

## ***Polytomous DIF Analysis***

The purpose of the differential item functioning programs are to identify test or attitude items that "perform" differently for two groups - a target group and a reference group. Two procedures are provided and selected on the basis of whether the items are dichotomous (0 and 1 scoring) or consist of multiple categories (e.g. Likert responses ranging from 1 to 5.) The latter case is where the Polytomous DIF Analysis is selected. When you initiate this procedure you will see the dialogue box shown below:

This procedure is an adaptation of the program written by Niels G. Waller, Dept. of Psychology, University of California - Davis, Jan. 1998. It's purpose is to identify test items that differ in the response pattern for two groups: a reference group and a focal group. The file of data to be analyzed should consist of a variable containing a code designating the two groups and variables containing subject's item responses coded 0 for incorrect and 1 for correct. No missing data may be included. The results provide the Mantel-Haenszel statistic for identifying those items which are different for the two groups.

Available Variables:  
VAR1  
VAR2  
VAR3  
VAR4  
VAR5  
VAR6

Items Selected

Options:  
☐ Graph of Level Means

No. of Grouping Levels: 1

Enter Bounds for Levels:  
Down Up Level  
1 1  
Lower Bound: 0  
Upper Bound: 1

Grouping Variable:

Reference Group Code:  
Focal Group Code:  
Lowest Item Score  
Highest Item Score

Reset Cancel Compute Return

**Figure 1 Polytomous Item Differential Item Functioning Dialog**

The results from an analysis of three items with five categories that have been collapsed into three category levels is shown below. A sample of 500 subject's attitude scores were observed.

Polytomous Item DIF Analysis adapted by Bill Miller from  
Procedures for extending item bias detection techniques  
by Catherine Welch and H.D. Hoover, 1993  
Applied Measurement in Education 6(1), pages 1-19.

Conditioning Levels

Lower	Upper
0	1
2	3
4	5

#### For Item 1:

##### Observed Category Frequencies

Item	Group	Level	Category Number				
			1	2	3	4	5
1	Ref.	1	46	51	39	64	48
1	Focal	1	40	41	38	46	42
1	Total	1	86	92	77	110	90
1	Ref.	2	2	0	0	0	0
1	Focal	2	1	0	0	0	0
1	Total	2	3	0	0	0	0
1	Ref.	3	12	8	1	0	0
1	Focal	3	15	6	0	0	0
1	Total	3	27	14	1	0	0

t-test values for Reference and Focus Means for each level

Mean Reference = 3.069 SD = 24.396 N = 248

Mean Focal = 3.043 SD = 21.740 N = 207

Level 1 t = -0.011 with deg. freedom = 453

Mean Reference = 2.000 SD = 2.000 N = 2

Mean Focal = 1.000 SD = 1.000 N = 1

Level 2 t = 0.000 with deg. freedom = 0

Mean Reference = 1.476 SD = 4.262 N = 21

Mean Focal = 1.286 SD = 4.088 N = 21

Level 3 t = -0.144 with deg. freedom = 40

Composite z statistic = -0.076. Prob. > |z| = 0.530

Weighted Composite z statistic = -0.248. Prob. > |z| = 0.598

Generalized Mantel-Haenszel = 0.102 with D.F. = 1 and Prob. > Chi-Sqr. = 0.749

#### For Item 2:

##### Observed Category Frequencies

Item	Group	Level	Category Number				
			1	2	3	4	5
2	Ref.	1	56	46	47	48	51
2	Focal	1	37	38	49	35	48
2	Total	1	93	84	96	83	99
2	Ref.	2	2	0	0	0	0
2	Focal	2	1	0	0	0	0
2	Total	2	3	0	0	0	0
2	Ref.	3	12	8	1	0	0
2	Focal	3	9	11	1	0	0
2	Total	3	21	19	2	0	0

t-test values for Reference and Focus Means for each level

Mean Reference = 2.968 SD = 23.046 N = 248  
 Mean Focal = 3.092 SD = 22.466 N = 207  
 Level 1 t = 0.058 with deg. freedom = 453  
 Mean Reference = 2.000 SD = 2.000 N = 2  
 Mean Focal = 1.000 SD = 1.000 N = 1  
 Level 2 t = 0.000 with deg. freedom = 0  
 Mean Reference = 1.476 SD = 4.262 N = 21  
 Mean Focal = 1.619 SD = 5.094 N = 21  
 Level 3 t = 0.096 with deg. freedom = 40  
 Composite z statistic = 0.075. Prob. > |z| = 0.470  
 Weighted Composite z statistic = 0.673. Prob. > |z| = 0.250  
 Generalized Mantel-Haenszel = 1.017 with D.F. = 1 and Prob. > Chi-Sqr. = 0.313

### For item 3:

#### Observed Category Frequencies

Item	Group	Level	Category Number				
			1	2	3	4	5
3	Ref.	1	35	38	52	68	55
3	Focal	1	42	41	37	42	45
3	Total	1	77	79	89	110	100
3	Ref.	2	2	0	0	0	0
3	Focal	2	1	0	0	0	0
3	Total	2	3	0	0	0	0
3	Ref.	3	8	10	3	0	0
3	Focal	3	7	10	4	0	0
3	Total	3	15	20	7	0	0

#### t-test values for Reference and Focus Means for each level

Mean Reference = 3.282 SD = 26.866 N = 248  
 Mean Focal = 3.034 SD = 21.784 N = 207  
 Level 1 t = -0.107 with deg. freedom = 453  
 Mean Reference = 2.000 SD = 2.000 N = 2  
 Mean Focal = 1.000 SD = 1.000 N = 1  
 Level 2 t = 0.000 with deg. freedom = 0  
 Mean Reference = 1.762 SD = 4.898 N = 21  
 Mean Focal = 1.857 SD = 5.102 N = 21  
 Level 3 t = 0.060 with deg. freedom = 40  
 Composite z statistic = -0.023. Prob. > |z| = 0.509  
 Weighted Composite z statistic = -1.026. Prob. > |z| = 0.848  
 Generalized Mantel-Haenszel = 3.248 with D.F. = 1 and Prob. > ChiSqr. = 0.071