Differential Item Functioning DIF-Analysis
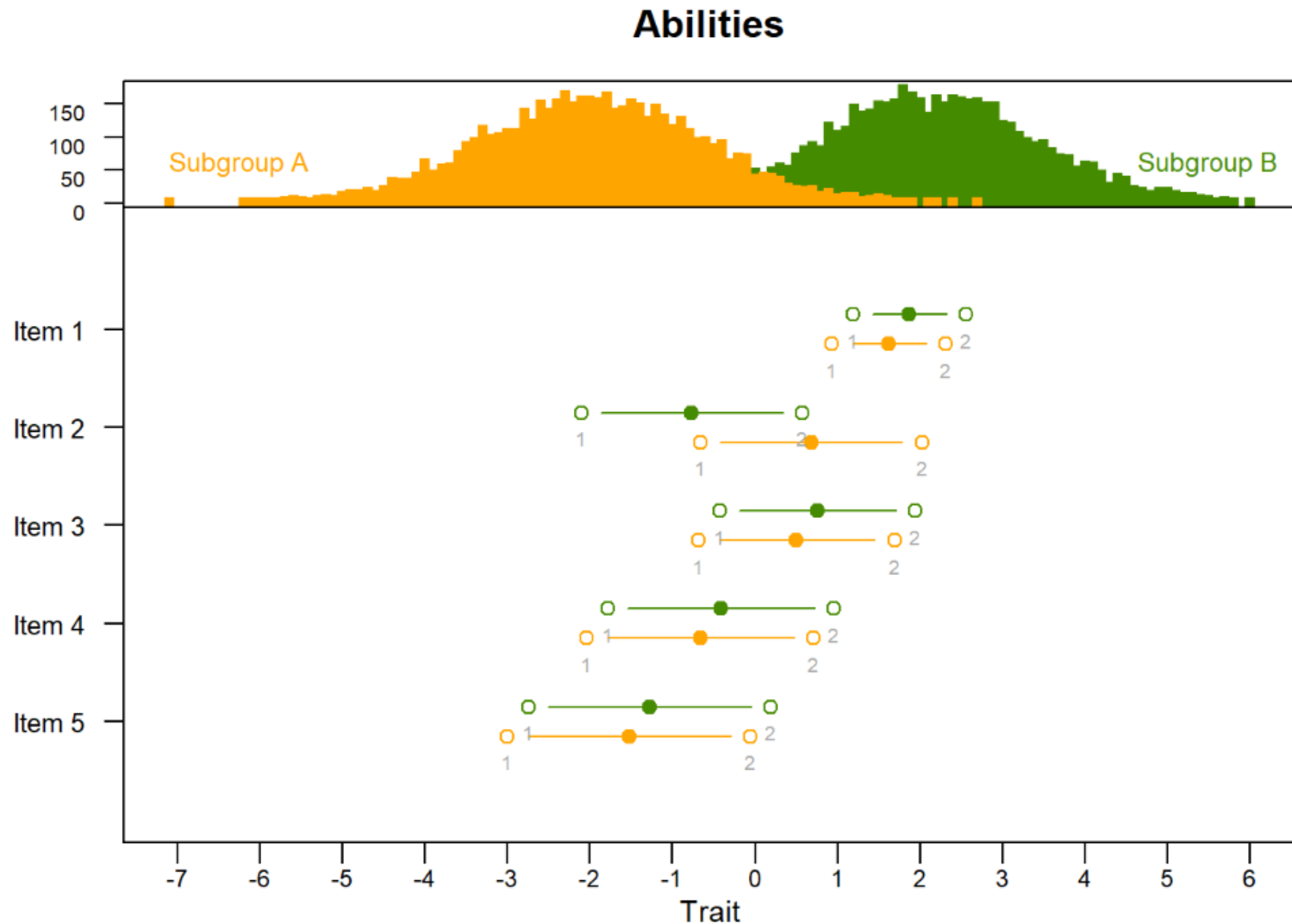
Master Rasch Seminar 11 – 25.11.2020

Carolina Fellinghauer : c.fellinghauer@psychologie.uzh.ch
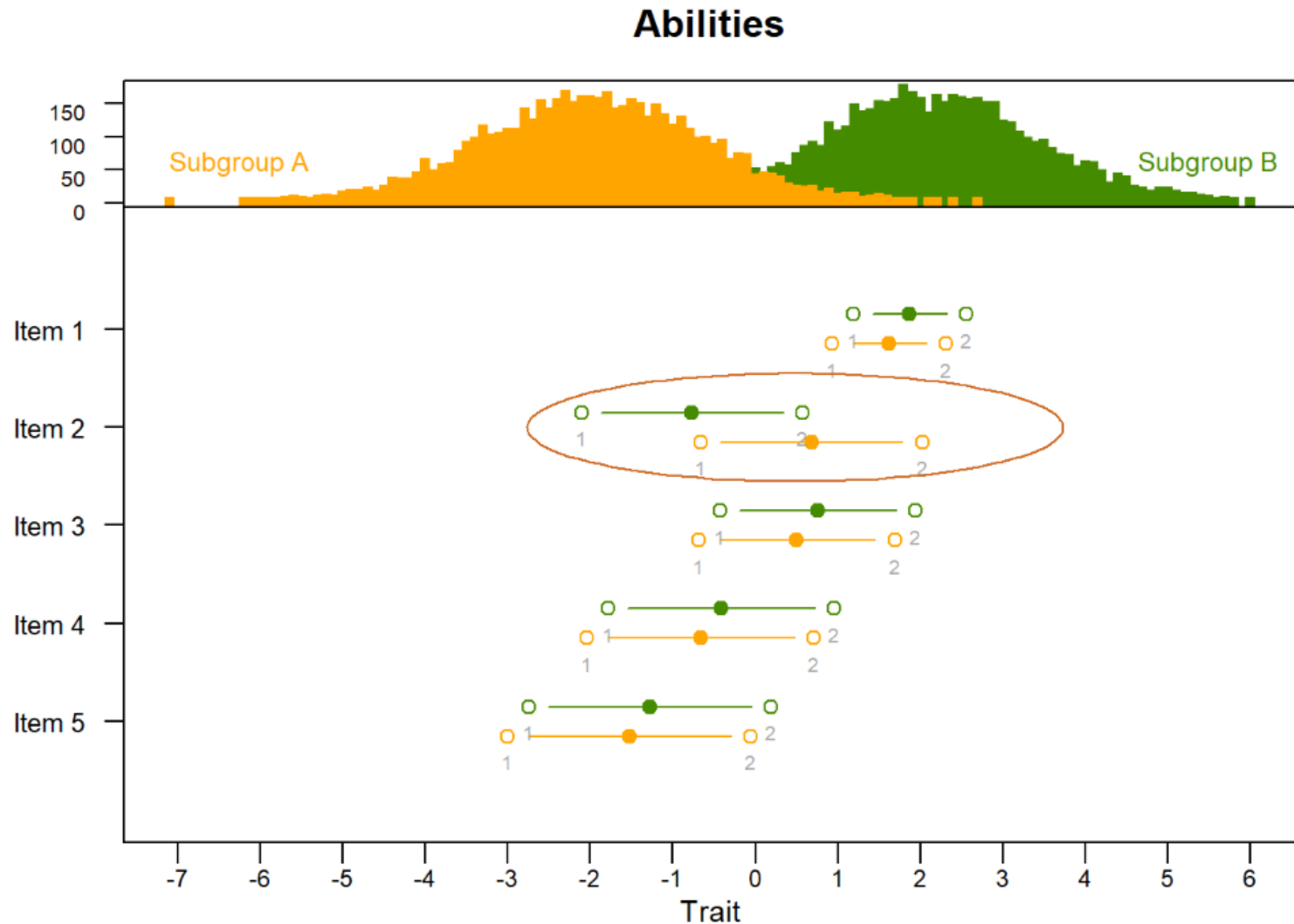
Differential Item Functioning

The Rasch model assumes the construct measured is valid across subgroups.

Differential item functioning tests if item are invariant across sample subgroups.
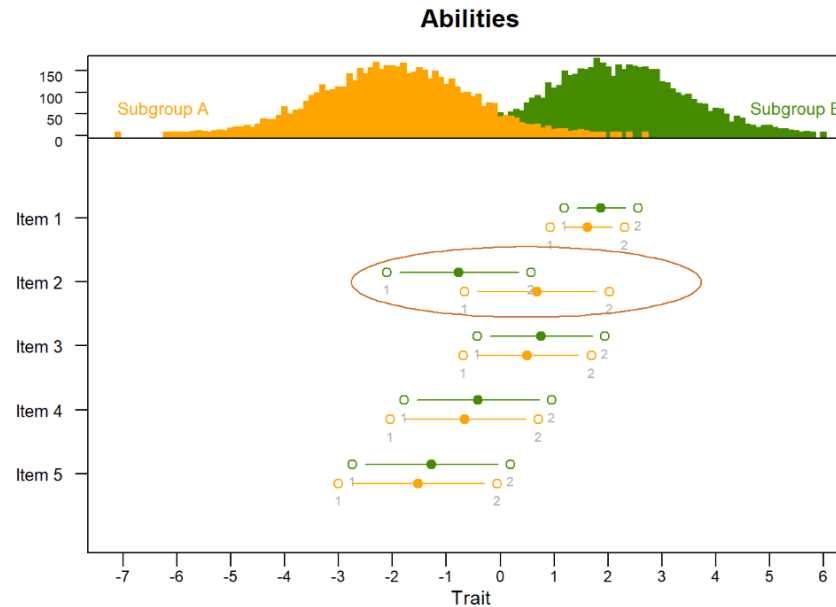
Differential Item Functioning

Differential Item Functioning

2) one item, the Item 2, is in different locations relative to the other items as a function of the subgroup.
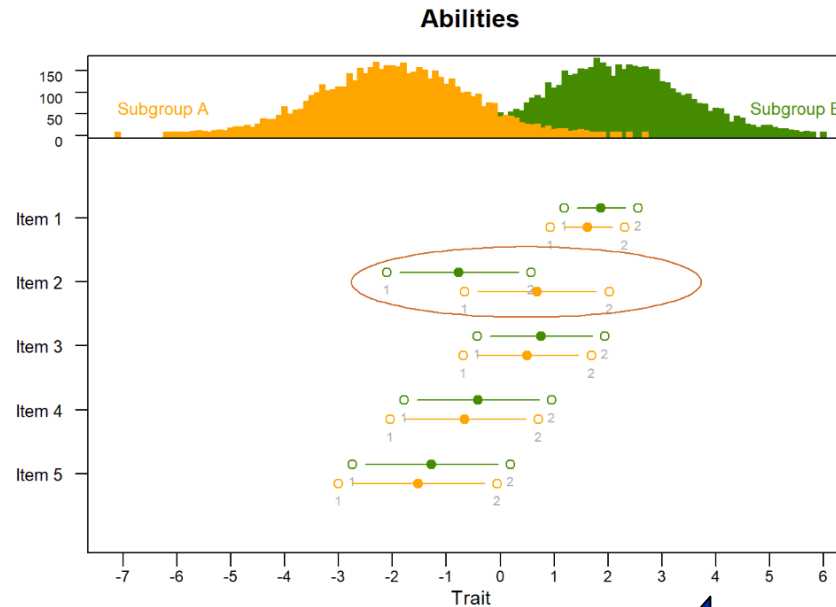
Differential Item Functioning?

1) nearly all of the items of subgroup A are shifted a similar distance "down" the measurement scale in comparison to the subgroup B.
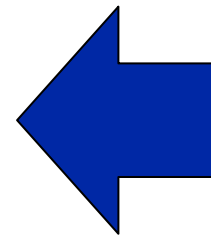
2) one item the Item 5, is in a different location relative to the other items as a function of the subgroup.
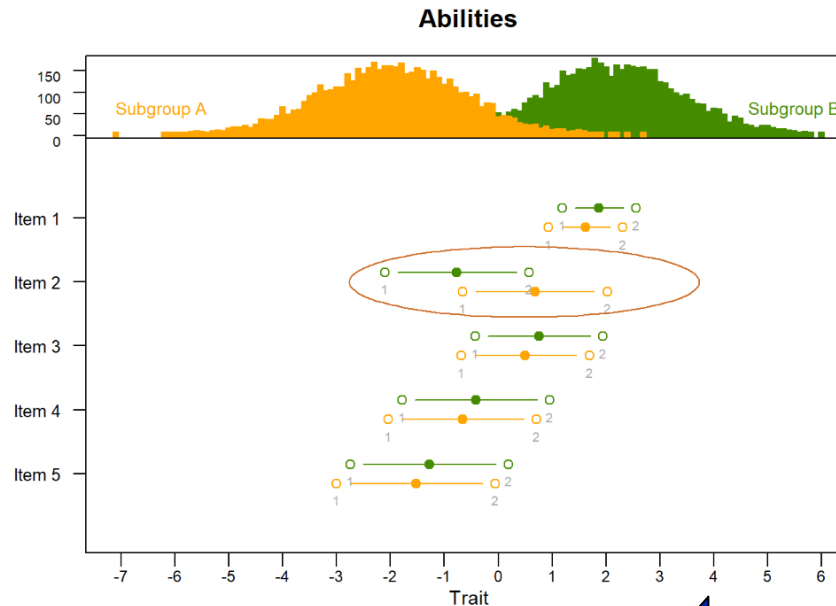
Differential Item Functioning?

1) Subgroup A and Subgroup B have different levels of ability.

2) One item the Item 2, is in a different locations relative to the other items as a function of the subgroup.
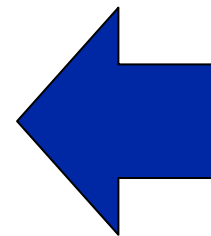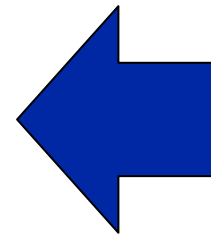
May not be a measurement bias or problem with the construct validity.

Differential Item Functioning?

1) Subgroup A and Subgroup B have different levels of ability.

May not be a measurement bias or problem with the construct validity.

2) One item the Item 2, is in a different locations relative to the other items as a function of the subgroup.

May be DIF. Item 2 performs very differently in the two constructs.

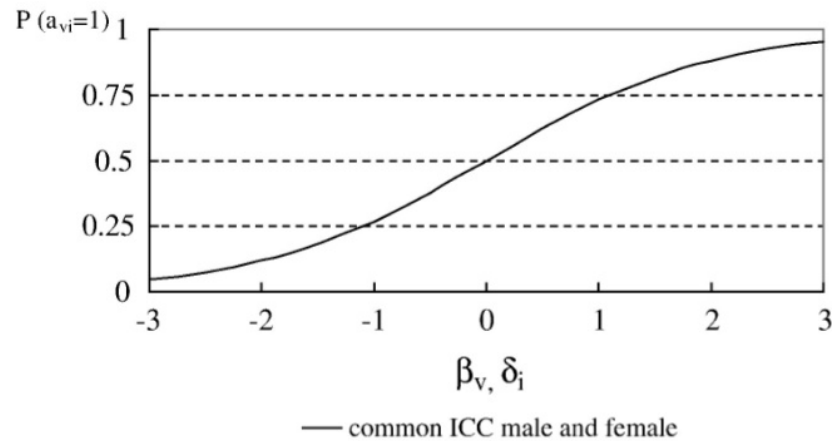# Differential Item Functioning Uniform vs Non-Uniform DIF

Uniform DIF:

Item difficulty estimates differ significantly across sample subgroups (age, gender etc..)

Non-Uniform DIF:

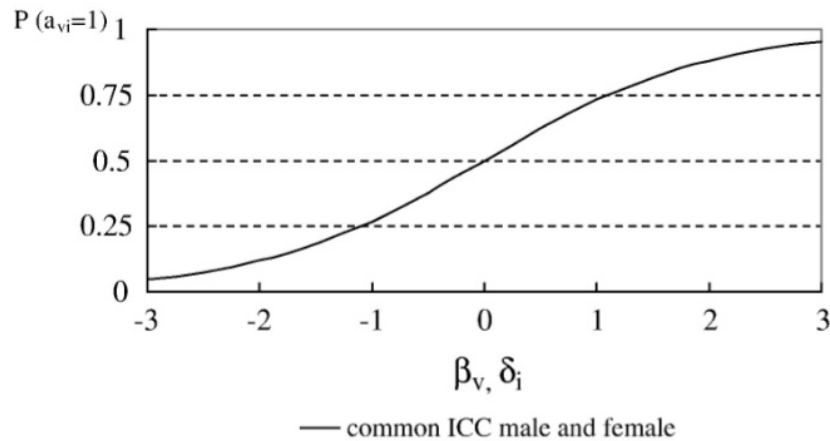Item difficulty estimates differ significantly across sample subgroups and score level.

Differential Item Functioning Uniform vs Non-Uniform DIF

(a) No presence of DIF
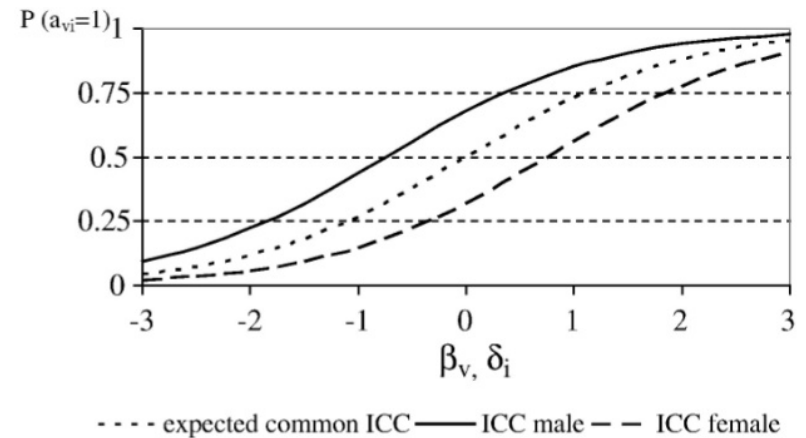

— common ICC male and female

Differential Item Functioning Uniform vs Non-Uniform DIF
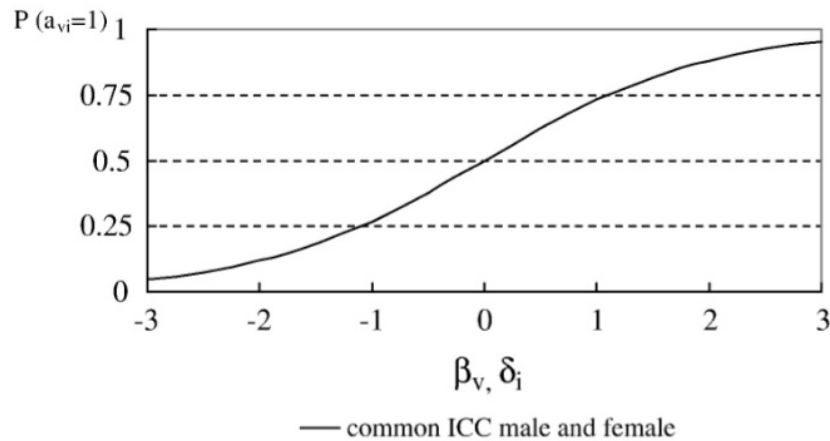

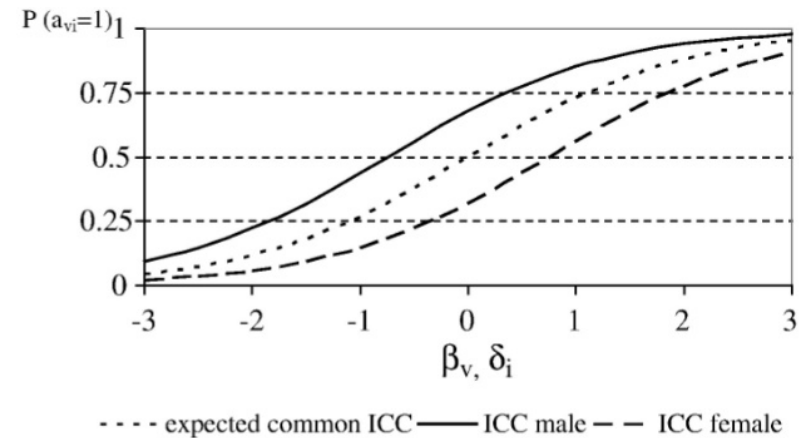(a) No presence of DIF

(b) Uniform DIF

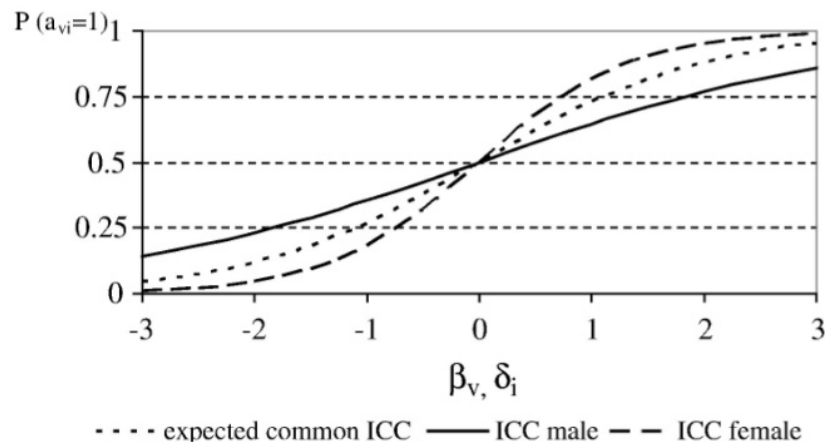# Differential Item Functioning Uniform vs Non-Uniform DIF

(a) No presence of DIF

(b) Uniform DIF

(c) Non-uniform DIF

Differential Item Functioning Uniform vs Non-Uniform DIF

(a) No presence of DIF

(b) Uniform DIF

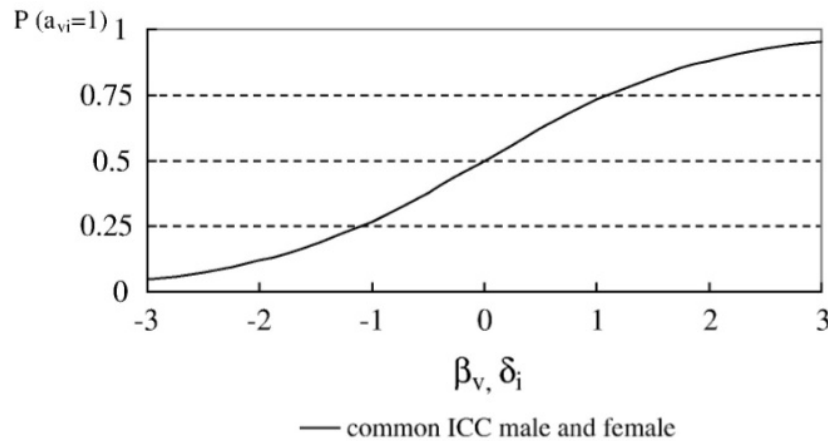(c) Non-uniform DIF
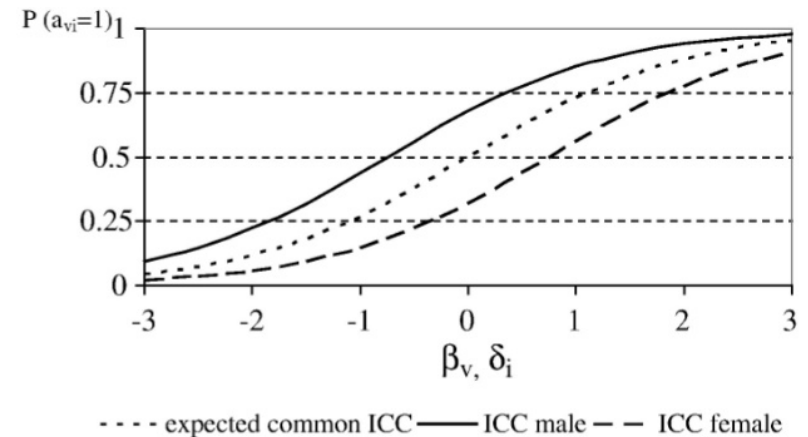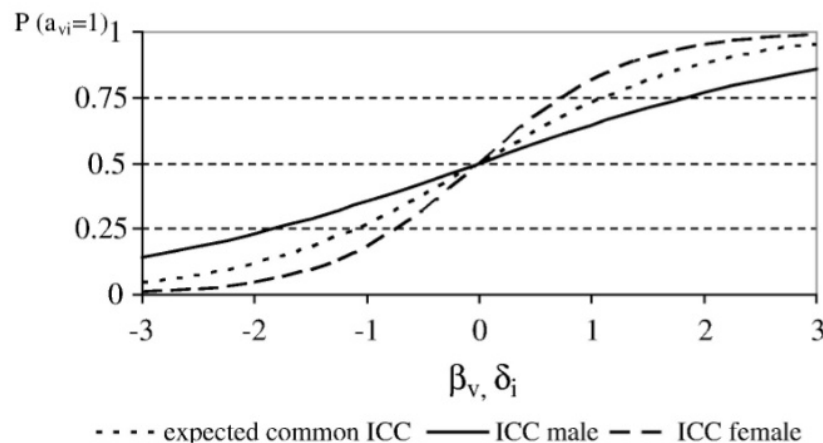
(d) Uniform and non-uniform DIF

Differential Item Functioning Uniform vs Non-Uniform DIF

(a) No presence of DIF

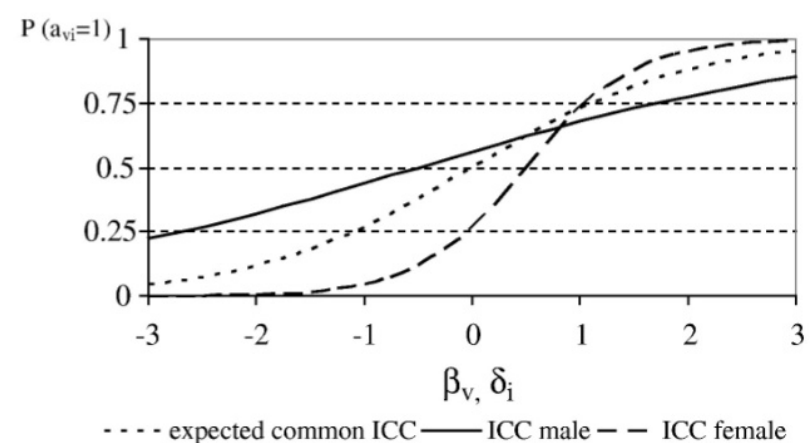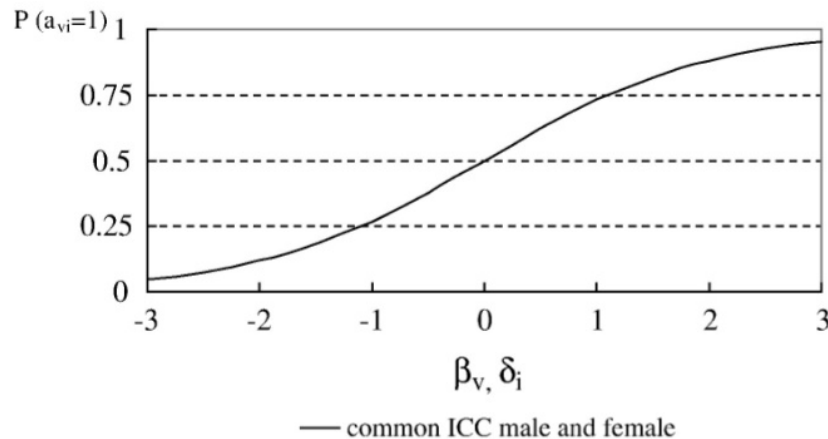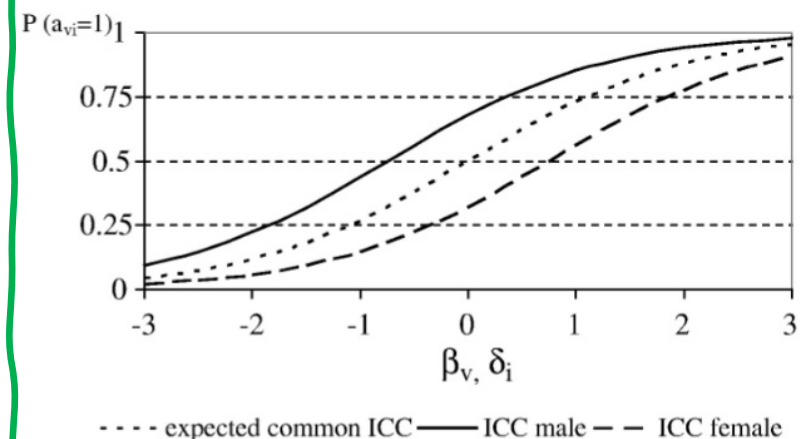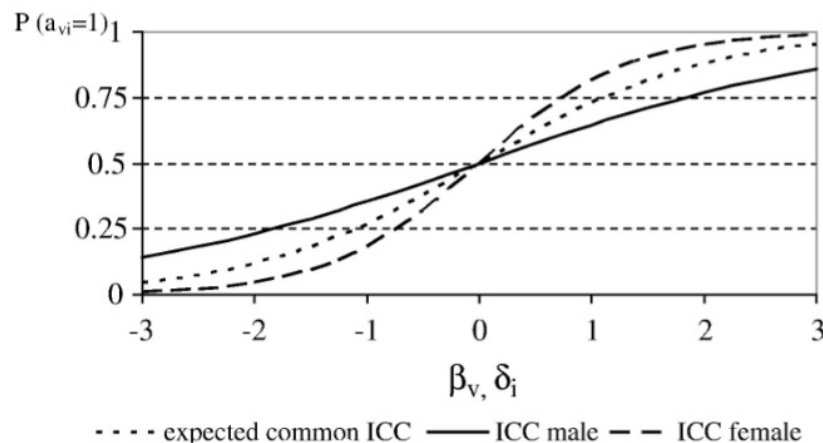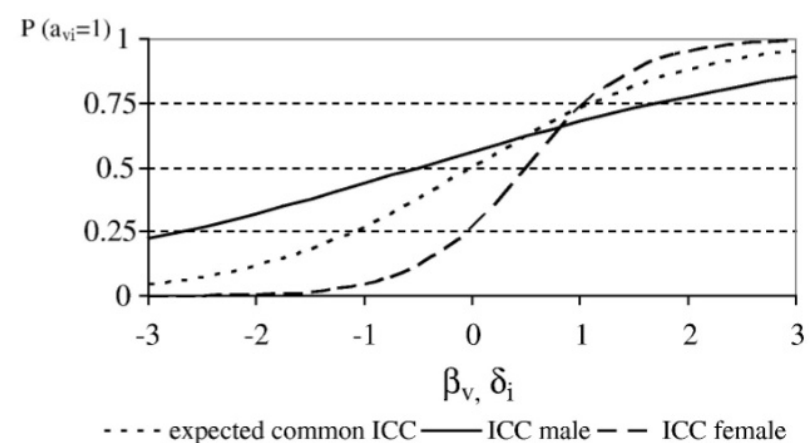(b) Uniform DIF

(c) Non-uniform DIF

(d) Uniform and non-uniform DIF

Differential Item Functioning Uniform vs Non-Uniform DIF

In presence of Uniform DIF, an approach to solve the DIF is item split.

(b) Uniform DIF

$P(a_{vi}=1)$

β_v, δ_i

- - - - expected common ICC —— ICC male — — ICC female

Dataset

Male

Female

Item 1

Item 2

Item 3

Item 4: Gender DIF!

Differential Item Functioning Uniform vs Non-Uniform DIF

In presence of Uniform DIF, an approach to solve the DIF is item split.
Instead of one item, as many items as DIF subgroup level will enter the Rasch analysis.
This creates than adjusted subgroup specific metrics.

(b) Uniform DIF

---- expected common ICC —— ICC male — — ICC female

Dataset

Male

Female

Item 1 Item 2 Item 3 Item 4: Gender DIF!

Item Split

Male

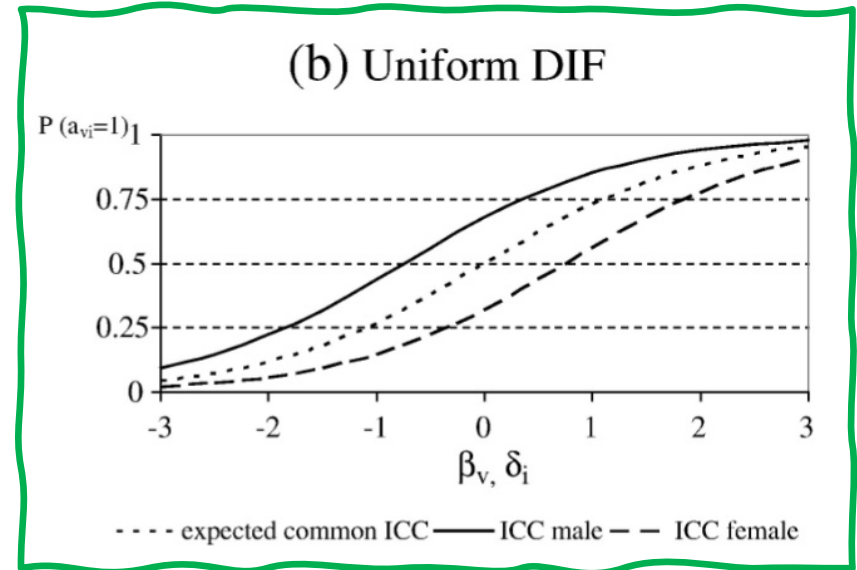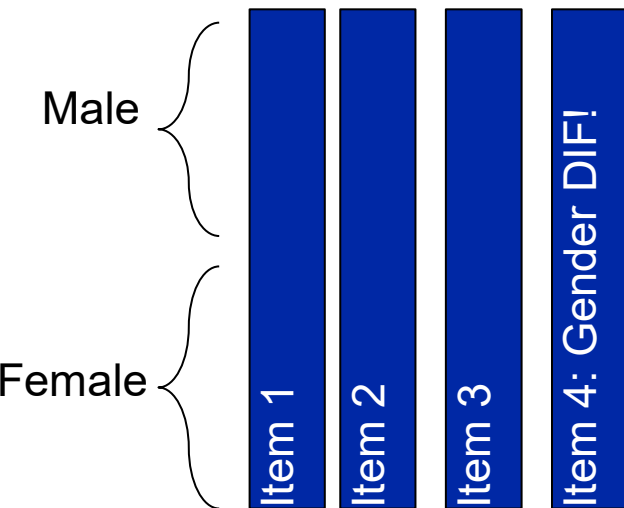Item 1 Item 2 Item 3 Item 4: M Item 4: F
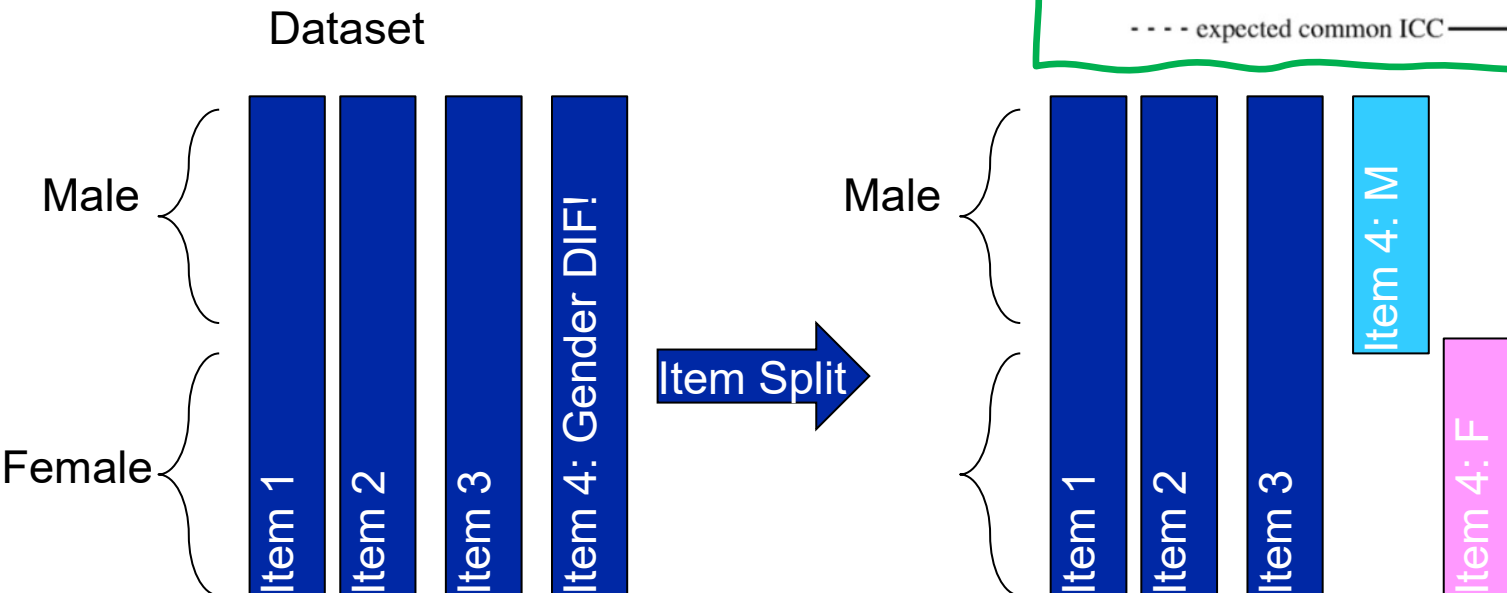
Differential Item Functioning Uniform vs Non-Uniform DIF

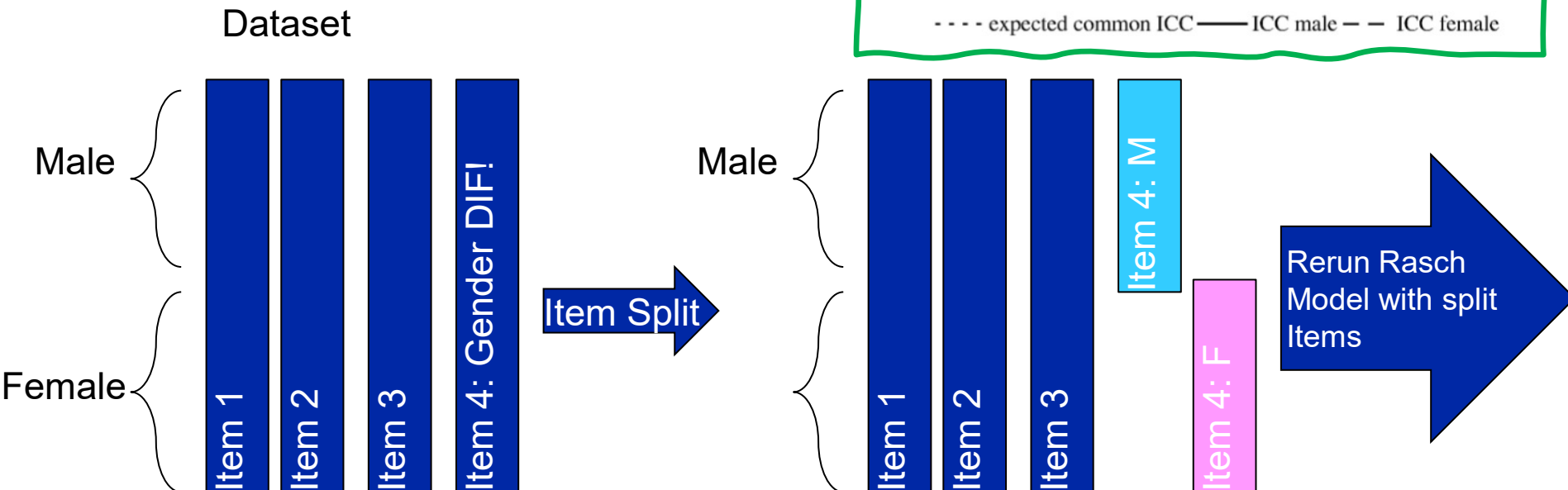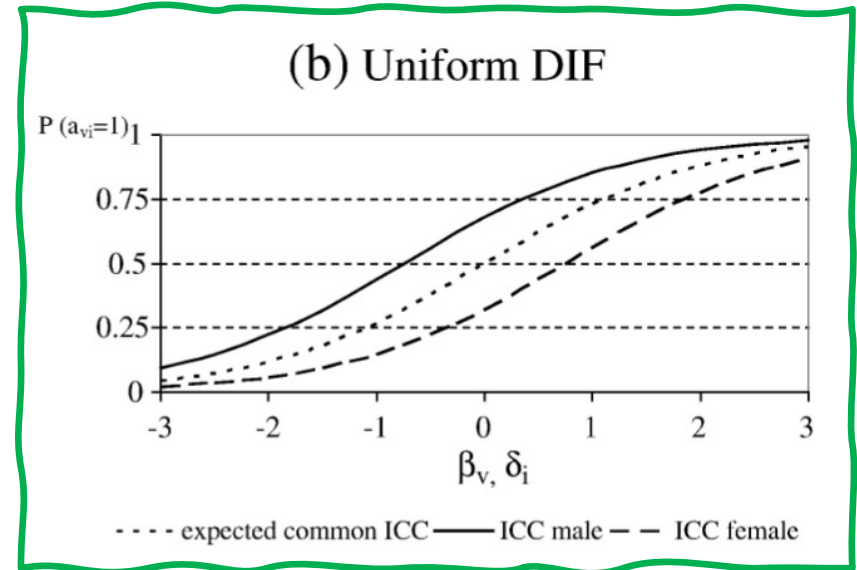In presence of Uniform DIF, an approach to solve the DIF is item split.
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(b) Uniform DIF

---- expected common ICC —— ICC male – – ICC female

Dataset

Male

Female

Item 1 | Item 2 | Item 3 | Item 4: Gender DIF!

Item Split

Male

Female

Item 1 | Item 2 | Item 3 | Item 4: M | Item 4: F

Rerun Rasch Model with split Items

Let's go to R-Studio

Open the R-Script MS11_Rscript.r from the OLAT or the MS-Teams Course Materials.

Exercises

Run the same DIF analysis for Age group, Completeness, and Injury etiology (Traumatic versus non-Traumatic). Decide if you would want to split items.