AGH University of Science and Technology

Common Set Analysis

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Outline

- Common Set Sequences
- ANOVA and Distribution Analysis
  - ILG Differences
  - PVS Differences
- Common Set Estimation
- After Correction Analysis

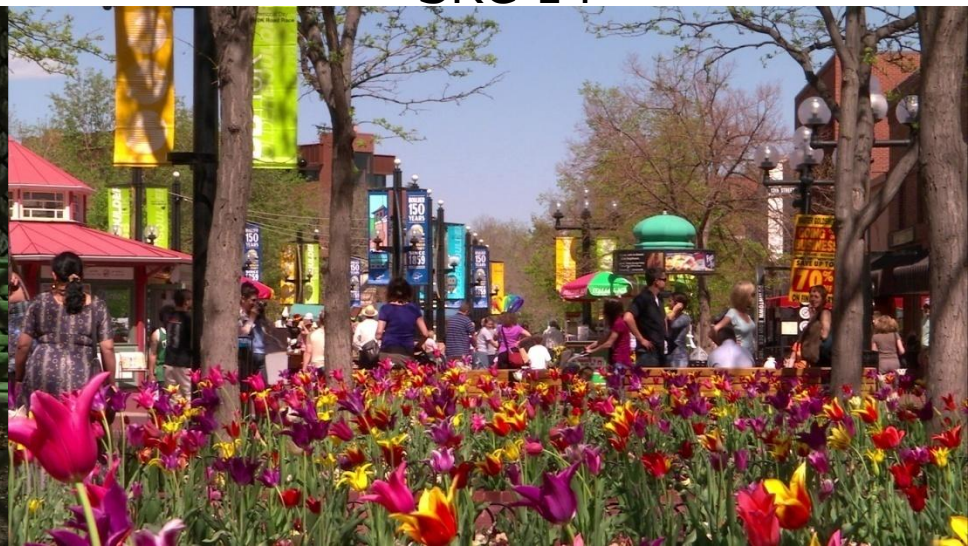
Common Set Sequences

SRC 11

SRC 12

SRC 13

SRC 14



ILGs

- vqeghd1 – Ghent (Belgium)
- vqeghd2 – IRCCyN (France)
- vqeghd3 – Acreo (Sweden, not analysed)
- vqeghd4 – AGH (Poland)
- vqeghd5 – Psytechnics (UK)
- vqeghd6 – FUB (Italy)

ANOVA analysis

- Are the results obtained by different ILGs different?
- What do different results mean?
- The MOSes obtained by different ILGs are statistically different
- This is the simplest definition for the differences in the results
- In order to compare two mean values we can use ANOVA analysis (MATLAB anova1 function)

Data

ILG	PVS	SRC	HRC	Subject 1	...	Subject 24
1	1100	11	00	5		4
1	1105	11	05	2		3
1	1210	12	10	2		3
2	1100	11	00	4		5
2	1105	11	05	3		3
2	1210	12	10	1		2
3	1100	11	00	3		5
3	1105	11	05	1		1
3	1210	12	10	1		2

Data, ILG Comparison

ILG	PVS	SRC	HRC	Subject 1	...	Subject 24
1	1100	11	00	5		4
1	1105	11	05	2		3
1	1210	12	10	2		3
2	1100	11	00	4		5
2	1105	11	05	3		3
2	1210	12	10	1		2
3	1100	11	00	3		5
3	1105	11	05	1		1
3	1210	12	10	1		2

Data, Two ILG Comparison

ILG	PVS	SRC	HRC	Subject 1	...	Subject 24
1	1100	11	00	5		4
1	1105	11	05	2		3
1	1210	12	10	2		3
2	1100	11	00	4		5
2	1105	11	05	3		3
2	1210	12	10	1		2
3	1100	11	00	3		5
3	1105	11	05	1		1
3	1210	12	10	1		2

Data, ILG Comparison For Specific PVS

ILG	PVS	SRC	HRC	Subject 1	...	Subject 24
1	1100	11	00	5		4
1	1105	11	05	2		3
1	1210	12	10	2		3
2	1100	11	00	4		5
2	1105	11	05	3		3
2	1210	12	10	1		2
3	1100	11	00	3		5
3	1105	11	05	1		1
3	1210	12	10	1		2

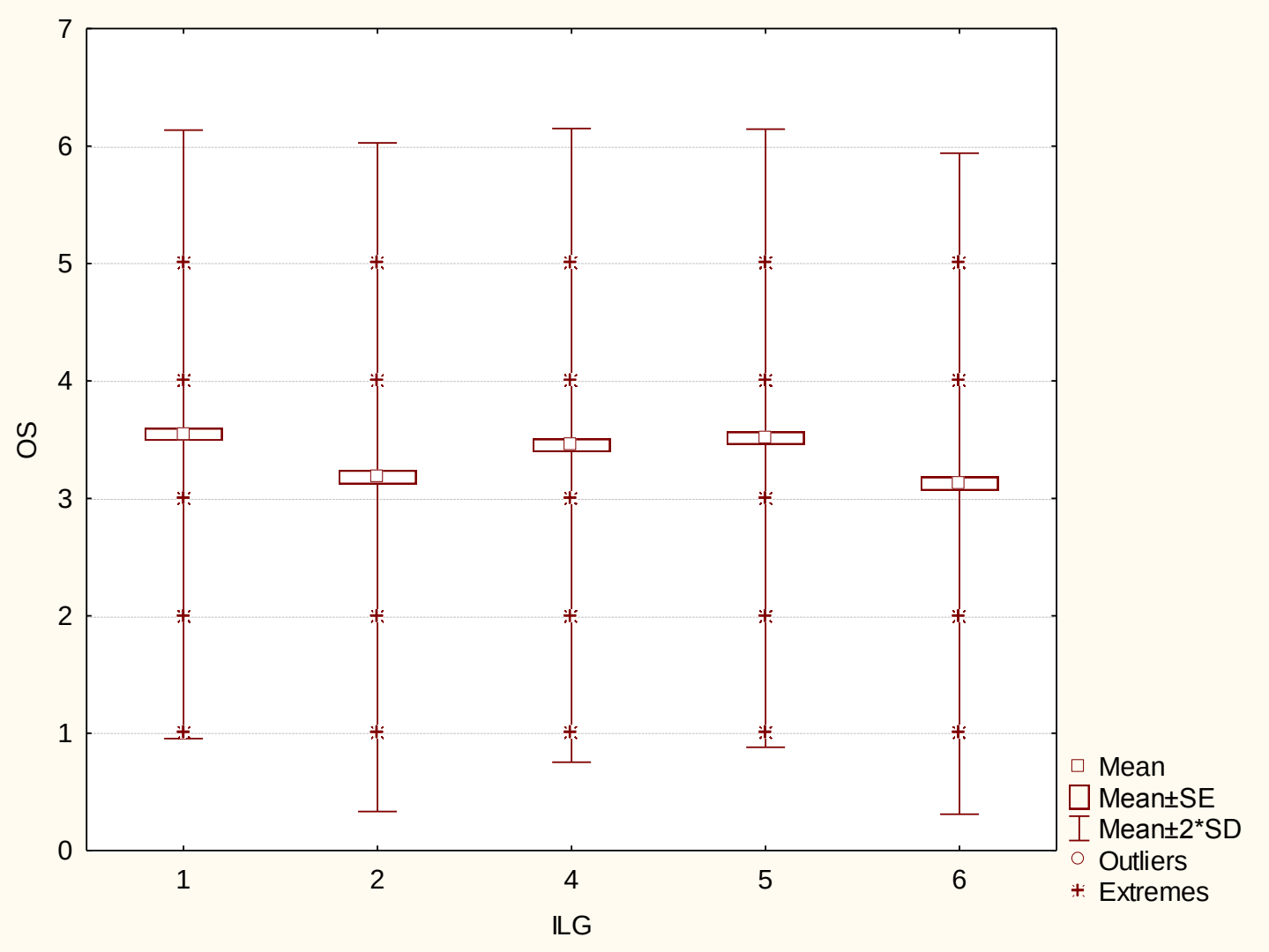
Data, Two ILG For Specific PVS

ILG	PVS	SRC	HRC	Subject 1	...	Subject 24
1	1100	11	00	5		4
1	1105	11	05	2		3
1	1210	12	10	2		3
2	1100	11	00	4		5
2	1105	11	05	3		3
2	1210	12	10	1		2
3	1100	11	00	3		5
3	1105	11	05	1		1
3	1210	12	10	1		2

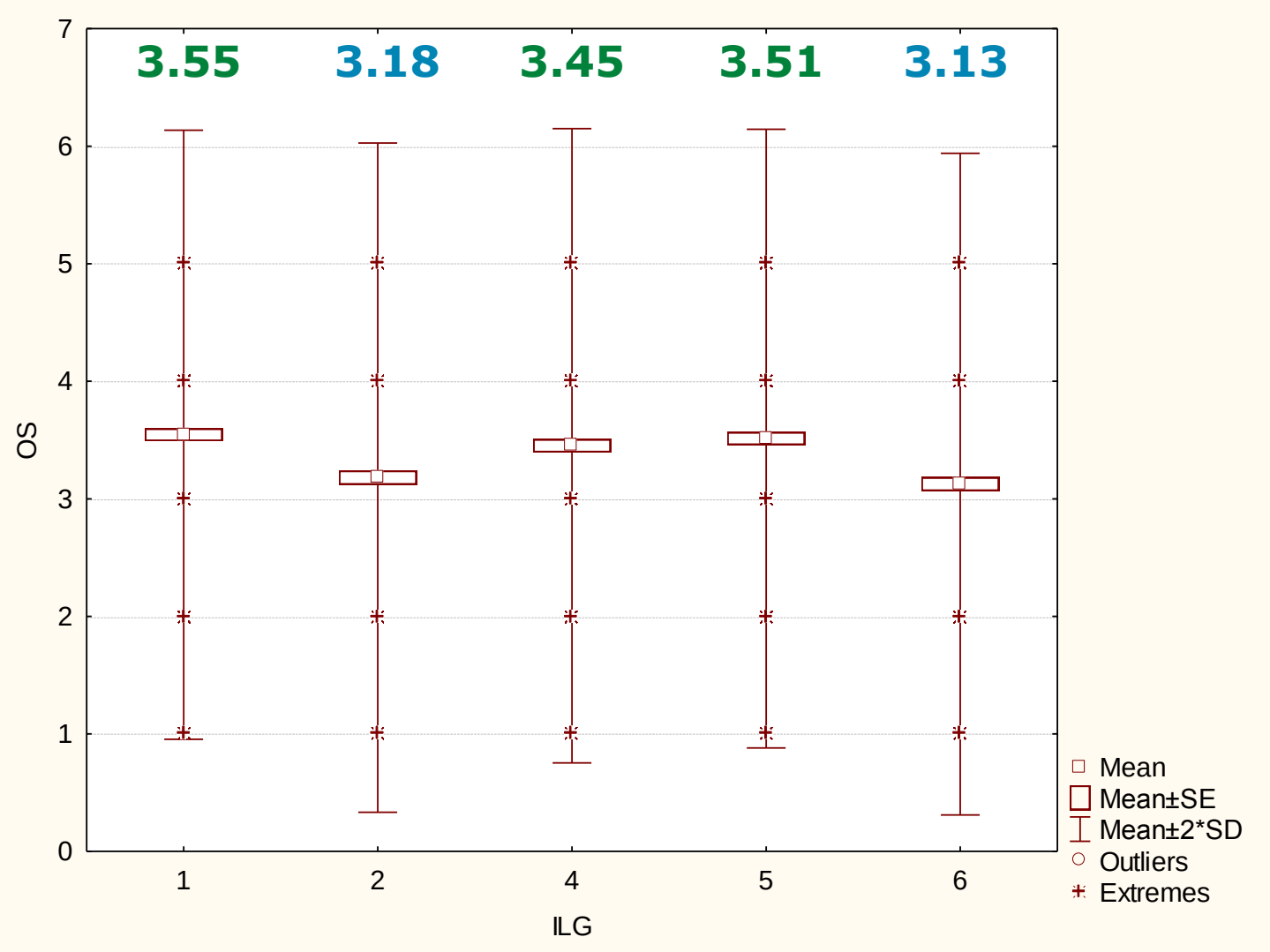
Data, ILG Comparison

ILG	PVS	SRC	HRC	Subject 1	...	Subject 24
1	1100	11	00	5		4
1	1105	11	05	2		3
1	1210	12	10	2		3
2	1100	11	00	4		5
2	1105	11	05	3		3
2	1210	12	10	1		2
3	1100	11	00	3		5
3	1105	11	05	1		1
3	1210	12	10	1		2

Box Plot


7
6
5
4
3
2
1
0
OS
1
2
4
5
6
ILG
Mean
Mean±SE
Mean±2*SD
Outliers
Extremes

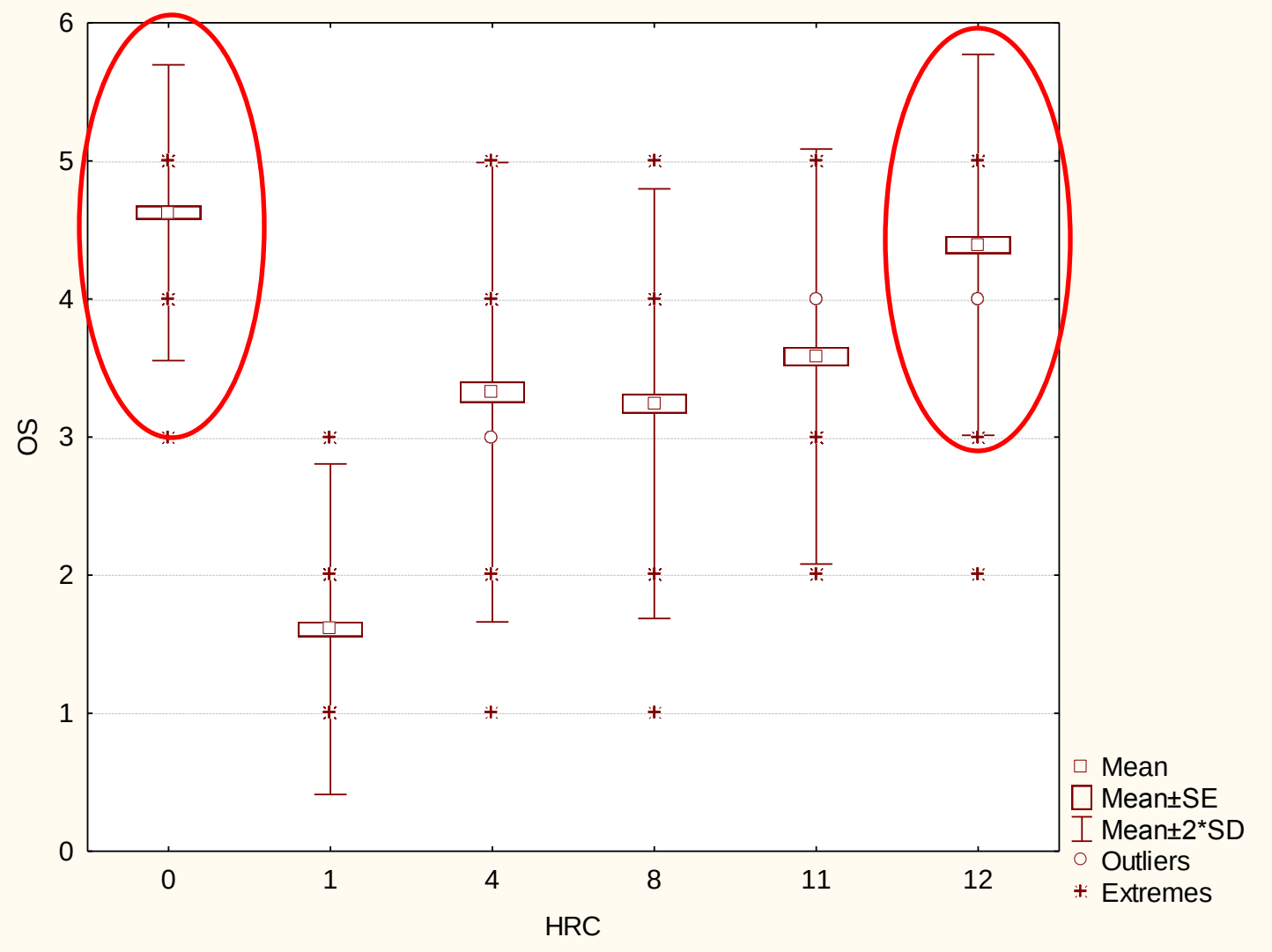
Global MOSes



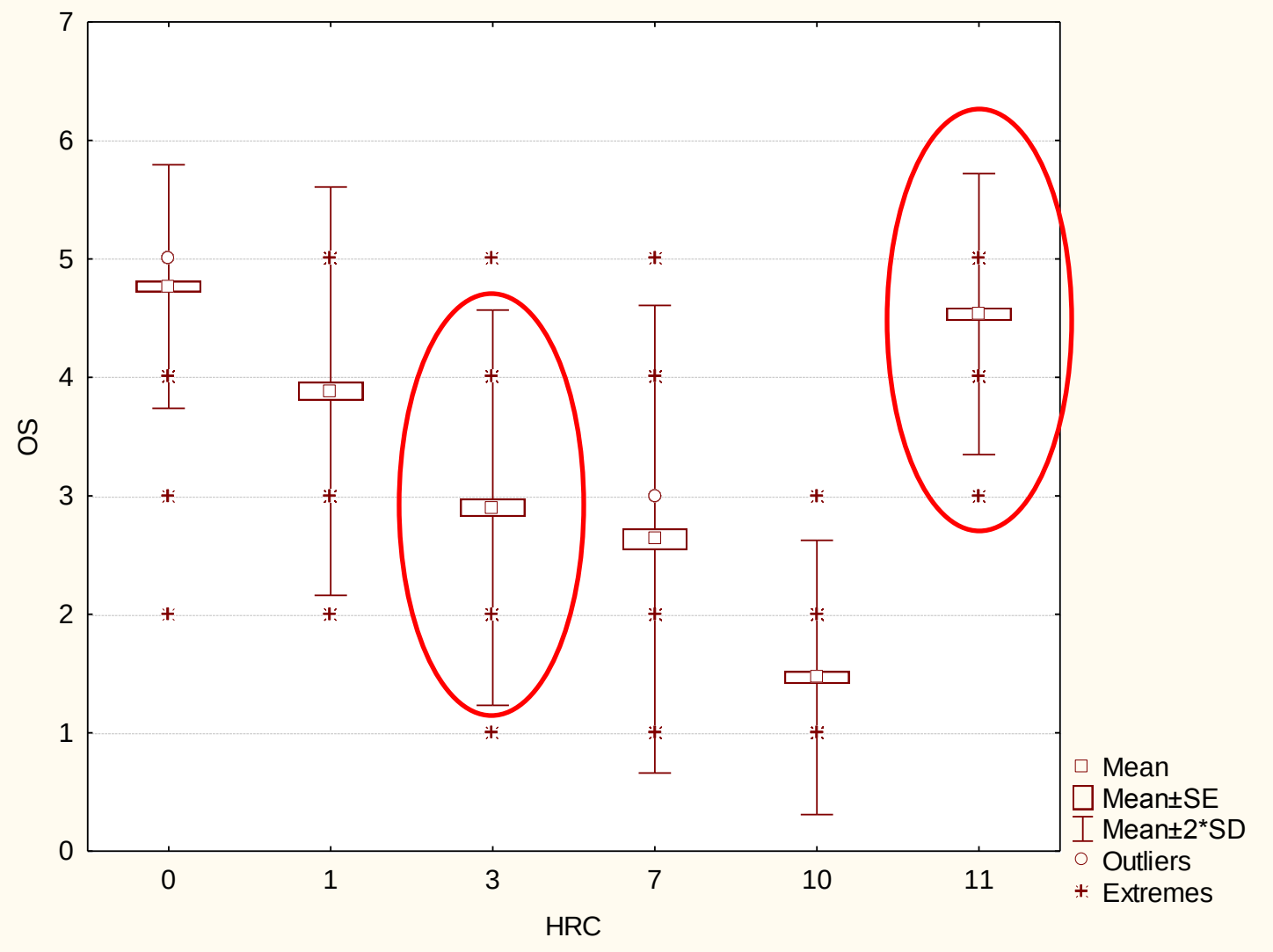
Data, ILG Comparison For Specific PVS

ILG	PVS	SRC	HRC	Subject 1	...	Subject 24
1	1100	11	00	5		4
1	1105	11	05	2		3
1	1210	12	10	2		3
2	1100	11	00	4		5
2	1105	11	05	3		3
2	1210	12	10	1		2
3	1100	11	00	3		5
3	1105	11	05	1		1
3	1210	12	10	1		2

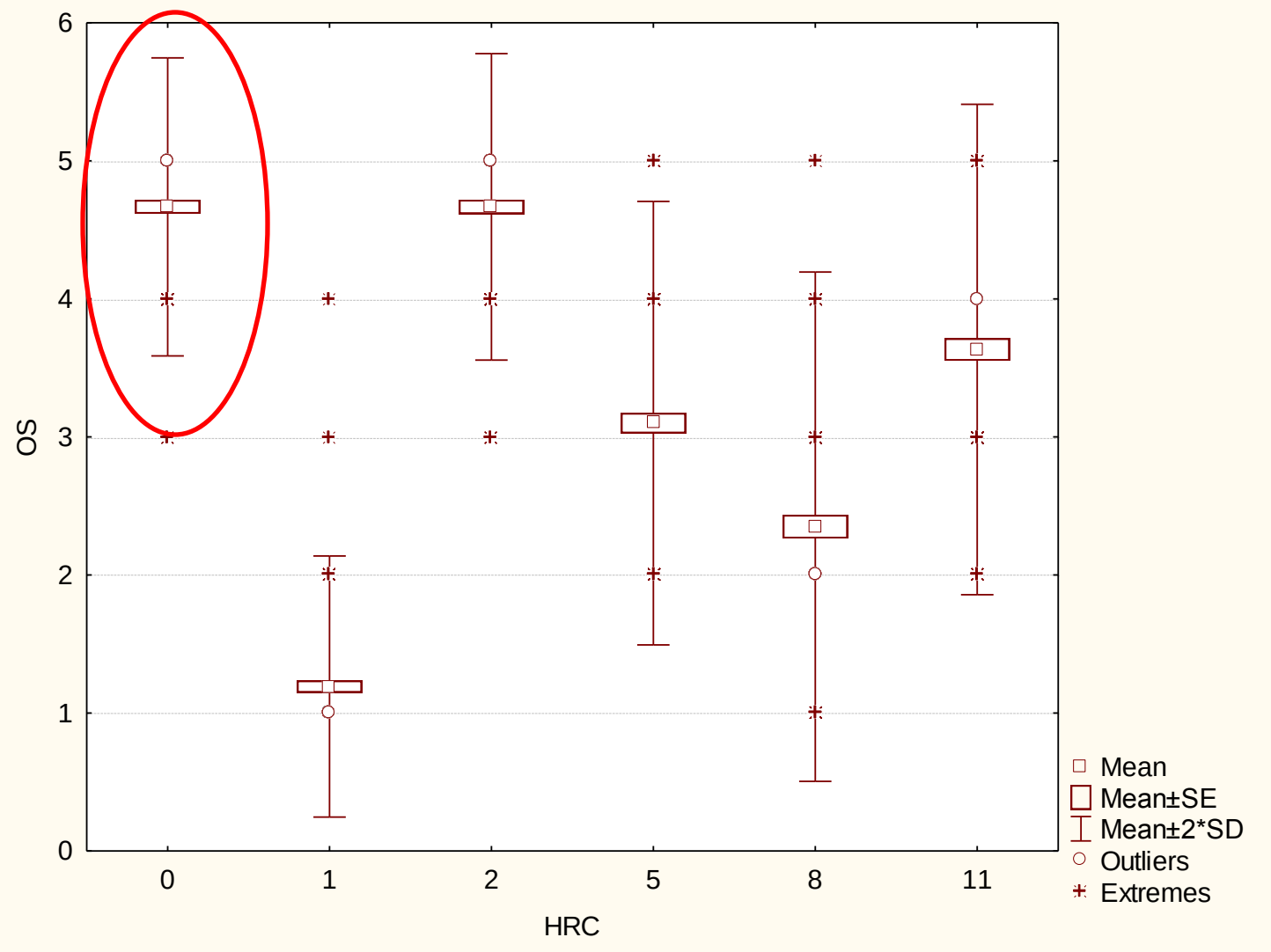
Box Plot Obtained for SRC 11



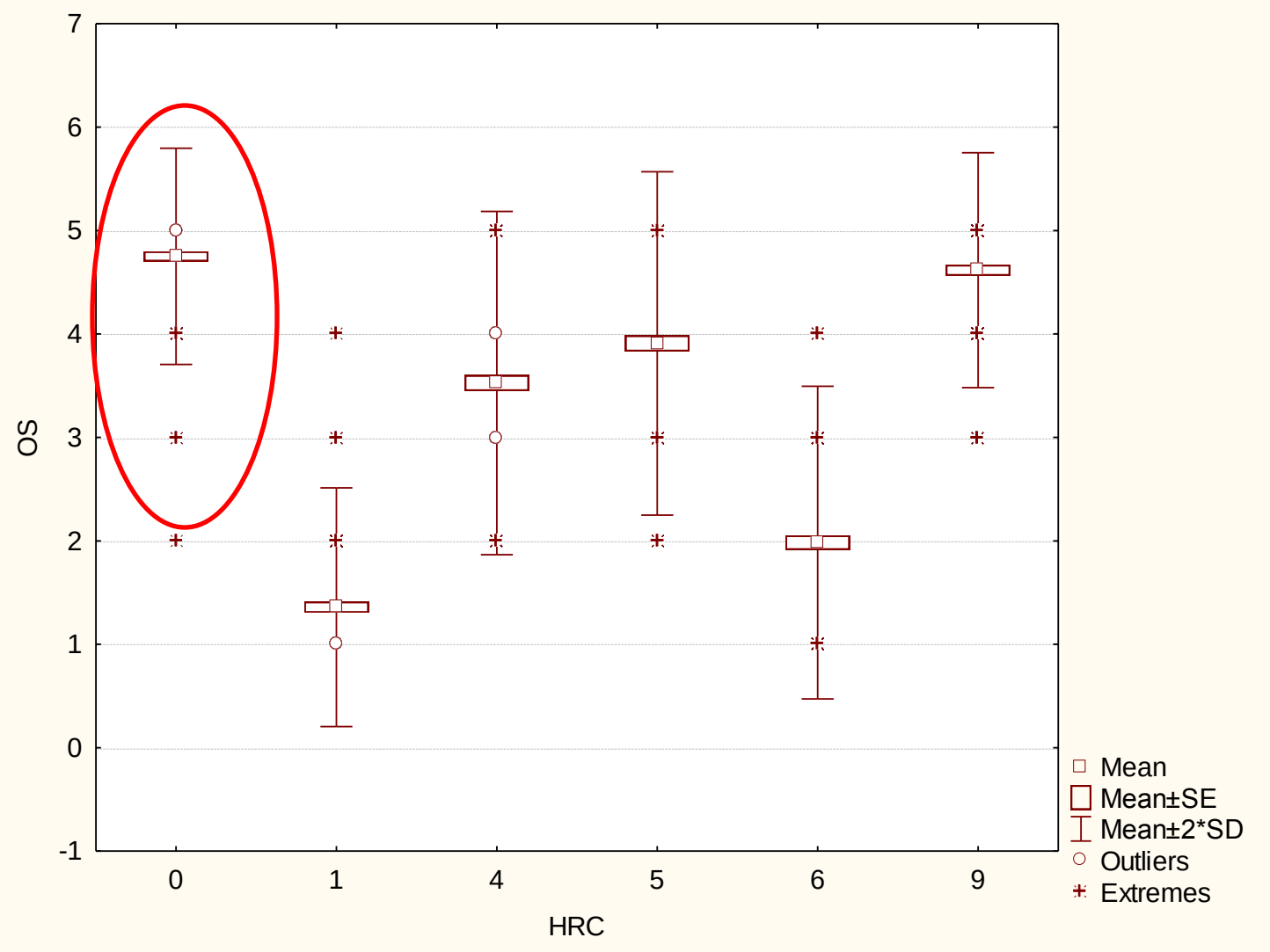
Box Plot Obtained for SRC 12



Box Plot Obtained for SRC 13



Box Plot Obtained for SRC 14



Data, Two ILG For Specific PVS

ILG	PVS	SRC	HRC	Subject 1	...	Subject 24
1	1100	11	00	5		4
1	1105	11	05	2		3
1	1210	12	10	2		3
2	1100	11	00	4		5
2	1105	11	05	3		3
2	1210	12	10	1		2
3	1100	11	00	3		5
3	1105	11	05	1		1
3	1210	12	10	1		2

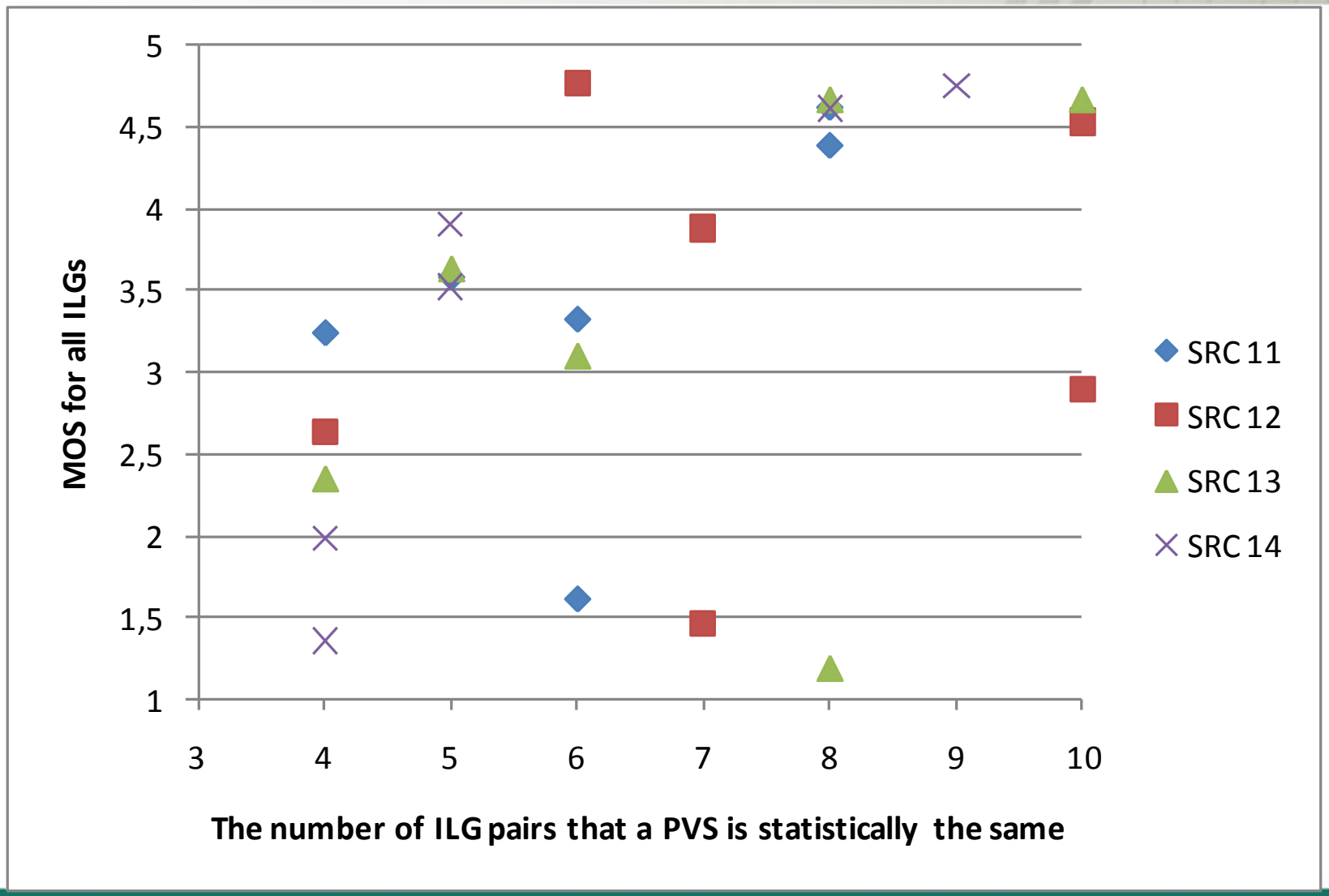
Aggregation of Each PVS Analysis

ILG	1	2	4	5	6
1	x	11	23	19	9
2	13	x	13	13	22
4	1	11	x	23	11
5	5	11	1	x	13
6	15	2	13	11	x

More Detail View On PVSes

- Note that for each PVS we have 10 ILG pairs
  - 1-2; 1-4; 1-5; 1-6; 2-4; ... ;5-6
- How may ILG paris are statistically different
- In order to specify a PVS I used MOS value

How Many ILGs are Statistically Different



Distributions

Let us be correct and consider distributions
i.e. let us use Pearson's chi^2 test

1. Again, distributions obtained by ILGs 1, 4 and 5 are statistically the same
2. Distributions obtained by ILGs 2 and 6 are also statistically the same
3. However, any other two distributions are statistically different
4. This confirms the ANOVA analysis

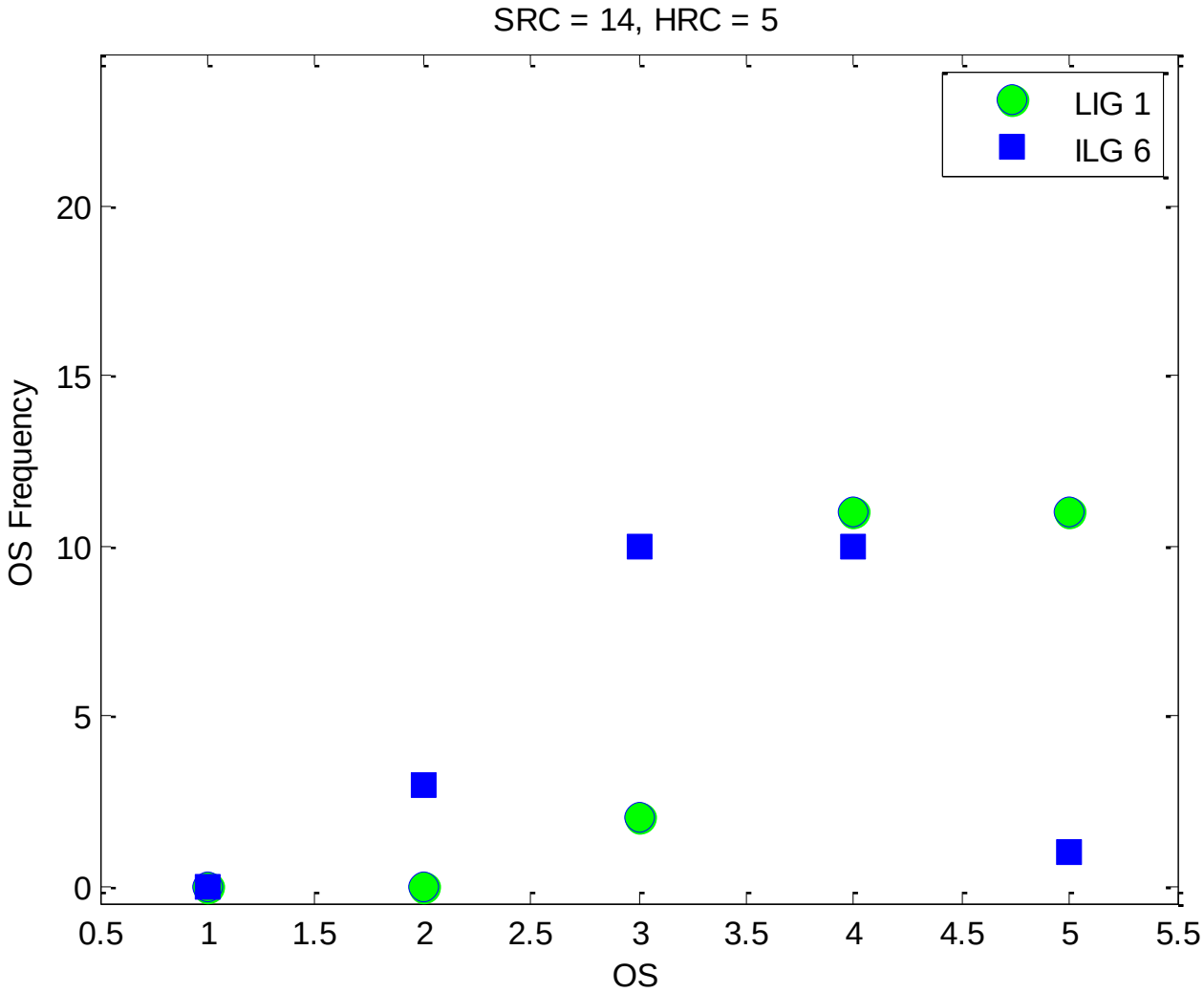
Aggregation of Each PVS Analysis (Distribution)

ILG	1	2	4	5	6
1	x	12	22	21	10
2	12	x	14	16	21
4	2	10	x	22	10
5	3	8	2	x	15
6	14	3	14	9	x

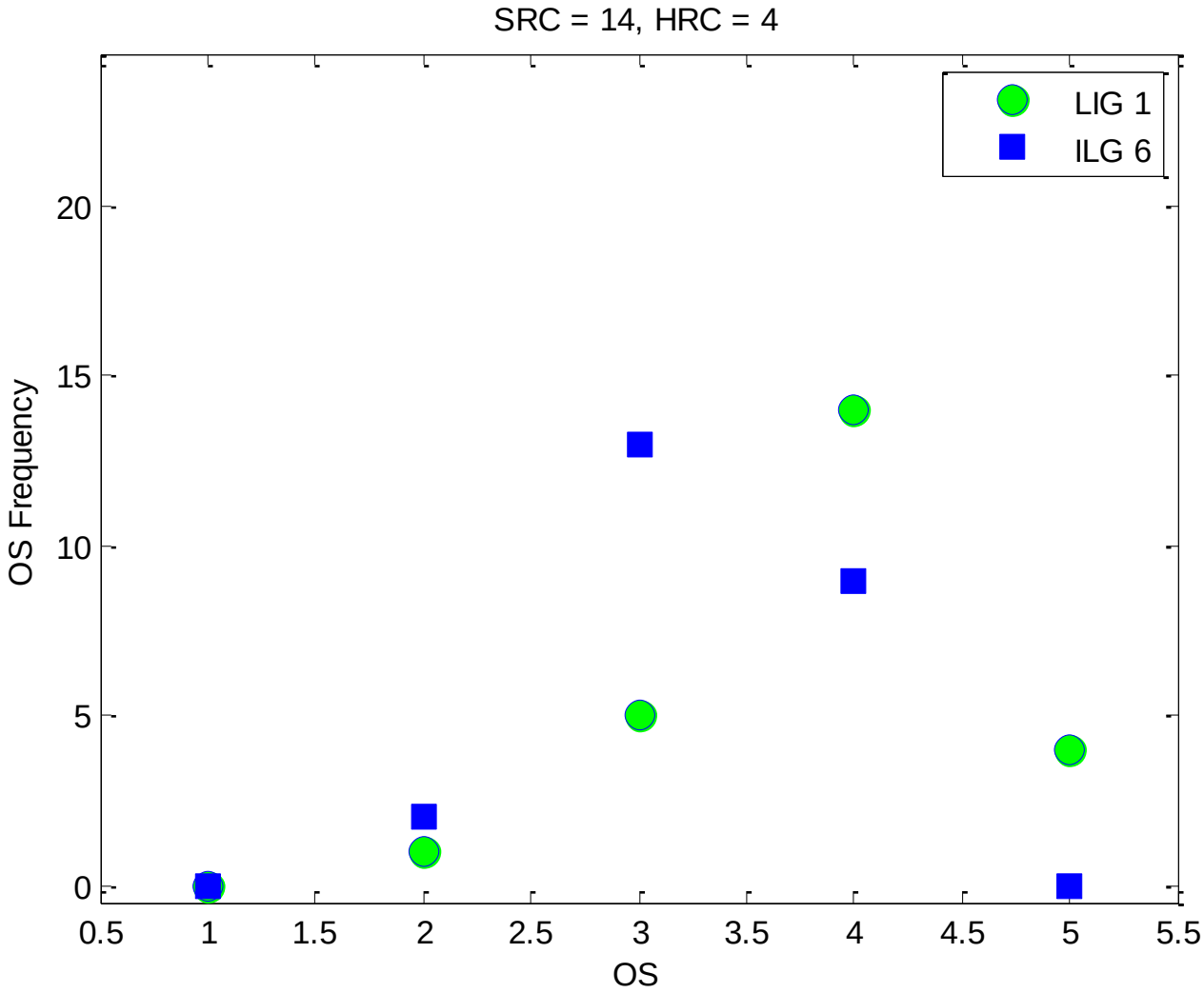
Individual Scale Point Analysis

ILG	1	2	4	5	6
1	x	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
2		x	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
4			x	1 2 3 4 5	1 2 3 4 5
5				x	1 2 3 4 5

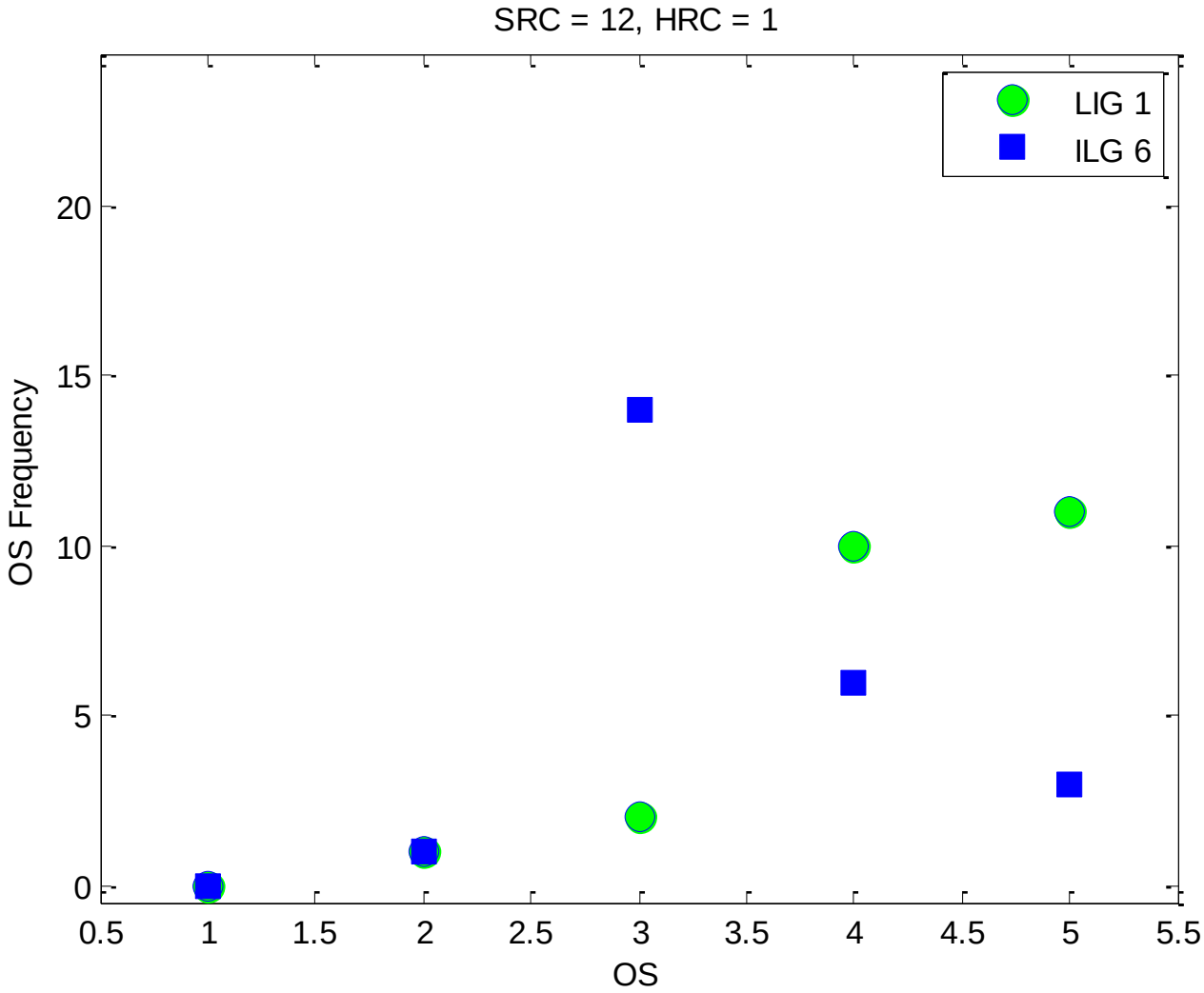
Two ILG Distributions: A Clear Shift



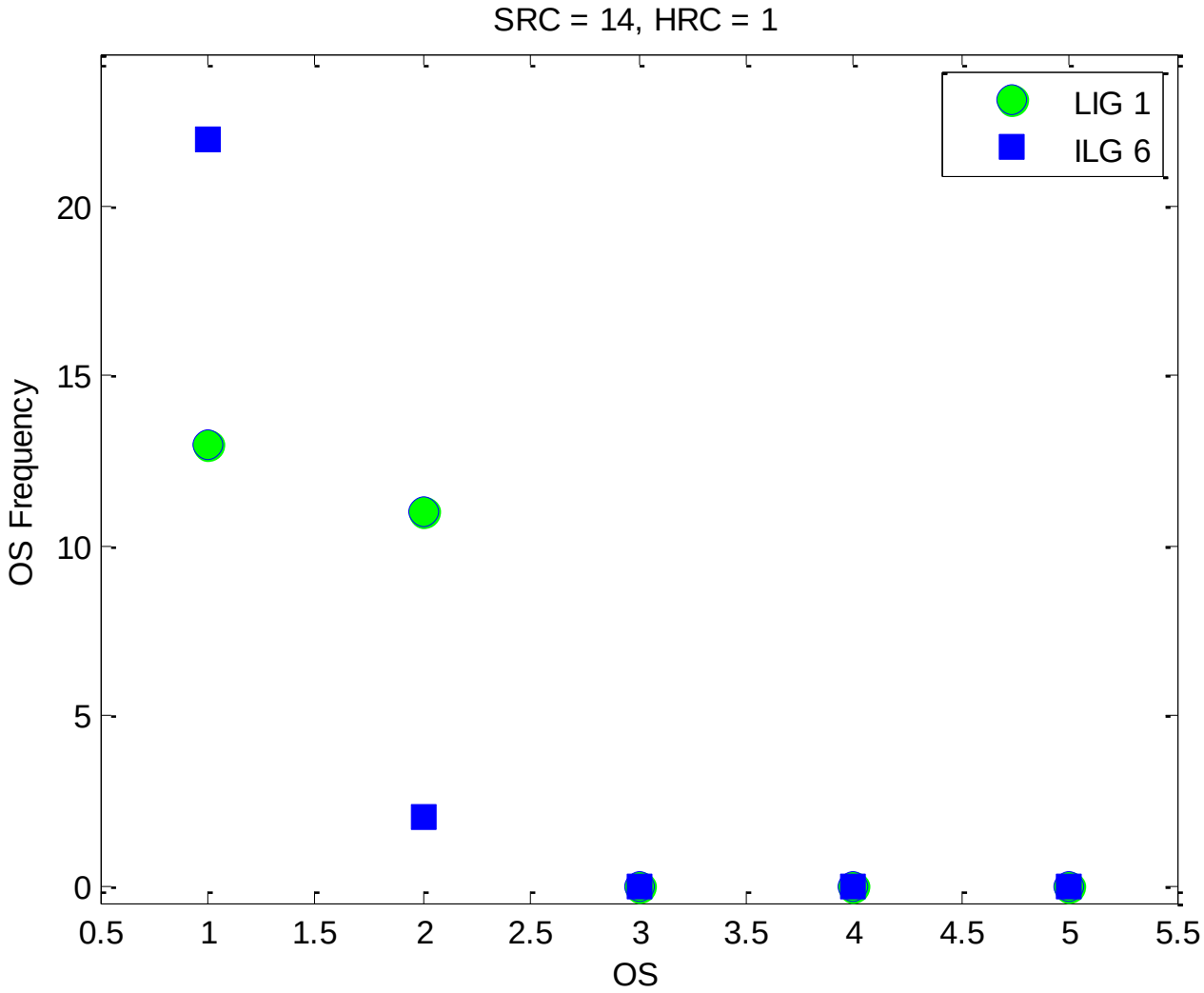
Two ILG Distributions: A Not So Clear Shift



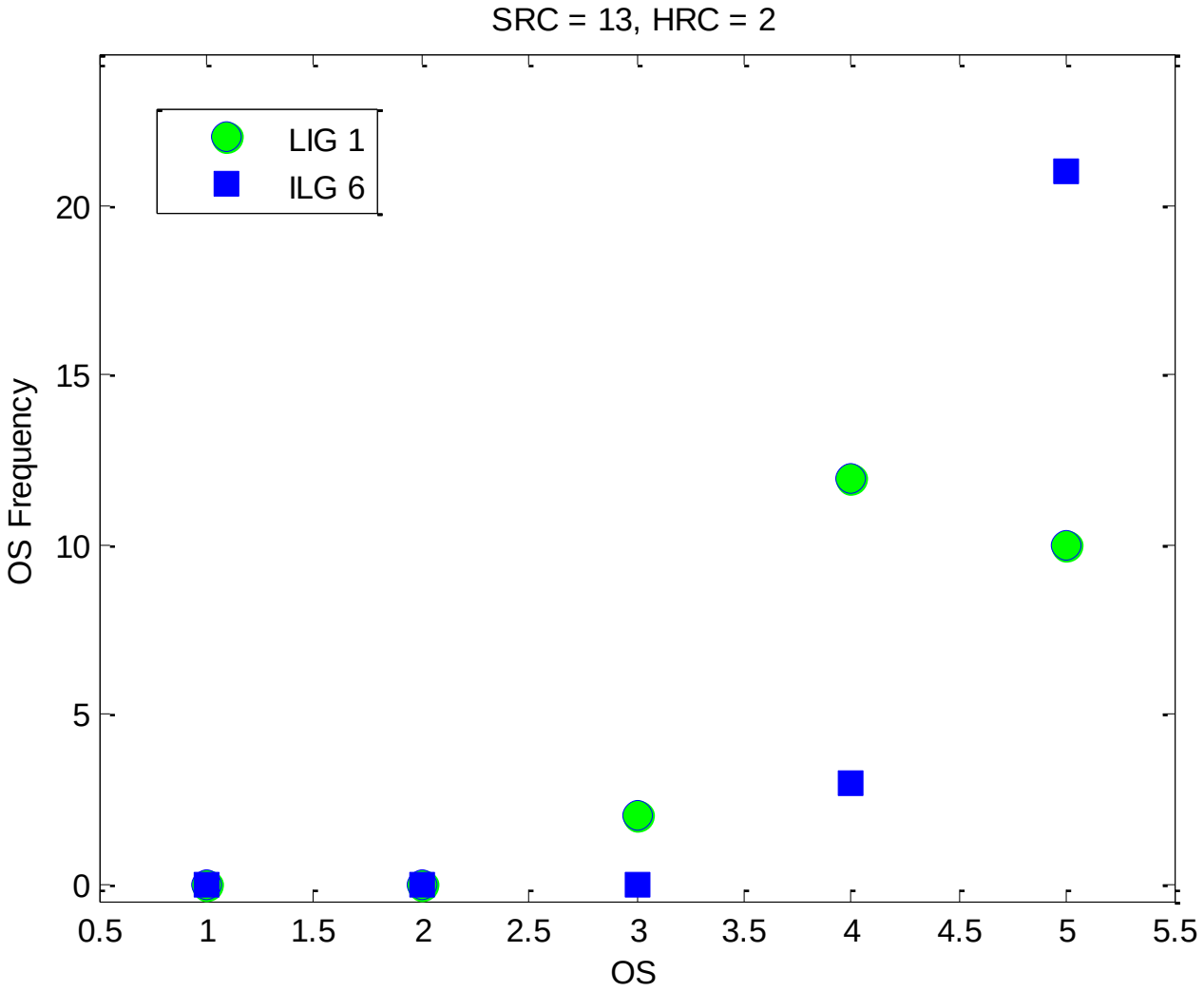
Two ILG Distributions: A Different Trend



Two ILG Distributions: A Boundary Problem



Two ILG Distributions: A Strange Result



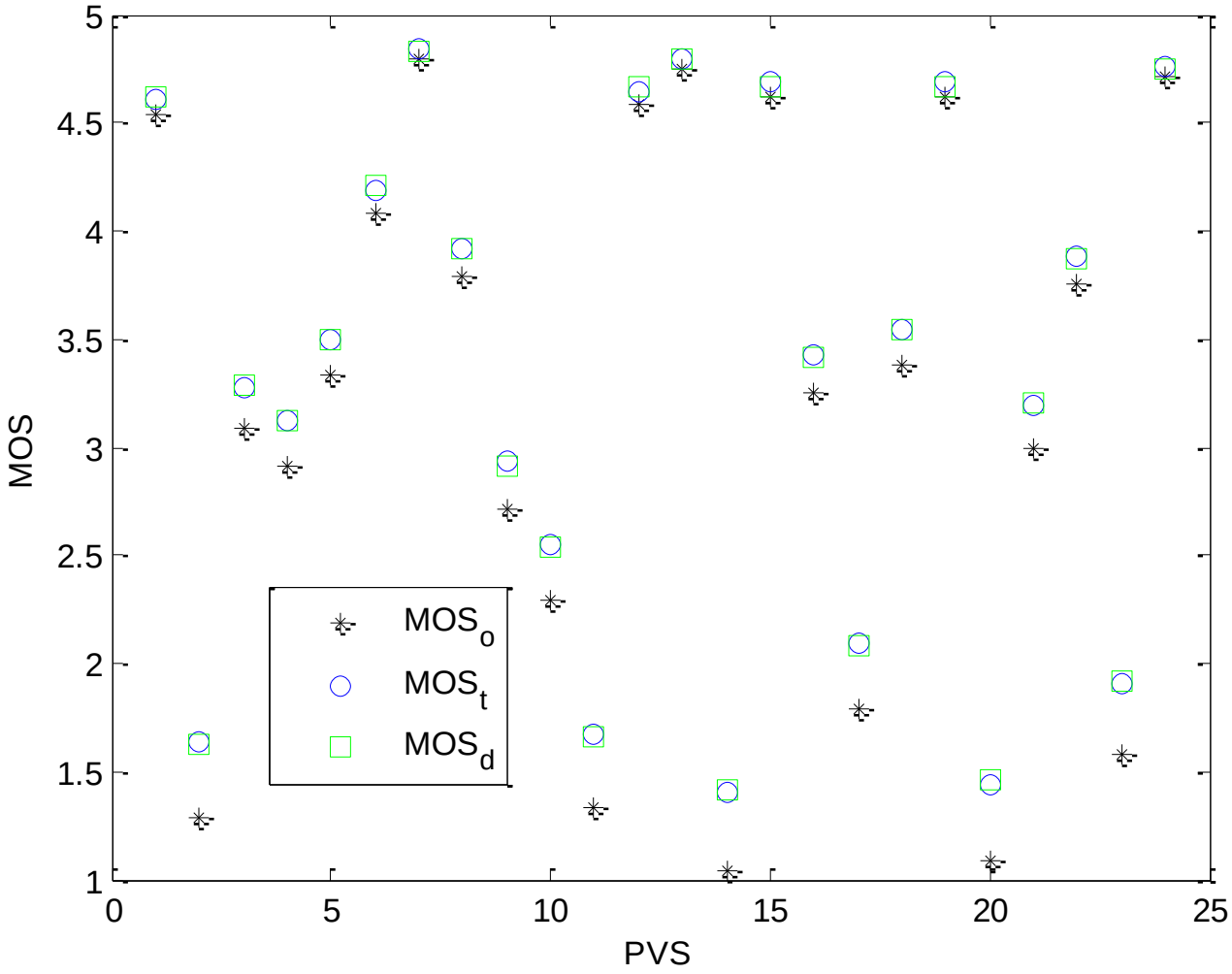
Transfering Data

- „Techniques for Evaluating Objective Video Quality Models Using Overlapping Subjective Data Sets”, Margaret H. Pinson and Stephen Wolf
- For each common set PVS_k global MOS value is computed MOS_gk
- Each ILG_i common set PVSes are mapped to MOS_g using a linear function given by a_i and b_i
- For a non common set PVS_j we can compute MOS by MOS_gj = a_i*MOS_oj + b_i

Transfer Data Modification

- Note that such transformation can be used only to change MOS value
- The consequence – we cannot repeat ANOVA and Pearson analysis
- Let us change the distribution
  - (MOS_gi-MOS_oi)*24 – how many subjective answers we have to change
  - answers are decreased or increased by 1 (not more)
  - random answres are changed
- The result is a new answers distribution for which MOS is very close to the MOS_gi

ILG 2 MOS Modification



After Modification

- All ILGs have statistically the same total mean value
- Only four sequences are statistically different
  - SRC = 12 and HRC = 0 (MOS = 4.71)
  - SRC = 13 and HRC = 1 (MOS = 1.25)
  - SRC = 13 and HRC = 2 (MOS = 4.62)
  - SRC = 13 and HRC = 11 (MOS = 3.65)
- The groups seen for single PVS analysis are not so clear

Aggregation of Each PVS Analysis

ILG	1	2	4	5	6
1	x	19	22	21	17
2	5	x	21	21	23
4	2	3	x	23	15
5	3	3	1	x	20
6	7	1	9	4	x

Aggregation of Each PVS Analysis (Distribution)

ILG	1	2	4	5	6
1	x	19	22	21	20
2	5	x	21	22	22
4	2	3	x	22	17
5	3	2	2	x	21
6	4	2	7	3	x

Group Modification

- All ILGs have statistically the same total mean value
- Only four sequences are statistically different
  - SRC = 12 and HRC = 0 (MOS = 4.73)
  - SRC = 13 and HRC = 2 (MOS = 4.64)
  - SRC = 13 and HRC = 11 (MOS = 3.65)
  - SRC = 14 and HRC = 9 (MOS = 4.60)
- The groups seen for single PVS analysis are not so clear

Aggregation of Each PVS Analysis (Group)

ILG	1	2	4	5	6
1	x	19	23	19	16
2	5	x	20	23	21
4	1	4	x	23	18
5	5	1	1	x	22
6	8	3	6	2	x

Aggregation of Each PVS Analysis (Distribution, Group)

ILG	1	2	4	5	6
1	x	17	22	21	19
2	7	x	19	22	22
4	2	5	x	22	15
5	3	2	2	x	20
6	5	2	9	4	x

Conclusions

- The obtained results are very close to each other
- We can divide ILGs into two groups in which most of the results are statistically the same
- Distribution analysis (Pearson chi^2 test) draws the same conclusions as the ANOVA analysis
- Group analysis gives similar results to each ILG analysis
- Using common set we are able to obtain statistically the same sets