Profile Analysis

Intro and Assumptions

Psy 524

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Profile Analysis

- Profile analysis is the repeated measures extension of MANOVA where a set of DVs are commensurate (on the same scale).

Profile Analysis

- The common use is where a set of DVs represent the same DV measured at multiple time points
- used in this way it is the multivariate alternative to repeated measures or mixed ANOVA
- The choice often depends on the number of subjects, power and whether the assumptions associated with within subjects ANOVA can be met (e.g. sphericity)

Repeated Measures Data

	T_1	T_2	T_3	T_4
G_1	*DV*	*DV*	*DV*	*DV*
G_2	*DV*	*DV*	*DV*	*DV*

Profile Analysis

- The less common use is to compare groups on multiple DVs that are commensurate (e.g. subscales of the same inventory)
- Current stat packages can be used to perform more complex analyses where there are multiple factorial between subjects effects

Commensurate Data

	DV_1	DV_2	DV_3	DV_4
G_1				
G_2				

Questions asked by profile analysis

- There is one major question asked by profile analysis; Do groups have similar profiles on a set of DVs?

Questions

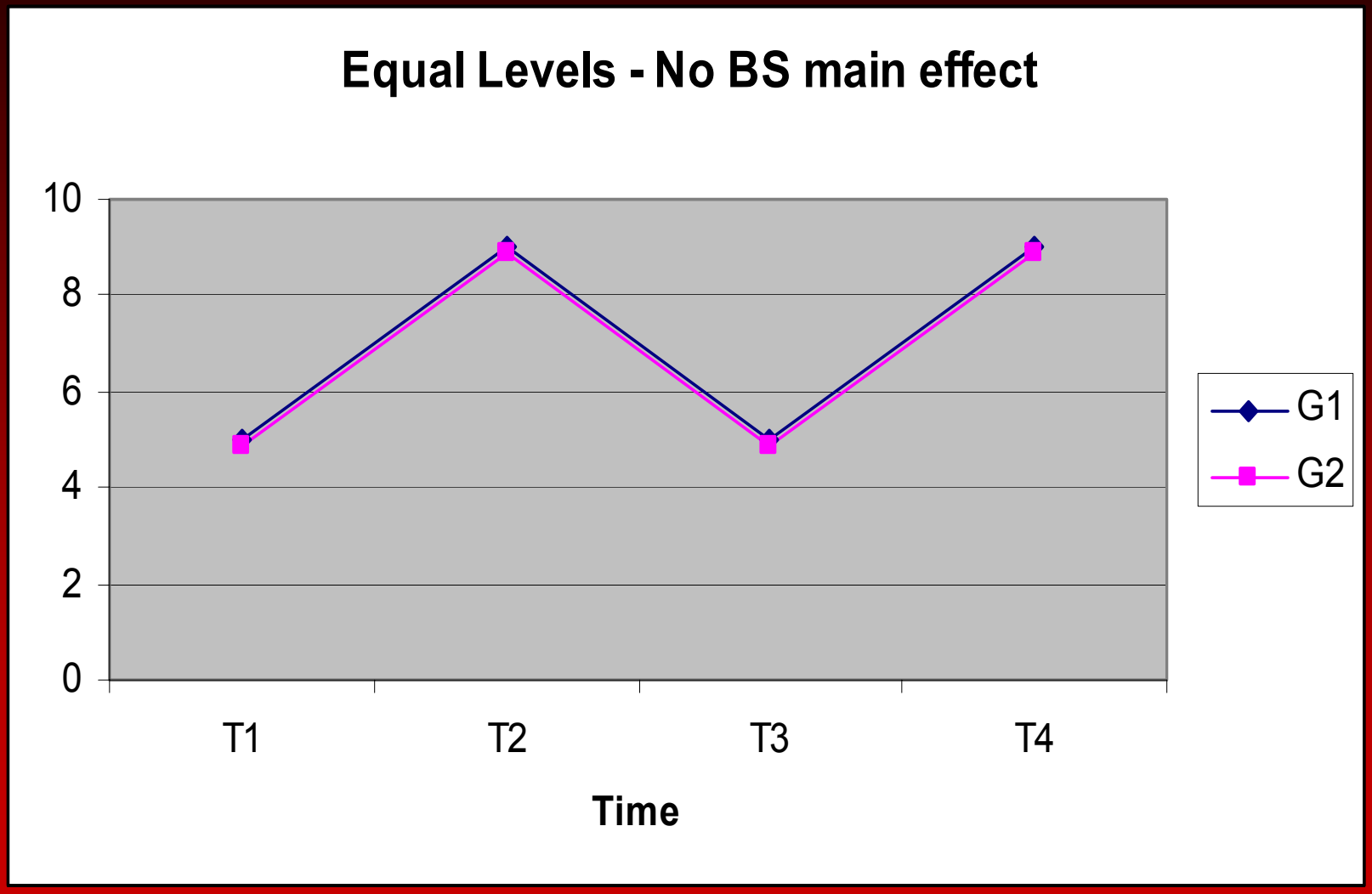
- Usually in application of profile analysis a researcher is trying to show that groups are not different, that is why most tests are named after the “null” case.

Questions

- Segments – difference scores (or other linear combinations) between adjacent DV scores that are used in two of the major tests of profile analysis

Questions

- Between Subjects – (univariate) – “Equal Levels”
  - On average does one group score higher than the other
  - Averaging across DVs are the groups different
  - This would be the between-groups main effect in mixed ANOVA

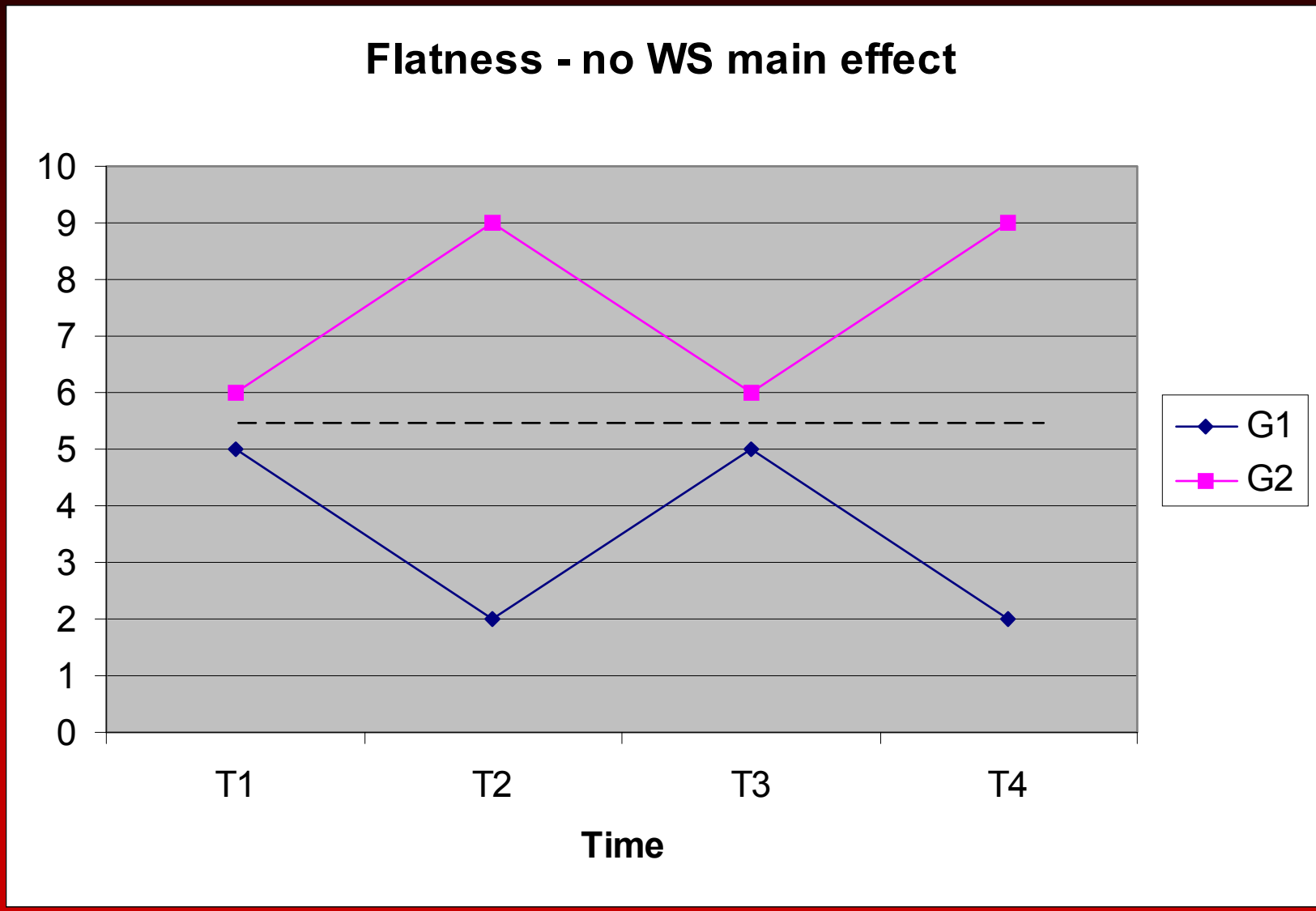

Equal Levels - No BS main effect
10
8
6
4
2
0
T1
T2
T3
T4
Time
G1
G2

Questions

- BS – (univariate) – “Equal Levels”
  - It is called the equal levels hypothesis in profile analysis
  - Groups are different when the equal levels hypothesis is rejected

Questions

- Within Subjects (multivariate) – “Flatness”
  - This is equivalent to the within subjects main effect in repeated measures ANOVA
  - In profile analysis terms this is a test for the flatness of the profiles
  - “Do all DVs elicit the same average response?”


Flatness - no WS main effect
10
9
8
7
6
5
4
3
2
1
0
T1
T2
T3
T4
Time
G1
G2

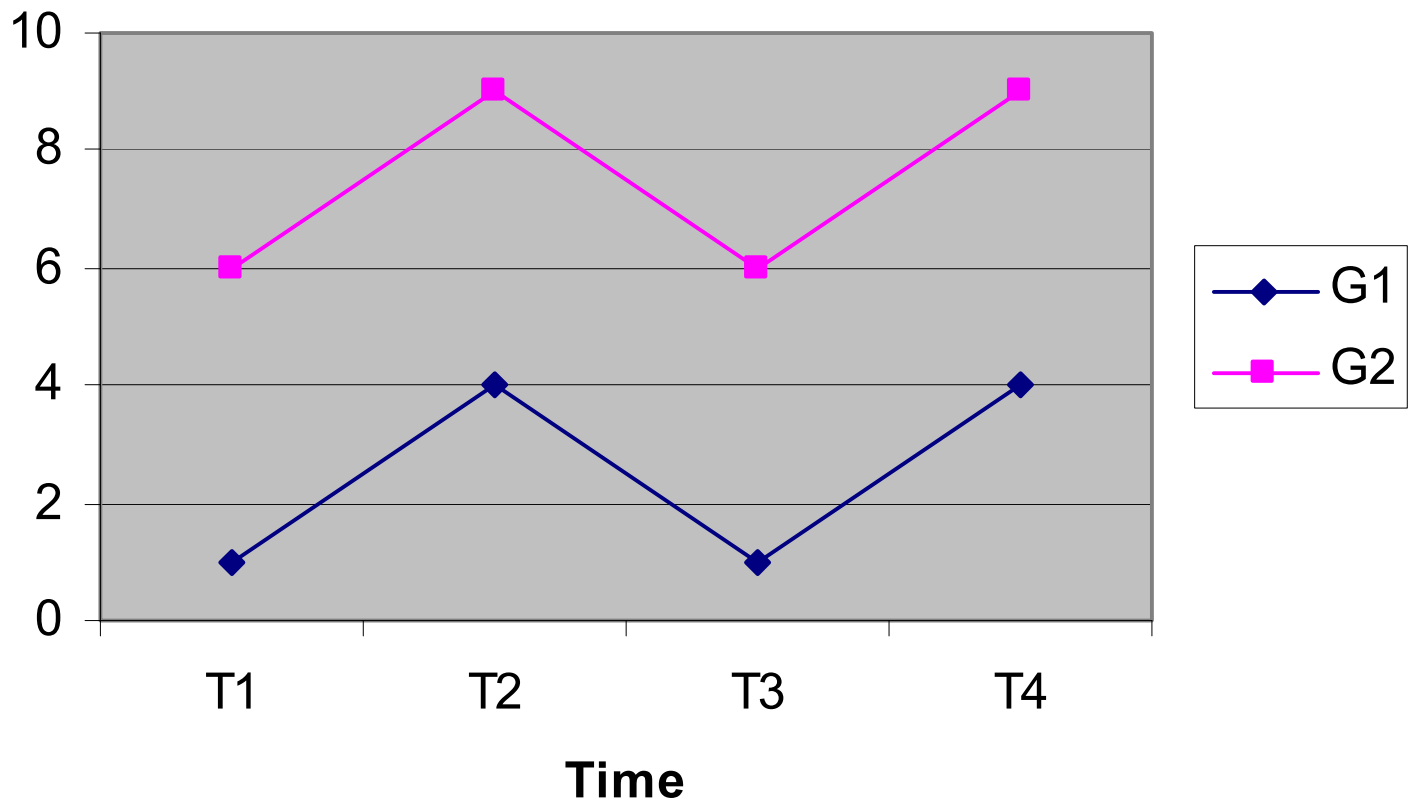
Questions

- WS (multivariate) – “Flatness”
  - If flatness is rejected than there is a main effect across the DVs
  - This is usually only tested if the test for parallel profiles is not rejected (we’ll talk about this in a second)

Questions

- Interaction (multivariate) – Parallel Profiles
  - Are the profiles for the two groups the same?
  - This is a test for the interaction in repeated measures ANOVA
  - This is usually the main test of interest in profile analysis
  - An interaction occurs when the profiles are not parallel

Parallel Profiles - no WS/BS interaction



Questions

- If any of the hypotheses tested by profile analysis are significant than they need to be followed by contrasts.
  - Contrasts (on the main effects, with no interaction)
  - Simple effects
  - Simple contrasts

  } Interaction and possibly one (but not both) main effect
  - Interaction contrasts (done when the interaction and both main effects are significant)
  - More on this later

Questions

- Estimating parameters
  - Usually done through plots of the actual profiles
  - If the flatness hypothesis is rejected than you would plot the average DV scores averaged across groups

Questions

- Estimating parameters
  - If equal levels hypothesis is rejected than you would plot the groups scores averaged across DVs

Questions

- Estimating parameters
  - And if the parallel profiles hypothesis is rejected you would plot the mean of each group on each DV

Questions

- Strength of association
  - Calculated in the same way
    - i.e. Eta squared and Partial Eta squared

Limitations

- Data must be on the same scale
  - This means that any alterations done to one variables need to be applied to the rest
  - This is why it is used often with repeated measures since it is the same variable multiple times

Limitations

- Data can be converted to Z-scores first and profile analysis can be applied
- Done by using the pooled within-subjects standard deviation to standardize all scores
- Factor scores can also be used (more later)
- Dangerous since it is based on sample estimates of population standard deviation

Limitations

- Causality is limited to manipulated group variables
- Generalizability is limited to population used

Limitations

- Assumptions should be tested on combined DVs but often difficult so screening on original DVs is used

Assumptions

- Sample size needs to be large enough; more subjects in the smallest cell than number of DVs
- This affects power and the test for homogeneity of covariance matrices
- Data can be imputed

Assumptions

- Power is also determined on whether the univariate assumptions were met or not; profile analysis has more power than univariate tests adjusted for sphericity violations

Assumptions

- Multivariate normality
  - If there are more subjects in the smallest cell than number of DVs and relatively equal n than PA is robust violations of multivariate normality
  - If very small samples and unequal n than look at the DVs to see if any are particularly skewed

Assumptions

- All DVs should be checked for univariate and multivariate outliers

Assumptions

- Homogeneity of Variance-Covariance matrices
  - If you have equal n than skip it
  - If there are unequal n across cells interpret Box's M at alpha equals .001.

Assumptions

- Linearity
  - It is assumed that the DVs are linearly related to one another
  - inspection of bivariate plots of the DVs is used to assess this
  - If symmetric DVs (normal) and large sample this can also be ignored