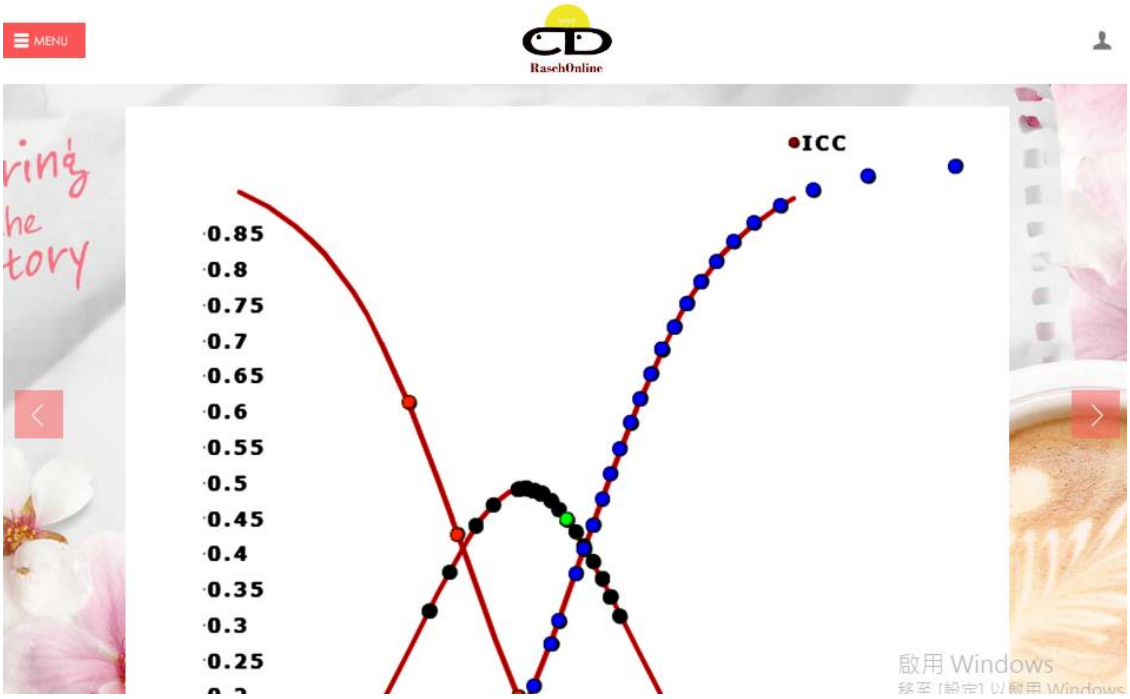
RaschOnline Computer program

Examples and Tutorial

Tsair-Wei Chien

Rasch.smile@gmail.com

2022/12/07



URL: http://www.healthup.org.tw/raschonline/

Data entry format:

A. With commas

responses(rows for person and columns for items)

```
1,2,1,1,1,0,2,0,1,2,2,2,2,0,2,1,1,2,2,0,2,1,0,2,0
2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2
2,2,1,1,0,1,1,0,1,2,2,2,2,1,2,2,1,2,2,1,2,1,1,1,1
1,0,1,0,0,1,0,1,2,2,1,2,2,1,1,1,1,2,2,0,2,1,1,1,1
1,0,1,0,1,0,1,0,0,1,1,1,1,0,0,1,1,2,2,1,1,1,1,1,0
1,0,1,1,2,1,1,0,1,1,1,2,1,0,1,0,1,2,2,1,0,1,2,1,0
2,2,2,0,0,2,2,2,0,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2
2,2,1,0,0,2,1,0,2,2,2,2,2,0,2,0,1,2,2,0,2,2,0,2,2
0,1,1,0,1,0,0,1,1,2,1,2,2,0,0,1,1,2,1,1,2,0,2,1,1
2,1,0,0,0,1,0,1,2,2,2,2,1,1,2,1,1,2,2,0,1,1,0,2,1
2,2,2,0,0,1,1,1,0,2,2,2,2,2,2,0,2,2,2,0,2,2,0,2,2
0,1,0,0,2,2,0,1,0,1,2,1,0,0,1,1,0,2,1,0,0,0,1,0,1
1,2,1,1,0,0,0,1,0,2,1,2,1,1,2,1,1,2,2,1,1,1,0,0,0
2,1,1,0,0,2,0,2,1,2,0,2,2,1,0,0,0,2,2,0,0,0,1,2,0
1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,2,2,1,1,1,1,1
```

B. Copy from MS Excel

responses(Person in rows and Variables in columns)

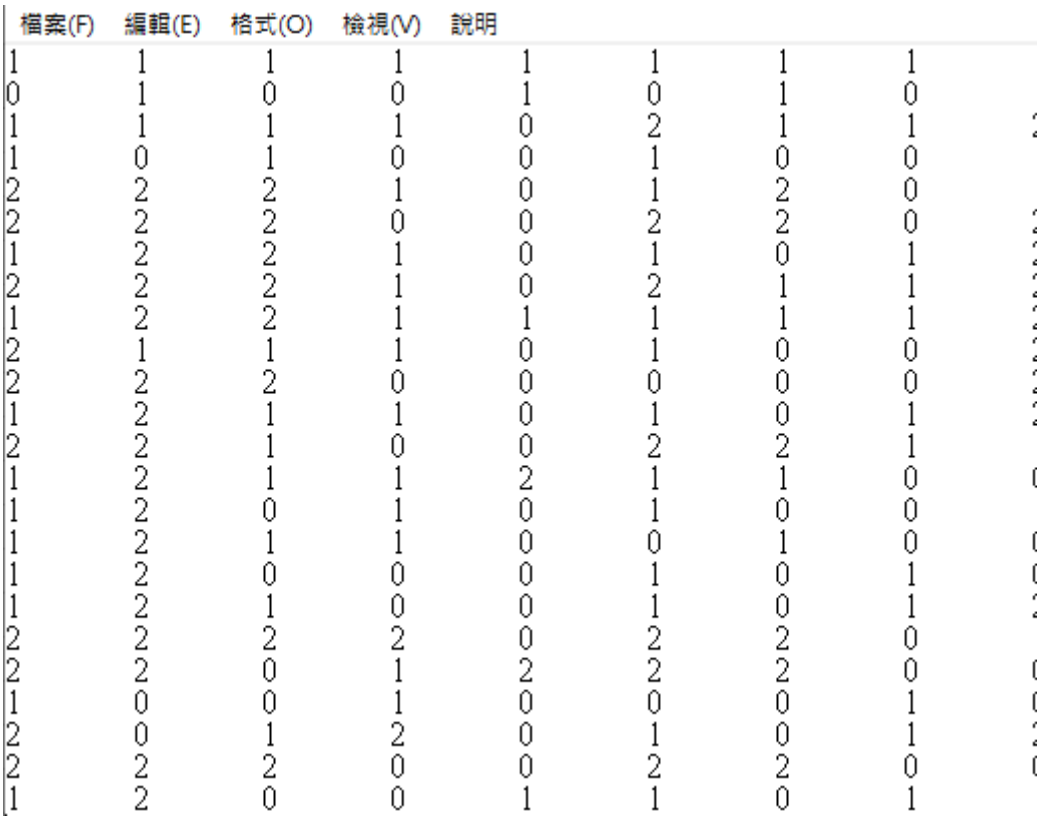
```
Item1   item2   Item3   Item4   Item5   Item6   Item7   Item
8       Item9   Item10  Item11  Item12  Item13  Item14  Item
15      Item16  name    group
1       1       1       0       1       1       0       1
1       0       1       0       0       0       0       0
Modelled/Ideal 1.0 1.1 1.0      1
1       1       1       1       1       1       1       1
0       0       0       0       0       0       0       0
Guttman/Deterministic 0.3 0.5 1.8       1
0       0       0       0       0       0       0       0
1       1       1       1       1       1       1       1
Miscode 12.6 4.3 3.5    1
0       1       1       1       1       1       1       1
1       0       0       0       0       0       0       0
Carelessness/Sleeping 3.8 1.0 1.9       0
```

C. Data with head labels and student names and groups in the last columns

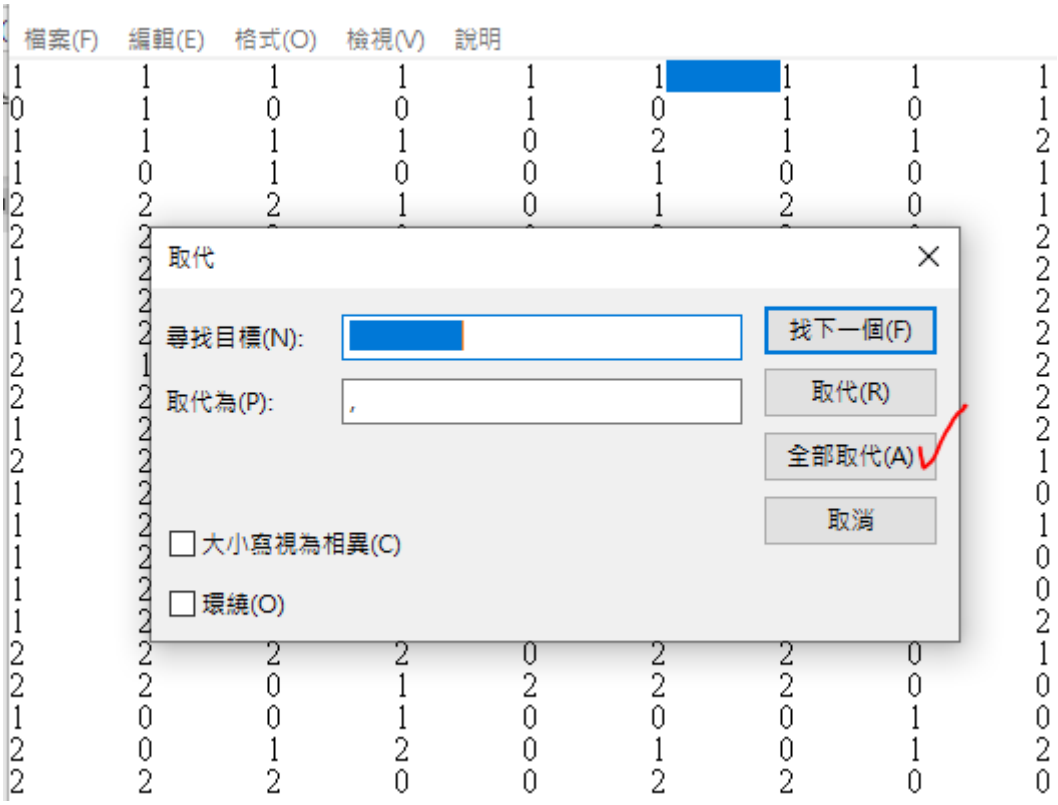
W	X	Y	Z	AA
1Watch a rat	Find out wl	Talk w/frie	name	group
0	2	0	Marc Danie	1
2	2	2	Lawrence I	1
1	1	1	Toby G.	1
1	1	1	Michael T.	1
1	1	0	Rebecca A	0
2	1	0	Tr Cat	1
2	2	2	Benjamin	1

How to transform the tab format into the comma separations in

20 **notebook:**



21



22

檔案(F)　編輯(E)　格式(O)　檢視(V)　說明

```
1,2,1,1,1,0,2,0,1,2,2,2,2,0,2,1,1,2,2,0,2,1,0,2,0
2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2
2,2,1,1,0,1,1,0,1,2,2,2,2,1,2,2,1,2,2,1,2,1,1,1,1
1,0,1,0,0,1,0,1,2,2,1,2,2,1,1,1,1,2,2,0,2,1,1,1,1
1,0,1,0,1,0,1,0,0,1,1,1,1,0,0,1,1,2,2,1,1,1,1,1,0
1,0,1,1,2,1,1,0,1,1,1,2,1,0,1,0,1,2,2,1,0,1,2,1,0
2,2,2,0,0,2,2,2,0,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2
2,2,1,0,0,2,1,0,2,2,2,2,2,0,2,0,1,2,2,0,2,2,0,2,2
0,1,1,0,1,0,0,1,1,2,1,2,2,0,0,1,1,2,1,1,2,0,2,1,1
2,1,0,0,0,1,0,1,2,2,2,2,1,1,2,1,1,2,2,0,1,1,0,2,1
2,2,2,0,0,1,1,1,0,2,2,2,2,2,2,0,2,2,2,0,2,2,0,2,2
0,1,0,0,2,2,0,1,0,1,2,1,0,0,1,1,0,2,1,0,0,0,1,0,1
1,2,1,1,0,0,0,1,0,2,1,2,1,1,2,1,1,2,2,1,1,1,0,0,0
2,1,1,0,0,2,0,2,1,2,0,2,2,1,0,0,0,2,2,0,0,0,1,2,0
1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,2,2,1,1,1,1,1
2,2,2,1,1,2,1,1,2,2,2,2,2,2,2,2,2,2,2,1,2,2,0,2,2
2,2,2,2,0,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,1,2,2
2,2,2,2,0,2,1,0,2,2,2,2,2,2,2,1,2,2,2,1,2,2,0,2,2
2,2,2,1,0,1,1,0,0,2,2,2,2,2,1,1,1,2,2,0,2,0,0,2,2
1,1,0,0,0,1,0,0,0,2,1,2,2,2,1,2,1,2,2,0,2,0,0,2,2
1,1,1,1,0,1,1,1,1,2,1,2,2,1,1,1,1,2,2,0,2,1,0,1,1
1,2,1,1,1,1,1,1,1,2,2,2,2,1,2,1,1,2,2,1,2,1,1,2,1
2,2,1,1,1,1,2,1,1,2,2,2,2,1,2,1,2,2,2,1,2,2,1,2,2
1,2,2,1,0,1,2,1,0,2,2,2,2,1,1,0,1,2,2,0,2,1,0,2,2
```

Contents　　Line

1. Simulation data ……6

2. Basic results in WebRasch……9

Data-model fit

Kendal W and correlation coefficient

Cronban alpha

Person measure

Item difficulties

Fit statistics

Z-score

3. Wright map generated from the online copy pasting jobs ……. ……. ……. …… 13

4 KIDMAP generated from the online copy pasting jobs ……. …… 18

5. Category probability curve generate……19

6. Performance plot generated from copy pasting jobs……22

7. DIF Graph……24

8. Item difficulties using forest plot……28

9. Person measures using forest plot……30

10. Forest plots……31

11. Other Examples in RaschOnline……37

12. KanoPlot.....44

13.Summary.....46

14.Appendices.....49

15 ANOVA.....51

Excel file: winstepsex0.xlsx

	A	B	C	D	E	F
1	KID	Gender	Watch bird	Read book	Read book	Watch gras
2	M Rossner, Marc Daniel	1	1	2	1	1
3	M Rossner, Lawrence F.	1	2	2	2	2
4	M Rossner, Toby G.	1	2	2	1	1
5	M Rossner, Michael T.	1	1	0	1	0
6	F Rossner, Rebecca A.	0	1	0	1	0
7	M Rossner, Tr Cat	1	1	0	1	1
8	M Wright, Benjamin	1	2	2	2	0
9	M Lambert, Md., Ross W.	1	2	2	1	0
10	M Schulz, Matthew	1	0	1	1	0

1. Simulation data

RaschOnline

Examples SELECTED:

A:Input data only and then click on Submit icon:

- Wright Map
- KIDMAP
- ICC_cat
- Performance
- Measure vs. Outfit
- Measure vs. Infit
- Simulation data

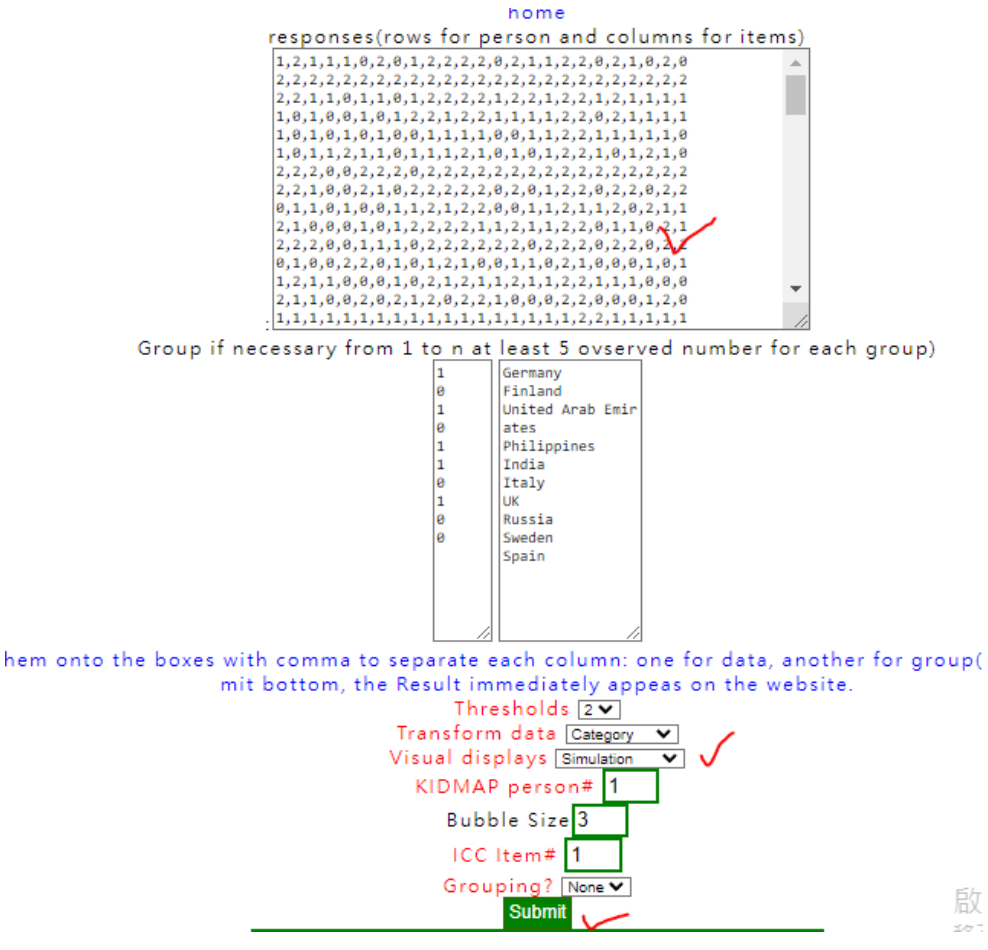
B:Input data without visualizations and then click on Submit icon:

- Estimations

C:Input data & slection types and then click on Submit icon:

- Others

57



58

Simulation data genetated

1,1,2,0,0,0,0,0,0,1,2,2,1,1,2,0,2,2,2,1,2,1,0,2,1
2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2
2,1,0,0,1,0,0,0,1,2,2,2,1,2,2,1,1,2,2,0,2,2,0,2,1
2,1,2,1,0,0,0,0,0,2,1,2,1,1,2,0,1,2,2,1,2,1,0,2,1
2,1,0,1,0,0,1,1,0,2,1,2,2,1,1,0,0,2,1,0,1,1,0,1,1
0,1,0,1,0,1,0,0,1,2,2,2,2,0,1,1,2,2,2,0,2,0,0,0,1
2,2,2,2,0,2,2,1,1,2,2,2,1,1,2,2,2,2,2,2,2,2,1,2,2
2,2,2,1,0,2,2,0,1,2,2,2,2,2,1,2,1,2,2,1,1,2,1,2,1
2,2,1,0,0,0,0,0,0,0,1,2,1,1,2,1,0,2,2,0,1,1,0,1,2
2,1,1,0,2,1,0,0,0,1,2,2,2,0,0,0,0,2,2,1,2,1,1,2,2
1,1,2,1,0,2,1,0,2,2,1,1,2,1,1,1,2,2,2,1,2,1,1,1,2
2,1,0,0,1,0,0,0,0,1,1,2,2,1,0,1,1,2,1,1,1,1,0,1,1
2,2,0,0,0,1,0,0,0,1,2,1,0,0,1,1,0,2,1,1,2,0,0,1,0
1,1,1,0,0,0,1,0,1,2,1,1,1,0,1,1,0,2,2,0,2,0,0,2,1

Note. The Rasch simulation data were generated. Copy & paste the simulation data to gain a newly estimated parameters in Rasch model.

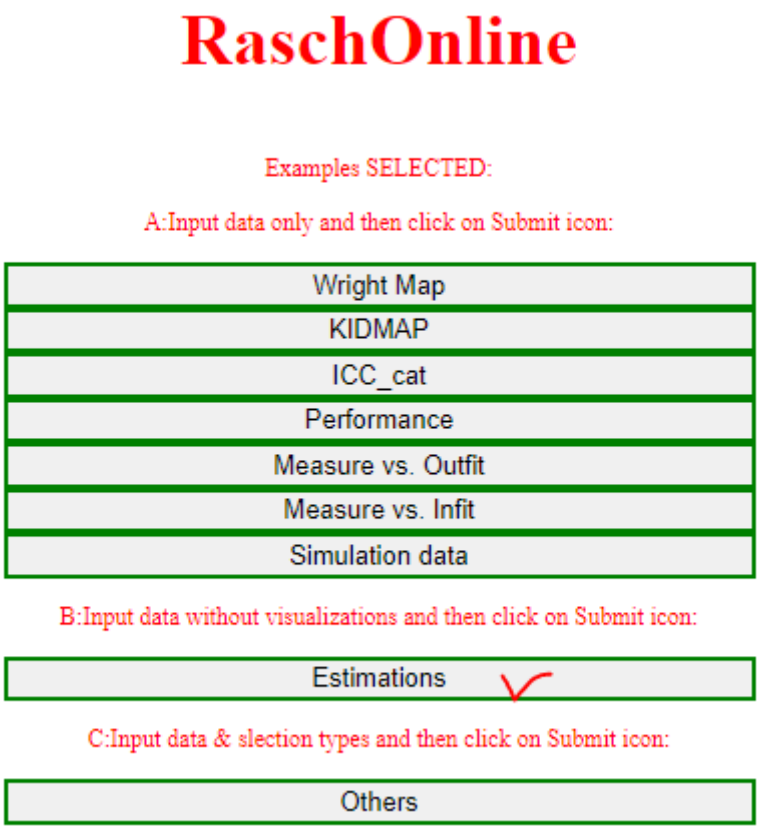
Reference at https://www.rasch.org/rmt/rmt213a.htm

In this study, the codes are below:

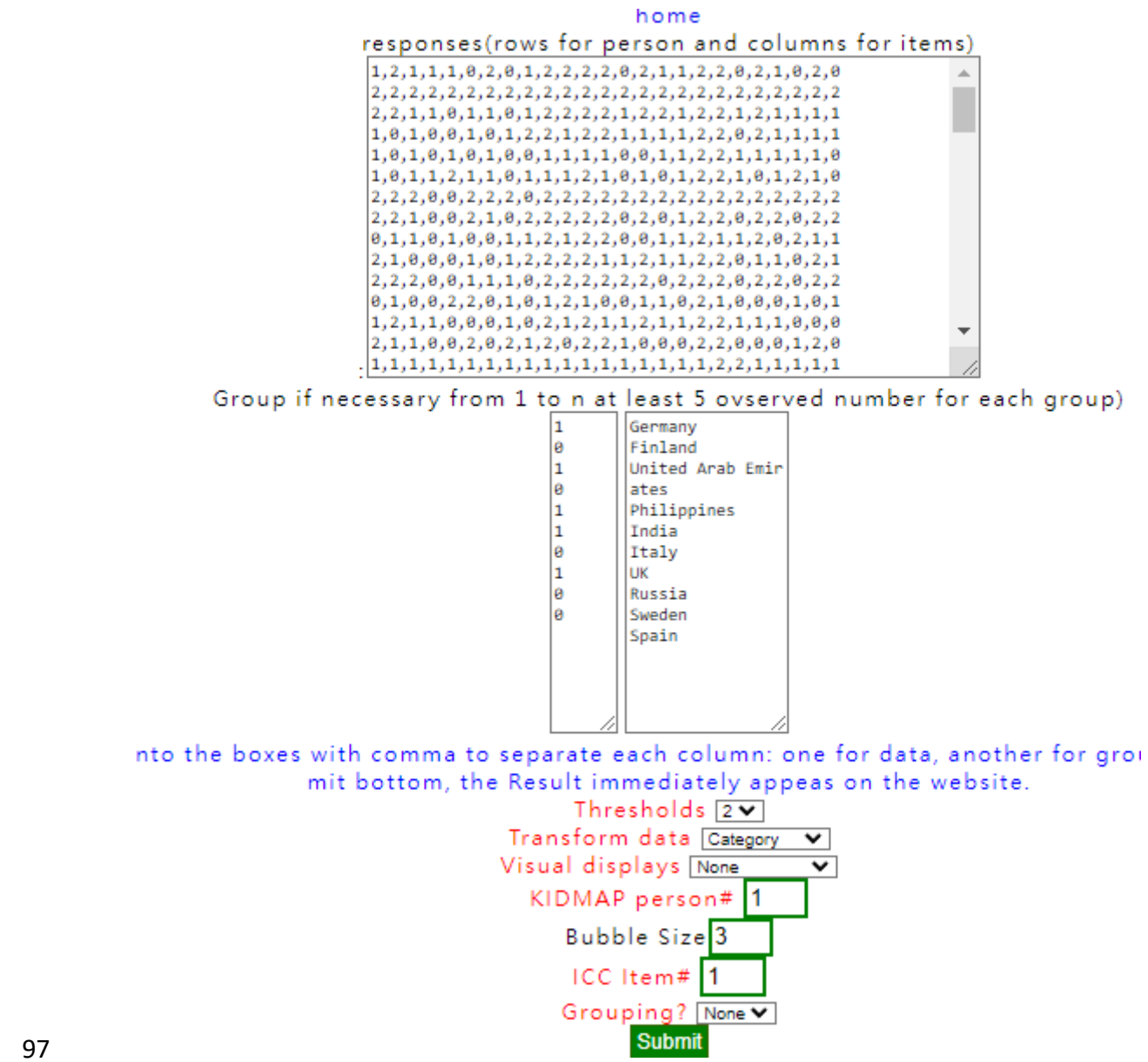
```
cguess_a=0:apha_a=1: threshold=category_number-1
 for jk =1 to personno
   ability2=person(jk)    'person measure
          mscore=0
          scoretxt=""
    for j= 1 to itemno
              item_diff=item(j) 'item difficulty
               ReDim cumexp(threshold + 1)
            M = threshold + 1
            measure = 0
            cumexp(1) = 1
  For Category = 2 To M
    measure = measure + ability2 - item_diff - catcalibrate(Category - 1) 'step difficulty
    FroExp = (1 - cguess_a) * Exp(apha_a * measure)
     cumexp(Category) = cumexp(Category - 1) + FroExp
  Next
    Randomize
     mrnd = Rnd
          u = mrnd * cumexp(M)
            For Category = 1 To M
                  If u <= cumexp(Category) Then x = Category - 1: Exit For
            Next
```

```
86                  if j=1 then
87                      scoretxt=x
88                  else
89                      scoretxt=scoretxt &"," & x
90                  end if
91              next
92               response.write scoretxt & chr(13) & "<br>"
93          next
```

94 2. Basic results in RaschOnline



95
96



97

98 Note. Data entry with comma separations or tab spaces from the spreadsheet of MS Excel

99

100 Click on Submit

No.	Person	Theta	SE	Infit	Outfit	Chi_q	Raw Score	2 SE(infit)	2 SE(outfit)	InfitZSTD	OutfitZSTD	Corr.	Relia_I	Relia_O
1	3	0.61	0.34	0.95	0.83	1	30	0.46	0.002	0.34	-35.78	0.71	0.76	0.79
2	5	10	327.77	0	0	1	50	885429536.74	0.002	0	0	0	1	1
3	4	1.1	0.36	0.44	0.4	1	34	0.56	0.002	-0.04	-156.56	0.81	0.89	0.9
4	2	0.26	0.34	0.72	0.71	1	27	0.42	0.002	0.06	-64.12	0.69	0.82	0.82
5	1	-0.68	0.35	0.88	1.33	1	19	0.46	0.002	0.28	59.21	0.4	0.77	0.66
6	1	-0.08	0.34	1.63	2.4*	0	24	0.42	0.002	0.85	200.98	0.1	0.59	0.42
7	5	2.72	0.48	1.85	1.1	1	44	1.98	0.002	1.79	19.17	0.46	0.54	0.72
8	3	0.97	0.35	1	0.82	1	33	0.52	0.002	0.43	-38.03	0.81	0.74	0.79
9	1	-0.08	0.34	1.41	1.83	1	24	0.42	0.002	0.69	132.42	0.32	0.64	0.54
10	2	0.38	0.34	0.71	0.66	1	28	0.44	0.002	0.08	-76.88	0.77	0.82	0.83
11	4	1.23	0.36	0.99	0.78	1	35	0.6	0.002	0.49	-47.23	0.8	0.75	0.8
12	1	-0.93	0.36	1.87	3.53*	0	17	0.5	0.002	0.97	309.74	0.13	0.53	0.25
13	1	-0.08	0.34	0.79	0.78	1	24	0.42	0.002	0.14	-47.23	0.65	0.8	0.8
14	1	-0.2	0.34	1.77	1.76	1	23	0.42	0.002	0.94	123.06	0.45	0.55	0.56
15	2	0.26	0.34	0.92	1.54	1	27	0.42	0.002	0.27	91.89	0.01	0.76	0.61
16	5	2.5	0.45	0.52	0.31	1	43	1.6	0.002	1.19	-192.34	0.78	0.87	0.92
17	5	3.61	0.63	1.18	0.39	1	47	5.28	0.002	4.41	-160.25	0.51	0.7	0.9
18	5	2.12	0.42	0.93	0.58	1	41	1.14	0.002	0.93	-98.72	0.73	0.76	0.85
19	3	0.85	0.35	0.93	0.78	1	32	0.5	0.002	0.36	-47.23	0.76	0.76	0.8
20	2	0.15	0.34	1.06	0.9	1	26	0.42	0.002	0.41	-20.5	0.74	0.73	0.77

101

No.	Item	Logit	SE	Infit	Outfit	Raw Score	2 SE(infit)	2 SE(outfit)	InfitZSTD	OutfitZSTD	Corr.	relia_I	relia_O
1		-0.4	0.21	0.55	0.49	109	29.68	0.002	42.84	-87.26	0.18	0.86	0.88
2		-0.71	0.22	0.93	0.71	116	38.54	0.002	55.63	-44.46	0.17	0.76	0.82
3		0.42	0.19	0.57	0.53	88	16.92	0.002	24.41	-78.63	0.2	0.86	0.87
4		1.76	0.2	0.89	0.9	52	9.66	0.002	13.94	-14.21	0.15	0.77	0.77
5		2.43	0.22	2.31	3.59	37	8.48	0.002	12.27	218.29	-0.02	0.44	0.25
6		0.31	0.19	0.81	0.75	91	18.06	0.002	26.06	-37.68	0.17	0.79	0.81
7		1.11	0.19	0.98	1	69	12.02	0.002	17.35	0	0.16	0.75	0.74
8		1.68	0.2	1.1	1.2	54	9.86	0.002	14.23	25.8	0.12	0.72	0.69
9		0.71	0.19	1.18	1.16	80	14.44	0.002	20.85	20.89	0.14	0.7	0.7
10		-1.49	0.26	0.78	0.56	130	81.74	0.002	117.98	-72.45	0.15	0.8	0.86
11		-0.96	0.23	0.63	0.49	121	48.2	0.002	69.57	-87.26	0.18	0.84	0.88
12		-2.05	0.31	0.7	0.5	137	151.76	0.002	219.05	-85.06	0.14	0.82	0.87
13		-1.3	0.25	1.23	0.93	127	66.96	0.002	96.65	-9.84	0.14	0.68	0.76
14		0.42	0.19	0.83	0.75	88	16.92	0.002	24.42	-37.68	0.17	0.79	0.81
15		-0.48	0.21	0.78	0.63	111	31.82	0.002	45.93	-58.83	0.18	0.8	0.84
16		0.6	0.19	0.97	0.94	83	15.28	0.002	22.05	-8.41	0.13	0.75	0.76
17		0.16	0.19	0.65	0.58	95	19.86	0.002	28.66	-68.45	0.2	0.83	0.85
18		-3.16	0.47	1.51	1.22	145	608.8	0.002	878.73	28.22	0.04	0.61	0.69
19		-2.49	0.36	1.09	1.09	141	258.38	0.002	372.94	12	0.09	0.72	0.72
20		1.84	0.2	1.34	1.81	50	9.46	0.002	13.66	89.98	0.09	0.66	0.54
21		-0.86	0.22	0.85	0.64	119	43.88	0.002	63.33	-56.97	0.17	0.78	0.84
22		0.08	0.2	0.83	0.73	97	20.88	0.002	30.14	-41.04	0.18	0.79	0.81
23		2.19	0.21	2.42	4.08	42	8.8	0.002	12.73	245.64	-0.03	0.42	0.2
24		-0.31	0.2	0.9	0.78	107	27.78	0.002	40.1	-32.75	0.17	0.77	0.8
25		0.53	0.19	0.8	0.73	85	15.9	0.002	22.95	-41.04	0.18	0.79	0.81

STRUCTURE-THRESHOLD MEASURE ANCHOR FILE FOR LIKING FOR SCIENCE (Wright & Masters p.18)

CATEGORY Rasch-Andrich threshold

1.=-0.86

2.=0.86

102

103 Note. Person measures and item difficulties are shown above.

104

105

person	Outfit	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
1	0.83	
2	0	
3	0.4	
4	0.71	
5	1.33	
6	2.4	
7	1.1	
8	0.82	
9	1.83	
10	0.66	
11	0.78	
12	3.53	
13	0.78	
14	1.76	

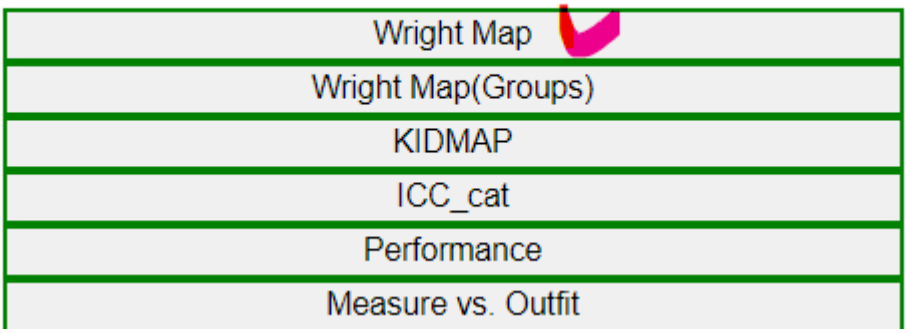
Note. Unexpected responses using Z-score>2 or ≤-2.0

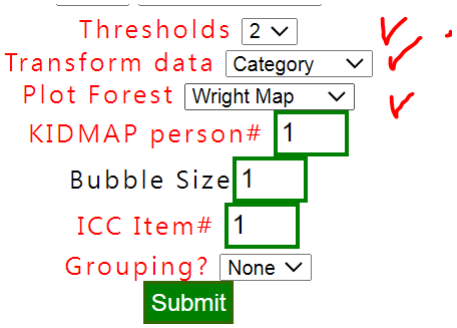
Person	Outfit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	0.83	-0.71	0.79	-0.13	0.81	1.37	-1.77	1.85	-0.99	0.07	0.54	0.7	0.41	0.59	-1.61	0.88	-0.01	-0.31	0.23
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0.4	0.72	0.62	-0.47	0.45	-0.79	-0.55	0	-1.13	-0.27	0.42	0.55	0.32	0.46	-0.47	0.69	1.17	-0.66	0.18
4	0.71	-0.45	-2.29	0.11	-0.73	-0.52	0.03	-0.99	1.02	1.81	0.64	-0.87	0.48	0.78	0.11	-0.51	0.23	-0.07	0.28
5	1.33	0.19	-1.5	0.77	-0.46	2.94	-0.93	1.34	-0.47	-0.77	-0.56	-0.19	-0.99	-0.43	-0.88	-1.35	0.91	0.58	0.44
6	2.4	-0.21	-1.96	0.34	1.45	4.67	0.27	0.84	-0.64	0.55	-1.02	-0.61	0.57	-0.86	-1.17	-0.27	-1.07	0.66	0.33
7	1.1	0.32	0.28	0.49	-2.28	-1.69	0.46	0.68	0.99	-3.69	0.19	0.24	0.14	0.21	0.49	0.31	0.53	0.43	0.08

Note. Display Z-scores for each response

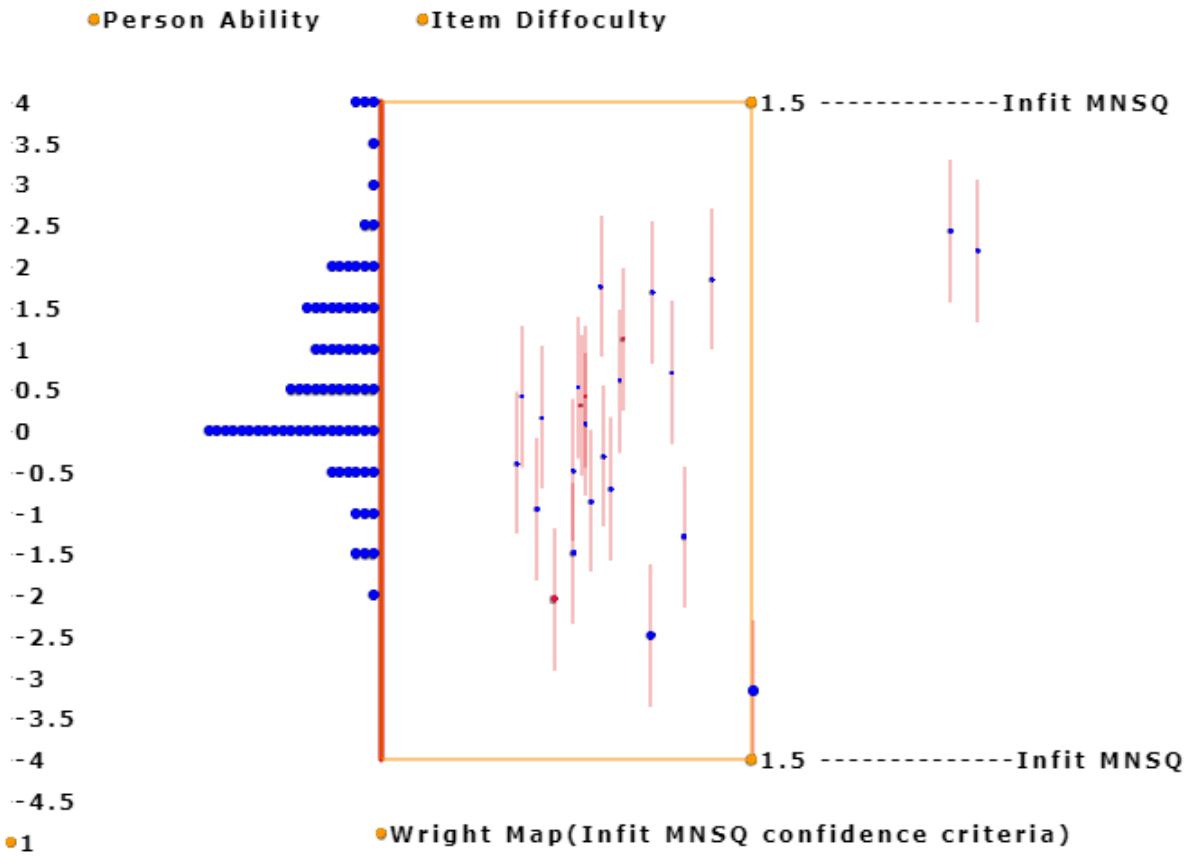
3. Wright map generated

A:Input data only and then click on Submit icon:





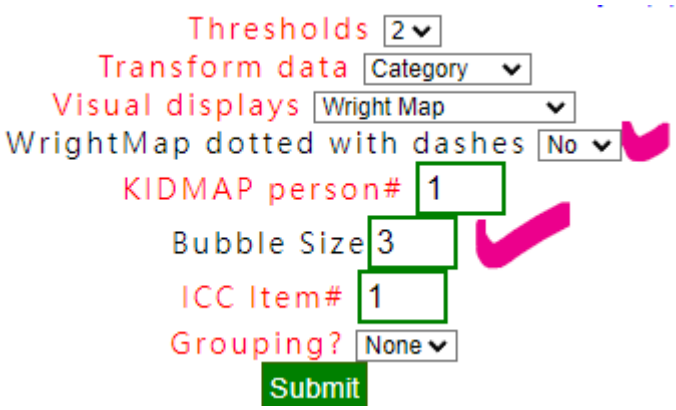
Note. select Wright Map and click on Submit



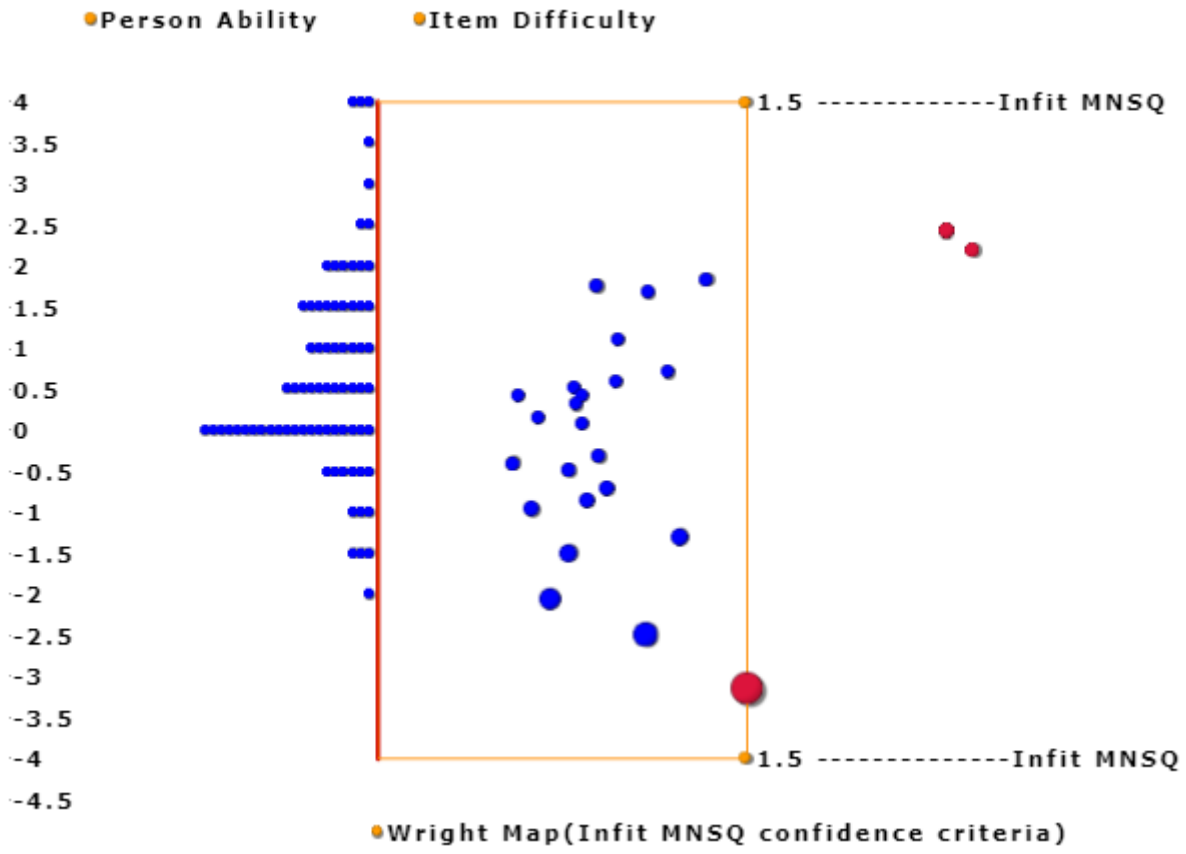
Note. Wright Map appears on Google Maps. Person measures are on the left-hand side and item difficulties on the right-hand side, where the dots indicate item overall item difficulties. The vertical lines on the right-hand side indicate the threshold difficulties(i.e., step difficulties) spread to the two sides of overall item difficulties.

Infit Mean Squares for each item are shown on the right-hand side. With which, we

can examine which items are misfitted to the Rasch model when the cutting point is set at 1.5.

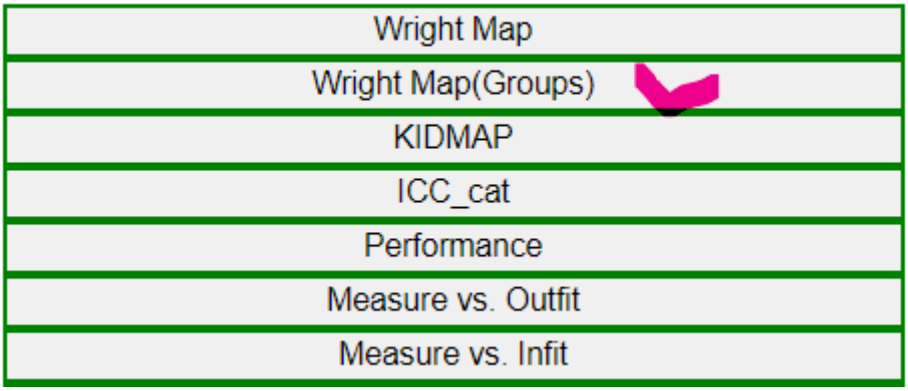


To adjust bubble size and confirm no dash line in Wright map:

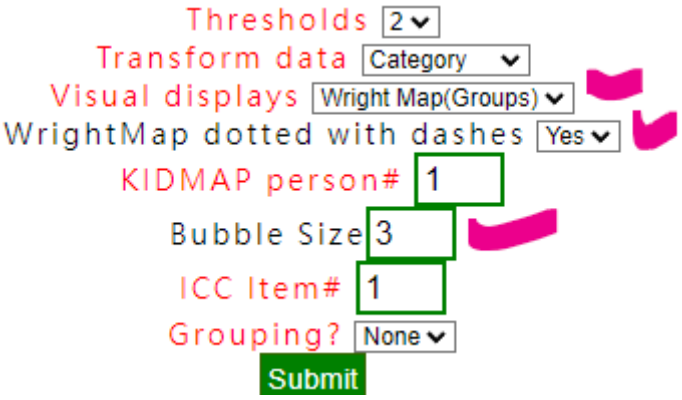


Note. Bubbles are sized by item SE.

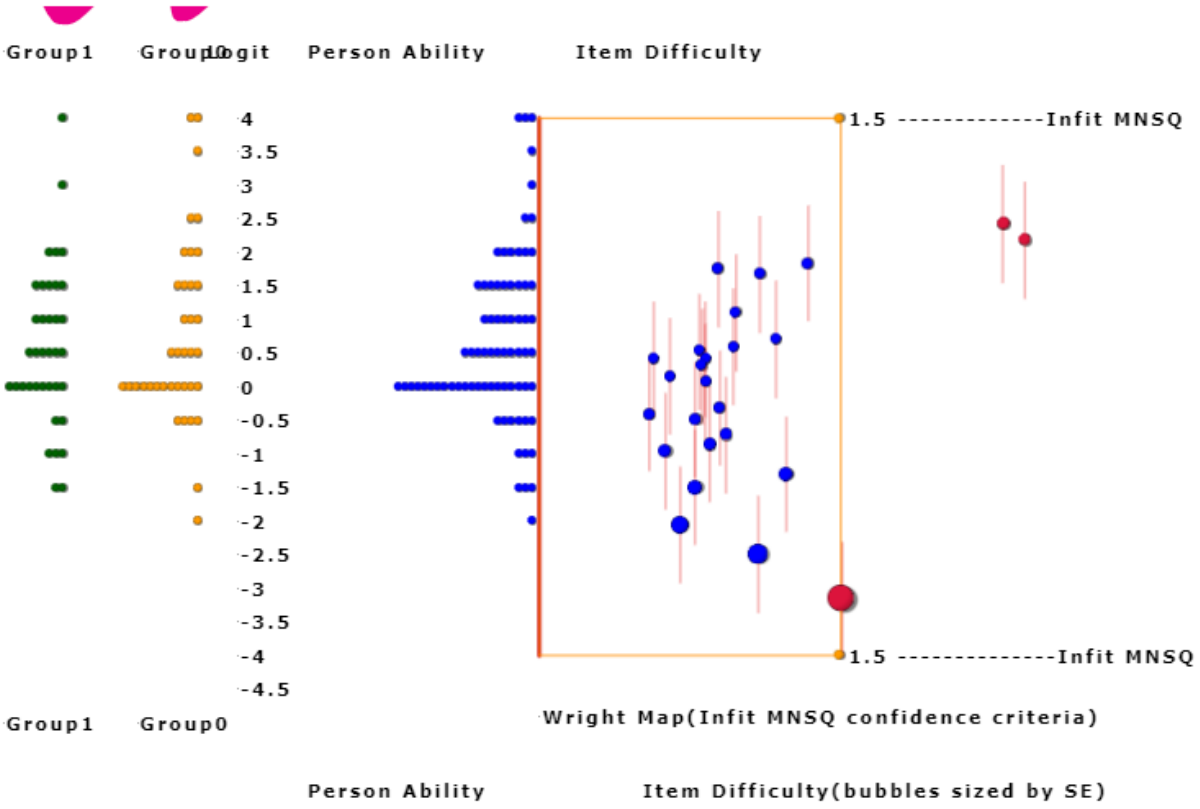
128


Wright Map
Wright Map(Groups)
KIDMAP
ICC_cat
Performance
Measure vs. Outfit
Measure vs. Infit

129

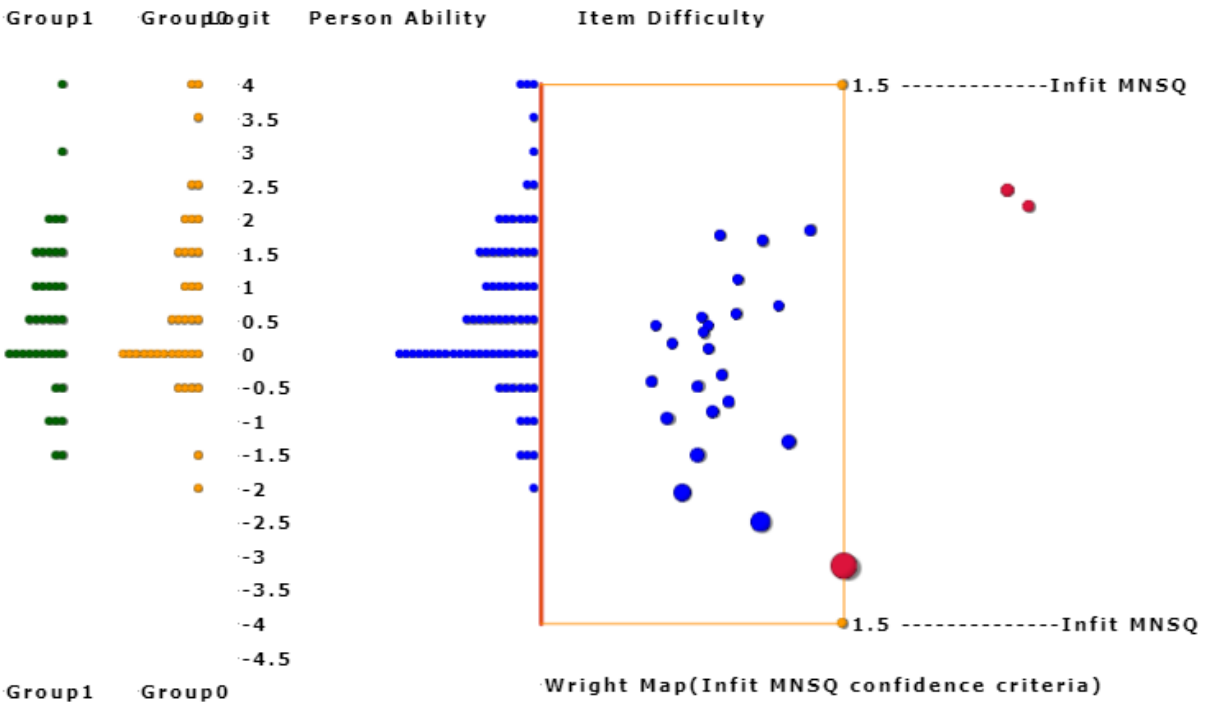

Thresholds 2
Transform data Category
Visual displays Wright Map(Groups)
WrightMap dotted with dashes Yes
KIDMAP person# 1
Bubble Size 3
ICC Item# 1
Grouping? None
Submit

130


Group1
Group0
Logit
Person Ability
Item Difficulty
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
-3
-3.5
-4
-4.5
1.5 ----------Infit MNSQ
1.5 ----------Infit MNSQ
Group1
Group0
Wright Map(Infit MNSQ confidence criteria)
Person Ability
Item Difficulty(bubbles sized by SE)

Thresholds 2
Transform data Category
Visual displays Wright Map(Groups)
WrightMap dotted with dashes No
KIDMAP person# 1
Bubble Size 3
ICC Item# 1
Grouping? None
Submit

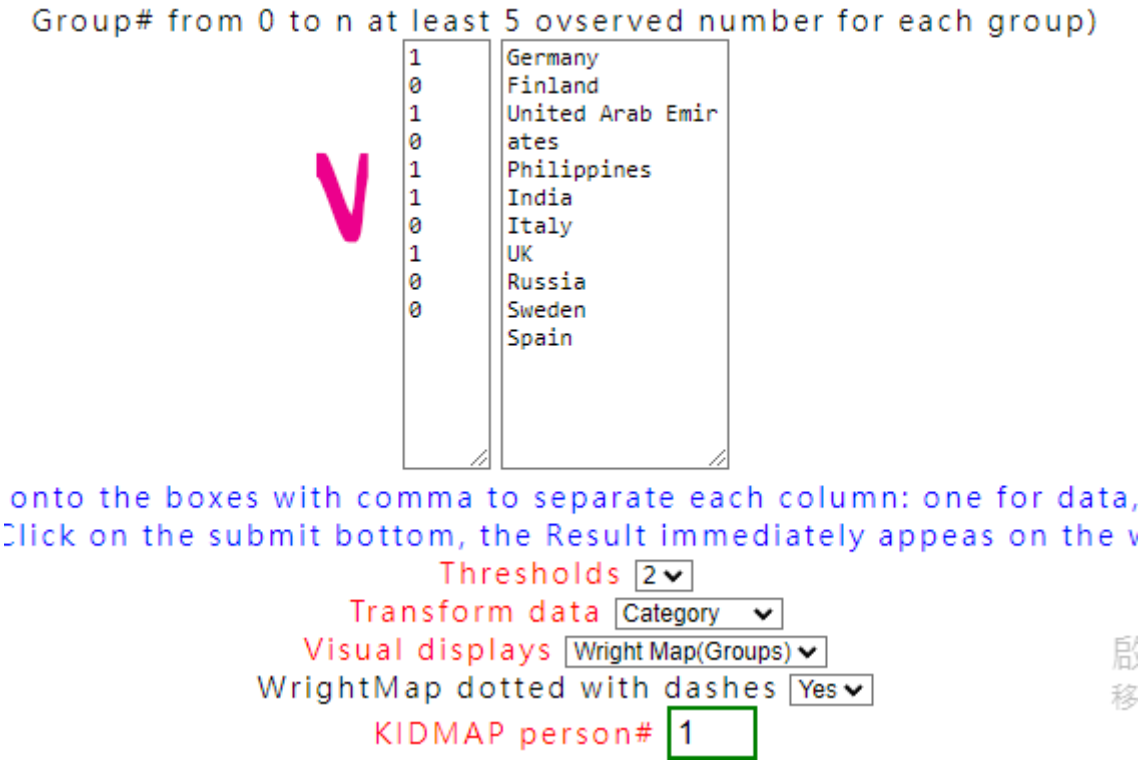
131



132

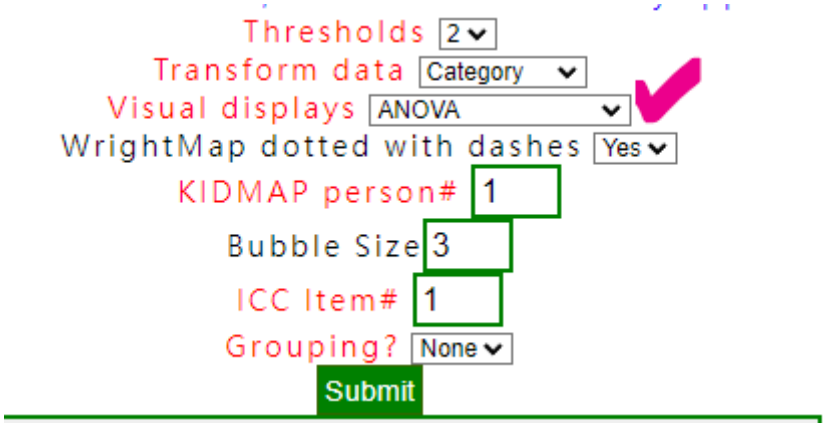
Person Ability

Item Difficulty(bubbles sized by SE)



133

134 Group# from 0 to n



135

136 Applying ANOVA to examine the mean difference among groups

				18/4		
ANOVA	Virable	SS	df	MSS	F	p
	Between	49.47	1	49.47	19.07	=FDIST(19.07,1,73)
	Within	189.37	73	2.59		p-value(Click on Me)
	TSS	238.84	74		All mean=	0.23

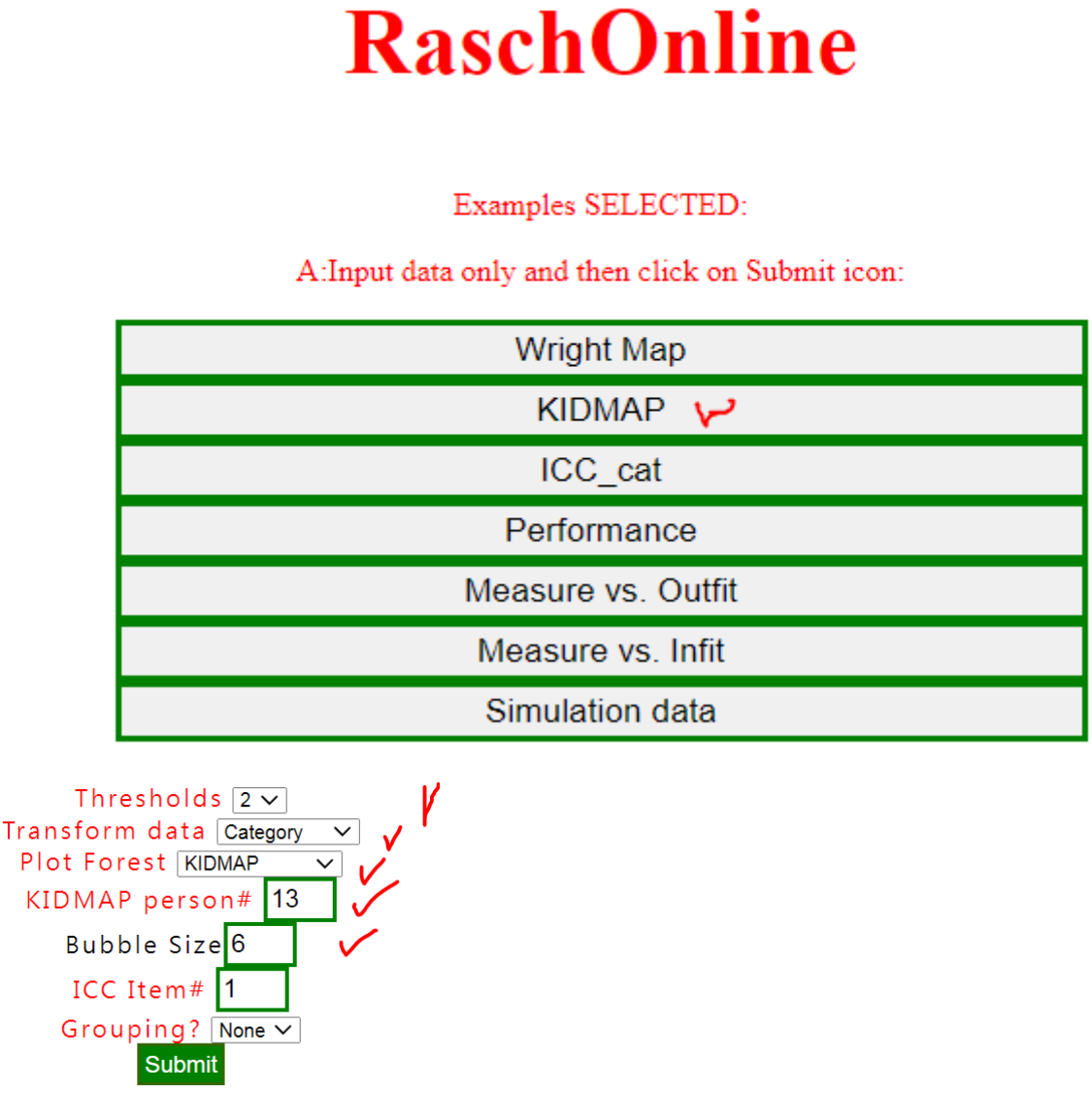
137 Group Count Total Mean Varince Tlogit Logt Va

138

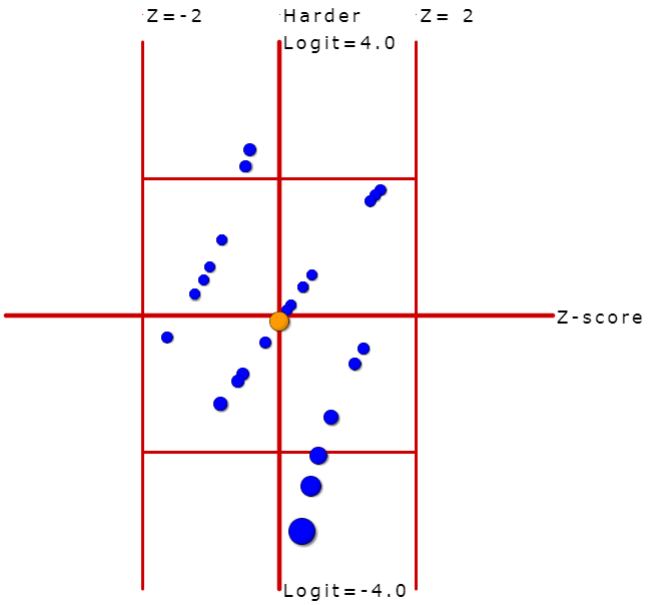
139

140

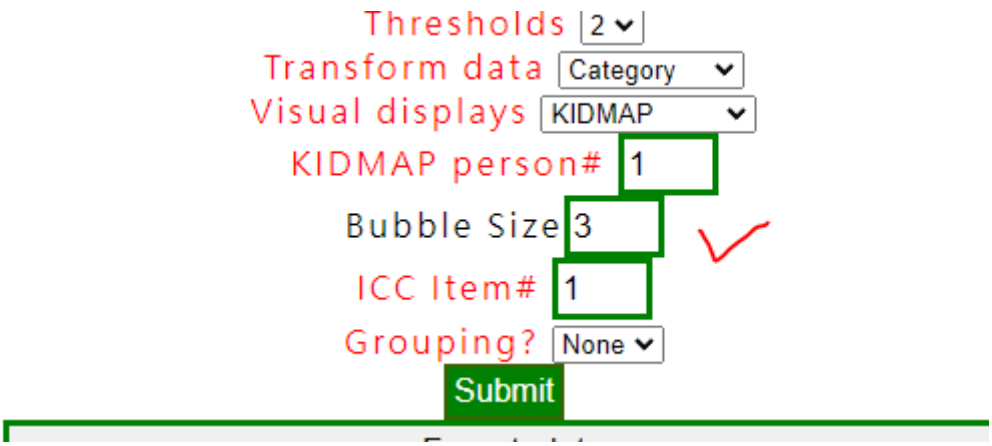
4. KIDMAP generated from the online copy pasting jobs



Note. ensure the student number(e.g., 13) and bubble size in this case after selecting the KIDMAP



Note. If aberrant responses exit, the |Zsocres| beyond 2.0 mean unexpected responses endorsed by the person. The yellow bubble is the person measure on the vertical axis. The bubbles of responses indicate the standard errors of items; KIDMAP appears on Google Maps. The bubble size can be adjusted by the methods shown below:

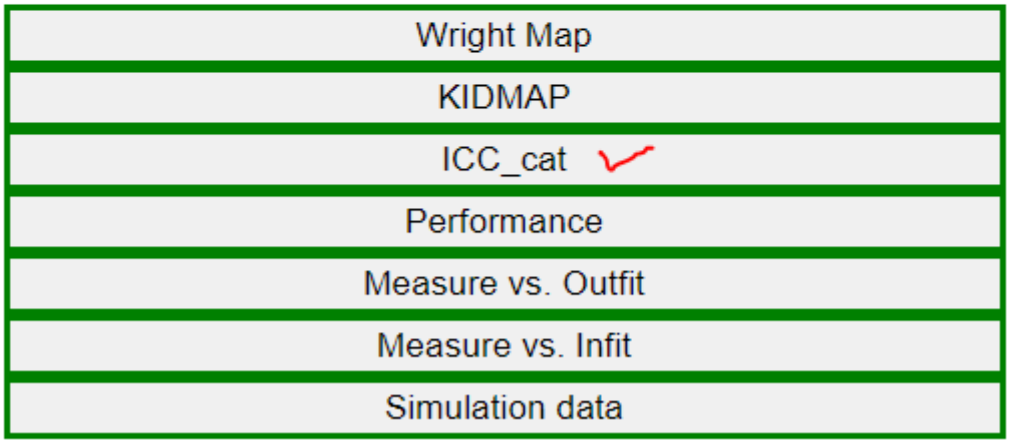


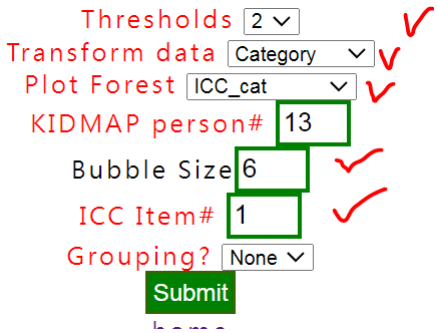
5. Category probability curve generated from online copy pasting jobs

RaschOnline

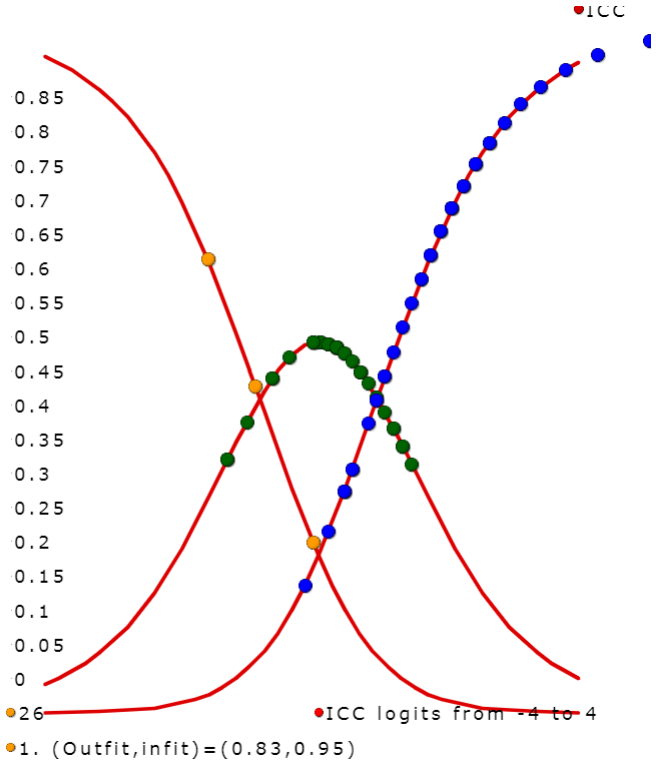
Examples SELECTED:

A:Input data only and then click on Submit icon:





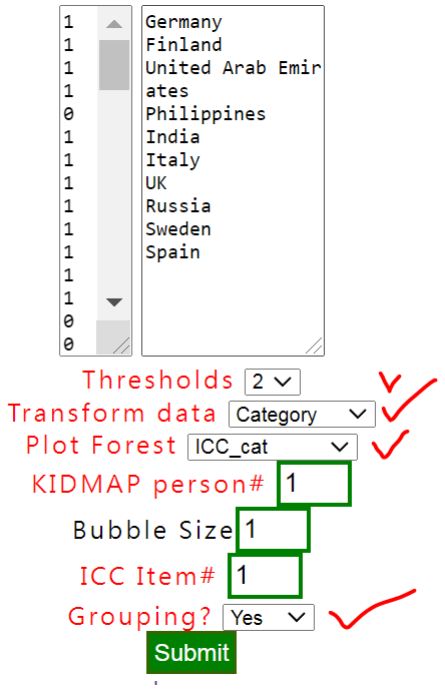
Note. To ensure that the item number was selected and ICC-cat selected



Note. Item #1 selected and all students on the curves

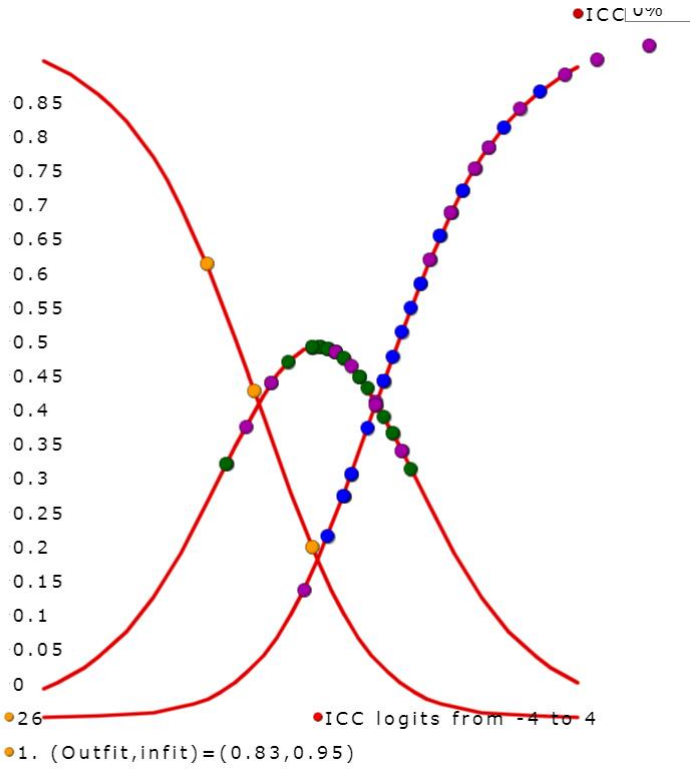
See the intersection of curves to determine the possible aberrant responses for persons. For example, the yellow bubble shows the person with a higher ability on the x-axis responses with a lower category(e.g., zero instead of 1 or more) on the zero curve rather than the middle curve to match with the person ability. Via the plot, we can examine person misfit on a specific item when examine the response probabilities and person measures on the y- and x- axes, respectively.

(If data are simulated, all bubbles are exactly on the appropriate curves)



167

168 Note. If grouping is selected as Yes



169

170 Note. The gender=0 will be colored in purple instead of yellow or blue

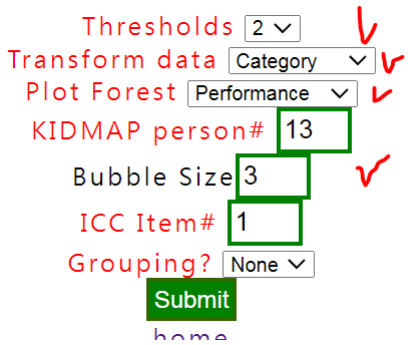
171 6. Performance plot generated from the online copy pasting jobs

RaschOnline

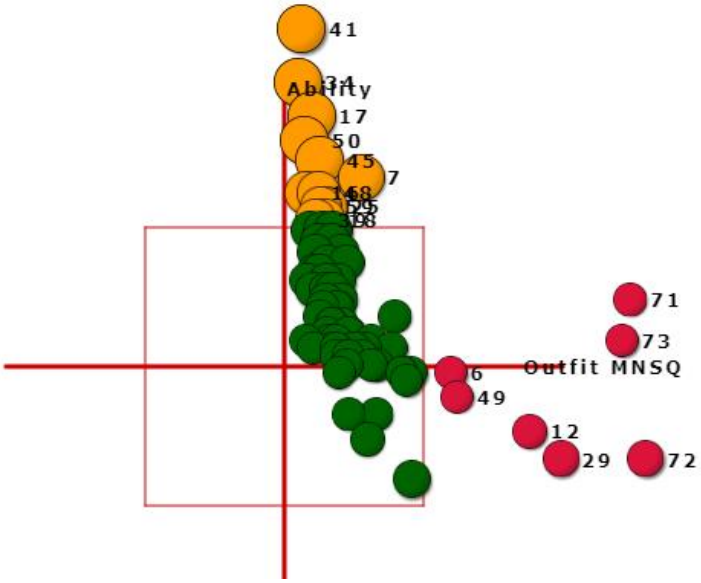
Examples SELECTED:

A:Input data only and then click on Submit icon:

- Wright Map
- KIDMAP
- ICC_cat
- Performance
- Measure vs. Outfit
- Measure vs. Infit
- Simulation data



Note. Performance was selected and bubble size was ensured



Note. All persons are on Google Maps by colors outside the limits. Outfits are on the x-axis and person measures on the y-axis. Bubbles are colored by three categories. In which, the red means responses aberrant much(i.e., Outfit MS>2.0) and the yellow indicates person measures beyond 2.0 in logit score.

7. DIF graph generated from the online copy pasting jobs

RaschOnline

Read Me First | MP4 | MP4

Examples SELECTED:

A:Input data only and then click on Submit icon:

- Wright Map
- KIDMAP
- ICC_cat
- Performance
- Measure vs. Outfit
- Measure vs. Infit
- Rawscore vs. Measure
- Simulation data
- Summary
- DIF:table(to define groups) ✓
- DIF:graph(to define groups) ✓

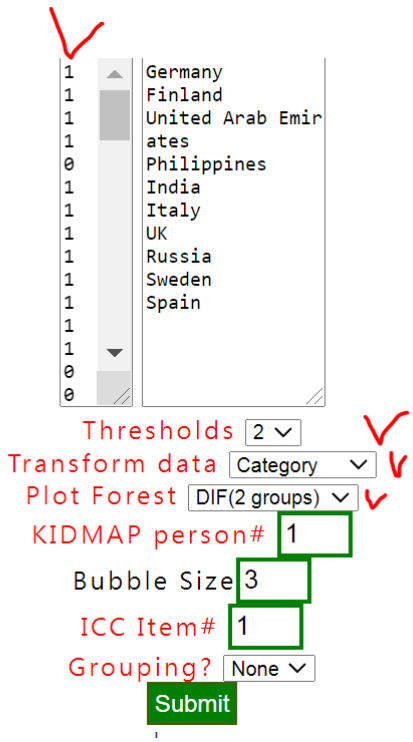
B:Input data without visualizations and then click on Submit icon:

- Estimations

C:Input data & slection types and then click on Submit icon:

- Others

183



184 .

185 Note. Groups were ensured and DIF(2 groups) was selected

186

Thresholds	Group 1	Group 2	n
Step1	-1.36	-1.07	18
Step2	1.36	1.07	57

DIF class/group specification is: Pairwise DIF=0,1(1)(If an item has a perfect socre, the delta is assigne with an overall delta)

KID CLASS	Obs-Exp Average	DIF MEASURES	DIF S.E.	KID CLASS	Obs-Exp Average	DIF MEASURES	DIF S.E.	DIF CONTRAST	S.E.	t	sig.	df	Name
0	0	-0.51	0.55	1	0	-0.43	0.24	-0.08	0.6	0.13	0.898	17	1
0	0	-0.51	0.55	1	0	-0.85	0.25	0.34	0.6	0.57	0.576	17	2
0	0	-0.22	0.53	1	0	0.62	0.22	-0.83	0.57	1.46	0.162	17	3
0	0.01	2.13	0.47	1	0	1.98	0.24	0.15	0.53	0.28	0.782	17	4
0	0.01	4.55	0.55	1	0	2.29	0.25	2.26	0.6	3.77	0.001	17	5
0	0.01	0.56	0.49	1	0	0.32	0.23	0.24	0.54	0.45	0.658	17	6
0	0.01	1.69	0.47	1	0	1.17	0.23	0.52	0.52	1	0.332	17	7
0	0.01	1.47	0.47	1	0	2.04	0.24	-0.57	0.53	1.07	0.3	17	8
0	0.01	1.02	0.48	1	0	0.77	0.22	0.26	0.53	0.48	0.638	17	9
0	0	-2.04	0.72	1	0	-1.58	0.29	-0.45	0.78	0.58	0.57	17	10
0	0	-0.82	0.57	1	0	-1.12	0.26	0.3	0.63	0.47	0.644	17	11

187

KID CLASS	Obs-Exp Average	DIF MEASURES	DIF S.E.	KID CLASS	Obs-Exp Average	DIF MEASURES	DIF S.E.	DIF CONTRAST	S.E.	t	sig.	df	Name
1	0	-0.43	0.24	0	0	-0.51	0.55	0	0.6	0.13	0.898	17	1
1	0	-0.85	0.25	0	0	-0.51	0.55	0	0.6	0.57	0.576	17	2
1	0	0.62	0.22	0	0	-0.22	0.53	0	0.57	1.46	0.162	17	3
1	0	1.98	0.24	0	0.01	2.13	0.47	0	0.53	0.28	0.782	17	4
1	0	2.29	0.25	0	0.01	4.55	0.55	0	0.6	3.77	0.001	17	5
1	0	0.32	0.23	0	0.01	0.56	0.49	0	0.54	0.45	0.658	17	6
1	0	1.17	0.23	0	0.01	1.69	0.47	0	0.52	1	0.332	17	7
1	0	2.04	0.24	0	0.01	1.47	0.47	0	0.53	1.07	0.3	17	8
1	0	0.77	0.22	0	0.01	1.02	0.48	0	0.53	0.48	0.638	17	9
1	0	-1.58	0.29	0	0	-2.04	0.72	0	0.78	0.58	0.57	17	10
1	0	-1.12	0.26	0	0	-0.82	0.57	0	0.63	0.47	0.644	17	11
1	0	-2.31	0.36	0	0	-2.04	0.72	0	0.8	0.34	0.738	17	12
1	0	-1.26	0.27	0	0	-2.63	0.83	0	0.87	1.58	0.132	17	13
1	0	0.57	0.22	0	0.01	0.05	0.51	0	0.56	0.92	0.37	17	14
1	0	-0.6	0.24	0	0	-0.22	0.53	0	0.58	0.67	0.512	17	15
1	0	0.47	0.22	0	0.01	1.69	0.47	0	0.52	2.36	0.03	17	16

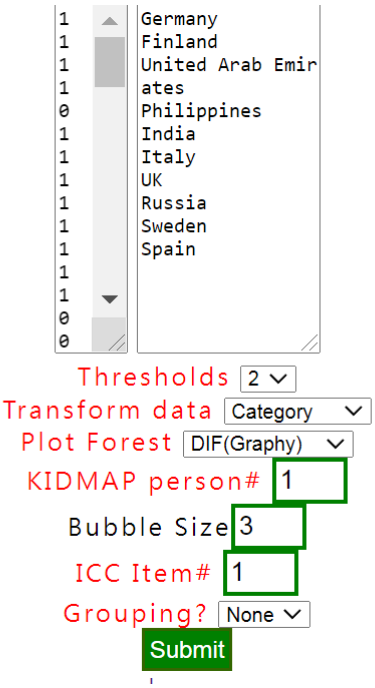
188

Class CLASS	OBSERVATIONS COUNT	BASE AVERAGE	LINE EXPECT	DIF MEASURE	DIF SCORE	DIF MEASURE	DIF SIZE	DIF S.E.	t	sig.	df	Item Name
0	18	1.61	1.61	-0.4	0	-0.51	0.11	0.55	0.2	0.844	17	1
1	57	1.4	1.4	-0.4	0	-0.43	0.03	0.24	0.14	0.658	17	1
0	18	1.61	1.61	-0.71	0	-0.51	-0.21	0.55	-0.37	0.716	17	2
1	57	1.53	1.53	-0.71	0	-0.85	0.14	0.25	0.56	0.424	17	2
0	18	1.56	1.55	0.42	0	-0.22	0.64	0.53	1.2	0.246	17	3
1	57	1.05	1.05	0.42	0	0.62	-0.2	0.22	-0.9	0.01	17	3
0	18	1	0.99	1.76	0.01	2.13	-0.37	0.47	-0.79	0.44	17	4
1	57	0.6	0.6	1.76	0	1.98	-0.23	0.24	-0.94	0.138	17	4
0	18	0.44	0.43	2.43	0.01	4.55	-2.13	0.55	-3.87	0.001	17	5
1	57	0.51	0.51	2.43	0	2.29	0.14	0.25	0.54	0.001	17	5
0	18	1.39	1.38	0.31	0.01	0.56	-0.25	0.49	-0.5	0.624	17	6
1	57	1.16	1.16	0.31	0	0.32	-0.01	0.23	-0.03	0.296	17	6

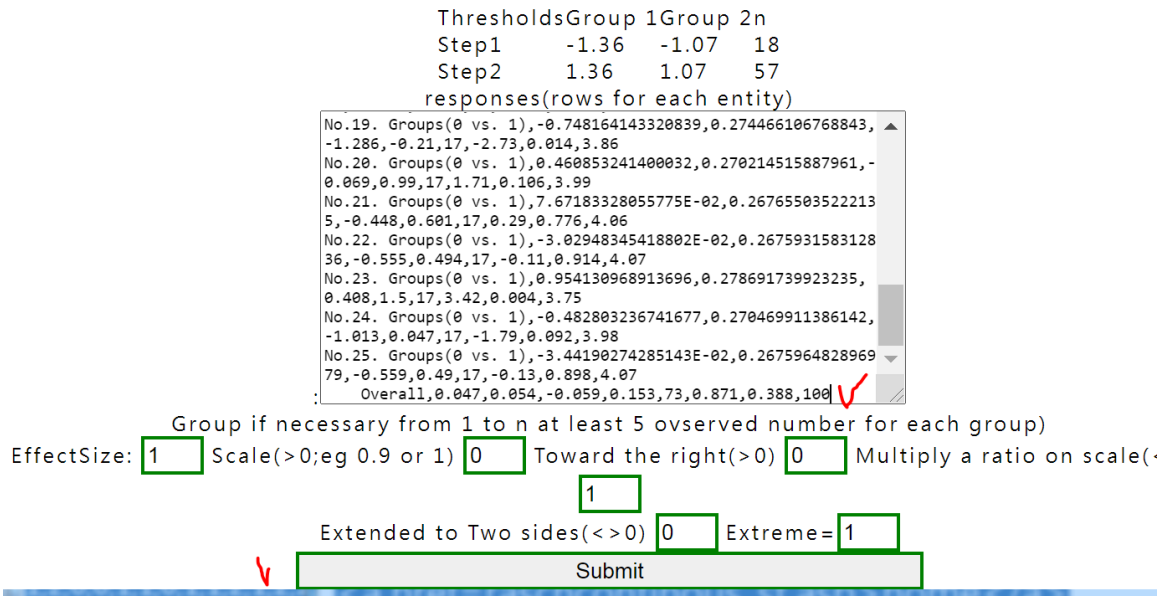
DIF class/group specification is: Chi-square-DIF=(

SUMMARY DIF CLASSES	CHI-SQUARED	D.F.	sig.	Item No.	Name
2	0.03	1	1	1	1
2	0.09	1	0.7522	2	
2	1.05	1	0.3173	3	
2	0.11	1	0.7524	4	
2	1.88	1	0.1685	5	
2	0.2	1	0.6556	6	
2	0.31	1	0.5847	7	
2	0.1	1	0.7528	8	
2	0.14	1	0.7529	9	
2	0.21	1	0.65510		
2	0.05	1	1	11	11
2	0.03	1	1	12	12
2	1.38	1	0.23713	13	
2	0.37	1	0.52714	14	

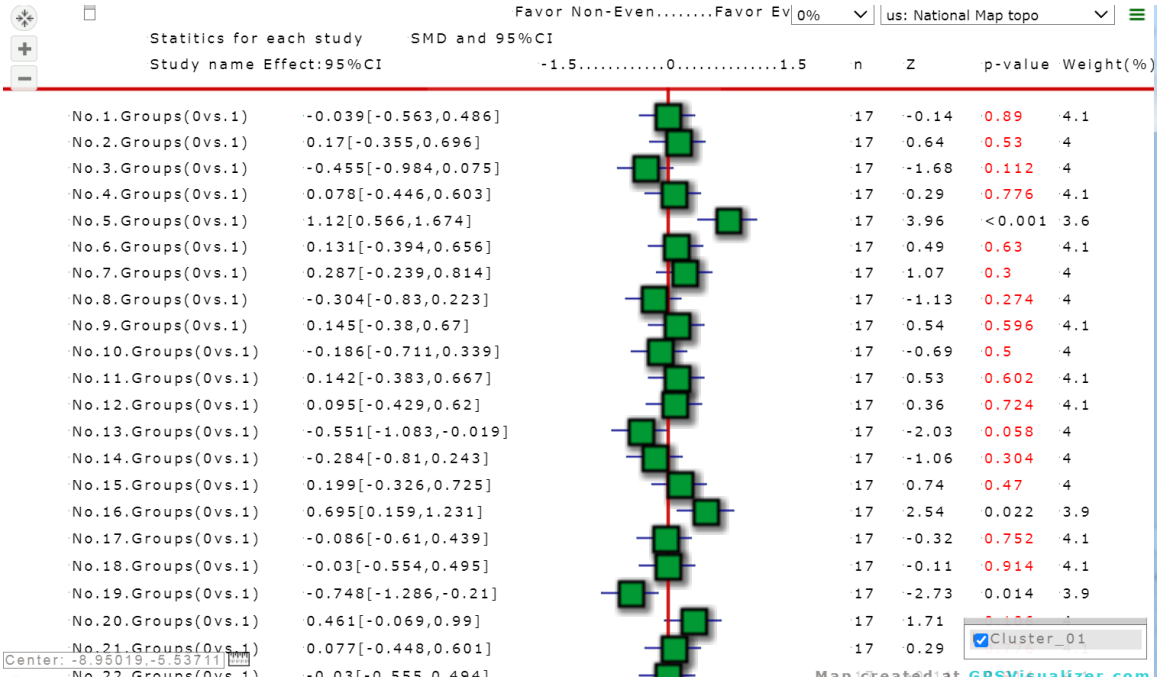
Note. Four Tables were generated for DIF detection



Note. DIF(Graph) was selected



Note. The icon of Submit is to be clicked and the last row in box is ensured.



Note. the forest plot was generated for DIF detection on two groups

8. Item difficulties using forest plot

RaschOnline

Examples SELECTED:

A:Input data only and then click on Submit icon:

- Wright Map
- KIDMAP
- ICC_cat
- Performance
- Measure vs. Outfit
- Measure vs. Infit
- Simulation data

B:Input data without visualizations and then click on Submit icon:

- Estimations

C:Input data & slection types and then click on Submit icon:

- Others

202

Thresholds 2

Transform data Category

Plot Forest Item Forest

KIDMAP person# 1

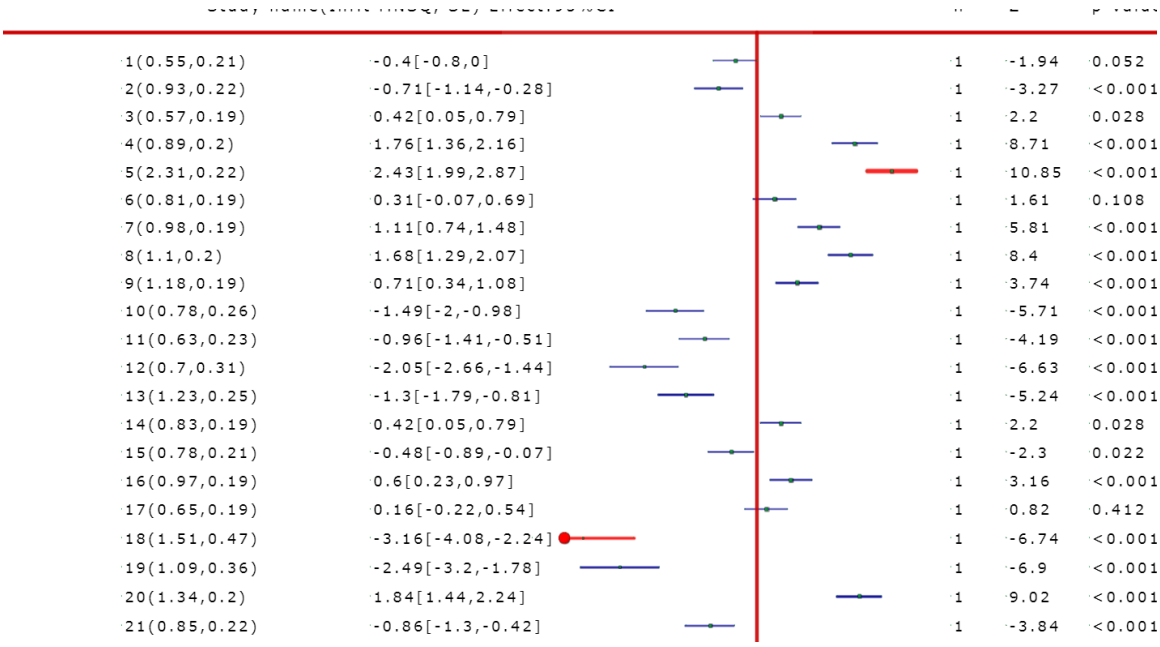
Bubble Size 1

ICC Item# 1

Grouping? None

Submit

203



1(0.55,0.21)	-0.4[-0.8,0]	1	-1.94	0.052
2(0.93,0.22)	-0.71[-1.14,-0.28]	1	-3.27	<0.001
3(0.57,0.19)	0.42[0.05,0.79]	1	2.2	0.028
4(0.89,0.2)	1.76[1.36,2.16]	1	8.71	<0.001
5(2.31,0.22)	2.43[1.99,2.87]	1	10.85	<0.001
6(0.81,0.19)	0.31[-0.07,0.69]	1	1.61	0.108
7(0.98,0.19)	1.11[0.74,1.48]	1	5.81	<0.001
8(1.1,0.2)	1.68[1.29,2.07]	1	8.4	<0.001
9(1.18,0.19)	0.71[0.34,1.08]	1	3.74	<0.001
10(0.78,0.26)	-1.49[-2,-0.98]	1	-5.71	<0.001
11(0.63,0.23)	-0.96[-1.41,-0.51]	1	-4.19	<0.001
12(0.7,0.31)	-2.05[-2.66,-1.44]	1	-6.63	<0.001
13(1.23,0.25)	-1.3[-1.79,-0.81]	1	-5.24	<0.001
14(0.83,0.19)	0.42[0.05,0.79]	1	2.2	0.028
15(0.78,0.21)	-0.48[-0.89,-0.07]	1	-2.3	0.022
16(0.97,0.19)	0.6[0.23,0.97]	1	3.16	<0.001
17(0.65,0.19)	0.16[-0.22,0.54]	1	0.82	0.412
18(1.51,0.47)	-3.16[-4.08,-2.24]	1	-6.74	<0.001
19(1.09,0.36)	-2.49[-3.2,-1.78]	1	-6.9	<0.001
20(1.34,0.2)	1.84[1.44,2.24]	1	9.02	<0.001
21(0.85,0.22)	-0.86[-1.3,-0.42]	1	-3.84	<0.001

204

205

206 9. Person measures using forest plot

RaschOnline

Examples SELECTED:

A:Input data only and then click on Submit icon:

Wright Map
KIDMAP
ICC_cat
Performance
Measure vs. Outfit
Measure vs. Infit
Simulation data

B:Input data without visualizations and then click on Submit icon:

Estimations

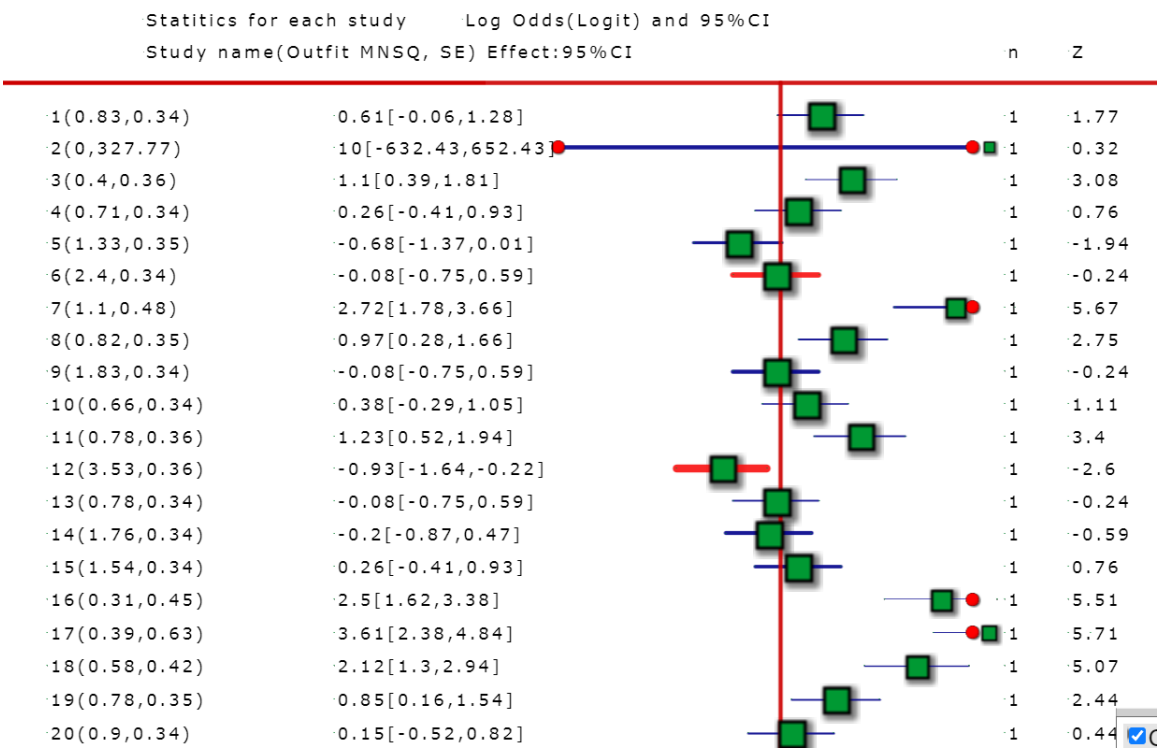
C:Input data & slection types and then click on Submit icon:

Others

207

Thresholds 2
Transform data Category
Plot Forest Person Forest
KIDMAP person# 1
Bubble Size 1
ICC Item# 1
Grouping? None
Submit

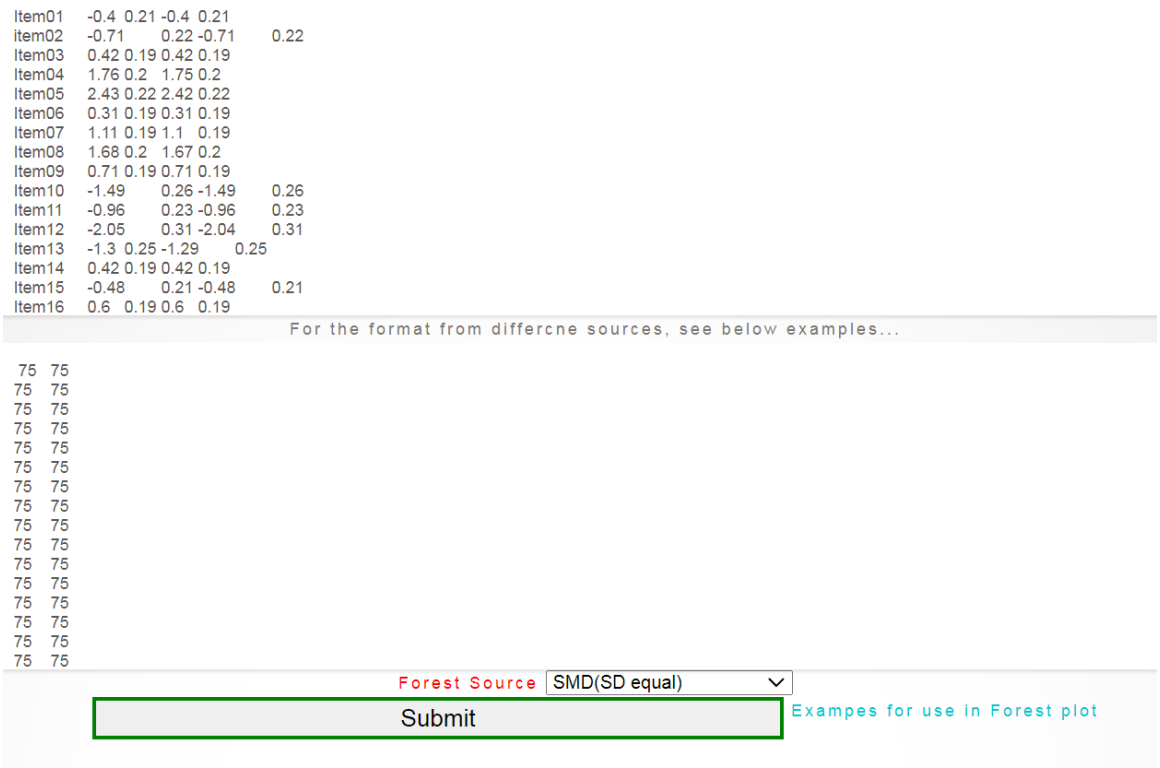
208



209

210

211 # 10. Forest plots



212

213 Examples at the bottom-right corner

Item01,0,0.162470385646532,-0.318,0.318,50,0,1,4
item02,0,0.162470385646532,-0.318,0.318,50,0,1,4
Item03,0,0.162470385646532,-0.318,0.318,50,0,1,4
Item04,0.05,0.162495769661318,-0.268,0.368,50,0.31,0.758,4
Item05,0.05,0.162491364455535,-0.268,0.368,50,0.28,0.78,4
Item06,0,0.162470385646532,-0.318,0.318,50,0,1,4
Item07,0.05,0.162498511741376,-0.268,0.368,50,0.32,0.75,4
Item08,0.05,0.162495769661318,-0.268,0.368,50,0.31,0.758,4
Item09,0,0.162470385646532,-0.318,0.318,50,0,1,4
Item10,0,0.162470385646532,-0.318,0.318,50,0,1,4
Item11,0,0.162470385646532,-0.318,0.318,50,0,1,4
Item12,-0.03,0.162480951795254,-0.348,0.288,50,-0.2,0.842,4
Item13,-0.04,0.162486631872826,-0.358,0.278,50,-0.24,0.812,4
Item14,0,0.162470385646532,-0.318,0.318,50,0,1,4
Item15,0,0.162470385646532,-0.318,0.318,50,0,1,4
Item16,0,0.162470385646532,-0.318,0.318,50,0,1,4

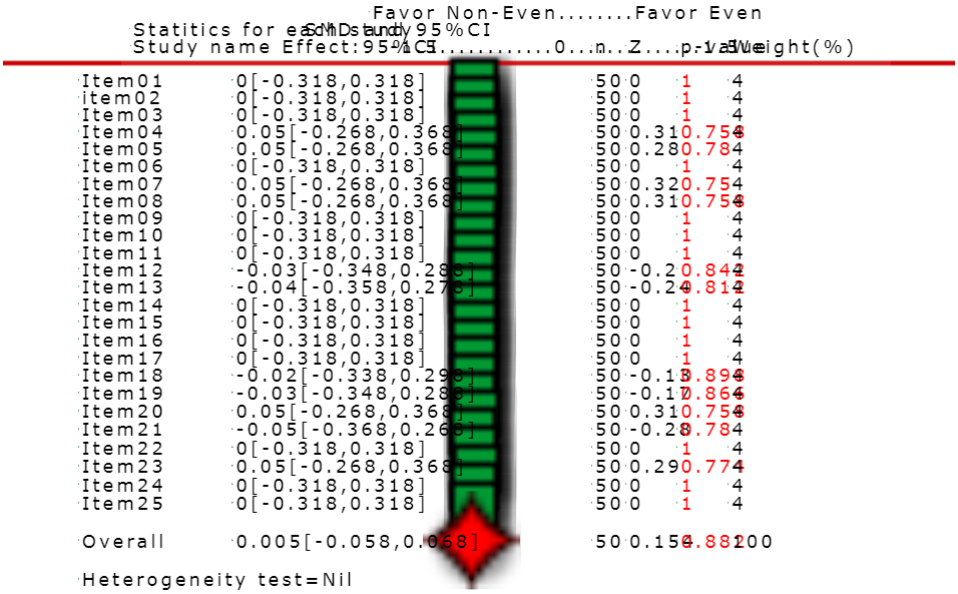
Group if necessary from 1 to n at least 5 ovserved number for each group)

EffectSize: 1 Scale(>0;eg 0.9 or 1) 0 Toward the right(>0) 0 Multiply a ratio on scale(<=1) 1

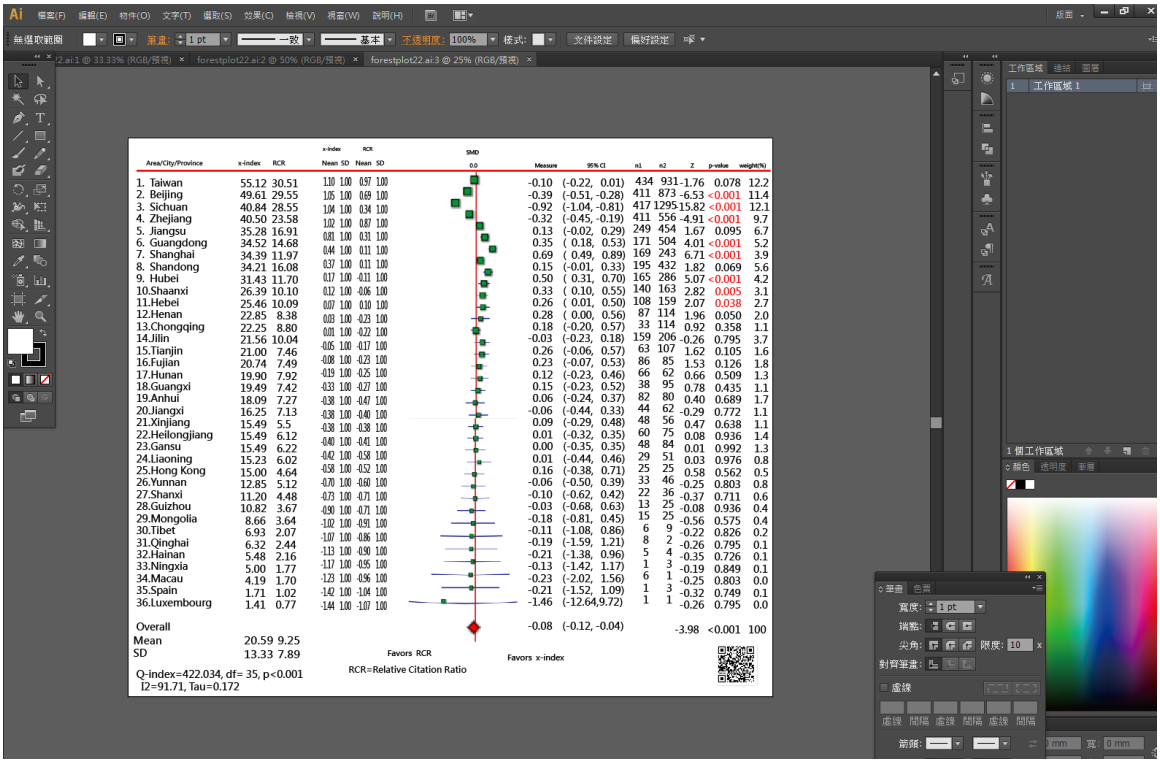
Extended to Two sides(<>0) 0 Extreme= 1

Submit

Note. If not any adjustment is made, click on the submit bottom and see the result in Forest plot below



Note. we suggest using AI software to make high solution Figure as blow:



Note. Using Illustrator to make better diagram

Input examples for different format and data sources

SMD	Treated		Control			
	Mean	SD	Mean	SD	n1	n2
A	94	22	92	20	60	60
B	98	21	92	22	65	65
C	98	28	88	26	40	40
D	94	19	82	17	200	200
E	98	21	88	22	50	45
F	96	21	92	22	85	85

Odds ration/Risk ratio	Treated		Control			
	Events	Non-events	Events	Non-events	n1	n2
A	12	53	16	49	65	65
B	8	32	10	30	40	40
C	14	66	19	61	80	80
D	25	375	80	320	400	400
E	8	32	11	29	40	40
F	16	49	18	47	65	65

Correlation

	Correlation	n
A	0.5	40
B	0.6	90
C	0.4	25
D	0.2	400
E	0.7	60
F	0.45	50

SMD

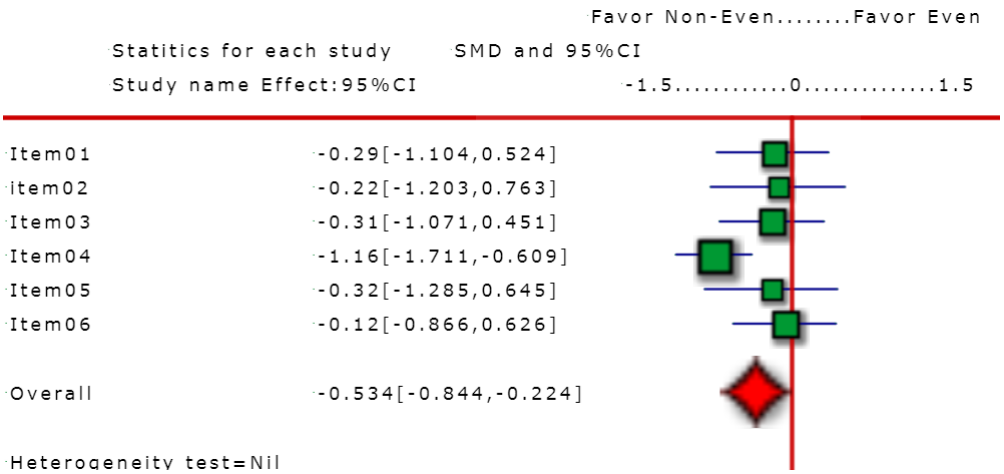
Paired	Mean	SD	Mean	SD	Sdif	corr.	n
A	94	22	92	20	22	0.7	50
B	98	21	92	22	21	0.7	40
C	98	28	88	26	22	0.7	80
D	94	19	82	17	12	0.7	400
E	98	21	88	22	23	0.7	40
F	96	21	92	22	24	0.7	65

ratio

Name	valuea		valueb		n1	n2
A	94	22	92	20	60	60
B	98	21	92	22	65	65
C	98	28	88	26	40	40
D	94	19	82	17	200	200
E	98	21	88	22	50	45
F	96	21	92	22	85	85

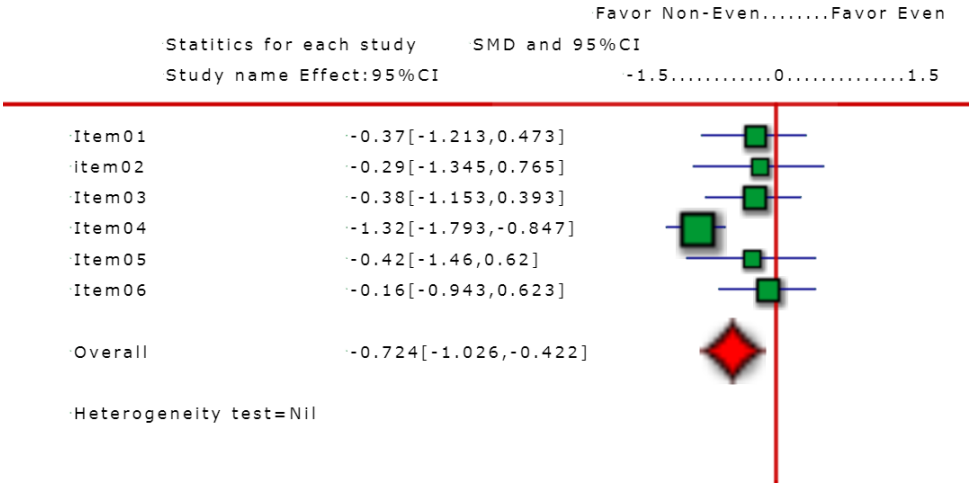
Subgroup (M+se)

	Mean(logit)	SE	n
Item01	-0.4	0.21	40
item02	-0.71	0.22	90
Item03	0.42	0.19	25
Item04	1.76	0.2	400
Item05	2.43	0.22	60
Item06	0.31	0.19	50



276

277 Note. Risk ratio

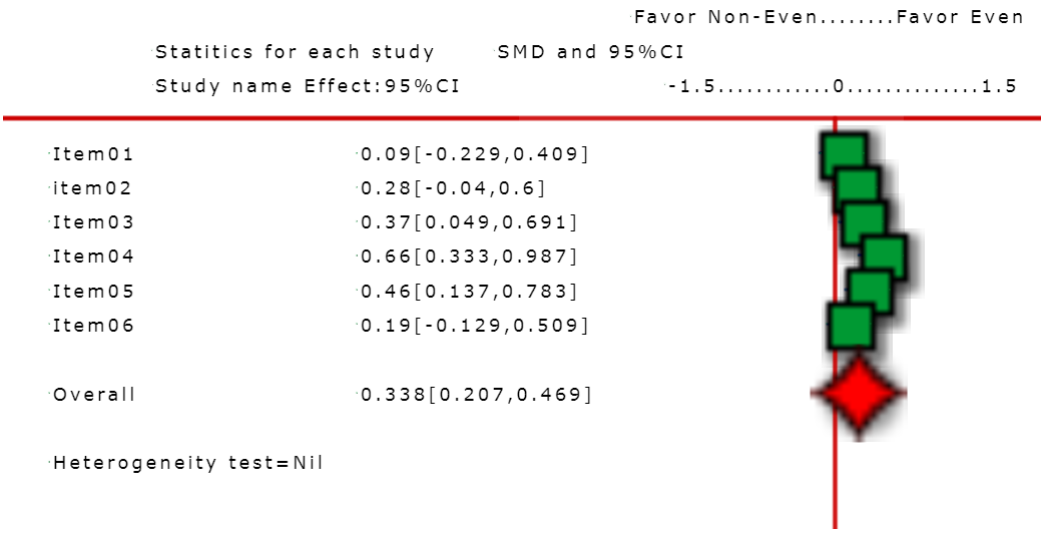


278

279 Note. Odds ratio

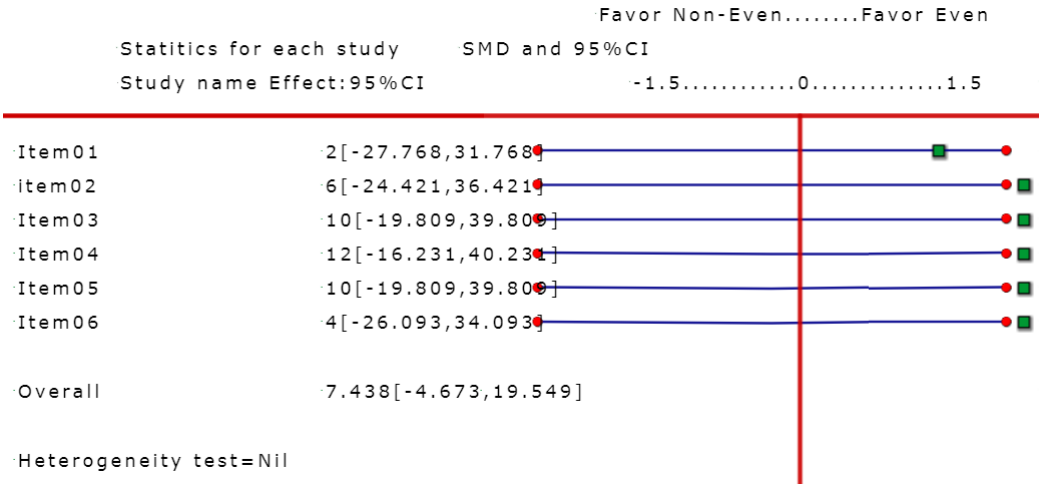
280

281



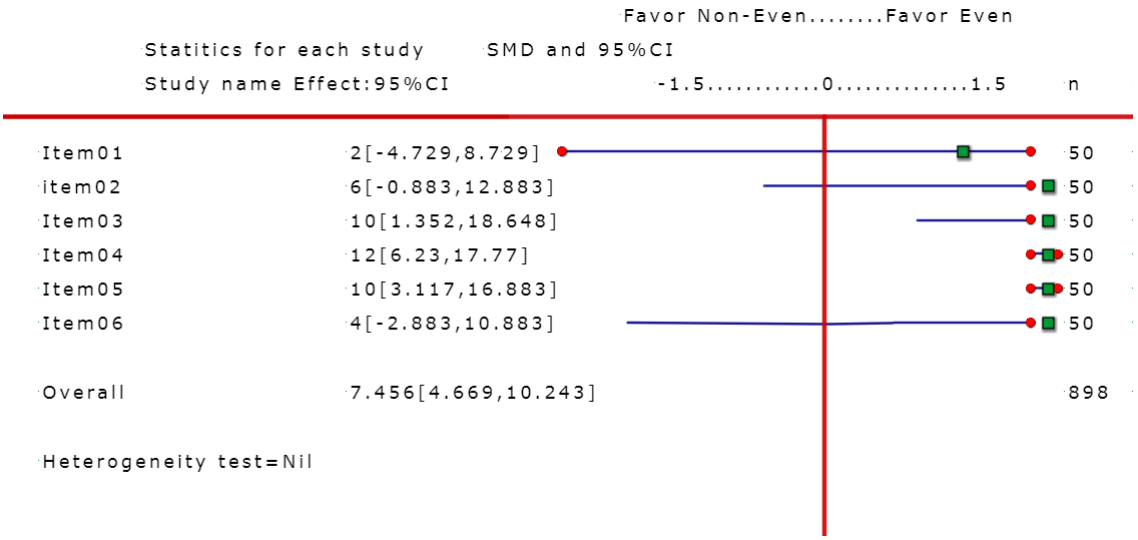
282

283 Note. SDM SD equal



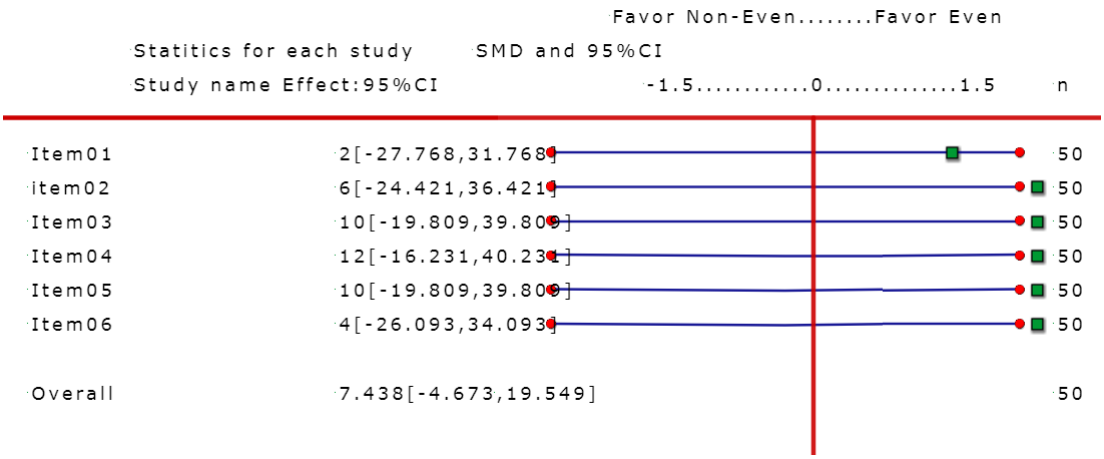
284

285 Note. SDM SD unequal



286

287 Note. DM SD equal



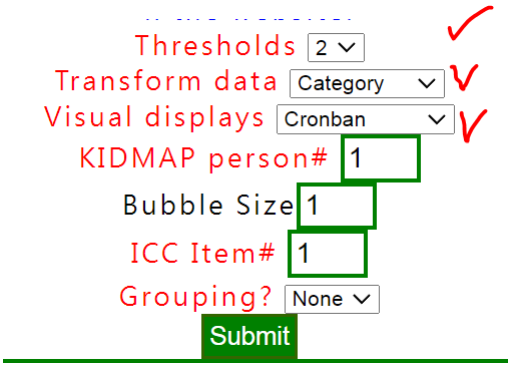
288

289 Note. DM SD unequal

290

291

11. Other examples

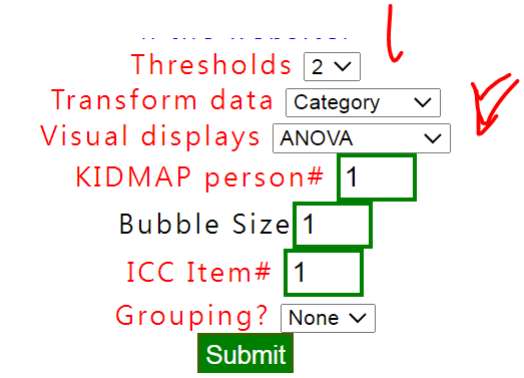


raters.
http://www.real-statistics.com/reliability/kendalls-w/

Kendall_w	dfchisquare(Col=item ,row for judge)	corr_k r W	Cronban alpha (Col= fo person)	Cronban alpha(Col=item, in tradition)
0.25	24 =round(CHIDIST(447.36,24),2)	0.24	0.98	0.89

Steps...1 -0.86
Steps...2 0.86
iteration...
23

1	Germany
1	Finland
1	United Arab Emirates
1	Philippines
1	India
0	Italy
1	UK
1	Russia
1	Sweden
1	Spain
1	
1	
1	
1	



ANOVA	Virable	SS	df	MSS	F	p
	Between	117.73	1	117.73	218.61	=FDIST(218.61,1,55)
	Within	1008.71	55	0.54		
	TSS	1126.45			All mean	1.28

Group	Count	Total	Mean	Varince	Tlogit	Logt	Var
0	18	656	36.44	91.79	36.74	2.04	5.51
1	57	1736	30.46	69.91	50.32	0.88	2.69

Note. If groups, e.g., gender, are defined, difference in measures between or among groups can be examined.

P-value is based in F distribution. In MSExcel, using the function of FDIST(), we can get the p-value=8.23121E-21 (=FDIS(218,61,1,55)).

12. KanoPliot for measure vs. Oufit MNSQ

RaschOnline

Read Me First | MP4 | MP4

Examples SELECTED:

A:Input data only and then click on Submit icon:

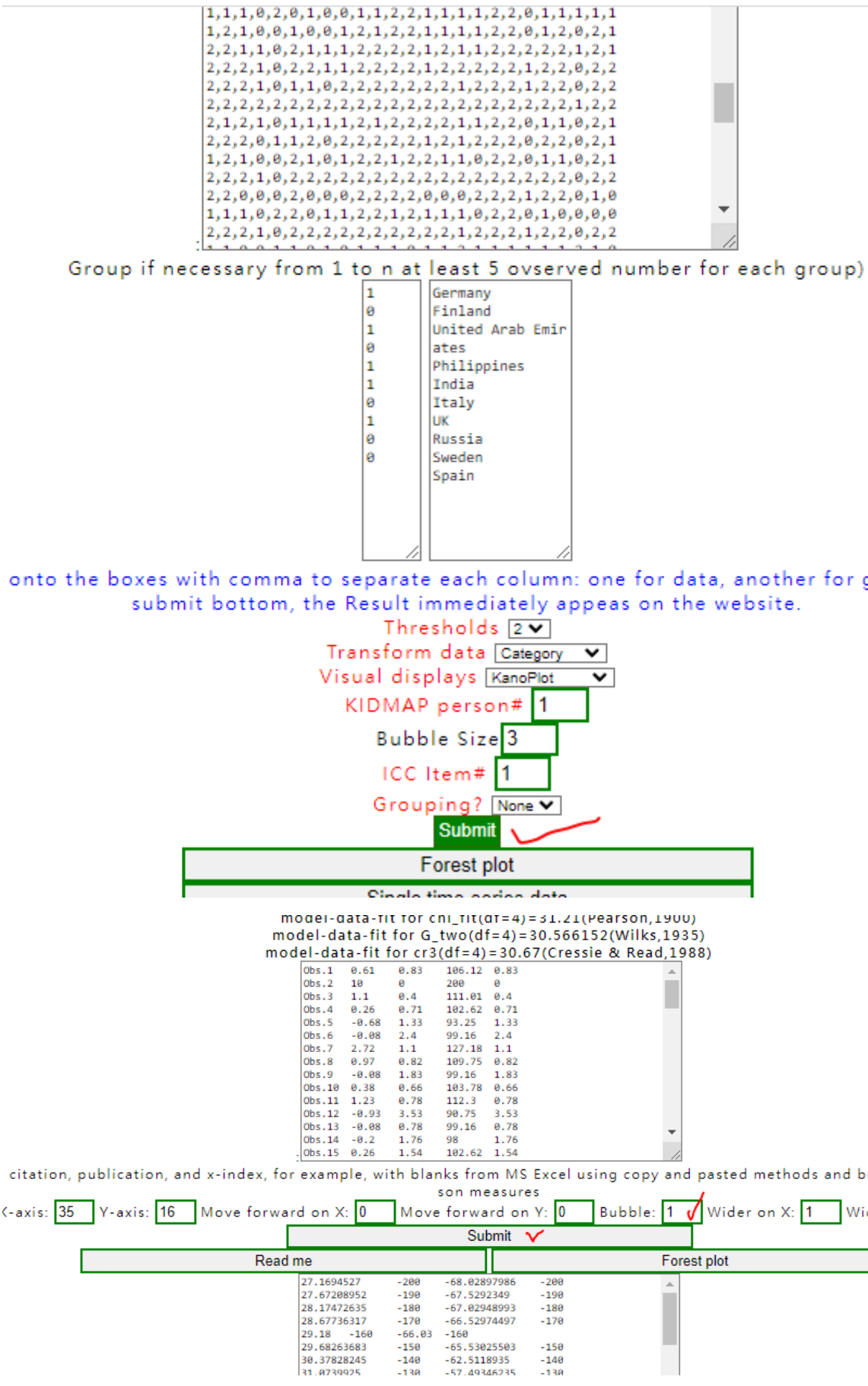
- Wright Map
- KIDMAP
- ICC_cat
- Performance
- Measure vs. Outfit ✓
- Measure vs. Infit ✓
- Rawscore vs. Measure
- Simulation data
- Summary
- DIF:table(to define groups)
- DIF:graph(to define groups)

B:Input data without visualizations and then click on Submit icon:

- Estimations

C:Input data & slection types and then click on Submit icon:

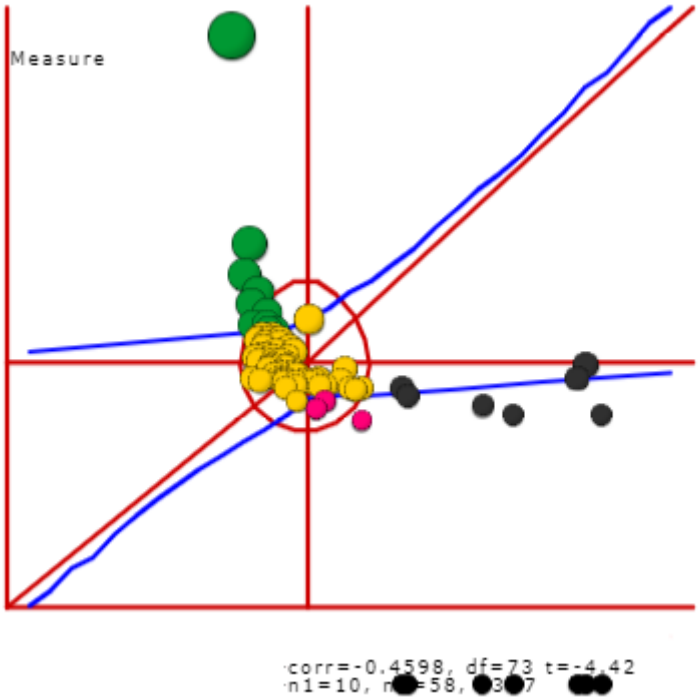
- Others


1,1,1,0,2,0,1,0,0,1,1,2,2,1,1,1,1,2,2,0,1,1,1,1,1
1,2,1,0,0,1,0,0,1,2,1,2,2,1,1,1,1,2,2,0,1,2,0,2,1
2,2,1,1,0,2,1,1,1,2,2,2,2,1,2,1,1,2,2,2,2,2,1,2,1
2,2,2,1,0,2,2,1,1,2,2,2,2,2,1,2,2,2,2,2,1,2,2,0,2,2
2,2,2,1,0,1,1,0,2,2,2,2,2,2,2,1,2,2,2,1,2,2,0,2,2
2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,1,2,2
2,1,2,1,0,1,1,1,1,2,1,2,2,2,2,1,1,2,2,0,1,1,0,2,1
2,2,2,0,1,1,2,0,2,2,2,2,2,1,2,1,2,2,2,0,2,2,0,2,1
1,2,1,0,0,2,1,0,1,2,2,1,2,2,1,1,0,2,2,0,1,1,0,2,1
2,2,2,1,0,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,0,2,2
2,2,0,0,0,2,0,0,0,2,2,2,2,2,0,0,0,2,2,2,1,2,2,0,1,0
1,1,1,0,2,2,0,1,1,2,2,1,2,1,1,1,1,0,2,2,0,1,0,0,0,0
2,2,2,1,0,2,2,2,2,2,2,2,2,2,2,1,2,2,2,1,2,2,0,2,2
Group if necessary from 1 to n at least 5 ovserved number for each group)
1
0
1
0
1
1
0
1
0
0
Germany
Finland
United Arab Emir
ates
Philippines
India
Italy
UK
Russia
Sweden
Spain
onto the boxes with comma to separate each column: one for data, another for g
submit bottom, the Result immediately appeas on the website.
Thresholds 2
Transform data Category
Visual displays KanoPlot
KIDMAP person# 1
Bubble Size 3
ICC Item# 1
Grouping? None
Submit
Forest plot
model-data-fit for chi_fit(df=4)=31.21(Pearson,1900)
model-data-fit for G_two(df=4)=30.566152(Wilks,1935)
model-data-fit for cr3(df=4)=30.67(Cressie & Read,1988)
Obs.1 0.61 0.83 106.12 0.83
Obs.2 10 0 200 0
Obs.3 1.1 0.4 111.01 0.4
Obs.4 0.26 0.71 102.62 0.71
Obs.5 -0.68 1.33 93.25 1.33
Obs.6 -0.08 2.4 99.16 2.4
Obs.7 2.72 1.1 127.18 1.1
Obs.8 0.97 0.82 109.75 0.82
Obs.9 -0.08 1.83 99.16 1.83
Obs.10 0.38 0.66 103.78 0.66
Obs.11 1.23 0.78 112.3 0.78
Obs.12 -0.93 3.53 90.75 3.53
Obs.13 -0.08 0.78 99.16 0.78
Obs.14 -0.2 1.76 98 1.76
Obs.15 0.26 1.54 102.62 1.54
citation, publication, and x-index, for example, with blanks from MS Excel using copy and pasted methods and bubble size is the
son measures
(-axis: 35 Y-axis: 16 Move forward on X: 0 Move forward on Y: 0 Bubble: 1 Wider on X: 1 Wider on Y: 1
Submit
Read me
Forest plot
27.1694527 -200 -68.02897986 -200
27.67208952 -190 -67.5292349 -190
28.17472635 -180 -67.02948993 -180
28.67736317 -170 -66.52974497 -170
29.18 -160 -66.03 -160
29.68263683 -150 -65.53025503 -150
30.37828245 -140 -62.5118935 -140

307

308

If bubble size is 1 or bigger, then click on the submit icon.



Three types of bubbles are colored. The black bubbles are Outfit greater than 2.0. Bubbles are sized by measure. Measures are on y-axis and Outfit are on x-axis.

KanoPliot for measure vs. Infit MNSQ

RaschOnline

Examples SELECTED:

A:Input data only and then click on Submit icon:

- Wright Map
- KIDMAP
- ICC_cat
- Performance
- Measure vs. Outfit
- Measure vs. Infit ✓

B:Input data without visualizations and then click on Submit icon:

- Estimations

C:Input data & slection types and then click on Submit icon:

- Others

316

```
2,2,2,0,0,2,2,2,0,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2
2,2,1,0,0,2,1,0,2,2,2,2,2,0,2,0,1,2,2,0,2,2,0,2,2
0,1,1,0,1,0,0,1,1,2,1,2,2,0,0,1,1,2,1,1,2,0,2,1,1
2,1,0,0,0,1,0,1,2,2,2,2,1,1,2,1,1,2,2,0,1,1,0,2,1
2,2,2,0,0,1,1,1,0,2,2,2,2,2,2,0,2,2,2,0,2,2,0,2,2
0,1,0,0,2,2,0,1,0,1,2,1,0,0,1,1,0,2,1,0,0,0,1,0,1
1,2,1,1,0,0,0,1,0,2,1,2,1,1,2,1,1,2,2,1,1,1,0,0,0
2,1,1,0,0,2,0,2,1,2,0,2,2,1,0,0,0,2,2,0,0,0,1,2,0
1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,2,2,1,1,1,1,1
```

Group if necessary from 1 to n at least 5 ovserved number for each group)

1	Germany
0	Finland
1	United Arab Emir
0	ates
1	Philippines
1	India
0	Italy
1	UK
0	Russia
0	Sweden
	Spain

n onto the boxes with comma to separate each column: one for data, another for gr
submit bottom, the Result immediately appeas on the website.

Thresholds 2

Transform data Category

Visual displays KanoPlot2

KIDMAP person# 1

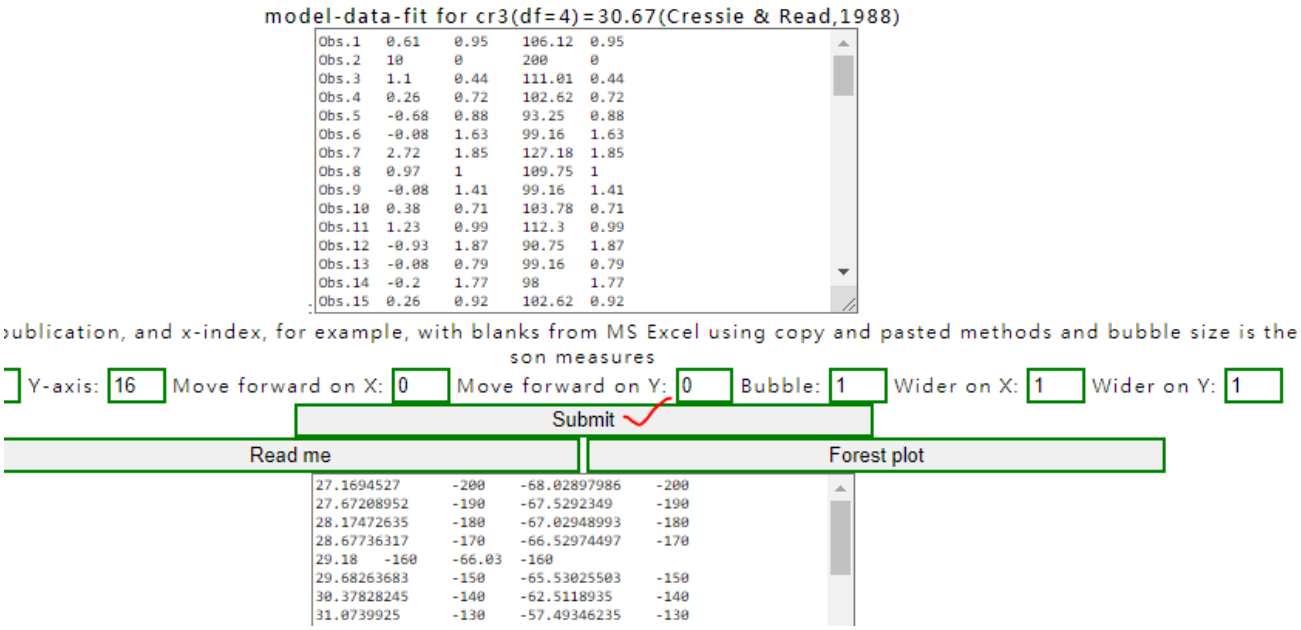
Bubble Size 3

ICC Item# 1

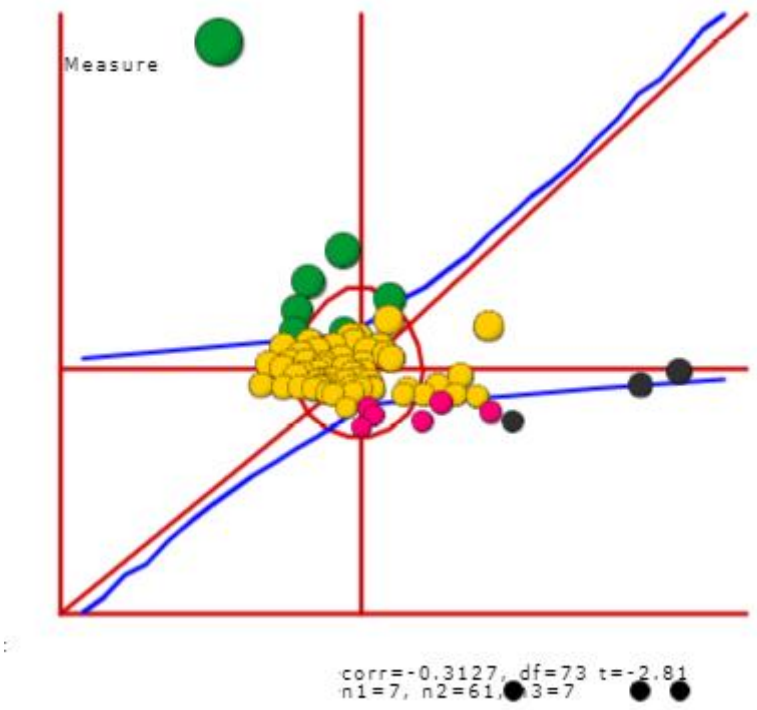
Grouping? None

Submit ✓

317



318



319

320 Three types of bubbles are colored. The black bubbles are Infit

321 greater than 2.0. Bubbles are sized by measure.

322 Measures are on y-axis and Infit are on x-axis.

323

324

325 KanoPliot for Measures vs. Rawscores

RaschOnline

Read Me First | MP4 | MP4

Examples SELECTED:

A:Input data only and then click on Submit icon:

- Wright Map
- KIDMAP
- ICC_cat
- Performance
- Measure vs. Outfit
- Measure vs. Infit
- Rawscore vs. Measure ✓
- Simulation data
- Summary

326

1,2,1,1,0,0,0,1,0,2,1,2,1,1,2,1,1,2,2,1,1,1,0,0,0
2,1,1,0,0,2,0,2,1,2,0,2,2,1,0,0,0,2,2,0,0,0,1,2,0
1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,2,2,1,1,1,1,1

Group if necessary from 1 to n at least 5 ovserved number for each gro

1	Germany
0	Finland
1	United Arab Emir
0	ates
1	Philippines
1	India
0	Italy
1	UK
0	Russia
0	Sweden
	Spain

nto the boxes with comma to separate each column: one for data, anotl
k on the submit bottom, the Result immediately appeas on the websit

Thresholds 2
Transform data Category
Visual displays KanoPlotRawscore
KIDMAP person# 1
Bubble Size 3
ICC Item# 1
Grouping? None
Submit

327

model-data-fit for G_two(df=4)=30.566152(Wilks,1935)
model-data-fit for cr3(df=4)=30.67(Cressie & Read,1988)

Obs.1	30	0.61	106.12	0.95
Obs.2	50	6.07	160.7	0
Obs.3	34	1.1	111.01	0.44
Obs.4	27	0.26	102.62	0.72
Obs.5	19	-0.68	93.25	0.88
Obs.6	24	-0.08	99.16	1.63
Obs.7	44	2.72	127.18	1.85
Obs.8	33	0.97	109.75	1
Obs.9	24	-0.08	99.16	1.41
Obs.10	28	0.38	103.78	0.71
Obs.11	35	1.23	112.3	0.99
Obs.12	17	-0.93	90.75	1.87
Obs.13	24	-0.08	99.16	0.79
Obs.14	23	-0.2	98	1.77
Obs.15	27	0.26	102.62	0.92

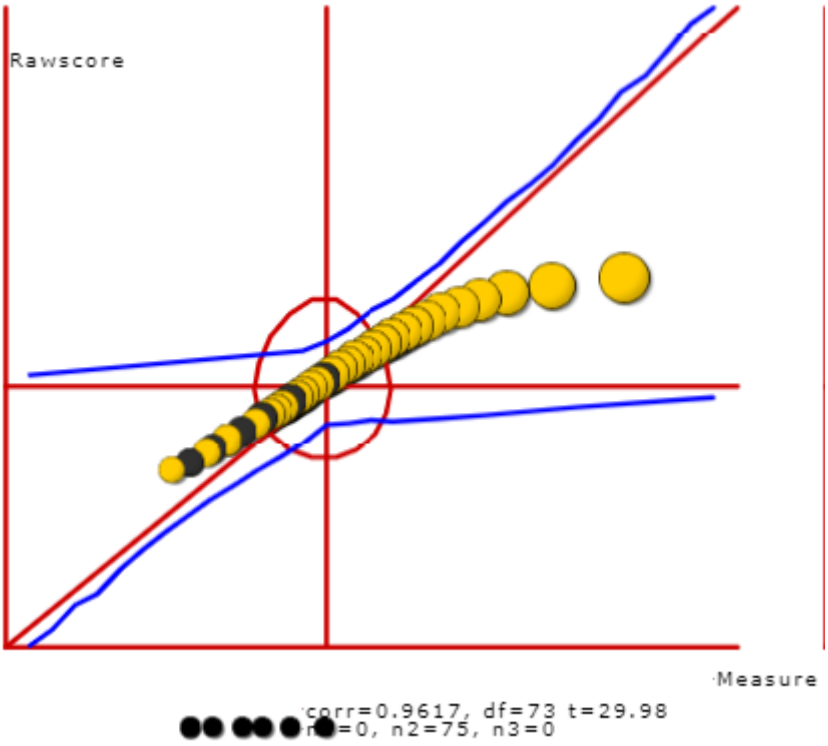
citation, publication, and x-index, for example, with blanks from MS Excel using copy and pasted methods and bubble
s the person measures

: 35 Y-axis: 16 Move forward on X: 0 Move forward on Y: 0 Bubble: 1 Wider on X: 1 Wider on Y:

Submit

Read me | Forest plot

328



Note. Black bubbles indicate persons with Outfit MNSQ>2.0

13. Summary

RaschOnline

Read Me First | MP4 | MP4

Examples SELECTED:

A:Input data only and then click on Submit icon:

- Wright Map
- KIDMAP
- ICC_cat
- Performance
- Measure vs. Outfit
- Measure vs. Infit
- Simulation data
- Summary

332

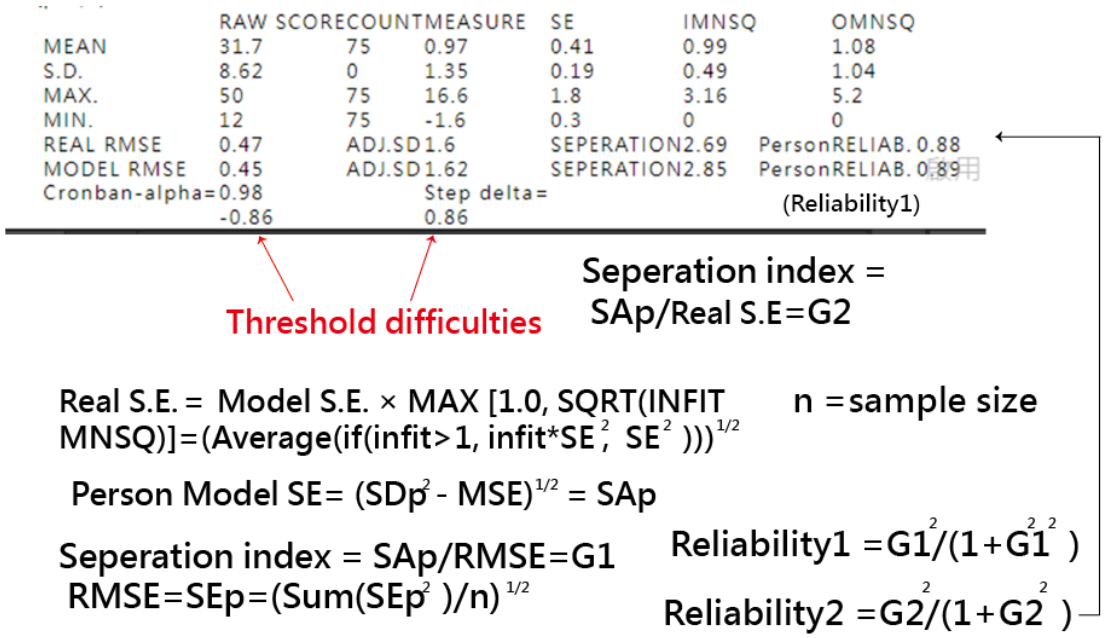
Thresholds 2
Transform data Category
Visual displays Summary
WrightMap dotted with dashes Yes
KIDMAP person# 1
Bubble Size 3
ICC Item# 1
Grouping? None
Submit

333

Person	RAW_SCOUNT	MEAS.	SE	IMNSQ	OMNSQ
MEAN	31.7	25 0.97	0.41	0.99	1.08
S.D.	8.62	0 1.35	0.19	0.49	1.04
MAX.	50	25 16.58	1.84	3.16	5.2
MIN.	12	25 -1.62	0.34	0.29	0.2
REAL RMSE	0.47	ADJ.SD 1.26	SEPERATION 2.69	PersonRELIAB. 0.88	
MODEL RMSE	0.48	ADJ.SD 1.27	SEPERATION 2.85	PersonRELIAB. 0.89	
Cronban-alpha=	0.98	Step delta=			
	-0.86	0.86			

Item	RAW_SCOUNT	MEAS.	SE	IMNSQ	OMNSQ
MEAN	94.96	75 0	0.23	1.03	1.07
S.D.	30.93	0 1.41	0.06	0.45	0.87
MAX.	145	75 2.43	0.47	2.42	4.1
MIN.	37	75 -3.16	0.19	0.55	0.5
REAL RMSE	0.26	ADJ.SD 1.39	SEPERATION 5.33	ItemRELIAB. 0.97	
MODEL RMSE	0.48	ADJ.SD 1.39	SEPERATION 5.67	ItemRELIAB. 0.97	

334



https://www.winsteps.com/winman/standarderrors.htm

14. Appendices

Appendix A

Rasch JMLE estimation

```
redim expect(personno,itemno),Var(personno,itemno),
      Zscore(personno,itemno),residual(personno,itemno),kurtosis
      (personno,itemno),kurtosis2(personno,itemno)
 redim item_error(itemno),item_var(itemno)
    perfect_i=0:perfect_p=0
 iterat=40
for iteration=1 to iterat
            zscore_mean=0 :zscore_sd=0
      For CATa = 0 To categoryabc 'maxcat - mincat
         catexp(CATa)=0
      Next
            'set category parameters equal zero
        redim    item_var(itemno)
        redim item_error(itemno)
        resi_a=0: resi_b=0: sumsqerror=0
        redim var_p(personno), person_exp(personno)
```

```
for jk=1 to personno
                person_error=0:person_max=-100: person_min=100
                sqaure_resi=0
   for j=1 to itemno
        If IsNumeric(test(jk,j)) = True Then
            logit = person(jk) -item(j)
            normalizer = 0 ' this will force the sum of the probabilities = 1.0
            sumsqu = 0: currentlogit = 0: all_asum = 0
            ReDim expaaa(maxcat - mincat+1)
             catcalibrate(0)=0
For CATa = 0 To categoryabc      '=maxcat - mincat
            msum_tau = 0
          if category_number>2 then
              For jk2 = 0 To CATa
                    msum_tau = msum_tau + catcalibrate(jk2)
              Next
           end if
           expaaa(CATa) = Exp(CATa * logit - msum_tau)
     all_asum = all_asum + expaaa(CATa)
Next
       exp_a = 0: kurtosisZ = 0
   For CATa = 0 To maxcat - mincat
      exp_a = exp_a + CATa * expaaa(CATa) / all_asum
   Next
      var_a = 0
   For CATa = 0 To maxcat - mincat
        kurtosisZ = kurtosisZ + (exp_a - CATa) ^ 4 * expaaa(CATa) / all_asum
        var_a = var_a + (exp_a - CATa) ^ 2 * expaaa(CATa) / all_asum
        catexp(CATa) = catexp(CATa) + expaaa(CATa) / all_asum
     Next
              EXPECT(jk, j) = exp_a
              var(jk, j) = var_a
               residual(jk, j)    = test(jk,j) - exp_a
               person_error=person_error+residual(jk,j)
               var_p(jk)=var_p(jk)+var_a
                item_var(j)=item_var(j)+var_a
                item_error(j)=item_error(j)+residual(jk,j)
                      if var(jk,j)>0 then
```

```
                                        Zscore(jk, j)    =    residual(jk,j)/var(jk,j)^0.5
                                                kurtosis(jk, j) = kurtosisZ /Var(jk, j)^2    'outfit
                                              kurtosis2(jk, j) = kurtosisZ -Var(jk, j)^2      'infit
                                else
                                        Zscore(jk, j) =0
                                          kurtosis(jk, j) = 1    'outfit
                                              kurtosis2(jk, j) = 1      'infit
                                end if
                            sqaure_resi= sqaure_resi + residual(jk,j)^2
                            zscore_mean=zscore_mean+ Zscore(jk, j)
                               zscore_sd= zscore_sd+Zscore(jk, j)^2
                                if raw_i(J)=personno*maxcat then
                                        kurtosis2(jk, j) =0.00001
                                        perfect_i=perfect_i+1
                                end if
                              if raw_p(jk)=itemno*maxcat then
                                        kurtosis2(jk, j) =0.00001
                                          perfect_p=perfect_p+1
                                end if

        else 'missing
                        catexp(jk, j) = "."
                        var(jk, j) =    "."
                        residual(jk, j)    =    "."
                        Zscore(jk, j)    =    "."
                        kurtosis(jk, j) =    "."
                        kurtosis2(jk, j) =    "."
    end if
next 'item
                    resi_a= resi_a+person_error
        if abs(person_error)>sumsqerror then
            sumsqerror= abs(person_error)
        end if
            if var_p(jk)<0.0001 then var_p(jk)=0.0001
                        if var_p(jk)>0 then
                  if person_error/var_p(jk)>10 then
                        person(jk)= 10
                 elseif person_error/var_p(jk)<-10 then
```

```
                                person(jk)= -10
                    else
                        person(jk)=person(jk)+    person_error/var_p(jk)
                '      response.write "<br>" & round(person(jk),2) & " " & round
(person_error,2) & " " & round(var_P(jk),2) & " " & round
(person_error/var_p(jk),2) & "=======<br>"
                    end if
                                person_exp(jk)=    sqaure_resi/var_p(jk)    'outfit
                        else
                                person(jk)=person(jk)
                                person_exp(jk)=    1    'outfit
                         end if
                if person_exp(jk)<.0016 then person_exp(jk)=0.0016
            next 'person
                     item_avg=0
                    for j=1 to itemno
                                resi_b=resi_b+ item_error(j)
                        if item_var(j)<0.0001 then item_var(j)=0.0001
                          if item_var(j)>0 then
                             if item_error(j)/item_var(j)>10 then
                                item(j)= 10
                        elseif item_error(j)/item_var(j)<-10 then
                           item(j)= -10
                        else
                                item(j)=item(j)- item_error(j)/item_var(j)
                        end if
                    else
                            item(j)=item(j)
                    end if
                                item_avg=item_avg+item(j)
                     next
                          item_avg= item_avg/itemno
                     for j=1 to itemno      ‘ adjust mean item difficulty to be zero
                            item(j)= item(j)-item_avg
                    next
                       cat_avg=0
                     For jkm = 0 To category_number - 1 ' mincat
                             'catexp
```

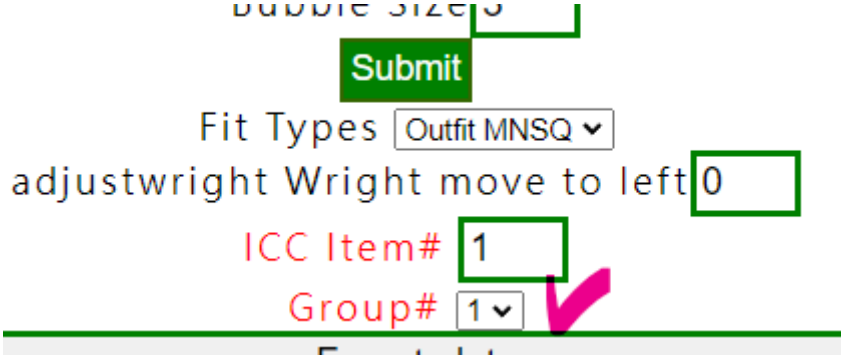
```
471                         catresi(jkm) = catobs(jkm)-CATEXP(jkm)
472                     if abs(catresi(jkm))>sumsqerror then
473                             sumsqerror= abs(catresi(jkm))
474                       end if
475                     if jkm>0 then
476                         if catobs(jkm)>0 and catexp(jkm)>0 then
477                             if catobs(jkm-1)/catobs(jkm)>0 and catexp(jkm-1)>0 then
478                                 catthresh(jkm) =catcalibrate(jkm)+Log(catobs(jkm-1)/catobs
479                                     (jkm)) -LOG(catexp(jkm-1)/catexp(jkm))
480                             end if
481                           else
482                           catthresh(jkm) =catcalibrate(jkm)
483                         end if
484                     cat_avg=cat_avg+catthresh(jkm)
485                     else
486                           catthresh(jkm) =0
487                     end if
488                 Next
489                       if (category_number - 1)>0 then
490                         cat_avg= cat_avg/(category_number - 1)
491                     else
492                           cat_avg=0.001
493                     end if
494                   catadj(0)=0
495               For jkm = 1 To category_number - 1 ' mincat
496                         catadj(jkm)=catthresh(jkm)-cat_avg
497                     catcalibrate(jkm)=catadj(jkm)
498             next
499         if sumsqerror<0.05 or    abs(sumsqerror2 - sumsqerror)<0.01 then
500               exit for
501         end if
502             sumsqerror2 = sumsqerror
503     next 'iteration
```

504

505 ANOVA

M	N	O	P	Q	R
Item13	Item14	Item15	Item16	name	group
0	0	0	0	Modelled/Id	1011
0	0	0	0	Guttman/De	1111
1	1	1	1	Miscode 12.	1110
0	0	0	0	Carelessness	0000
0	0	0	1	Lucky Guess	0000
1	0	1	0	Response se	1110
0	0	0	0	Special knov	1011
0	0	0	0	Imputed outl	1111
1	0	0	0	low discrimi	0000
0	0	0	0	high discrim	0000
0	0	0	0	very high dis	0000

Input data with multiply groups as shown above



In RaschOnline, the group# is used to define the group used to compute or plot Rasch analysis