 7 7 7 8 8 8 8 8

3 C14 1 4 5 5 6 6 6 6 7 7 7 8 8 8 8 8

3 C15 1 3 4 5 6 6 6 6 7 7 7 7 7 8 8 8

3 C16 1 3 4 4 5 6 6 6 6 7 7 7 8 8 8 8

3 C17 1 3 5 5 6 6 6 6 6 6 8 8 8 8 8 8

3 C18 1 2 4 4 4 5 5 6 6 6 7 7 7 8 8 8

3 C19 1 4 4 5 6 6 6 7 7 7 8 8 8 8 8 8

3 C20 1 4 5 5 6 6 6 7 7 7 8 8 8 8 8 8

4 D11 1 3 3 4 4 5 6 6 6 6 7 7 7 8 8 8

4 D12 1 4 4 5 6 6 6 7 7 7 7 7 7 8 8 8

4 D13 1 4 4 5 5 5 6 6 7 7 7 8 8 8 8 8

4 D14 1 2 3 4 4 5 6 6 7 7 7 8 8 8 8 8

4 D15 1 4 4 5 5 6 6 7 7 7 8 8 8 8 8 8

4 D16 1 4 4 4 5 6 6 7 7 7 7 8 8 8 8 8

4 D17 1 4 4 4 5 5 6 6 7 7 7 7 8 8 8 8

4 D18 1 4 5 5 6 6 7 7 7 8 8 8 8 8 8 8

4 D19 1 3 4 4 5 6 6 7 7 7 7 7 7 8 8 8

4 D20 1 3 4 4 4 5 6 6 7 7 7 7 7 8 8 8

5 BA11 1 2 3 3 4 4 4 5 6 6 6 7 7 7 8 8

5 BA12 1 2 3 4 4 4 5 5 6 6 6 7 7 7 8 8

5 BA13 1 4 4 4 5 6 6 6 6 6 7 7 7 8 8 8

5 BA14 1 3 4 4 5 5 6 6 6 7 7 7 8 8 8 8

5 BA15 1 4 5 5 6 6 7 7 7 7 7 8 8 8 8 8

5 BA16 1 4 4 5 5 5 6 6 6 6 7 7 8 8 8 8

5 BA17 1 3 4 4 5 5 6 6 7 7 7 8 8 8 8 8

5 BA18 1 4 4 5 5 6 6 6 7 7 7 7 8 8 8 8

5 BA19 1 2 4 4 5 6 6 6 7 7 7 7 7 8 8 8

5 BA20 1 3 4 4 4 4 5 5 6 6 6 7 7 7 8 8

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6 CA12 1 3 4 4 5 5 5 6 6 7 8 8 8 8 8 8

6 CA13 1 3 4 4 5 5 6 6 6 7 7 7 7 8 8 8

6 CA14 1 3 4 4 5 5 5 6 6 6 7 7 7 8 8 8

6 CA15 1 3 4 4 5 5 5 6 6 7 7 7 7 7 7 7

6 CA16 1 4 4 4 5 5 6 6 6 7 7 8 8 8 8 8

6 CA17 1 3 4 4 5 5 6 6 7 7 7 7 7 8 8 8

6 CA18 1 4 4 5 5 6 6 7 7 7 7 7 7 8 8 8

6 CA19 1 2 3 4 5 5 5 6 7 7 7 7 7 8 8 8

6 CA20 1 3 4 5 6 6 7 7 7 7 8 8 8 8 8 8

7 DA11 1 3 3 4 4 5 6 6 6 7 7 8 8 8 8 8

7 DA12 1 3 3 4 4 4 5 5 6 6 7 7 7 8 8 8

7 DA13 1 2 3 4 4 5 5 6 6 7 7 7 7 8 8 8

7 DA14 1 3 3 4 4 5 5 6 6 7 7 7 8 8 8 8

7 DA15 1 2 3 4 5 5 5 6 6 7 7 7 8 8 8 8

7 DA16 1 3 4 4 5 6 6 6 6 7 7 7 7 8 8 8

7 DA17 1 2 3 4 5 5 6 6 7 7 7 8 8 8 8 8

7 DA18 1 2 3 4 4 5 5 6 7 7 7 7 8 8 8 8

7 DA19 1 4 5 5 5 6 6 6 7 7 7 8 8 8 8 8

7 DA20 1 3 4 4 4 5 6 6 7 7 7 7 8 8 8 8

8 NC11 1 3 4 5 5 6 7 6 7 7 7 8 8 8 8 8

8 NC12 1 4 4 5 5 6 6 7 7 7 7 7 7 8 8 8

8 NC13 1 4 4 4 4 5 5 5 7 7 7 7 7 8 8 8

8 NC14 1 2 3 4 5 6 6 7 7 7 7 7 7 8 8 8

8 NC15 1 3 4 4 5 6 6 6 7 7 7 7 8 8 8 8

8 NC16 1 2 3 4 4 4 4 5 6 6 7 7 7 8 8 8

8 NC17 1 3 4 4 4 5 5 6 7 7 7 7 7 8 8 8

8 NC18 1 3 4 4 4 5 5 7 7 7 7 7 8 8 8 8

8 NC19 1 3 4 5 5 6 6 7 7 7 8 8 8 8 8 8

8 NC20 1 4 4 5 6 6 6 6 6 7 7 7 7 8 8 8

9 PC11 1 3 4 4 5 5 5 6 6 7 7 7 7 8 8 8

9 PC12 1 3 4 4 4 5 5 5 6 6 7 7 7 8 8 8

9 PC13 1 4 4 4 5 5 6 6 6 7 7 7 7 8 8 8

9 PC14 1 3 3 4 4 5 6 6 7 7 8 8 8 8 8 8

9 PC15 1 3 4 4 5 5 6 6 7 7 7 7 7 8 8 8

9 PC16 1 4 4 5 5 6 6 6 7 7 7 8 8 8 8 8

9 PC17 1 4 5 5 6 6 7 7 7 7 8 8 8 8 8 8

9 PC18 1 3 4 4 4 5 5 6 6 6 7 7 7 8 8 8

9 PC19 1 3 4 4 4 5 5 6 6 7 7 7 7 7 8 8

9 PC20 1 3 4 4 4 5 5 6 6 7 7 7 7 8 8 8

1 A21 1 2 3 4 4 5 6 6 7 7 7 7 7 8 8 8

1 A22 1 2 4 5 5 6 7 7 8 8 8 8 8 8 8 8

1 A23 1 3 4 5 5 5 6 7 7 8 8 8 8 8 8 8

1 A24 1 3 4 5 5 5 6 7 7 8 8 8 8 8 8 8

1 A25 1 2 4 5 5 5 6 7 7 7 7 7 7 8 8 8

1 A26 1 2 3 4 5 5 6 7 7 7 7 7 7 7 8 8

1 A27 1 2 4 5 5 5 6 7 7 8 8 8 8 8 8 8

1 A28 1 3 4 5 5 6 7 7 8 8 8 8 8 8 8 8

1 A29 1 2 4 4 5 5 6 7 7 8 8 8 8 8 8 8

1 A30 1 2 4 5 5 5 5 7 7 8 7 7 8 8 8 8

2 B21 1 2 4 4 4 5 6 7 7 7 7 7 7 7 8 8

2 B22 1 2 4 4 4 4 5 7 7 7 7 7 7 7 8 8

2 B23 1 2 4 5 5 5 6 7 7 8 8 8 8 8 8 8

2 B24 1 3 4 5 5 5 6 7 7 8 8 8 8 8 8 8

2 B25 1 3 4 5 5 5 6 7 7 8 8 8 8 8 8 8

2 B26 1 3 4 5 5 5 6 7 7 7 8 8 8 8 8 8

2 B27 1 3 4 5 5 5 6 7 7 7 8 8 8 8 8 8

2 B28 1 3 4 4 5 5 5 7 7 7 7 7 8 8 8 8

2 B29 1 3 4 5 5 5 6 7 8 8 8 8 8 8 8 8

2 B30 1 3 4 5 5 5 6 7 8 8 8 8 8 8 8 8

3 C21 1 3 4 4 5 5 6 7 7 7 7 7 8 8 8 8

3 C22 1 3 4 5 5 5 6 7 7 8 8 8 8 7 8 8

3 C23 1 3 3 5 5 5 6 7 7 7 8 7 7 8 8 8

3 C24 1 3 4 5 5 6 7 7 8 8 8 8 8 8 8 8

3 C25 1 3 3 4 5 5 6 7 7 8 8 8 8 8 8 8

3 C26 1 3 4 4 5 5 6 7 7 7 7 7 7 8 8 8

3 C27 1 3 3 5 5 5 6 7 7 8 8 8 8 8 8 8

3 C28 1 3 4 5 5 5 6 7 7 8 8 8 8 8 8 8

3 C29 1 2 4 5 6 6 6 7 7 8 8 8 8 8 8 8

3 C30 1 3 4 5 6 6 6 7 7 8 8 8 8 8 8 8

4 D21 1 2 4 5 5 5 6 7 7 7 7 7 7 7 8 8

4 D22 1 2 3 4 4 5 6 7 7 7 7 7 7 7 8 8

4 D23 1 2 4 4 5 6 6 7 8 8 8 8 8 8 8 8

4 D24 1 2 3 5 5 5 5 6 7 7 7 7 7 7 8 8

4 D25 1 2 4 5 5 5 6 7 7 8 8 8 8 8 8 8

4 D26 1 2 4 5 5 6 6 7 7 8 8 8 8 8 8 8

4 D27 1 2 4 5 5 5 6 7 7 7 8 8 8 8 8 8

4 D28 1 2 4 5 5 6 6 7 8 8 8 8 8 8 8 8

4 D29 1 2 4 5 5 6 6 7 8 8 8 7 7 7 8 8

4 D30 1 2 4 5 5 6 6 7 8 8 8 8 8 8 8 8

5 BA21 1 2 4 5 5 5 6 7 7 8 8 8 8 8 8 8

5 BA22 1 3 4 4 5 5 6 7 8 8 8 8 8 8 8 8

5 BA23 1 2 4 4 5 5 6 7 7 8 8 8 8 8 8 8

5 BA24 1 3 4 4 5 5 6 7 7 7 8 8 8 8 8 8

5 BA25 1 2 4 5 5 5 6 7 7 7 8 8 8 8 8 8

5 BA26 1 3 4 5 4 6 7 8 8 8 8 8 8 8 8 8

5 BA27 1 3 4 5 5 5 6 7 7 7 8 8 8 8 8 8

5 BA28 1 2 4 4 4 5 6 8 8 8 8 8 8 8 8 8

5 BA29 1 4 4 4 5 5 6 7 7 8 8 8 8 8 8 8

5 BA30 1 3 3 4 5 5 6 7 7 8 8 8 8 8 8 8

6 CA21 1 2 4 4 5 5 6 7 7 8 8 8 8 8 8 8

6 CA22 1 2 4 5 5 5 6 7 7 8 8 8 8 8 8 8

6 CA23 1 2 4 4 5 5 6 7 7 8 8 8 8 8 8 8

6 CA24 1 3 4 5 5 5 6 7 7 8 8 8 8 8 8 8

6 CA25 1 3 4 5 5 5 6 7 7 8 8 8 8 8 8 8

6 CA26 1 3 4 5 5 5 6 7 8 8 8 8 8 8 8 8

6 CA27 1 3 4 5 5 5 5 7 8 8 8 8 8 8 8 8

6 CA28 1 2 4 5 5 5 6 7 8 8 8 8 8 8 8 8

6 CA29 1 2 4 5 5 5 6 7 8 8 8 8 8 8 8 8

6 CA30 1 2 4 5 5 5 6 7 7 8 8 8 8 8 8 8

7 DA21 1 3 4 4 5 5 6 7 8 8 8 8 8 8 8 8

7 DA22 1 2 4 4 5 5 6 7 7 7 7 7 7 7 8 8

7 DA23 1 4 4 4 5 6 7 7 7 7 7 7 7 8 8 8

7 DA24 1 3 4 5 5 5 6 7 7 7 8 8 8 8 8 8

7 DA25 1 4 4 5 5 6 6 7 7 7 8 8 8 8 8 8

7 DA26 1 3 4 5 5 5 6 7 7 8 8 8 8 8 8 8

7 DA27 1 3 4 5 5 5 6 7 7 8 8 8 8 8 8 8

7 DA28 1 4 4 5 5 5 6 8 8 8 8 8 8 8 8 8

7 DA29 1 3 4 5 6 6 7 7 8 8 8 8 8 8 8 8

7 DA30 1 2 4 5 5 5 6 7 7 8 8 8 8 8 8 8

8 NC21 1 2 3 4 5 6 6 7 7 8 8 8 8 8 8 8

8 NC22 1 2 4 5 5 5 6 7 7 7 7 8 8 8 8 8

8 NC23 1 3 4 5 5 5 6 7 7 7 7 7 8 8 8 8

8 NC24 1 3 4 5 5 5 6 7 7 7 7 7 8 8 8 8

8 NC25 1 3 4 5 5 6 6 7 7 8 8 8 8 8 8 8

8 NC26 1 3 4 5 5 6 6 7 7 8 8 8 8 8 8 8

8 NC27 1 3 4 5 5 5 5 7 7 8 8 8 8 8 8 8

8 NC28 1 2 4 4 5 6 6 7 7 7 8 8 8 8 8 8

8 NC29 1 2 4 4 5 6 6 7 7 8 8 8 8 8 8 8

8 NC30 1 2 4 4 5 6 6 7 7 8 8 8 8 8 8 8

9 PC21 1 2 4 5 5 5 5 7 7 7 7 7 7 7 7 7

9 PC22 1 3 4 5 5 5 6 7 7 7 7 7 8 8 8 8

9 PC23 1 2 4 5 5 5 6 7 7 7 7 7 8 8 8 8

9 PC24 1 2 4 5 5 5 6 7 7 8 8 8 8 8 8 8

9 PC25 1 3 4 5 5 5 6 8 8 8 8 8 8 8 8 8

9 PC26 1 3 4 4 4 4 6 7 7 7 8 8 8 8 8 8

9 PC27 1 3 4 5 5 5 6 7 7 7 7 7 8 8 8 8

9 PC28 1 3 4 4 4 5 6 6 7 8 7 7 8 8 8 8

9 PC29 1 3 4 4 5 5 6 8 8 8 8 8 8 8 8 8

9 PC30 1 2 4 5 5 5 6 7 8 8 8 7 8 8 8 8

;

**run**;

**proc** **print** data=all\_treatments\_n\_is30\_torso;

**run**;

**proc** **glm** data=all\_treatments\_n\_is30\_torso;

Class Group;

model PBS\_0-PBS\_15 = Group/nouni;

repeated logADD;

**run**;

**Output**

**The GLM Procedure**

| **Class Level Information** | | |
| --- | --- | --- |
| **Class** | **Levels** | **Values** |
| **Group** | 9 | 1 2 3 4 5 6 7 8 9 |

|  |  |
| --- | --- |
| **Number of Observations Read** | 270 |
| **Number of Observations Used** | 270 |

**GLM Procedure**

**Repeated Measures Analysis of Variance**

| **Repeated Measures Level Information** | | | | | | | | | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Dependent Variable** | **PBS\_0** | **PBS\_1** | **PBS\_2** | **PBS\_3** | | **PBS\_4** | **PBS\_5** | **PBS\_6** | **PBS\_7** | | **PBS\_8** | **PBS\_9** | **PBS\_10** | | **PBS\_11** | **PBS\_12** | | **PBS\_13** | **PBS\_14** | **PBS\_15** |
| **Level of logADD** | **1** | **2** | **3** | **4** | | **5** | **6** | **7** | **8** | | **9** | **10** | **11** | | **12** | **13** | | **14** | **15** | **16** |
| **MANOVA Test Criteria and Exact F Statistics for the Hypothesis of no logADD Effect H = Type III SSCP Matrix for logADD E = Error SSCP Matrix  S=1 M=6.5 N=122.5** | | | | | | | | | | | | | | | | | | | | |
| **Statistic** | | | | | **Value** | | | | | **F Value** | | | | **Num DF** | | | **Den DF** | | | **Pr > F** |
| **Wilks' Lambda** | | | | | 0.0009766 | | | | | 16844.1 | | | | 15 | | | 247 | | | <.0001 |
| **Pillai's Trace** | | | | | 0.9990234 | | | | | 16844.1 | | | | 15 | | | 247 | | | <.0001 |
| **Hotelling-Lawley Trace** | | | | | 1022.9223780 | | | | | 16844.1 | | | | 15 | | | 247 | | | <.0001 |
| **Roy's Greatest Root** | | | | | 1022.9223780 | | | | | 16844.1 | | | | 15 | | | 247 | | | <.0001 |

| **MANOVA Test Criteria and F Approximations for the Hypothesis of no logADD\*Group Effect H = Type III SSCP Matrix for logADD\*Group E = Error SSCP Matrix  S=8 M=3 N=122.5** | | | | | |
| --- | --- | --- | --- | --- | --- |
| **Statistic** | **Value** | **F Value** | **Num DF** | **Den DF** | **Pr > F** |
| **Wilks' Lambda** | 0.58430261 | 1.16 | 120 | 1770.8 | 0.1244 |
| **Pillai's Trace** | 0.51168982 | 1.16 | 120 | 2032 | 0.1228 |
| **Hotelling-Lawley Trace** | 0.56514124 | 1.16 | 120 | 1219.1 | 0.1298 |
| **Roy's Greatest Root** | 0.16826816 | 2.85 | 15 | 254 | 0.0004 |
| **NOTE: F Statistic for Roy's Greatest Root is an upper bound.** | | | | | |

**The GLM Procedure**

**Repeated Measures Analysis of Variance**

**Tests of Hypotheses for Between Subjects Effects**

| **Source** | **DF** | **Type III SS** | **Mean Square** | **F Value** | **Pr > F** |
| --- | --- | --- | --- | --- | --- |
| **Group** | 8 | 13.6171296 | 1.7021412 | 1.02 | 0.4202 |
| **Error** | 261 | 434.9812500 | 1.6665948 |  |  |

**The GLM Procedure**

**Repeated Measures Analysis of Variance**

**Univariate Tests of Hypotheses for Within Subject Effects**

| **Source** | **DF** | **Type III SS** | **Mean Square** | **F Value** | **Pr > F** | **Adj Pr > F** | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **G - G** | **H-F-L** |
| **logADD** | 15 | 16875.83866 | 1125.05591 | 6237.75 | <.0001 | <.0001 | <.0001 |
| **logADD\*Group** | 120 | 26.60509 | 0.22171 | 1.23 | 0.0477 | 0.1246 | 0.1215 |
| **Error(logADD)** | 3915 | 706.11875 | 0.18036 |  |  |  |  |

|  |  |
| --- | --- |
| **Greenhouse-Geisser Epsilon** | 0.4507 |
| **Huynh-Feldt-Lecoutre Epsilon** | 0.4640 |

**SAS Code Repeated measures ANOVA PBS heads only**

**data** all\_treatments\_n\_is30\_head;

input Group ID$ PBS\_0 PBS\_1 PBS\_2 PBS\_3 PBS\_4 PBS\_5 PBS\_6 PBS\_7 PBS\_8 PBS\_9 PBS\_10 PBS\_11 PBS\_12 PBS\_13 PBS\_14 PBS\_15;

datalines;

1 A1 1 3 5 5 5 6 6 7 7 8 8 8 8 8 8 8

1 A2 1 3 3 4 4 5 5 6 6 7 7 7 8 8 8 8

1 A3 1 3 5 5 6 6 7 7 8 8 8 8 8 8 8 8

1 A4 1 2 3 3 5 5 5 5 6 6 6 6 7 8 8 8

1 A5 1 3 3 4 5 6 7 8 8 8 8 8 8 8 8 8

1 A6 1 3 4 5 5 6 6 7 7 7 8 8 8 8 8 8

1 A7 1 3 5 5 5 5 5 5 7 7 7 8 8 8 8 8

1 A8 1 3 4 5 5 5 6 6 7 7 7 8 8 8 8 8

1 A9 1 2 3 3 5 5 6 7 7 8 8 8 8 8 8 8

1 A10 1 3 5 5 6 7 7 8 8 8 8 8 8 8 8 8

2 B1 1 2 2 3 5 6 6 7 8 8 8 8 8 8 8 8

2 B2 1 1 2 3 3 3 6 6 6 7 7 7 8 8 8 8

2 B3 1 2 3 3 3 3 5 6 6 8 8 8 8 8 8 8

2 B4 1 3 3 4 5 5 6 7 7 8 8 8 8 8 8 8

2 B5 1 2 3 4 5 5 6 7 7 8 8 8 8 8 8 8

2 B6 1 2 3 4 5 5 6 6 7 7 8 8 8 8 8 8

2 B7 1 2 2 3 5 6 6 7 7 8 8 8 8 8 8 8

2 B8 1 2 3 3 4 4 4 5 5 6 6 7 7 7 8 8

2 B9 1 3 4 5 5 5 5 6 6 7 7 7 8 8 8 8

2 B10 1 3 3 4 5 6 7 7 8 8 8 8 8 8 8 8

3 C1 1 3 4 4 5 5 6 6 7 7 7 7 8 8 8 8

3 C2 1 1 2 3 4 4 5 5 6 6 7 7 7 8 8 8

3 C3 1 2 3 4 4 5 5 5 6 6 7 7 7 7 7 8

3 C4 1 2 3 4 4 5 5 5 6 6 6 7 7 7 8 8

3 C5 1 3 4 4 5 5 6 6 6 7 7 7 8 8 8 8

3 C6 1 2 3 4 4 4 5 6 6 6 6 6 7 7 8 8

3 C7 1 3 3 4 4 5 5 6 7 7 7 8 8 8 8 8

3 C8 1 3 3 4 5 5 5 6 6 7 8 8 8 8 8 8

3 C9 1 2 4 4 5 5 6 6 6 7 7 8 8 8 8 8

3 C10 1 3 4 5 5 6 6 7 8 8 8 8 8 8 8 8

4 D1 1 2 2 3 4 5 5 6 6 6 6 7 7 8 8 8

4 D2 1 2 3 4 5 5 5 5 6 6 7 7 7 8 8 8

4 D3 1 2 3 3 3 4 5 5 5 6 6 6 7 7 7 7

4 D4 1 3 4 4 5 5 6 6 6 7 7 7 8 8 8 8

4 D5 1 2 3 5 5 6 7 7 8 8 8 8 8 8 8 8

4 D6 1 3 4 4 5 5 6 6 6 7 7 7 7 7 7 8

4 D7 1 3 4 5 6 6 7 7 7 8 8 8 8 8 8 8

4 D8 1 2 3 4 5 5 5 6 6 7 7 7 7 8 8 8

4 D9 1 2 3 4 4 5 6 7 7 8 8 8 8 8 8 8

4 D10 1 3 4 5 5 6 6 7 7 8 8 8 8 8 8 8

5 BA1 1 2 3 5 5 5 6 7 7 7 7 7 8 8 8 8

5 BA2 1 3 4 5 5 5 5 6 6 6 7 8 8 8 8 8

5 BA3 1 3 4 4 4 4 5 5 5 6 6 7 7 8 8 8

5 BA4 1 2 3 4 4 4 5 6 6 6 7 8 8 8 8 8

5 BA5 1 3 4 5 5 6 6 6 6 7 7 7 8 8 8 8

5 BA6 1 3 3 4 4 5 5 6 6 7 7 7 7 8 8 8

5 BA7 1 3 3 4 4 4 5 5 5 6 6 7 7 8 8 8

5 BA8 1 2 3 4 4 5 6 6 6 7 7 7 7 7 7 7

5 BA9 1 3 3 4 4 4 5 5 5 6 6 6 7 7 7 8

5 BA10 1 3 4 4 4 4 5 6 6 7 7 7 8 8 8 8

6 CA1 1 3 4 4 5 6 6 6 6 7 7 7 8 8 8 8

6 CA2 1 3 3 4 4 5 5 5 6 6 7 8 8 8 8 8

6 CA3 1 3 4 4 5 5 5 5 6 6 7 7 8 8 8 8

6 CA4 1 3 3 4 5 5 6 7 7 7 7 7 8 8 8 8

6 CA5 1 1 2 5 5 6 6 7 7 8 8 8 8 8 8 8

6 CA6 1 3 4 4 4 6 6 7 7 8 8 8 8 8 8 8

6 CA7 1 3 3 4 5 5 5 6 7 8 8 8 8 8 8 8

6 CA8 1 3 5 6 6 7 7 8 8 8 8 8 8 8 8 8

6 CA9 1 3 3 4 4 4 6 6 6 7 7 8 8 8 8 8

6 CA10 1 3 4 5 5 5 6 6 6 7 7 7 8 8 8 8

7 DA1 1 3 4 4 5 5 5 6 6 6 7 8 8 8 8 8

7 DA2 1 2 2 3 4 5 5 6 6 7 8 8 8 8 8 8

7 DA3 1 1 3 4 5 5 6 6 6 7 7 7 7 7 8 8

7 DA4 1 3 4 4 5 6 6 6 6 7 7 7 8 8 8 8

7 DA5 1 2 3 4 4 5 6 6 7 7 8 8 8 8 8 8

7 DA6 1 3 4 4 5 5 5 6 6 7 7 7 7 8 8 8

7 DA7 1 3 3 4 5 5 5 6 6 7 7 7 8 8 8 8

7 DA8 1 3 3 4 5 5 5 5 5 6 7 7 8 8 8 8

7 DA9 1 1 2 3 4 5 6 6 6 7 7 7 7 8 8 8

7 DA10 1 3 4 5 5 6 6 7 7 8 8 8 8 8 8 8

8 NC1 1 1 2 2 3 4 5 5 5 6 6 6 6 7 8 8

8 NC2 1 3 4 5 5 5 6 6 6 7 7 7 8 8 8 8

8 NC3 1 3 4 4 5 5 6 6 6 7 7 7 8 8 8 8

8 NC4 1 3 4 5 6 6 6 6 7 7 7 7 7 8 8 8

8 NC5 1 3 4 4 5 5 5 5 6 6 6 7 7 7 8 8

8 NC6 1 3 4 4 5 5 6 6 6 7 7 7 7 8 8 8

8 NC7 1 3 4 5 5 6 6 7 7 7 8 8 8 8 8 8

8 NC8 1 3 3 4 5 5 6 6 6 7 7 7 8 8 8 8

8 NC9 1 3 4 5 6 6 6 7 7 8 8 8 8 8 8 8

8 NC10 1 3 4 4 5 5 5 6 6 7 7 8 8 8 8 8

9 PC1 1 3 3 4 5 6 6 7 7 7 8 8 8 8 8 8

9 PC2 1 2 3 4 6 6 7 7 7 8 8 8 8 8 8 8

9 PC3 1 3 4 4 5 5 5 6 6 7 7 7 7 8 8 8

9 PC4 1 2 3 4 5 5 6 6 7 7 8 8 8 8 8 8

9 PC5 1 3 4 5 5 5 6 7 7 7 8 8 8 8 8 8

9 PC6 1 3 3 4 5 5 6 6 7 7 7 8 8 8 8 8

9 PC7 1 2 5 5 5 6 6 7 7 8 8 8 8 8 8 8

9 PC8 1 3 4 5 6 6 6 8 8 8 8 8 8 8 8 8

9 PC9 1 3 4 5 7 7 8 8 8 8 8 8 8 8 8 8

9 PC10 1 3 5 5 6 7 7 7 7 7 7 8 8 8 8 8

1 A11 1 3 4 5 5 6 6 6 7 7 7 8 8 8 8 8

1 A12 1 2 3 4 5 5 5 5 6 6 6 7 7 8 8 8

1 A13 1 3 4 5 5 5 6 6 7 7 7 7 8 8 8 8

1 A14 1 3 4 5 5 6 6 7 7 7 7 7 8 8 8 8

1 A15 1 3 4 5 6 6 7 7 7 8 8 8 8 8 8 8

1 A16 1 2 2 3 3 4 4 6 6 6 6 6 6 6 6 7

1 A17 1 4 5 5 6 6 7 7 8 8 8 8 8 8 8 8

1 A18 1 3 4 5 5 6 7 7 7 7 8 8 8 8 8 8

1 A19 1 3 4 5 6 6 6 7 7 7 7 8 8 8 8 8

1 A20 1 3 4 5 5 6 7 8 8 8 8 8 8 8 8 8

2 B11 1 3 4 5 6 6 7 7 7 7 8 8 8 8 8 8

2 B12 1 1 2 2 3 3 4 5 5 6 6 6 6 8 8 8

2 B13 1 3 4 5 6 6 6 7 7 7 7 8 8 8 8 8

2 B14 1 3 4 4 5 6 6 7 7 7 8 8 8 8 8 8

2 B15 1 3 4 5 5 6 7 7 7 8 8 8 8 8 8 8

2 B16 1 3 4 5 5 6 6 7 7 8 8 8 8 8 8 8

2 B17 1 3 4 4 5 6 7 7 7 7 7 8 . 8 8 8

2 B18 1 3 4 5 6 6 7 7 7 8 8 8 . 8 8 8

2 B19 1 4 5 5 6 6 7 7 8 8 8 8 . 8 8 8

2 B20 1 3 4 5 6 6 7 7 7 8 8 8 . 8 8 8

3 C11 1 3 4 5 5 6 6 7 7 7 8 8 . 8 8 8

3 C12 1 3 4 4 5 6 6 6 7 7 8 8 . 8 8 8

3 C13 1 3 4 5 5 5 6 6 7 8 8 8 . 8 8 8

3 C14 1 3 4 5 6 6 7 7 7 8 8 8 . 8 8 8

3 C15 1 3 4 5 5 5 6 6 7 7 8 8 . 8 8 8

3 C16 1 3 4 4 5 5 6 6 7 7 7 7 . 8 8 8

3 C17 1 4 5 6 7 7 7 7 8 8 8 8 . 8 8 8

3 C18 1 3 4 5 5 6 6 6 7 8 8 8 . 8 8 8

3 C19 1 3 4 4 6 6 7 7 7 8 8 8 . 8 8 8

3 C20 1 3 4 5 6 6 7 8 8 8 8 8 . 8 8 8

4 D11 1 2 3 3 4 5 5 6 7 7 7 8 . 8 8 8

4 D12 1 3 4 6 6 7 5 8 8 8 8 8 . 8 8 8

4 D13 1 3 4 5 5 6 6 7 7 8 8 8 . 8 8 8

4 D14 1 3 4 5 5 6 7 7 7 7 8 8 . 8 8 8

4 D15 1 3 4 5 6 6 7 7 8 8 8 8 . 8 8 8

4 D16 1 3 4 5 5 6 7 6 7 7 7 8 . 8 8 8

4 D17 1 3 4 5 6 6 6 6 7 8 8 8 . 8 8 8

4 D18 1 3 4 6 6 7 7 7 8 8 8 8 . 8 8 8

4 D19 1 2 3 4 5 5 6 7 7 8 8 8 . 8 8 8

4 D20 1 2 3 4 5 6 6 6 7 7 7 8 . 8 8 8

5 BA11 1 2 3 4 4 4 5 5 6 6 6 7 . 7 8 8

5 BA12 1 3 4 4 5 5 6 6 7 7 7 8 . 8 8 8

5 BA13 1 2 3 4 5 5 6 6 6 6 7 7 . 7 8 8

5 BA14 1 2 3 4 5 5 6 6 6 7 7 7 . 8 8 8

5 BA15 1 4 5 5 5 5 6 7 7 7 7 8 . 8 8 8

5 BA16 1 3 4 5 5 5 6 6 7 7 7 7 . 8 8 8

5 BA17 1 3 4 5 5 5 6 7 8 8 8 8 . 8 8 8

5 BA18 1 3 4 5 5 6 6 6 7 7 7 7 . 8 8 8

5 BA19 1 2 3 4 5 5 6 6 6 7 7 7 . 8 8 8

5 BA20 1 3 4 4 5 5 6 6 6 7 7 8 . 8 8 8

6 CA11 1 3 4 5 5 6 6 6 7 7 7 8 . 8 8 8

6 CA12 1 3 4 5 6 6 7 7 7 7 8 8 . 8 8 8

6 CA13 1 3 4 4 5 6 6 6 7 7 7 8 . 8 8 8

6 CA14 1 2 3 4 5 5 5 6 6 6 6 7 . 8 8 8

6 CA15 1 2 3 4 5 6 6 7 7 7 7 8 . 8 8 8

6 CA16 1 3 4 5 6 7 7 8 8 8 8 8 . 8 8 8

6 CA17 1 2 3 4 5 5 6 6 6 7 6 6 . 7 8 8

6 CA18 1 3 4 5 6 7 7 7 8 8 8 8 . 8 8 8

6 CA19 1 3 4 5 5 6 6 6 7 7 7 7 . 8 8 8

6 CA20 1 2 3 4 5 6 6 7 7 7 8 8 . 8 8 8

7 DA11 1 2 3 4 4 4 5 6 6 7 7 8 . 8 8 8

7 DA12 1 2 3 3 4 4 5 5 6 6 7 7 . 8 8 8

7 DA13 1 2 3 4 5 5 6 6 6 6 7 7 . 8 8 8

7 DA14 1 2 3 4 4 5 5 6 6 7 7 8 . 8 8 8

7 DA15 1 2 3 3 4 4 5 6 6 7 7 7 . 8 8 8

7 DA16 1 3 4 5 6 6 7 7 7 7 7 8 . 8 8 8

7 DA17 1 3 4 4 5 5 6 6 7 7 7 7 . 8 8 8

7 DA18 1 3 4 4 5 6 6 7 7 7 7 8 . 8 8 8

7 DA19 1 5 5 6 6 6 7 7 7 8 8 8 . 8 8 8

7 DA20 1 3 3 4 5 6 6 6 7 7 7 8 . 8 8 8

8 NC11 1 3 4 4 5 6 6 7 7 7 8 8 . 8 8 8

8 NC12 1 2 3 3 4 5 5 6 7 8 8 8 . 8 8 8

8 NC13 1 3 3 4 5 5 6 7 7 8 8 8 . 8 8 8

8 NC14 1 3 4 5 5 7 7 8 8 8 8 8 . 8 8 8

8 NC15 1 3 3 3 4 4 5 6 7 7 8 8 . 8 8 8

8 NC16 1 2 3 4 5 6 7 7 7 8 8 8 . 8 8 8

8 NC17 1 2 3 4 5 6 6 7 8 8 8 8 . 8 8 8

8 NC18 1 2 3 6 7 7 8 8 8 8 8 8 . 8 8 8

8 NC19 1 3 4 5 6 6 7 7 8 8 8 8 . 8 8 8

8 NC20 1 2 3 4 5 5 6 7 8 8 8 8 . 8 8 8

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9 PC12 1 2 3 4 5 5 6 6 7 7 8 8 . 8 8 8

9 PC13 1 4 4 5 5 6 6 7 7 8 8 8 . 8 8 8

9 PC14 1 3 4 5 5 6 7 7 7 8 8 8 . 8 8 8

9 PC15 1 3 4 5 5 6 7 7 7 8 8 8 . 8 8 8

9 PC16 1 3 4 4 5 6 6 7 7 8 8 8 . 8 8 8

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9 PC18 1 2 3 4 4 5 6 6 7 7 8 8 . 8 8 8

9 PC19 1 3 4 5 5 6 6 7 7 7 7 8 . 8 8 8

9 PC20 1 3 4 5 5 5 6 6 7 7 8 8 . 8 8 8

1 A21 1 2 2 3 5 5 5 7 7 8 8 8 8 8 8 8

1 A22 1 2 3 3 5 6 6 7 7 7 7 8 8 8 8 8

1 A23 1 2 2 3 4 5 6 7 7 7 7 7 8 8 8 8

1 A24 1 2 3 3 5 5 6 7 7 7 7 8 8 8 8 8

1 A25 1 2 4 5 5 5 6 7 7 7 7 8 8 8 8 8

1 A26 1 2 3 3 5 5 6 6 6 7 7 8 8 8 8 8

1 A27 1 2 3 5 5 6 7 7 7 8 8 8 8 8 8 8

1 A28 1 2 4 5 5 7 7 7 7 7 8 8 8 8 8 8

1 A29 1 2 3 4 5 5 7 7 7 8 8 8 8 8 8 8

1 A30 1 2 3 4 5 5 6 6 6 7 8 8 8 8 8 8

2 B21 1 2 4 5 5 5 6 6 7 8 8 8 8 8 8 8

2 B22 1 2 4 5 5 5 6 7 7 7 7 7 7 8 8 8

2 B23 1 2 3 5 5 5 6 7 7 8 8 8 8 8 8 8

2 B24 1 2 4 4 5 5 6 7 7 8 8 8 8 8 8 8

2 B25 1 2 4 5 5 5 7 7 7 8 8 8 8 8 8 8

2 B26 1 2 3 5 5 5 6 7 7 8 8 8 8 8 8 8

2 B27 1 2 3 5 5 5 6 7 7 8 8 8 8 8 8 8

2 B28 1 2 3 5 5 5 6 7 7 7 8 8 8 8 8 8

2 B29 1 2 4 5 5 5 6 7 7 7 8 8 8 8 8 8

2 B30 1 2 4 5 5 5 7 7 7 7 8 8 8 8 8 8

3 C21 1 2 3 5 6 6 6 6 6 7 7 8 8 8 8 8

3 C22 1 2 4 4 5 5 6 6 6 7 7 7 7 8 8 8

3 C23 1 2 5 5 5 5 6 6 6 7 7 8 8 8 8 8

3 C24 1 2 3 5 6 7 7 8 8 8 8 8 8 8 8 8

3 C25 1 2 3 5 5 6 6 7 7 8 8 8 8 8 8 8

3 C26 1 2 3 5 5 5 6 6 6 7 8 8 8 8 8 8

3 C27 1 2 4 5 5 6 6 6 6 7 8 8 8 8 8 8

3 C28 1 2 4 5 5 6 6 7 8 8 8 8 8 8 8 8

3 C29 1 2 3 5 5 6 7 7 7 8 8 8 8 8 8 8

3 C30 1 2 4 5 5 6 7 7 7 8 8 8 8 8 8 8

4 D21 1 2 4 5 5 5 6 7 7 8 8 8 8 8 8 8

4 D22 1 2 4 5 5 5 7 7 7 7 7 8 8 8 8 8

4 D23 1 2 4 5 5 6 6 6 7 7 7 8 8 8 8 8

4 D24 1 2 4 5 5 5 6 7 7 7 7 8 8 8 8 8

4 D25 1 2 4 5 5 5 6 6 6 8 8 8 8 8 8 8

4 D26 1 2 3 5 5 5 6 7 7 8 8 8 8 8 8 8

4 D27 1 2 4 5 5 6 6 7 7 8 8 8 8 8 8 8

4 D28 1 2 4 5 6 6 7 7 7 7 7 8 8 8 8 8

4 D29 1 2 5 5 5 6 6 7 7 7 7 8 8 8 8 8

4 D30 1 2 3 5 5 5 6 7 7 8 8 8 8 8 8 8

5 BA21 1 2 4 5 5 5 6 7 7 7 7 8 8 8 8 8

5 BA22 1 2 3 5 5 5 7 7 8 8 8 8 8 8 8 8

5 BA23 1 2 4 5 5 5 7 7 7 7 7 8 8 8 8 8

5 BA24 1 2 3 5 5 5 6 7 7 7 7 8 8 8 8 8

5 BA25 1 2 4 5 6 5 6 7 7 7 7 8 8 8 8 8

5 BA26 1 2 3 3 5 6 7 8 8 8 8 8 8 8 8 8

5 BA27 1 2 3 5 5 6 6 7 7 7 7 8 8 8 8 8

5 BA28 1 2 3 5 5 6 6 7 7 7 8 8 8 8 8 8

5 BA29 1 3 4 5 5 5 6 7 7 8 8 8 8 8 8 8

5 BA30 1 2 3 5 5 5 6 7 7 7 8 8 8 8 8 8

6 CA21 1 2 4 5 6 6 6 7 7 7 7 7 8 8 8 8

6 CA22 1 2 3 5 5 5 6 7 7 7 7 8 8 8 8 8

6 CA23 1 2 4 5 5 5 6 7 7 7 7 8 8 8 8 8

6 CA24 1 2 2 5 6 6 6 7 7 7 7 7 8 8 8 8

6 CA25 1 2 3 5 5 6 6 7 7 7 8 8 8 8 8 8

6 CA26 1 2 4 5 6 6 6 7 7 8 8 8 8 8 8 8

6 CA27 1 2 3 5 6 6 6 7 7 7 7 8 8 8 8 8

6 CA28 1 2 5 5 5 6 6 7 7 7 7 8 8 8 8 8

6 CA29 1 2 3 5 5 6 6 7 7 7 7 8 8 8 8 8

6 CA30 1 2 5 5 5 6 6 7 7 7 7 8 8 8 8 8

7 DA21 1 2 3 3 6 6 6 7 7 7 8 8 8 8 8 8

7 DA22 1 2 3 5 5 5 6 7 7 8 8 8 8 8 8 8

7 DA23 1 2 3 5 6 6 7 7 8 8 8 8 8 8 8 8

7 DA24 1 2 4 5 6 6 6 7 7 7 7 8 8 8 8 8

7 DA25 1 2 3 5 5 5 6 7 7 7 7 8 8 8 8 8

7 DA26 1 2 4 5 5 5 6 7 7 7 7 8 8 8 8 8

7 DA27 1 2 5 6 6 6 6 7 7 8 8 8 8 8 8 8

7 DA28 1 2 3 5 5 6 7 7 8 8 8 8 8 8 8 8

7 DA29 1 2 3 6 6 6 7 7 7 7 8 8 8 8 8 8

7 DA30 1 2 4 5 6 6 6 7 7 7 7 8 8 8 8 8

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8 NC22 1 2 3 5 6 6 6 6 6 7 7 8 8 8 8 8

8 NC23 1 2 4 4 6 6 6 7 7 7 7 7 7 8 8 8

8 NC24 1 2 2 3 5 5 6 7 7 7 7 7 7 8 8 8

8 NC25 1 2 4 5 6 6 6 7 7 7 7 8 8 8 8 8

8 NC26 1 2 4 5 6 6 6 6 7 8 8 8 8 8 8 8

8 NC27 1 2 3 5 5 5 5 6 6 7 8 8 8 8 8 8

8 NC28 1 2 5 6 6 6 6 7 7 7 8 8 8 8 8 8

8 NC29 1 2 3 5 5 6 6 7 7 7 7 7 8 8 8 8

8 NC30 1 2 5 5 5 6 6 7 7 7 7 8 8 8 8 8

9 PC21 1 2 3 5 6 6 6 7 7 7 7 8 8 8 8 8

9 PC22 1 2 3 5 5 6 6 7 7 7 7 8 8 8 8 8

9 PC23 1 2 2 5 6 6 6 7 7 7 7 8 8 8 8 8

9 PC24 1 4 4 5 6 6 6 7 7 7 7 8 8 8 8 8

9 PC25 1 2 3 6 6 6 6 7 7 8 8 8 8 8 8 8

9 PC26 1 2 3 5 5 5 6 7 7 8 8 8 8 8 8 8

9 PC27 1 2 2 5 6 6 6 7 7 8 8 8 8 8 8 8

9 PC28 1 2 3 5 5 5 5 6 7 7 8 8 8 8 8 8

9 PC29 1 2 3 5 6 6 6 8 8 8 8 8 8 8 8 8

9 PC30 1 2 5 5 5 5 5 7 7 7 7 8 8 8 8 8

;

**run**;

**proc** **print** data=all\_treatments\_n\_is30\_head;

**run**;

**proc** **glm** data=all\_treatments\_n\_is30\_head;

Class Group;

model PBS\_0-PBS\_15 = Group/nouni;

repeated logADD;

**run**;

**Output**

**The GLM Procedure**

| **Class Level Information** | | |
| --- | --- | --- |
| **Class** | **Levels** | **Values** |
| **Group** | 9 | 1 2 3 4 5 6 7 8 9 |

|  |  |
| --- | --- |
| **Number of Observations Read** | 270 |
| **Number of Observations Used** | 196 |

**The GLM Procedure**

**Repeated Measures Analysis of Variance**

| **Repeated Measures Level Information** | | | | | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Dependent Variable** | **PBS\_0** | **PBS\_1** | **PBS\_2** | **PBS\_3** | **PBS\_4** | **PBS\_5** | **PBS\_6** | **PBS\_7** | **PBS\_8** | **PBS\_9** | **PBS\_10** | **PBS\_11** | **PBS\_12** | **PBS\_13** | **PBS\_14** | **PBS\_15** |
| **Level of logADD** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |

| **MANOVA Test Criteria and Exact F Statistics for the Hypothesis of no logADD Effect H = Type III SSCP Matrix for logADD E = Error SSCP Matrix  S=1 M=6.5 N=85.5** | | | | | |
| --- | --- | --- | --- | --- | --- |
| **Statistic** | **Value** | **F Value** | **Num DF** | **Den DF** | **Pr > F** |
| **Wilks' Lambda** | 0.0002667 | 43232.7 | 15 | 173 | <.0001 |
| **Pillai's Trace** | 0.9997333 | 43232.7 | 15 | 173 | <.0001 |
| **Hotelling-Lawley Trace** | 3748.5041839 | 43232.7 | 15 | 173 | <.0001 |
| **Roy's Greatest Root** | 3748.5041839 | 43232.7 | 15 | 173 | <.0001 |

| **MANOVA Test Criteria and F Approximations for the Hypothesis of no logADD\*Group Effect H = Type III SSCP Matrix for logADD\*Group E = Error SSCP Matrix  S=8 M=3 N=85.5** | | | | | |
| --- | --- | --- | --- | --- | --- |
| **Statistic** | **Value** | **F Value** | **Num DF** | **Den DF** | **Pr > F** |
| **Wilks' Lambda** | 0.39005599 | 1.47 | 120 | 1243.9 | 0.0013 |
| **Pillai's Trace** | 0.86488654 | 1.45 | 120 | 1440 | 0.0015 |
| **Hotelling-Lawley Trace** | 1.02893917 | 1.47 | 120 | 843.16 | 0.0015 |
| **Roy's Greatest Root** | 0.28833974 | 3.46 | 15 | 180 | <.0001 |
| **NOTE: F Statistic for Roy's Greatest Root is an upper bound.** | | | | | |

**The GLM Procedure**

**Repeated Measures Analysis of Variance**

**Tests of Hypotheses for Between Subjects Effects**

| **Source** | **DF** | **Type III SS** | **Mean Square** | **F Value** | **Pr > F** |
| --- | --- | --- | --- | --- | --- |
| **Group** | 8 | 23.7490417 | 2.9686302 | 1.48 | 0.1654 |
| **Error** | 187 | 374.0940705 | 2.0005031 |  |  |

T**he GLM Procedure**

**Repeated Measures Analysis of Variance**

**Univariate Tests of Hypotheses for Within Subject Effects**

| **Source** | **DF** | **Type III SS** | **Mean Square** | **F Value** | **Pr > F** | **Adj Pr > F** | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **G - G** | **H-F-L** |
| **logADD** | 15 | 13446.37123 | 896.42475 | 4280.04 | <.0001 | <.0001 | <.0001 |
| **logADD\*Group** | 120 | 46.46483 | 0.38721 | 1.85 | <.0001 | 0.0004 | 0.0003 |
| **Error(logADD)** | 2805 | 587.48798 | 0.20944 |  |  |  |  |

|  |  |
| --- | --- |
| **Greenhouse-Geisser Epsilon** | 0.4148 |
| **Huynh-Feldt-Lecoutre Epsilon** | 0.4307 |

**SAS CODE all\_treatments\_n\_is30\_head\_wet**

**data** all\_treatments\_n\_is30\_head\_wet;

input Group ID$ PBS\_0 PBS\_1 PBS\_2 PBS\_3 PBS\_4 PBS\_5 PBS\_6 PBS\_7;

datalines;

1 A1 1 3 5 5 5 6 6 7

1 A2 1 3 3 4 4 5 5 6

1 A3 1 3 5 5 6 6 7 7

1 A4 1 2 3 3 5 5 5 5

1 A5 1 3 3 4 5 6 7 8

1 A6 1 3 4 5 5 6 6 7

1 A7 1 3 5 5 5 5 5 5

1 A8 1 3 4 5 5 5 6 6

1 A9 1 2 3 3 5 5 6 7

1 A10 1 3 5 5 6 7 7 8

2 B1 1 2 2 3 5 6 6 7

2 B2 1 1 2 3 3 3 6 6

2 B3 1 2 3 3 3 3 5 6

2 B4 1 3 3 4 5 5 6 7

2 B5 1 2 3 4 5 5 6 7

2 B6 1 2 3 4 5 5 6 6

2 B7 1 2 2 3 5 6 6 7

2 B8 1 2 3 3 4 4 4 5

2 B9 1 3 4 5 5 5 5 6

2 B10 1 3 3 4 5 6 7 7

3 C1 1 3 4 4 5 5 6 6

3 C2 1 1 2 3 4 4 5 5

3 C3 1 2 3 4 4 5 5 5

3 C4 1 2 3 4 4 5 5 5

3 C5 1 3 4 4 5 5 6 6

3 C6 1 2 3 4 4 4 5 6

3 C7 1 3 3 4 4 5 5 6

3 C8 1 3 3 4 5 5 5 6

3 C9 1 2 4 4 5 5 6 6

3 C10 1 3 4 5 5 6 6 7

4 D1 1 2 2 3 4 5 5 6

4 D2 1 2 3 4 5 5 5 5

4 D3 1 2 3 3 3 4 5 5

4 D4 1 3 4 4 5 5 6 6

4 D5 1 2 3 5 5 6 7 7

4 D6 1 3 4 4 5 5 6 6

4 D7 1 3 4 5 6 6 7 7

4 D8 1 2 3 4 5 5 5 6

4 D9 1 2 3 4 4 5 6 7

4 D10 1 3 4 5 5 6 6 7

5 BA1 1 2 3 5 5 5 6 7

5 BA2 1 3 4 5 5 5 5 6

5 BA3 1 3 4 4 4 4 5 5

5 BA4 1 2 3 4 4 4 5 6

5 BA5 1 3 4 5 5 6 6 6

5 BA6 1 3 3 4 4 5 5 6

5 BA7 1 3 3 4 4 4 5 5

5 BA8 1 2 3 4 4 5 6 6

5 BA9 1 3 3 4 4 4 5 5

5 BA10 1 3 4 4 4 4 5 6

6 CA1 1 3 4 4 5 6 6 6

6 CA2 1 3 3 4 4 5 5 5

6 CA3 1 3 4 4 5 5 5 5

6 CA4 1 3 3 4 5 5 6 7

6 CA5 1 1 2 5 5 6 6 7

6 CA6 1 3 4 4 4 6 6 7

6 CA7 1 3 3 4 5 5 5 6

6 CA8 1 3 5 6 6 7 7 8

6 CA9 1 3 3 4 4 4 6 6

6 CA10 1 3 4 5 5 5 6 6

7 DA1 1 3 4 4 5 5 5 6

7 DA2 1 2 2 3 4 5 5 6

7 DA3 1 1 3 4 5 5 6 6

7 DA4 1 3 4 4 5 6 6 6

7 DA5 1 2 3 4 4 5 6 6

7 DA6 1 3 4 4 5 5 5 6

7 DA7 1 3 3 4 5 5 5 6

7 DA8 1 3 3 4 5 5 5 5

7 DA9 1 1 2 3 4 5 6 6

7 DA10 1 3 4 5 5 6 6 7

8 NC1 1 1 2 2 3 4 5 5

8 NC2 1 3 4 5 5 5 6 6

8 NC3 1 3 4 4 5 5 6 6

8 NC4 1 3 4 5 6 6 6 6

8 NC5 1 3 4 4 5 5 5 5

8 NC6 1 3 4 4 5 5 6 6

8 NC7 1 3 4 5 5 6 6 7

8 NC8 1 3 3 4 5 5 6 6

8 NC9 1 3 4 5 6 6 6 7

8 NC10 1 3 4 4 5 5 5 6

9 PC1 1 3 3 4 5 6 6 7

9 PC2 1 2 3 4 6 6 7 7

9 PC3 1 3 4 4 5 5 5 6

9 PC4 1 2 3 4 5 5 6 6

9 PC5 1 3 4 5 5 5 6 7

9 PC6 1 3 3 4 5 5 6 6

9 PC7 1 2 5 5 5 6 6 7

9 PC8 1 3 4 5 6 6 6 8

9 PC9 1 3 4 5 7 7 8 8

9 PC10 1 3 5 5 6 7 7 7

1 A11 1 3 4 5 5 6 6 6

1 A12 1 2 3 4 5 5 5 5

1 A13 1 3 4 5 5 5 6 6

1 A14 1 3 4 5 5 6 6 7

1 A15 1 3 4 5 6 6 7 7

1 A16 1 2 2 3 3 4 4 6

1 A17 1 4 5 5 6 6 7 7

1 A18 1 3 4 5 5 6 7 7

1 A19 1 3 4 5 6 6 6 7

1 A20 1 3 4 5 5 6 7 8

2 B11 1 3 4 5 6 6 7 7

2 B12 1 1 2 2 3 3 4 5

2 B13 1 3 4 5 6 6 6 7

2 B14 1 3 4 4 5 6 6 7

2 B15 1 3 4 5 5 6 7 7

2 B16 1 3 4 5 5 6 6 7

2 B17 1 3 4 4 5 6 7 7

2 B18 1 3 4 5 6 6 7 7

2 B19 1 4 5 5 6 6 7 7

2 B20 1 3 4 5 6 6 7 7

3 C11 1 3 4 5 5 6 6 7

3 C12 1 3 4 4 5 6 6 6

3 C13 1 3 4 5 5 5 6 6

3 C14 1 3 4 5 6 6 7 7

3 C15 1 3 4 5 5 5 6 6

3 C16 1 3 4 4 5 5 6 6

3 C17 1 4 5 6 7 7 7 7

3 C18 1 3 4 5 5 6 6 6

3 C19 1 3 4 4 6 6 7 7

3 C20 1 3 4 5 6 6 7 8

4 D11 1 2 3 3 4 5 5 6

4 D12 1 3 4 6 6 7 5 8

4 D13 1 3 4 5 5 6 6 7

4 D14 1 3 4 5 5 6 7 7

4 D15 1 3 4 5 6 6 7 7

4 D16 1 3 4 5 5 6 7 6

4 D17 1 3 4 5 6 6 6 6

4 D18 1 3 4 6 6 7 7 7

4 D19 1 2 3 4 5 5 6 7

4 D20 1 2 3 4 5 6 6 6

5 BA11 1 2 3 4 4 4 5 5

5 BA12 1 3 4 4 5 5 6 6

5 BA13 1 2 3 4 5 5 6 6

5 BA14 1 2 3 4 5 5 6 6

5 BA15 1 4 5 5 5 5 6 7

5 BA16 1 3 4 5 5 5 6 6

5 BA17 1 3 4 5 5 5 6 7

5 BA18 1 3 4 5 5 6 6 6

5 BA19 1 2 3 4 5 5 6 6

5 BA20 1 3 4 4 5 5 6 6

6 CA11 1 3 4 5 5 6 6 6

6 CA12 1 3 4 5 6 6 7 7

6 CA13 1 3 4 4 5 6 6 6

6 CA14 1 2 3 4 5 5 5 6

6 CA15 1 2 3 4 5 6 6 7

6 CA16 1 3 4 5 6 7 7 8

6 CA17 1 2 3 4 5 5 6 6

6 CA18 1 3 4 5 6 7 7 7

6 CA19 1 3 4 5 5 6 6 6

6 CA20 1 2 3 4 5 6 6 7

7 DA11 1 2 3 4 4 4 5 6

7 DA12 1 2 3 3 4 4 5 5

7 DA13 1 2 3 4 5 5 6 6

7 DA14 1 2 3 4 4 5 5 6

7 DA15 1 2 3 3 4 4 5 6

7 DA16 1 3 4 5 6 6 7 7

7 DA17 1 3 4 4 5 5 6 6

7 DA18 1 3 4 4 5 6 6 7

7 DA19 1 5 5 6 6 6 7 7

7 DA20 1 3 3 4 5 6 6 6

8 NC11 1 3 4 4 5 6 6 7

8 NC12 1 2 3 3 4 5 5 6

8 NC13 1 3 3 4 5 5 6 7

8 NC14 1 3 4 5 5 7 7 8

8 NC15 1 3 3 3 4 4 5 6

8 NC16 1 2 3 4 5 6 7 7

8 NC17 1 2 3 4 5 6 6 7

8 NC18 1 2 3 6 7 7 8 8

8 NC19 1 3 4 5 6 6 7 7

8 NC20 1 2 3 4 5 5 6 7

9 PC11 1 2 3 3 4 5 5 6

9 PC12 1 2 3 4 5 5 6 6

9 PC13 1 4 4 5 5 6 6 7

9 PC14 1 3 4 5 5 6 7 7

9 PC15 1 3 4 5 5 6 7 7

9 PC16 1 3 4 4 5 6 6 7

9 PC17 1 4 4 5 5 6 6 7

9 PC18 1 2 3 4 4 5 6 6

9 PC19 1 3 4 5 5 6 6 7

9 PC20 1 3 4 5 5 5 6 6

1 A21 1 2 2 3 5 5 5 7

1 A22 1 2 3 3 5 6 6 7

1 A23 1 2 2 3 4 5 6 7

1 A24 1 2 3 3 5 5 6 7

1 A25 1 2 4 5 5 5 6 7

1 A26 1 2 3 3 5 5 6 6

1 A27 1 2 3 5 5 6 7 7

1 A28 1 2 4 5 5 7 7 7

1 A29 1 2 3 4 5 5 7 7

1 A30 1 2 3 4 5 5 6 6

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2 B22 1 2 4 5 5 5 6 7

2 B23 1 2 3 5 5 5 6 7

2 B24 1 2 4 4 5 5 6 7

2 B25 1 2 4 5 5 5 7 7

2 B26 1 2 3 5 5 5 6 7

2 B27 1 2 3 5 5 5 6 7

2 B28 1 2 3 5 5 5 6 7

2 B29 1 2 4 5 5 5 6 7

2 B30 1 2 4 5 5 5 7 7

3 C21 1 2 3 5 6 6 6 6

3 C22 1 2 4 4 5 5 6 6

3 C23 1 2 5 5 5 5 6 6

3 C24 1 2 3 5 6 7 7 8

3 C25 1 2 3 5 5 6 6 7

3 C26 1 2 3 5 5 5 6 6

3 C27 1 2 4 5 5 6 6 6

3 C28 1 2 4 5 5 6 6 7

3 C29 1 2 3 5 5 6 7 7

3 C30 1 2 4 5 5 6 7 7

4 D21 1 2 4 5 5 5 6 7

4 D22 1 2 4 5 5 5 7 7

4 D23 1 2 4 5 5 6 6 6

4 D24 1 2 4 5 5 5 6 7

4 D25 1 2 4 5 5 5 6 6

4 D26 1 2 3 5 5 5 6 7

4 D27 1 2 4 5 5 6 6 7

4 D28 1 2 4 5 6 6 7 7

4 D29 1 2 5 5 5 6 6 7

4 D30 1 2 3 5 5 5 6 7

5 BA21 1 2 4 5 5 5 6 7

5 BA22 1 2 3 5 5 5 7 7

5 BA23 1 2 4 5 5 5 7 7

5 BA24 1 2 3 5 5 5 6 7

5 BA25 1 2 4 5 6 5 6 7

5 BA26 1 2 3 3 5 6 7 8

5 BA27 1 2 3 5 5 6 6 7

5 BA28 1 2 3 5 5 6 6 7

5 BA29 1 3 4 5 5 5 6 7

5 BA30 1 2 3 5 5 5 6 7

6 CA21 1 2 4 5 6 6 6 7

6 CA22 1 2 3 5 5 5 6 7

6 CA23 1 2 4 5 5 5 6 7

6 CA24 1 2 2 5 6 6 6 7

6 CA25 1 2 3 5 5 6 6 7

6 CA26 1 2 4 5 6 6 6 7

6 CA27 1 2 3 5 6 6 6 7

6 CA28 1 2 5 5 5 6 6 7

6 CA29 1 2 3 5 5 6 6 7

6 CA30 1 2 5 5 5 6 6 7

7 DA21 1 2 3 3 6 6 6 7

7 DA22 1 2 3 5 5 5 6 7

7 DA23 1 2 3 5 6 6 7 7

7 DA24 1 2 4 5 6 6 6 7

7 DA25 1 2 3 5 5 5 6 7

7 DA26 1 2 4 5 5 5 6 7

7 DA27 1 2 5 6 6 6 6 7

7 DA28 1 2 3 5 5 6 7 7

7 DA29 1 2 3 6 6 6 7 7

7 DA30 1 2 4 5 6 6 6 7

8 NC21 1 2 2 5 6 6 6 7

8 NC22 1 2 3 5 6 6 6 6

8 NC23 1 2 4 4 6 6 6 7

8 NC24 1 2 2 3 5 5 6 7

8 NC25 1 2 4 5 6 6 6 7

8 NC26 1 2 4 5 6 6 6 6

8 NC27 1 2 3 5 5 5 5 6

8 NC28 1 2 5 6 6 6 6 7

8 NC29 1 2 3 5 5 6 6 7

8 NC30 1 2 5 5 5 6 6 7

9 PC21 1 2 3 5 6 6 6 7

9 PC22 1 2 3 5 5 6 6 7

9 PC23 1 2 2 5 6 6 6 7

9 PC24 1 4 4 5 6 6 6 7

9 PC25 1 2 3 6 6 6 6 7

9 PC26 1 2 3 5 5 5 6 7

9 PC27 1 2 2 5 6 6 6 7

9 PC28 1 2 3 5 5 5 5 6

9 PC29 1 2 3 5 6 6 6 8

9 PC30 1 2 5 5 5 5 5 7

;

**run**;

**proc** **glm** data=all\_treatments\_n\_is30\_head\_wet;

Class Group;

model PBS\_0-PBS\_7 = Group/nouni;

repeated logADD;

run;

**Output**

**The GLM Procedure**

| **Class Level Information** | | |
| --- | --- | --- |
| **Class** | **Levels** | **Values** |
| **Group** | 9 | 1 2 3 4 5 6 7 8 9 |

|  |  |
| --- | --- |
| **Number of Observations Read** | 270 |
| **Number of Observations Used** | 270 |

**The GLM Procedure**

**Repeated Measures Analysis of Variance**

| **Repeated Measures Level Information** | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Dependent Variable** | **PBS\_0** | **PBS\_1** | **PBS\_2** | **PBS\_3** | **PBS\_4** | **PBS\_5** | **PBS\_6** | **PBS\_7** |
| **Level of logADD** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

| **MANOVA Test Criteria and Exact F Statistics for the Hypothesis of no logADD Effect H = Type III SSCP Matrix for logADD E = Error SSCP Matrix  S=1 M=2.5 N=126.5** | | | | | |
| --- | --- | --- | --- | --- | --- |
| **Statistic** | **Value** | **F Value** | **Num DF** | **Den DF** | **Pr > F** |
| **Wilks' Lambda** | 0.01293136 | 2780.64 | 7 | 255 | <.0001 |
| **Pillai's Trace** | 0.98706864 | 2780.64 | 7 | 255 | <.0001 |
| **Hotelling-Lawley Trace** | 76.33139503 | 2780.64 | 7 | 255 | <.0001 |
| **Roy's Greatest Root** | 76.33139503 | 2780.64 | 7 | 255 | <.0001 |

| **MANOVA Test Criteria and F Approximations for the Hypothesis of no logADD\*Group Effect H = Type III SSCP Matrix for logADD\*Group E = Error SSCP Matrix  S=7 M=0 N=126.5** | | | | | |
| --- | --- | --- | --- | --- | --- |
| **Statistic** | **Value** | **F Value** | **Num DF** | **Den DF** | **Pr > F** |
| **Wilks' Lambda** | 0.68150138 | 1.82 | 56 | 1378.5 | 0.0003 |
| **Pillai's Trace** | 0.36253857 | 1.78 | 56 | 1827 | 0.0004 |
| **Hotelling-Lawley Trace** | 0.40649742 | 1.84 | 56 | 904.57 | 0.0002 |
| **Roy's Greatest Root** | 0.19086134 | 6.23 | 8 | 261 | <.0001 |
| **NOTE: F Statistic for Roy's Greatest Root is an upper bound.** | | | | | |

**The GLM Procedure**

**Repeated Measures Analysis of Variance**

**Tests of Hypotheses for Between Subjects Effects**

| **Source** | **DF** | **Type III SS** | **Mean Square** | **F Value** | **Pr > F** |
| --- | --- | --- | --- | --- | --- |
| **Group** | 8 | 15.9287037 | 1.9910880 | 1.24 | 0.2760 |
| **Error** | 261 | 419.1250000 | 1.6058429 |  |  |

**The GLM Procedure**

**Repeated Measures Analysis of Variance**

**Univariate Tests of Hypotheses for Within Subject Effects**

| **Source** | **DF** | **Type III SS** | **Mean Square** | **F Value** | **Pr > F** | **Adj Pr > F** | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **G - G** | **H-F-L** |
| **logADD** | 7 | 6692.325926 | 956.046561 | 3756.27 | <.0001 | <.0001 | <.0001 |
| **logADD\*Group** | 56 | 23.915741 | 0.427067 | 1.68 | 0.0014 | 0.0062 | 0.0058 |
| **Error(logADD)** | 1827 | 465.008333 | 0.254520 |  |  |  |  |

|  |  |
| --- | --- |
| **Greenhouse-Geisser Epsilon** | 0.6876 |
| **Huynh-Feldt-Lecoutre Epsilon** | 0.7021 |

**SAS code all\_treatments\_n\_is30\_head\_dry**

**data** all\_treatments\_n\_is30\_head\_dry;

input Group ID$ PBS\_8 PBS\_9 PBS\_10 PBS\_11 PBS\_12 PBS\_13 PBS\_14 PBS\_15;

datalines;

1 A1 7 8 8 8 8 8 8 8

1 A2 6 7 7 7 8 8 8 8

1 A3 8 8 8 8 8 8 8 8

1 A4 6 6 6 6 7 8 8 8

1 A5 8 8 8 8 8 8 8 8

1 A6 7 7 8 8 8 8 8 8

1 A7 7 7 7 8 8 8 8 8

1 A8 7 7 7 8 8 8 8 8

1 A9 7 8 8 8 8 8 8 8

1 A10 8 8 8 8 8 8 8 8

2 B1 8 8 8 8 8 8 8 8

2 B2 6 7 7 7 8 8 8 8

2 B3 6 8 8 8 8 8 8 8

2 B4 7 8 8 8 8 8 8 8

2 B5 7 8 8 8 8 8 8 8

2 B6 7 7 8 8 8 8 8 8

2 B7 7 8 8 8 8 8 8 8

2 B8 5 6 6 7 7 7 8 8

2 B9 6 7 7 7 8 8 8 8

2 B10 8 8 8 8 8 8 8 8

3 C1 7 7 7 7 8 8 8 8

3 C2 6 6 7 7 7 8 8 8

3 C3 6 6 7 7 7 7 7 8

3 C4 6 6 6 7 7 7 8 8

3 C5 6 7 7 7 8 8 8 8

3 C6 6 6 6 6 7 7 8 8

3 C7 7 7 7 8 8 8 8 8

3 C8 6 7 8 8 8 8 8 8

3 C9 6 7 7 8 8 8 8 8

3 C10 8 8 8 8 8 8 8 8

4 D1 6 6 6 7 7 8 8 8

4 D2 6 6 7 7 7 8 8 8

4 D3 5 6 6 6 7 7 7 7

4 D4 6 7 7 7 8 8 8 8

4 D5 8 8 8 8 8 8 8 8

4 D6 6 7 7 7 7 7 7 8

4 D7 7 8 8 8 8 8 8 8

4 D8 6 7 7 7 7 8 8 8

4 D9 7 8 8 8 8 8 8 8

4 D10 7 8 8 8 8 8 8 8

5 BA1 7 7 7 7 8 8 8 8

5 BA2 6 6 7 8 8 8 8 8

5 BA3 5 6 6 7 7 8 8 8

5 BA4 6 6 7 8 8 8 8 8

5 BA5 6 7 7 7 8 8 8 8

5 BA6 6 7 7 7 7 8 8 8

5 BA7 5 6 6 7 7 8 8 8

5 BA8 6 7 7 7 7 7 7 7

5 BA9 5 6 6 6 7 7 7 8

5 BA10 6 7 7 7 8 8 8 8

6 CA1 6 7 7 7 8 8 8 8

6 CA2 6 6 7 8 8 8 8 8

6 CA3 6 6 7 7 8 8 8 8

6 CA4 7 7 7 7 8 8 8 8

6 CA5 7 8 8 8 8 8 8 8

6 CA6 7 8 8 8 8 8 8 8

6 CA7 7 8 8 8 8 8 8 8

6 CA8 8 8 8 8 8 8 8 8

6 CA9 6 7 7 8 8 8 8 8

6 CA10 6 7 7 7 8 8 8 8

7 DA1 6 6 7 8 8 8 8 8

7 DA2 6 7 8 8 8 8 8 8

7 DA3 6 7 7 7 7 7 8 8

7 DA4 6 7 7 7 8 8 8 8

7 DA5 7 7 8 8 8 8 8 8

7 DA6 6 7 7 7 7 8 8 8

7 DA7 6 7 7 7 8 8 8 8

7 DA8 5 6 7 7 8 8 8 8

7 DA9 6 7 7 7 7 8 8 8

7 DA10 7 8 8 8 8 8 8 8

8 NC1 5 6 6 6 6 7 8 8

8 NC2 6 7 7 7 8 8 8 8

8 NC3 6 7 7 7 8 8 8 8

8 NC4 7 7 7 7 7 8 8 8

8 NC5 6 6 6 7 7 7 8 8

8 NC6 6 7 7 7 7 8 8 8

8 NC7 7 7 8 8 8 8 8 8

8 NC8 6 7 7 7 8 8 8 8

8 NC9 7 8 8 8 8 8 8 8

8 NC10 6 7 7 8 8 8 8 8

9 PC1 7 7 8 8 8 8 8 8

9 PC2 7 8 8 8 8 8 8 8

9 PC3 6 7 7 7 7 8 8 8

9 PC4 7 7 8 8 8 8 8 8

9 PC5 7 7 8 8 8 8 8 8

9 PC6 7 7 7 8 8 8 8 8

9 PC7 7 8 8 8 8 8 8 8

9 PC8 8 8 8 8 8 8 8 8

9 PC9 8 8 8 8 8 8 8 8

9 PC10 7 7 7 8 8 8 8 8

1 A11 7 7 7 8 8 8 8 8

1 A12 6 6 6 7 7 8 8 8

1 A13 7 7 7 7 8 8 8 8

1 A14 7 7 7 7 8 8 8 8

1 A15 7 8 8 8 8 8 8 8

1 A16 6 6 6 6 6 6 6 7

1 A17 8 8 8 8 8 8 8 8

1 A18 7 7 8 8 8 8 8 8

1 A19 7 7 7 8 8 8 8 8

1 A20 8 8 8 8 8 8 8 8

2 B11 7 7 8 8 8 8 8 8

2 B12 5 6 6 6 6 8 8 8

2 B13 7 7 7 8 8 8 8 8

2 B14 7 7 8 8 8 8 8 8

2 B15 7 8 8 8 8 8 8 8

2 B16 7 8 8 8 8 8 8 8

2 B17 7 7 7 8 . 8 8 8

2 B18 7 8 8 8 . 8 8 8

2 B19 8 8 8 8 . 8 8 8

2 B20 7 8 8 8 . 8 8 8

3 C11 7 7 8 8 . 8 8 8

3 C12 7 7 8 8 . 8 8 8

3 C13 7 8 8 8 . 8 8 8

3 C14 7 8 8 8 . 8 8 8

3 C15 7 7 8 8 . 8 8 8

3 C16 7 7 7 7 . 8 8 8

3 C17 8 8 8 8 . 8 8 8

3 C18 7 8 8 8 . 8 8 8

3 C19 7 8 8 8 . 8 8 8

3 C20 8 8 8 8 . 8 8 8

4 D11 7 7 7 8 . 8 8 8

4 D12 8 8 8 8 . 8 8 8

4 D13 7 8 8 8 . 8 8 8

4 D14 7 7 8 8 . 8 8 8

4 D15 8 8 8 8 . 8 8 8

4 D16 7 7 7 8 . 8 8 8

4 D17 7 8 8 8 . 8 8 8

4 D18 8 8 8 8 . 8 8 8

4 D19 7 8 8 8 . 8 8 8

4 D20 7 7 7 8 . 8 8 8

5 BA11 6 6 6 7 . 7 8 8

5 BA12 7 7 7 8 . 8 8 8

5 BA13 6 6 7 7 . 7 8 8

5 BA14 6 7 7 7 . 8 8 8

5 BA15 7 7 7 8 . 8 8 8

5 BA16 7 7 7 7 . 8 8 8

5 BA17 8 8 8 8 . 8 8 8

5 BA18 7 7 7 7 . 8 8 8

5 BA19 6 7 7 7 . 8 8 8

5 BA20 6 7 7 8 . 8 8 8

6 CA11 7 7 7 8 . 8 8 8

6 CA12 7 7 8 8 . 8 8 8

6 CA13 7 7 7 8 . 8 8 8

6 CA14 6 6 6 7 . 8 8 8

6 CA15 7 7 7 8 . 8 8 8

6 CA16 8 8 8 8 . 8 8 8

6 CA17 6 7 6 6 . 7 8 8

6 CA18 8 8 8 8 . 8 8 8

6 CA19 7 7 7 7 . 8 8 8

6 CA20 7 7 8 8 . 8 8 8

7 DA11 6 7 7 8 . 8 8 8

7 DA12 6 6 7 7 . 8 8 8

7 DA13 6 6 7 7 . 8 8 8

7 DA14 6 7 7 8 . 8 8 8

7 DA15 6 7 7 7 . 8 8 8

7 DA16 7 7 7 8 . 8 8 8

7 DA17 7 7 7 7 . 8 8 8

7 DA18 7 7 7 8 . 8 8 8

7 DA19 7 8 8 8 . 8 8 8

7 DA20 7 7 7 8 . 8 8 8

8 NC11 7 7 8 8 . 8 8 8

8 NC12 7 8 8 8 . 8 8 8

8 NC13 7 8 8 8 . 8 8 8

8 NC14 8 8 8 8 . 8 8 8

8 NC15 7 7 8 8 . 8 8 8

8 NC16 7 8 8 8 . 8 8 8

8 NC17 8 8 8 8 . 8 8 8

8 NC18 8 8 8 8 . 8 8 8

8 NC19 8 8 8 8 . 8 8 8

8 NC20 8 8 8 8 . 8 8 8

9 PC11 6 6 7 8 . 8 8 8

9 PC12 7 7 8 8 . 8 8 8

9 PC13 7 8 8 8 . 8 8 8

9 PC14 7 8 8 8 . 8 8 8

9 PC15 7 8 8 8 . 8 8 8

9 PC16 7 8 8 8 . 8 8 8

9 PC17 8 8 8 8 . 8 8 8

9 PC18 7 7 8 8 . 8 8 8

9 PC19 7 7 7 8 . 8 8 8

9 PC20 7 7 8 8 . 8 8 8

1 A21 7 8 8 8 8 8 8 8

1 A22 7 7 7 8 8 8 8 8

1 A23 7 7 7 7 8 8 8 8

1 A24 7 7 7 8 8 8 8 8

1 A25 7 7 7 8 8 8 8 8

1 A26 6 7 7 8 8 8 8 8

1 A27 7 8 8 8 8 8 8 8

1 A28 7 7 8 8 8 8 8 8

1 A29 7 8 8 8 8 8 8 8

1 A30 6 7 8 8 8 8 8 8

2 B21 7 8 8 8 8 8 8 8

2 B22 7 7 7 7 7 8 8 8

2 B23 7 8 8 8 8 8 8 8

2 B24 7 8 8 8 8 8 8 8

2 B25 7 8 8 8 8 8 8 8

2 B26 7 8 8 8 8 8 8 8

2 B27 7 8 8 8 8 8 8 8

2 B28 7 7 8 8 8 8 8 8

2 B29 7 7 8 8 8 8 8 8

2 B30 7 7 8 8 8 8 8 8

3 C21 6 7 7 8 8 8 8 8

3 C22 6 7 7 7 7 8 8 8

3 C23 6 7 7 8 8 8 8 8

3 C24 8 8 8 8 8 8 8 8

3 C25 7 8 8 8 8 8 8 8

3 C26 6 7 8 8 8 8 8 8

3 C27 6 7 8 8 8 8 8 8

3 C28 8 8 8 8 8 8 8 8

3 C29 7 8 8 8 8 8 8 8

3 C30 7 8 8 8 8 8 8 8

4 D21 7 8 8 8 8 8 8 8

4 D22 7 7 7 8 8 8 8 8

4 D23 7 7 7 8 8 8 8 8

4 D24 7 7 7 8 8 8 8 8

4 D25 6 8 8 8 8 8 8 8

4 D26 7 8 8 8 8 8 8 8

4 D27 7 8 8 8 8 8 8 8

4 D28 7 7 7 8 8 8 8 8

4 D29 7 7 7 8 8 8 8 8

4 D30 7 8 8 8 8 8 8 8

5 BA21 7 7 7 8 8 8 8 8

5 BA22 8 8 8 8 8 8 8 8

5 BA23 7 7 7 8 8 8 8 8

5 BA24 7 7 7 8 8 8 8 8

5 BA25 7 7 7 8 8 8 8 8

5 BA26 8 8 8 8 8 8 8 8

5 BA27 7 7 7 8 8 8 8 8

5 BA28 7 7 8 8 8 8 8 8

5 BA29 7 8 8 8 8 8 8 8

5 BA30 7 7 8 8 8 8 8 8

6 CA21 7 7 7 7 8 8 8 8

6 CA22 7 7 7 8 8 8 8 8

6 CA23 7 7 7 8 8 8 8 8

6 CA24 7 7 7 7 8 8 8 8

6 CA25 7 7 8 8 8 8 8 8

6 CA26 7 8 8 8 8 8 8 8

6 CA27 7 7 7 8 8 8 8 8

6 CA28 7 7 7 8 8 8 8 8

6 CA29 7 7 7 8 8 8 8 8

6 CA30 7 7 7 8 8 8 8 8

7 DA21 7 7 8 8 8 8 8 8

7 DA22 7 8 8 8 8 8 8 8

7 DA23 8 8 8 8 8 8 8 8

7 DA24 7 7 7 8 8 8 8 8

7 DA25 7 7 7 8 8 8 8 8

7 DA26 7 7 7 8 8 8 8 8

7 DA27 7 8 8 8 8 8 8 8

7 DA28 8 8 8 8 8 8 8 8

7 DA29 7 7 8 8 8 8 8 8

7 DA30 7 7 7 8 8 8 8 8

8 NC21 7 7 7 8 8 8 8 8

8 NC22 6 7 7 8 8 8 8 8

8 NC23 7 7 7 7 7 8 8 8

8 NC24 7 7 7 7 7 8 8 8

8 NC25 7 7 7 8 8 8 8 8

8 NC26 7 8 8 8 8 8 8 8

8 NC27 6 7 8 8 8 8 8 8

8 NC28 7 7 8 8 8 8 8 8

8 NC29 7 7 7 7 8 8 8 8

8 NC30 7 7 7 8 8 8 8 8

9 PC21 7 7 7 8 8 8 8 8

9 PC22 7 7 7 8 8 8 8 8

9 PC23 7 7 7 8 8 8 8 8

9 PC24 7 7 7 8 8 8 8 8

9 PC25 7 8 8 8 8 8 8 8

9 PC26 7 8 8 8 8 8 8 8

9 PC27 7 8 8 8 8 8 8 8

9 PC28 7 7 8 8 8 8 8 8

9 PC29 8 8 8 8 8 8 8 8

9 PC30 7 7 7 8 8 8 8 8

;

**run**;

**proc** **glm** data=all\_treatments\_n\_is30\_head\_dry;

Class Group;

model PBS\_8-PBS\_15 = Group/nouni;

repeated logADD;

**run**;

**Output**

**The GLM Procedure**

| **Class Level Information** | | |
| --- | --- | --- |
| **Class** | **Levels** | **Values** |
| **Group** | 9 | 1 2 3 4 5 6 7 8 9 |

|  |  |
| --- | --- |
| **Number of Observations Read** | 270 |
| **Number of Observations Used** | 196 |

**The GLM Procedure**

**Repeated Measures Analysis of Variance**

| **Repeated Measures Level Information** | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Dependent Variable** | **PBS\_8** | **PBS\_9** | **PBS\_10** | **PBS\_11** | **PBS\_12** | **PBS\_13** | **PBS\_14** | **PBS\_15** |
| **Level of logADD** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

| **MANOVA Test Criteria and Exact F Statistics for the Hypothesis of no logADD Effect H = Type III SSCP Matrix for logADD E = Error SSCP Matrix  S=1 M=2.5 N=89.5** | | | | | |
| --- | --- | --- | --- | --- | --- |
| **Statistic** | **Value** | **F Value** | **Num DF** | **Den DF** | **Pr > F** |
| **Wilks' Lambda** | 0.18613507 | 113.06 | 7 | 181 | <.0001 |
| **Pillai's Trace** | 0.81386493 | 113.06 | 7 | 181 | <.0001 |
| **Hotelling-Lawley Trace** | 4.37244280 | 113.06 | 7 | 181 | <.0001 |
| **Roy's Greatest Root** | 4.37244280 | 113.06 | 7 | 181 | <.0001 |

| **MANOVA Test Criteria and F Approximations for the Hypothesis of no logADD\*Group Effect H = Type III SSCP Matrix for logADD\*Group E = Error SSCP Matrix  S=7 M=0 N=89.5** | | | | | |
| --- | --- | --- | --- | --- | --- |
| **Statistic** | **Value** | **F Value** | **Num DF** | **Den DF** | **Pr > F** |
| **Wilks' Lambda** | 0.70447474 | 1.18 | 56 | 980.03 | 0.1807 |
| **Pillai's Trace** | 0.33510684 | 1.18 | 56 | 1309 | 0.1798 |
| **Hotelling-Lawley Trace** | 0.36668995 | 1.18 | 56 | 636.4 | 0.1856 |
| **Roy's Greatest Root** | 0.14763288 | 3.45 | 8 | 187 | 0.0010 |
| **NOTE: F Statistic for Roy's Greatest Root is an upper bound.** | | | | | |

The GLM Procedure

Repeated Measures Analysis of Variance

Tests of Hypotheses for Between Subjects Effects

| **Source** | **DF** | **Type III SS** | **Mean Square** | **F Value** | **Pr > F** |
| --- | --- | --- | --- | --- | --- |
| **Group** | 8 | 14.0547652 | 1.7568456 | 1.92 | 0.0593 |
| **Error** | 187 | 171.1410256 | 0.9151927 |  |  |

The GLM Procedure

Repeated Measures Analysis of Variance

Univariate Tests of Hypotheses for Within Subject Effects

| **Source** | **DF** | **Type III SS** | **Mean Square** | **F Value** | **Pr > F** | **Adj Pr > F** | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **G - G** | **H-F-L** |
| **logADD** | 7 | 274.1762840 | 39.1680406 | 313.09 | <.0001 | <.0001 | <.0001 |
| **logADD\*Group** | 56 | 11.8360512 | 0.2113581 | 1.69 | 0.0013 | 0.0183 | 0.0174 |
| **Error(logADD)** | 1309 | 163.7589744 | 0.1251023 |  |  |  |  |

|  |  |
| --- | --- |
| **Greenhouse-Geisser Epsilon** | 0.4638 |
| **Huynh-Feldt-Lecoutre Epsilon** | 0.4729 |

SAS Code Torso wet

**data** all\_treatments\_n\_is30\_torso\_wet;

input Group ID$ PBS\_0 PBS\_1 PBS\_2 PBS\_3 PBS\_4 PBS\_5 PBS\_6 PBS\_7;

datalines;

1 A1 1 4 4 4 5 5 5 6

1 A2 1 2 3 4 4 5 5 6

1 A3 1 3 4 5 6 7 7 7

1 A4 1 2 3 4 5 5 6 6

1 A5 1 3 3 4 4 5 5 6

1 A6 1 2 3 4 4 4 5 5

1 A7 1 3 3 4 5 5 5 5

1 A8 1 3 4 4 4 4 5 5

1 A9 1 3 4 5 5 5 6 6

1 A10 1 3 4 4 5 6 6 7

2 B1 1 2 3 4 4 5 5 6

2 B2 1 4 4 5 5 5 6 6

2 B3 1 3 4 4 4 4 4 5

2 B4 1 3 4 4 4 5 6 6

2 B5 1 2 3 5 6 6 7 7

2 B6 1 3 4 5 5 5 5 6

2 B7 1 3 4 4 4 5 5 5

2 B8 1 2 3 4 4 5 5 6

2 B9 1 3 3 5 5 5 5 6

2 B10 1 3 4 4 5 5 6 6

3 C1 1 3 4 4 5 5 5 7

3 C2 1 3 4 4 5 5 5 6

3 C3 1 3 3 4 4 5 5 6

3 C4 1 2 3 4 4 4 5 5

3 C5 1 3 4 5 5 5 6 6

3 C6 1 3 4 4 4 5 5 6

3 C7 1 3 4 4 5 6 6 7

3 C8 1 3 4 4 5 5 6 6

3 C9 1 2 3 4 5 5 6 7

3 C10 1 3 4 5 5 6 6 7

4 D1 1 3 3 4 4 5 5 6

4 D2 1 2 3 4 5 5 6 6

4 D3 1 3 4 4 5 5 5 6

4 D4 1 3 4 4 4 5 6 6

4 D5 1 2 3 4 5 5 6 6

4 D6 1 3 3 4 5 5 6 6

4 D7 1 3 4 5 6 6 7 7

4 D8 1 3 4 4 4 5 6 6

4 D9 1 2 3 4 5 6 6 7

4 D10 1 3 4 5 5 5 6 7

5 BA1 1 3 4 4 5 5 6 6

5 BA2 1 2 4 4 5 5 5 6

5 BA3 1 3 4 5 5 5 5 6

5 BA4 1 2 3 4 4 5 6 6

5 BA5 1 4 4 5 5 6 6 6

5 BA6 1 3 4 4 5 6 6 7

5 BA7 1 2 4 4 5 5 5 6

5 BA8 1 3 4 4 4 4 5 5

5 BA9 1 3 4 4 5 5 6 6

5 BA10 1 4 5 5 6 6 6 7

6 CA1 1 3 4 5 5 6 6 7

6 CA2 1 3 4 5 5 6 6 6

6 CA3 1 2 3 4 4 5 6 6

6 CA4 1 2 3 4 5 6 6 7

6 CA5 1 2 3 4 5 6 6 7

6 CA6 1 3 4 4 5 5 6 6

6 CA7 1 3 4 4 5 5 6 6

6 CA8 1 4 5 5 6 6 7 7

6 CA9 1 3 4 5 5 5 6 6

6 CA10 1 3 4 4 5 5 6 6

7 DA1 1 3 4 4 5 6 7 7

7 DA2 1 2 3 4 4 5 5 6

7 DA3 1 3 4 4 5 5 6 6

7 DA4 1 2 3 4 4 5 5 5

7 DA5 1 2 3 4 4 5 6 6

7 DA6 1 2 3 4 5 6 6 6

7 DA7 1 2 3 4 4 5 5 6

7 DA8 1 2 3 4 5 5 6 7

7 DA9 1 2 3 4 4 5 5 6

7 DA10 1 3 4 5 6 6 6 7

8 NC1 1 2 3 4 4 5 5 6

8 NC2 1 3 4 4 5 5 6 6

8 NC3 1 3 4 5 5 6 6 6

8 NC4 1 3 3 4 5 6 6 6

8 NC5 1 3 4 4 5 5 6 6

8 NC6 1 3 4 4 5 5 6 6

8 NC7 1 3 4 5 5 6 6 7

8 NC8 1 2 3 4 5 5 6 6

8 NC9 1 3 4 5 6 6 7 7

8 NC10 1 4 5 5 5 5 5 6

9 PC1 1 2 3 3 4 4 5 6

9 PC2 1 2 3 4 5 5 6 6

9 PC3 1 3 4 4 5 5 6 6

9 PC4 1 3 3 4 4 5 5 5

9 PC5 1 4 4 4 5 6 6 7

9 PC6 1 3 3 4 5 5 6 6

9 PC7 1 2 3 4 5 6 6 6

9 PC8 1 4 5 6 6 6 6 7

9 PC9 1 3 3 4 5 5 6 6

9 PC10 1 4 5 5 6 7 7 7

1 A11 1 3 4 5 5 6 6 6

1 A12 1 2 3 4 4 5 5 5

1 A13 1 4 4 4 4 5 5 5

1 A14 1 4 4 5 5 5 6 6

1 A15 1 3 4 5 5 6 6 6

1 A16 1 2 3 4 4 4 5 5

1 A17 1 4 5 5 6 6 7 7

1 A18 1 3 4 5 6 6 7 7

1 A19 1 2 3 4 4 5 5 6

1 A20 1 4 4 5 5 5 6 6

2 B11 1 3 4 4 5 6 6 6

2 B12 1 2 3 3 4 4 5 5

2 B13 1 3 3 4 4 6 6 7

2 B14 1 4 5 5 6 6 6 6

2 B15 1 2 4 5 5 6 6 6

2 B16 1 4 5 5 6 6 6 7

2 B17 1 4 5 5 6 6 6 7

2 B18 1 4 5 5 5 6 7 7

2 B19 1 4 5 5 6 6 7 7

2 B20 1 4 5 5 6 6 7 7

3 C11 1 3 4 5 6 6 7 7

3 C12 1 4 4 5 5 6 6 6

3 C13 1 4 4 5 5 6 7 7

3 C14 1 4 5 5 6 6 6 6

3 C15 1 3 4 5 6 6 6 6

3 C16 1 3 4 4 5 6 6 6

3 C17 1 3 5 5 6 6 6 6

3 C18 1 2 4 4 4 5 5 6

3 C19 1 4 4 5 6 6 6 7

3 C20 1 4 5 5 6 6 6 7

4 D11 1 3 3 4 4 5 6 6

4 D12 1 4 4 5 6 6 6 7

4 D13 1 4 4 5 5 5 6 6

4 D14 1 2 3 4 4 5 6 6

4 D15 1 4 4 5 5 6 6 7

4 D16 1 4 4 4 5 6 6 7

4 D17 1 4 4 4 5 5 6 6

4 D18 1 4 5 5 6 6 7 7

4 D19 1 3 4 4 5 6 6 7

4 D20 1 3 4 4 4 5 6 6

5 BA11 1 2 3 3 4 4 4 5

5 BA12 1 2 3 4 4 4 5 5

5 BA13 1 4 4 4 5 6 6 6

5 BA14 1 3 4 4 5 5 6 6

5 BA15 1 4 5 5 6 6 7 7

5 BA16 1 4 4 5 5 5 6 6

5 BA17 1 3 4 4 5 5 6 6

5 BA18 1 4 4 5 5 6 6 6

5 BA19 1 2 4 4 5 6 6 6

5 BA20 1 3 4 4 4 4 5 5

6 CA11 1 3 4 4 4 5 5 5

6 CA12 1 3 4 4 5 5 5 6

6 CA13 1 3 4 4 5 5 6 6

6 CA14 1 3 4 4 5 5 5 6

6 CA15 1 3 4 4 5 5 5 6

6 CA16 1 4 4 4 5 5 6 6

6 CA17 1 3 4 4 5 5 6 6

6 CA18 1 4 4 5 5 6 6 7

6 CA19 1 2 3 4 5 5 5 6

6 CA20 1 3 4 5 6 6 7 7

7 DA11 1 3 3 4 4 5 6 6

7 DA12 1 3 3 4 4 4 5 5

7 DA13 1 2 3 4 4 5 5 6

7 DA14 1 3 3 4 4 5 5 6

7 DA15 1 2 3 4 5 5 5 6

7 DA16 1 3 4 4 5 6 6 6

7 DA17 1 2 3 4 5 5 6 6

7 DA18 1 2 3 4 4 5 5 6

7 DA19 1 4 5 5 5 6 6 6

7 DA20 1 3 4 4 4 5 6 6

8 NC11 1 3 4 5 5 6 7 6

8 NC12 1 4 4 5 5 6 6 7

8 NC13 1 4 4 4 4 5 5 5

8 NC14 1 2 3 4 5 6 6 7

8 NC15 1 3 4 4 5 6 6 6

8 NC16 1 2 3 4 4 4 4 5

8 NC17 1 3 4 4 4 5 5 6

8 NC18 1 3 4 4 4 5 5 7

8 NC19 1 3 4 5 5 6 6 7

8 NC20 1 4 4 5 6 6 6 6

9 PC11 1 3 4 4 5 5 5 6

9 PC12 1 3 4 4 4 5 5 5

9 PC13 1 4 4 4 5 5 6 6

9 PC14 1 3 3 4 4 5 6 6

9 PC15 1 3 4 4 5 5 6 6

9 PC16 1 4 4 5 5 6 6 6

9 PC17 1 4 5 5 6 6 7 7

9 PC18 1 3 4 4 4 5 5 6

9 PC19 1 3 4 4 4 5 5 6

9 PC20 1 3 4 4 4 5 5 6

1 A21 1 2 3 4 4 5 6 6

1 A22 1 2 4 5 5 6 7 7

1 A23 1 3 4 5 5 5 6 7

1 A24 1 3 4 5 5 5 6 7

1 A25 1 2 4 5 5 5 6 7

1 A26 1 2 3 4 5 5 6 7

1 A27 1 2 4 5 5 5 6 7

1 A28 1 3 4 5 5 6 7 7

1 A29 1 2 4 4 5 5 6 7

1 A30 1 2 4 5 5 5 5 7

2 B21 1 2 4 4 4 5 6 7

2 B22 1 2 4 4 4 4 5 7

2 B23 1 2 4 5 5 5 6 7

2 B24 1 3 4 5 5 5 6 7

2 B25 1 3 4 5 5 5 6 7

2 B26 1 3 4 5 5 5 6 7

2 B27 1 3 4 5 5 5 6 7

2 B28 1 3 4 4 5 5 5 7

2 B29 1 3 4 5 5 5 6 7

2 B30 1 3 4 5 5 5 6 7

3 C21 1 3 4 4 5 5 6 7

3 C22 1 3 4 5 5 5 6 7

3 C23 1 3 3 5 5 5 6 7

3 C24 1 3 4 5 5 6 7 7

3 C25 1 3 3 4 5 5 6 7

3 C26 1 3 4 4 5 5 6 7

3 C27 1 3 3 5 5 5 6 7

3 C28 1 3 4 5 5 5 6 7

3 C29 1 2 4 5 6 6 6 7

3 C30 1 3 4 5 6 6 6 7

4 D21 1 2 4 5 5 5 6 7

4 D22 1 2 3 4 4 5 6 7

4 D23 1 2 4 4 5 6 6 7

4 D24 1 2 3 5 5 5 5 6

4 D25 1 2 4 5 5 5 6 7

4 D26 1 2 4 5 5 6 6 7

4 D27 1 2 4 5 5 5 6 7

4 D28 1 2 4 5 5 6 6 7

4 D29 1 2 4 5 5 6 6 7

4 D30 1 2 4 5 5 6 6 7

5 BA21 1 2 4 5 5 5 6 7

5 BA22 1 3 4 4 5 5 6 7

5 BA23 1 2 4 4 5 5 6 7

5 BA24 1 3 4 4 5 5 6 7

5 BA25 1 2 4 5 5 5 6 7

5 BA26 1 3 4 5 4 6 7 8

5 BA27 1 3 4 5 5 5 6 7

5 BA28 1 2 4 4 4 5 6 8

5 BA29 1 4 4 4 5 5 6 7

5 BA30 1 3 3 4 5 5 6 7

6 CA21 1 2 4 4 5 5 6 7

6 CA22 1 2 4 5 5 5 6 7

6 CA23 1 2 4 4 5 5 6 7

6 CA24 1 3 4 5 5 5 6 7

6 CA25 1 3 4 5 5 5 6 7

6 CA26 1 3 4 5 5 5 6 7

6 CA27 1 3 4 5 5 5 5 7

6 CA28 1 2 4 5 5 5 6 7

6 CA29 1 2 4 5 5 5 6 7

6 CA30 1 2 4 5 5 5 6 7

7 DA21 1 3 4 4 5 5 6 7

7 DA22 1 2 4 4 5 5 6 7

7 DA23 1 4 4 4 5 6 7 7

7 DA24 1 3 4 5 5 5 6 7

7 DA25 1 4 4 5 5 6 6 7

7 DA26 1 3 4 5 5 5 6 7

7 DA27 1 3 4 5 5 5 6 7

7 DA28 1 4 4 5 5 5 6 8

7 DA29 1 3 4 5 6 6 7 7

7 DA30 1 2 4 5 5 5 6 7

8 NC21 1 2 3 4 5 6 6 7

8 NC22 1 2 4 5 5 5 6 7

8 NC23 1 3 4 5 5 5 6 7

8 NC24 1 3 4 5 5 5 6 7

8 NC25 1 3 4 5 5 6 6 7

8 NC26 1 3 4 5 5 6 6 7

8 NC27 1 3 4 5 5 5 5 7

8 NC28 1 2 4 4 5 6 6 7

8 NC29 1 2 4 4 5 6 6 7

8 NC30 1 2 4 4 5 6 6 7

9 PC21 1 2 4 5 5 5 5 7

9 PC22 1 3 4 5 5 5 6 7

9 PC23 1 2 4 5 5 5 6 7

9 PC24 1 2 4 5 5 5 6 7

9 PC25 1 3 4 5 5 5 6 8

9 PC26 1 3 4 4 4 4 6 7

9 PC27 1 3 4 5 5 5 6 7

9 PC28 1 3 4 4 4 5 6 6

9 PC29 1 3 4 4 5 5 6 8

9 PC30 1 2 4 5 5 5 6 7

;

**run**;

**proc** **glm** data=all\_treatments\_n\_is30\_torso\_wet;

Class Group;

model PBS\_1-PBS\_7 = Group/nouni;

repeated logADD;

**run**;

Output

**The GLM Procedure**

| **Class Level Information** | | |
| --- | --- | --- |
| **Class** | **Levels** | **Values** |
| **Group** | 9 | 1 2 3 4 5 6 7 8 9 |

|  |  |
| --- | --- |
| **Number of Observations Read** | 270 |
| **Number of Observations Used** | 270 |

**The GLM Procedure**

**Repeated Measures Analysis of Variance**

| **Repeated Measures Level Information** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Dependent Variable** | **PBS\_1** | **PBS\_2** | **PBS\_3** | **PBS\_4** | **PBS\_5** | **PBS\_6** | **PBS\_7** |
| **Level of logADD** | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| **MANOVA Test Criteria and Exact F Statistics for the Hypothesis of no logADD Effect H = Type III SSCP Matrix for logADD E = Error SSCP Matrix  S=1 M=2 N=127** | | | | | |
| --- | --- | --- | --- | --- | --- |
| **Statistic** | **Value** | **F Value** | **Num DF** | **Den DF** | **Pr > F** |
| **Wilks' Lambda** | 0.04618587 | 881.14 | 6 | 256 | <.0001 |
| **Pillai's Trace** | 0.95381413 | 881.14 | 6 | 256 | <.0001 |
| **Hotelling-Lawley Trace** | 20.65164356 | 881.14 | 6 | 256 | <.0001 |
| **Roy's Greatest Root** | 20.65164356 | 881.14 | 6 | 256 | <.0001 |

| **MANOVA Test Criteria and F Approximations for the Hypothesis of no logADD\*Group Effect H = Type III SSCP Matrix for logADD\*Group E = Error SSCP Matrix  S=6 M=0.5 N=127** | | | | | |
| --- | --- | --- | --- | --- | --- |
| **Statistic** | **Value** | **F Value** | **Num DF** | **Den DF** | **Pr > F** |
| **Wilks' Lambda** | 0.79145899 | 1.28 | 48 | 1263.7 | 0.0963 |
| **Pillai's Trace** | 0.22671861 | 1.28 | 48 | 1566 | 0.0956 |
| **Hotelling-Lawley Trace** | 0.24143782 | 1.28 | 48 | 836.38 | 0.0996 |
| **Roy's Greatest Root** | 0.10669070 | 3.48 | 8 | 261 | 0.0008 |
| **NOTE: F Statistic for Roy's Greatest Root is an upper bound.** | | | | | |

**The GLM Procedure**

**Repeated Measures Analysis of Variance**

**Tests of Hypotheses for Between Subjects Effects**

| **Source** | **DF** | **Type III SS** | **Mean Square** | **F Value** | **Pr > F** |
| --- | --- | --- | --- | --- | --- |
| **Group** | 8 | 10.3185185 | 1.2898148 | 1.02 | 0.4245 |
| **Error** | 261 | 331.4571429 | 1.2699507 |  |  |

**The GLM Procedure**

**Repeated Measures Analysis of Variance**

**Univariate Tests of Hypotheses for Within Subject Effects**

| **Source** | **DF** | **Type III SS** | **Mean Square** | **F Value** | **Pr > F** | **Adj Pr > F** | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **G - G** | **H-F-L** |
| **logADD** | 6 | 2403.776720 | 400.629453 | 1977.00 | <.0001 | <.0001 | <.0001 |
| **logADD\*Group** | 48 | 11.451852 | 0.238580 | 1.18 | 0.1915 | 0.2275 | 0.2259 |
| **Error(logADD)** | 1566 | 317.342857 | 0.202646 |  |  |  |  |

|  |  |
| --- | --- |
| **Greenhouse-Geisser Epsilon** | 0.6864 |
| **Huynh-Feldt-Lecoutre Epsilon** | 0.6988 |

**SAS Code Torso dry**

**data** all\_treatments\_n\_is30\_torso\_dry;

input Group ID$ PBS\_8 PBS\_9 PBS\_10 PBS\_11 PBS\_12 PBS\_13 PBS\_14 PBS\_15;

datalines;

1 A1 6 7 7 7 8 8 8 8

1 A2 6 7 7 7 7 7 7 8

1 A3 7 7 7 7 8 8 8 8

1 A4 7 7 7 7 8 8 8 8

1 A5 7 7 8 8 8 8 8 8

1 A6 6 6 6 6 7 7 7 7

1 A7 6 6 6 6 7 7 7 8

1 A8 6 6 6 6 7 7 7 8

1 A9 7 7 7 7 7 8 8 8

1 A10 7 8 8 8 8 8 8 8

2 B1 6 6 7 7 7 7 8 8

2 B2 7 7 7 7 8 8 8 8

2 B3 5 6 6 6 7 8 8 8

2 B4 7 7 7 7 7 7 7 7

2 B5 7 7 7 7 8 8 8 8

2 B6 7 7 7 7 8 8 8 8

2 B7 6 6 7 7 7 8 8 8

2 B8 6 6 7 7 8 8 8 8

2 B9 6 6 6 6 7 7 7 7

2 B10 7 7 7 7 8 8 8 8

3 C1 7 7 7 7 8 8 8 8

3 C2 6 6 6 6 7 7 7 7

3 C3 6 7 7 7 7 7 7 8

3 C4 6 7 7 7 7 8 8 8

3 C5 6 7 7 7 8 8 8 8

3 C6 6 7 7 7 7 7 8 8

3 C7 7 7 7 7 8 8 8 8

3 C8 7 7 7 7 8 8 8 8

3 C9 7 7 7 7 8 8 8 8

3 C10 7 7 7 7 8 8 8 8

4 D1 6 6 6 7 7 7 7 8

4 D2 7 7 7 7 8 8 8 8

4 D3 6 7 7 7 8 8 8 8

4 D4 7 7 7 7 7 8 8 8

4 D5 6 7 7 7 7 7 7 8

4 D6 7 7 7 7 7 7 7 8

4 D7 7 8 8 8 8 8 8 8

4 D8 7 7 7 7 8 8 8 8

4 D9 7 8 8 8 8 8 8 8

4 D10 7 7 7 7 8 8 8 8

5 BA1 6 7 7 8 8 8 8 8

5 BA2 6 6 7 7 7 7 7 8

5 BA3 6 7 7 7 7 8 8 8

5 BA4 7 7 7 7 7 8 8 8

5 BA5 7 7 7 7 7 7 8 8

5 BA6 7 7 7 7 7 7 8 8

5 BA7 6 7 7 7 8 8 8 8

5 BA8 6 6 6 6 7 7 7 7

5 BA9 7 7 7 7 7 7 8 8

5 BA10 7 7 7 8 8 8 8 8

6 CA1 7 7 8 8 8 8 8 8

6 CA2 7 7 7 7 7 8 8 8

6 CA3 6 7 7 7 8 8 8 8

6 CA4 7 7 7 7 8 8 8 8

6 CA5 7 7 7 7 8 8 8 8

6 CA6 6 7 7 8 8 8 8 8

6 CA7 6 6 7 7 8 8 8 8

6 CA8 8 8 8 8 8 8 8 8

6 CA9 7 7 7 7 7 7 8 8

6 CA10 6 7 7 7 7 8 8 8

7 DA1 7 7 7 8 8 8 8 8

7 DA2 6 7 7 7 8 8 8 8

7 DA3 6 7 8 7 7 7 8 8

7 DA4 5 6 6 6 7 7 8 8

7 DA5 7 7 7 7 7 8 8 8

7 DA6 6 7 7 7 7 7 8 8

7 DA7 7 7 7 7 8 8 8 8

7 DA8 7 8 8 8 8 8 8 8

7 DA9 6 7 7 7 8 8 8 8

7 DA10 7 7 7 8 8 8 8 8

8 NC1 6 6 7 7 7 8 8 8

8 NC2 6 7 7 7 8 8 8 8

8 NC3 7 7 7 7 7 7 8 8

8 NC4 7 7 7 7 7 7 7 8

8 NC5 6 7 7 7 8 8 8 8

8 NC6 6 7 7 7 7 7 7 7

8 NC7 7 7 7 7 8 8 8 8

8 NC8 6 7 7 7 7 8 8 8

8 NC9 7 7 7 7 8 8 8 8

8 NC10 6 7 7 7 8 8 8 8

9 PC1 6 7 7 7 7 7 8 8

9 PC2 6 7 7 7 7 8 8 8

9 PC3 7 7 7 7 7 7 8 8

9 PC4 6 6 7 7 7 7 7 8

9 PC5 7 7 7 7 8 8 8 8

9 PC6 7 7 7 7 8 8 8 8

9 PC7 7 7 7 7 7 7 7 8

9 PC8 7 7 7 7 7 7 7 7

9 PC9 7 7 7 7 7 7 7 7

9 PC10 7 8 8 8 8 8 8 8

1 A11 7 7 7 7 7 8 8 8

1 A12 5 6 6 6 7 7 7 7

1 A13 6 6 6 6 7 8 8 8

1 A14 6 7 7 7 7 8 8 8

1 A15 6 7 7 7 7 8 7 7

1 A16 5 6 6 6 6 7 7 7

1 A17 7 7 7 7 8 8 8 8

1 A18 7 7 7 7 8 8 8 8

1 A19 6 6 6 7 8 8 8 7

1 A20 7 7 7 7 7 8 8 8

2 B11 6 7 7 7 7 8 8 8

2 B12 6 6 6 7 7 7 7 7

2 B13 7 7 7 8 8 8 8 8

2 B14 7 7 7 7 8 8 8 8

2 B15 6 7 7 7 8 8 8 8

2 B16 7 7 7 7 8 8 8 8

2 B17 7 7 7 8 8 8 8 8

2 B18 7 7 7 8 8 8 8 8

2 B19 7 7 7 7 8 8 8 8

2 B20 7 7 7 7 7 8 8 8

3 C11 7 7 7 8 8 8 8 8

3 C12 7 7 7 7 8 8 8 8

3 C13 7 7 7 8 8 8 8 8

3 C14 7 7 7 8 8 8 8 8

3 C15 7 7 7 7 7 8 8 8

3 C16 6 7 7 7 8 8 8 8

3 C17 6 6 8 8 8 8 8 8

3 C18 6 6 7 7 7 8 8 8

3 C19 7 7 8 8 8 8 8 8

3 C20 7 7 8 8 8 8 8 8

4 D11 6 6 7 7 7 8 8 8

4 D12 7 7 7 7 7 8 8 8

4 D13 7 7 7 8 8 8 8 8

4 D14 7 7 7 8 8 8 8 8

4 D15 7 7 8 8 8 8 8 8

4 D16 7 7 7 8 8 8 8 8

4 D17 7 7 7 7 8 8 8 8

4 D18 7 8 8 8 8 8 8 8

4 D19 7 7 7 7 7 8 8 8

4 D20 7 7 7 7 7 8 8 8

5 BA11 6 6 6 7 7 7 8 8

5 BA12 6 6 6 7 7 7 8 8

5 BA13 6 6 7 7 7 8 8 8

5 BA14 6 7 7 7 8 8 8 8

5 BA15 7 7 7 8 8 8 8 8

5 BA16 6 6 7 7 8 8 8 8

5 BA17 7 7 7 8 8 8 8 8

5 BA18 7 7 7 7 8 8 8 8

5 BA19 7 7 7 7 7 8 8 8

5 BA20 6 6 6 7 7 7 8 8

6 CA11 6 6 7 7 7 8 8 8

6 CA12 6 7 8 8 8 8 8 8

6 CA13 6 7 7 7 7 8 8 8

6 CA14 6 6 7 7 7 8 8 8

6 CA15 6 7 7 7 7 7 7 7

6 CA16 6 7 7 8 8 8 8 8

6 CA17 7 7 7 7 7 8 8 8

6 CA18 7 7 7 7 7 8 8 8

6 CA19 7 7 7 7 7 8 8 8

6 CA20 7 7 8 8 8 8 8 8

7 DA11 6 7 7 8 8 8 8 8

7 DA12 6 6 7 7 7 8 8 8

7 DA13 6 7 7 7 7 8 8 8

7 DA14 6 7 7 7 8 8 8 8

7 DA15 6 7 7 7 8 8 8 8

7 DA16 6 7 7 7 7 8 8 8

7 DA17 7 7 7 8 8 8 8 8

7 DA18 7 7 7 7 8 8 8 8

7 DA19 7 7 7 8 8 8 8 8

7 DA20 7 7 7 7 8 8 8 8

8 NC11 7 7 7 8 8 8 8 8

8 NC12 7 7 7 7 7 8 8 8

8 NC13 7 7 7 7 7 8 8 8

8 NC14 7 7 7 7 7 8 8 8

8 NC15 7 7 7 7 8 8 8 8

8 NC16 6 6 7 7 7 8 8 8

8 NC17 7 7 7 7 7 8 8 8

8 NC18 7 7 7 7 8 8 8 8

8 NC19 7 7 8 8 8 8 8 8

8 NC20 6 7 7 7 7 8 8 8

9 PC11 6 7 7 7 7 8 8 8

9 PC12 6 6 7 7 7 8 8 8

9 PC13 6 7 7 7 7 8 8 8

9 PC14 7 7 8 8 8 8 8 8

9 PC15 7 7 7 7 7 8 8 8

9 PC16 7 7 7 8 8 8 8 8

9 PC17 7 7 8 8 8 8 8 8

9 PC18 6 6 7 7 7 8 8 8

9 PC19 6 7 7 7 7 7 8 8

9 PC20 6 7 7 7 7 8 8 8

1 A21 7 7 7 7 7 8 8 8

1 A22 8 8 8 8 8 8 8 8

1 A23 7 8 8 8 8 8 8 8

1 A24 7 8 8 8 8 8 8 8

1 A25 7 7 7 7 7 8 8 8

1 A26 7 7 7 7 7 7 8 8

1 A27 7 8 8 8 8 8 8 8

1 A28 8 8 8 8 8 8 8 8

1 A29 7 8 8 8 8 8 8 8

1 A30 7 8 7 7 8 8 8 8

2 B21 7 7 7 7 7 7 8 8

2 B22 7 7 7 7 7 7 8 8

2 B23 7 8 8 8 8 8 8 8

2 B24 7 8 8 8 8 8 8 8

2 B25 7 8 8 8 8 8 8 8

2 B26 7 7 8 8 8 8 8 8

2 B27 7 7 8 8 8 8 8 8

2 B28 7 7 7 7 8 8 8 8

2 B29 8 8 8 8 8 8 8 8

2 B30 8 8 8 8 8 8 8 8

3 C21 7 7 7 7 8 8 8 8

3 C22 7 8 8 8 8 7 8 8

3 C23 7 7 8 7 7 8 8 8

3 C24 8 8 8 8 8 8 8 8

3 C25 7 8 8 8 8 8 8 8

3 C26 7 7 7 7 7 8 8 8

3 C27 7 8 8 8 8 8 8 8

3 C28 7 8 8 8 8 8 8 8

3 C29 7 8 8 8 8 8 8 8

3 C30 7 8 8 8 8 8 8 8

4 D21 7 7 7 7 7 7 8 8

4 D22 7 7 7 7 7 7 8 8

4 D23 8 8 8 8 8 8 8 8

4 D24 7 7 7 7 7 7 8 8

4 D25 7 8 8 8 8 8 8 8

4 D26 7 8 8 8 8 8 8 8

4 D27 7 7 8 8 8 8 8 8

4 D28 8 8 8 8 8 8 8 8

4 D29 8 8 8 7 7 7 8 8

4 D30 8 8 8 8 8 8 8 8

5 BA21 7 8 8 8 8 8 8 8

5 BA22 8 8 8 8 8 8 8 8

5 BA23 7 8 8 8 8 8 8 8

5 BA24 7 7 8 8 8 8 8 8

5 BA25 7 7 8 8 8 8 8 8

5 BA26 8 8 8 8 8 8 8 8

5 BA27 7 7 8 8 8 8 8 8

5 BA28 8 8 8 8 8 8 8 8

5 BA29 7 8 8 8 8 8 8 8

5 BA30 7 8 8 8 8 8 8 8

6 CA21 7 8 8 8 8 8 8 8

6 CA22 7 8 8 8 8 8 8 8

6 CA23 7 8 8 8 8 8 8 8

6 CA24 7 8 8 8 8 8 8 8

6 CA25 7 8 8 8 8 8 8 8

6 CA26 8 8 8 8 8 8 8 8

6 CA27 8 8 8 8 8 8 8 8

6 CA28 8 8 8 8 8 8 8 8

6 CA29 8 8 8 8 8 8 8 8

6 CA30 7 8 8 8 8 8 8 8

7 DA21 8 8 8 8 8 8 8 8

7 DA22 7 7 7 7 7 7 8 8

7 DA23 7 7 7 7 7 8 8 8

7 DA24 7 7 8 8 8 8 8 8

7 DA25 7 7 8 8 8 8 8 8

7 DA26 7 8 8 8 8 8 8 8

7 DA27 7 8 8 8 8 8 8 8

7 DA28 8 8 8 8 8 8 8 8

7 DA29 8 8 8 8 8 8 8 8

7 DA30 7 8 8 8 8 8 8 8

8 NC21 7 8 8 8 8 8 8 8

8 NC22 7 7 7 8 8 8 8 8

8 NC23 7 7 7 7 8 8 8 8

8 NC24 7 7 7 7 8 8 8 8

8 NC25 7 8 8 8 8 8 8 8

8 NC26 7 8 8 8 8 8 8 8

8 NC27 7 8 8 8 8 8 8 8

8 NC28 7 7 8 8 8 8 8 8

8 NC29 7 8 8 8 8 8 8 8

8 NC30 7 8 8 8 8 8 8 8

9 PC21 7 7 7 7 7 7 7 7

9 PC22 7 7 7 7 8 8 8 8

9 PC23 7 7 7 7 8 8 8 8

9 PC24 7 8 8 8 8 8 8 8

9 PC25 8 8 8 8 8 8 8 8

9 PC26 7 7 8 8 8 8 8 8

9 PC27 7 7 7 7 8 8 8 8

9 PC28 7 8 7 7 8 8 8 8

9 PC29 8 8 8 8 8 8 8 8

9 PC30 8 8 8 7 8 8 8 8

;

**run**;

**proc** **glm** data=all\_treatments\_n\_is30\_torso\_dry;

Class Group;

model PBS\_8-PBS\_15 = Group/nouni;

repeated logADD;

**run**;

**Output**

**The GLM Procedure**

| **Class Level Information** | | |
| --- | --- | --- |
| **Class** | **Levels** | **Values** |
| **Group** | 9 | 1 2 3 4 5 6 7 8 9 |

|  |  |
| --- | --- |
| **Number of Observations Read** | 270 |
| **Number of Observations Used** | 270 |

**The GLM Procedure**

**Repeated Measures Analysis of Variance**

| **Repeated Measures Level Information** | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Dependent Variable** | **PBS\_8** | **PBS\_9** | **PBS\_10** | **PBS\_11** | **PBS\_12** | **PBS\_13** | **PBS\_14** | **PBS\_15** |
| **Level of logADD** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

| **MANOVA Test Criteria and Exact F Statistics for the Hypothesis of no logADD Effect H = Type III SSCP Matrix for logADD E = Error SSCP Matrix  S=1 M=2.5 N=126.5** | | | | | |
| --- | --- | --- | --- | --- | --- |
| **Statistic** | **Value** | **F Value** | **Num DF** | **Den DF** | **Pr > F** |
| **Wilks' Lambda** | 0.19702637 | 148.46 | 7 | 255 | <.0001 |
| **Pillai's Trace** | 0.80297363 | 148.46 | 7 | 255 | <.0001 |
| **Hotelling-Lawley Trace** | 4.07546287 | 148.46 | 7 | 255 | <.0001 |
| **Roy's Greatest Root** | 4.07546287 | 148.46 | 7 | 255 | <.0001 |

| **MANOVA Test Criteria and F Approximations for the Hypothesis of no logADD\*Group Effect H = Type III SSCP Matrix for logADD\*Group E = Error SSCP Matrix  S=7 M=0 N=126.5** | | | | | |
| --- | --- | --- | --- | --- | --- |
| **Statistic** | **Value** | **F Value** | **Num DF** | **Den DF** | **Pr > F** |
| **Wilks' Lambda** | 0.79247290 | 1.09 | 56 | 1378.5 | 0.3104 |
| **Pillai's Trace** | 0.22528581 | 1.08 | 56 | 1827 | 0.3121 |
| **Hotelling-Lawley Trace** | 0.24030124 | 1.09 | 56 | 904.57 | 0.3101 |
| **Roy's Greatest Root** | 0.10134829 | 3.31 | 8 | 261 | 0.0013 |
| **NOTE: F Statistic for Roy's Greatest Root is an upper bound.** | | | | | |

**The GLM Procedure**

**Repeated Measures Analysis of Variance**

**Tests of Hypotheses for Between Subjects Effects**

| **Source** | **DF** | **Type III SS** | **Mean Square** | **F Value** | **Pr > F** |
| --- | --- | --- | --- | --- | --- |
| **Group** | 8 | 11.1250000 | 1.3906250 | 1.38 | 0.2035 |
| **Error** | 261 | 262.2458333 | 1.0047733 |  |  |

**The GLM Procedure**

**Repeated Measures Analysis of Variance**

**Univariate Tests of Hypotheses for Within Subject Effects**

| **Source** | **DF** | **Type III SS** | **Mean Square** | **F Value** | **Pr > F** | **Adj Pr > F** | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **G - G** | **H-F-L** |
| **logADD** | 7 | 331.7439815 | 47.3919974 | 376.37 | <.0001 | <.0001 | <.0001 |
| **logADD\*Group** | 56 | 7.3268519 | 0.1308366 | 1.04 | 0.3971 | 0.4089 | 0.4087 |
| **Error(logADD)** | 1827 | 230.0541667 | 0.1259191 |  |  |  |  |

|  |  |
| --- | --- |
| **Greenhouse-Geisser Epsilon** | 0.5563 |
| **Huynh-Feldt-Lecoutre Epsilon** | 0.5658 |