Pedersen M, Møller S, Frøkjær-Jensen B, Thyme-Frøkjær K (2005) Musicality Training Level of Listeners to the Voice Perception test GRBAS. *International Federation of Oto-rhino-largyngological Societies (IFOS), Rome*

Musicality Training Level of Listeners to the Voice Perception test GRBAS

Authors
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Susanne Moeller,
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Lx 180Deg 210.0Hz 79.3dB

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Introduction

GRBAS perception test of voice has been considered the best perception test of voice for many years. A modification has been suggested by ASHA and differentiated for vowels, consonants etc. A division has been made between normality, slight, moderate and severe voice disorders on a visual scale from 1-100 for general, rough, strained, and breathy voices, and pitch and loudness.

The use of the history of the Northern wind and the sun has been established in phonetical circles, since the phonetical aspects vary very little for measurements also in different languages (E.Abberton 2004).

There are no standard requirements of the level of musical training of the listeners/examiners for diagnosis and treatment of dysphonic voices.
The results could differ depending on their musicality.

The aim of the study was to measure the results of GRBAS perception test compared with the musicality/musical training level of the listeners

Methods (musicality)

A test of musicality was used for many years in other connections, we call it Wöldike test because it was used for inclusion in the Copenhagen music school during my 11 years there.

A further comparison to other tests has not been made although the impression is that there are no better ones, not even in Leipzig.

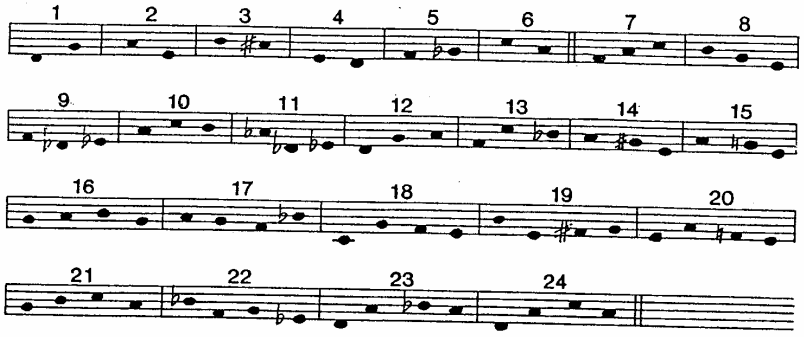
Pedersen M F (1991). Pilot Studie der Stimmfunktion von und nach Behandlung von Hirngeschädigten, in: Die Krankheit der Stimme, die Stimme der Krankheit. Ed H. Gundermann. Fischer Verlag: 162-71

Pedersen M F (1995). Stimmfunktion vor und nach Behandlung von Hirngeschädigten Mit Stroboskopie, Phonetographie und Luft Stromanalyse durchgeführt. Sprache Stimme Gehöhr 19: 84-89

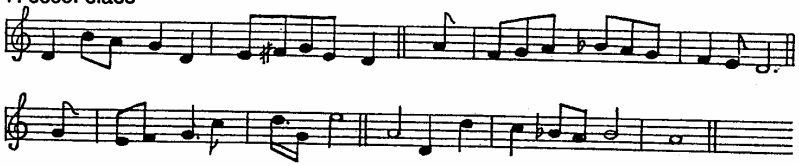
Test of musicality and rhythm

Fig. 2a

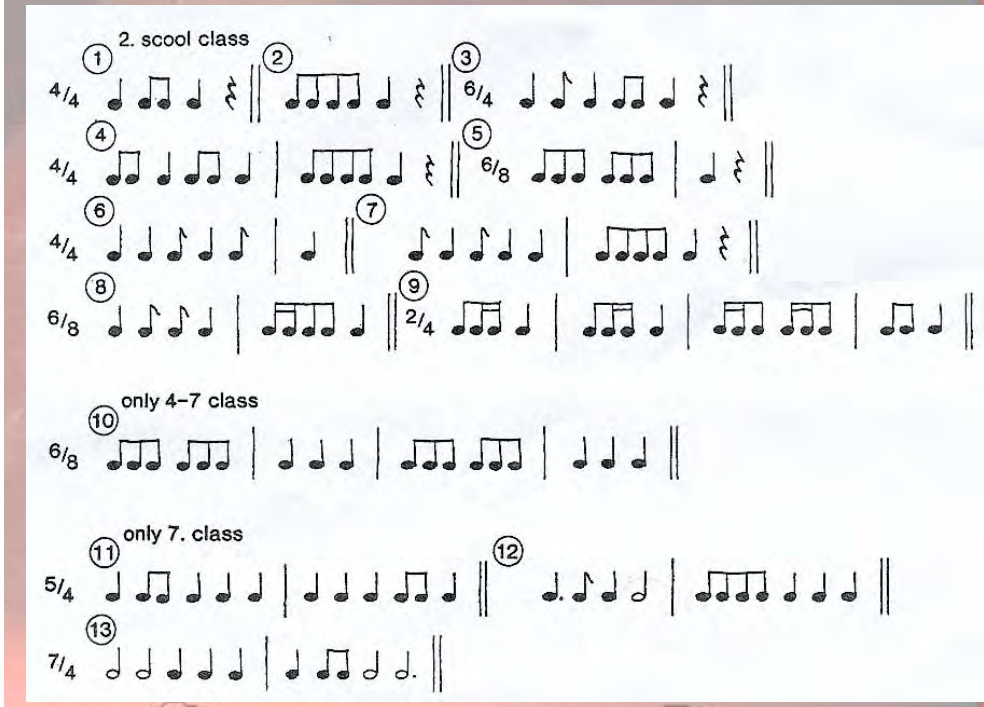
2. scool class



7. scool class



Wöldiketest (Test vor der Aufnahme in den Kopenhagener Knabenchor)



Methods (GRBAS perception test)

Three experienced listeners (an ear-nose-throat specialist, a phonetician and a academic speech therapist) evaluated more than 150 voices with disorders of the voice.

The scores were made visually from 1-100 as referred to by ASHA of overall dysphonia, roughness, breathiness, strain, deviant pitch and deviant loudness.

The evaluation was made on one day by all three listeners to a reproduction from a CD with the Key-Elemetric set-up in a clinical setting.
No talking was allowed during the test.

Lx 180Deg 210.0Hz 79.3dB

		Mark the performance of the speaker	Circle consistent / intermittent
Overall Severity		_____	C / I_____
Roughness		_____	C / I_____
Breathiness		_____	C / I_____
Strain		_____	C / I_____
Pitch	soft/loud	_____	C / I_____
Loudness	low/high	_____	C / I_____

Results

Musical testing of tone jumps:

First test person:	2 mistakes in the musical test of 24 tone jumps	(2/24)
Second test person:	0 mistakes in the musical test of 24 tone jumps	(0/24)
Third test person:	8 mistakes in the musical test of 24 tone jumps	(8/24)

Musical testing of rhythm:

First test person:	6 mistakes in the rhythm test of 13 variations	(6/13)
Second test person:	2 mistakes in the rhythm test of 13 variations	(2/13)
Third test person:	5 mistakes in the rhythm test of 13 variation	(5/13)

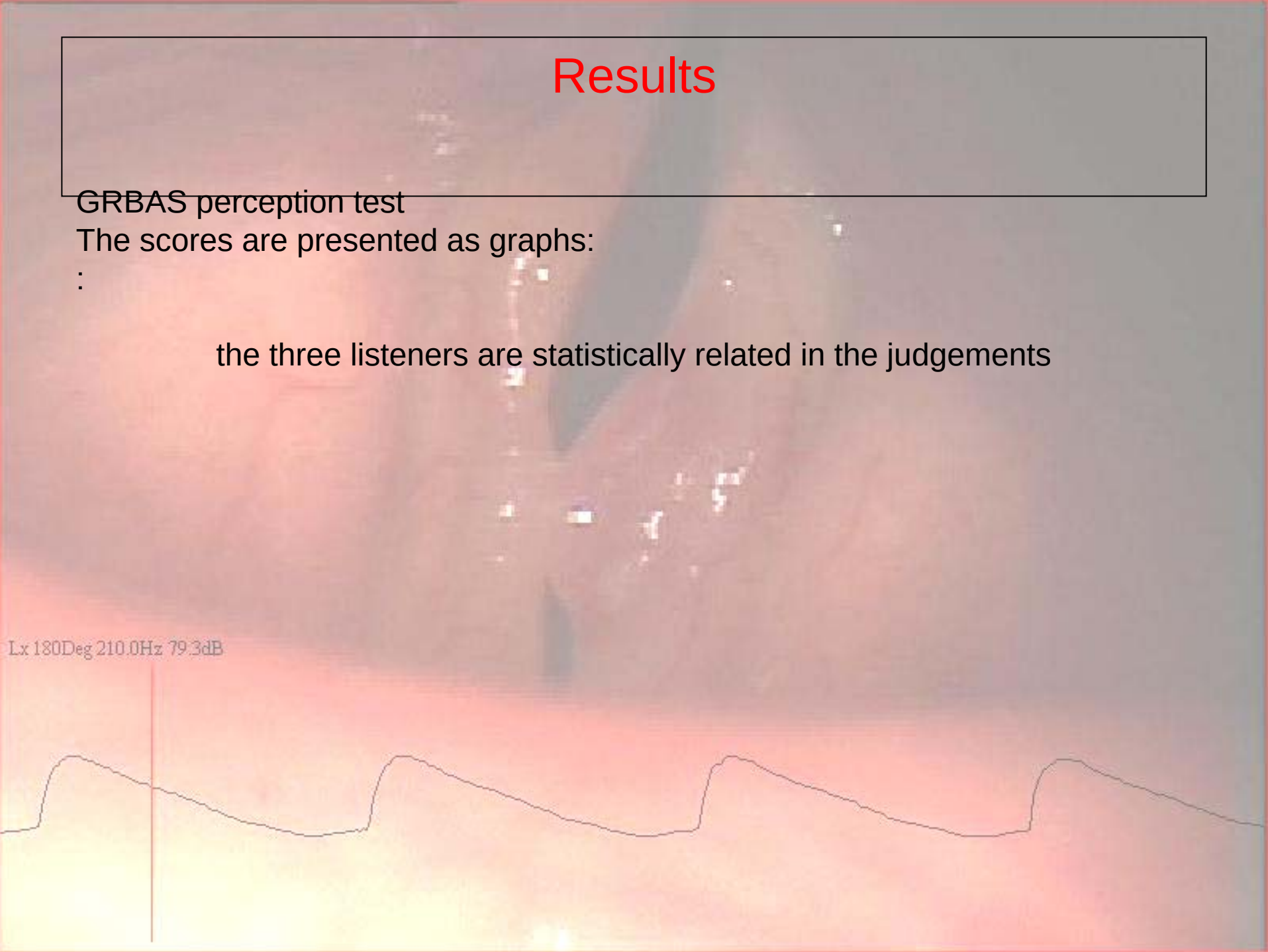
Results

GRBAS perception test

The scores are presented as graphs:

:

the three listeners are statistically related in the judgements



```
inv    o
   Midpoint
          |
 1    4   |********
     12   |*****************
     20   |**************
     28   |*********
     36   |********
     44   |********
     52   |***
     60   |****
     68   |***
     76   |**
     84   |**
     92   |
    100   |**
          |
 2    4   |******
     12   |**********
     20   |***********
     28   |**********
     36   |******
     44   |******
     52   |*****
     60   |*********
     68   |****
     76   |******
     84   |****
     92   |**
    100   |**
          |
 3    4   |***********************
     12   |*********
     20   |********
     28   |*****
     36   |****
     44   |****
     52   |*****
     60   |******
     68   |****
     76   |****
     84   |*****
     92   |***
    100   |*
          |
          -----+----+----+----+---
               10   20   30   40

               Frequency
```

```
inv    r
   Midpoint
          |
 1    4   |**********
     12   |**************
     20   |*********
     28   |**********
     36   |*******
     44   |**********
     52   |****
     60   |******
     68   |****
     76   |***
     84   |*
     92   |*
    100   |*
          |
 2    4   |******************
     12   |******************
     20   |*****************
     28   |******
     36   |*******
     44   |******
     52   |**
     60   |**
     68   |**
     76   |*
     84   |*
     92   |
    100   |
          |
 3    4   |************************************
     12   |****
     20   |****
     28   |*
     36   |*****
     44   |***
     52   |*****
     60   |***
     68   |*****
     76   |*****
     84   |****
     92   |*****
    100   |
          |
          -----+----+----+----+----+----+----+---
               10   20   30   40   50   60   70

               Frequency
```

```
inv    b
   Midpoint
          |
 1    0   |****************************
     10   |************************
     20   |***********
     30   |****
     40   |****
     50   |***
     60   |***
     70   |*
     80   |**
     90   |*
    100   |
          |
 2    0   |***
     10   |****************
     20   |******************
     30   |*********
     40   |*********
     50   |******
     60   |*********
     70   |******
     80   |**
     90   |
    100   |*
          |
 3    0   |************************
     10   |********
     20   |***********
     30   |***
     40   |*****
     50   |******
     60   |******
     70   |*****
     80   |*******
     90   |****
    100   |*
          |
          -----+----+----+----+----+---
               10   20   30   40   50

               Frequency
```

```
inv    s
   Midpoint
          |
 1    4   |*********
     12   |*************
     20   |**************
     28   |********
     36   |*******
     44   |****
     52   |**
     60   |**********
     68   |****
     76   |***
     84   |*
     92   |**
    100   |**
          |
 2    4   |*******
     12   |***********
     20   |*********
     28   |************
     36   |**************
     44   |*********
     52   |*****
     60   |****
     68   |******
     76   |***
     84   |**
     92   |
    100   |
          |
 3    4   |********************
     12   |*******
     20   |*******
     28   |*****
     36   |*****
     44   |*******
     52   |****
     60   |****
     68   |*******
     76   |****
     84   |******
     92   |*****
    100   |*
          |
          -----+----+----+----+
               10   20   30   40

               Frequency
```

Lx 180Deg 2180Hz 79.3dB

```
inv    p
   Midpoint
          |
 1    4   |**********************************
     12   |***************
     20   |***********
     28   |******
     36   |*
     44   |****
     52   |**
     60   |**
     68   |*
     76   |
     84   |*
     92   |**
    100   |*
          |
 2    4   |****************************
     12   |***************
     20   |*********
     28   |******
     36   |****
     44   |***
     52   |****
     60   |***
     68   |**
     76   |**
     84   |*
     92   |*
    100   |
          |
 3    4   |****************************
     12   |*****
     20   |*****
     28   |*******
     36   |*******
     44   |****
     52   |*****
     60   |*****
     68   |***
     76   |****
     84   |******
     92   |*
    100   |*
          |
           -----+----+----+----+----+----+----+
              10   20   30   40   50   60   70

                 Frequency
```

```
inv    l
   Midpoint
          |
 1   20   |************************
     60   |*******
    100   |
    140   |
    180   |
    220   |
    260   |
    300   |
    340   |
    380   |
    420   |
          |
 2   20   |*************************
     60   |*****
    100   |*
    140   |
    180   |
    220   |
    260   |
    300   |
    340   |
    380   |
    420   |
          |
 3   20   |********************
     60   |*********
    100   |**
    140   |
    180   |
    220   |
    260   |
    300   |
    340   |
    380   |
    420   |
          |
           ----+---+---+---+---+---+-
             20  40  60  80 100 120

                 Frequency
```

Results of the GRBAS test

The scores are also presented as plots:

Comparing the first test person with the second.
Comparing the first test person with the third.
Comparing the second test person with the third
:

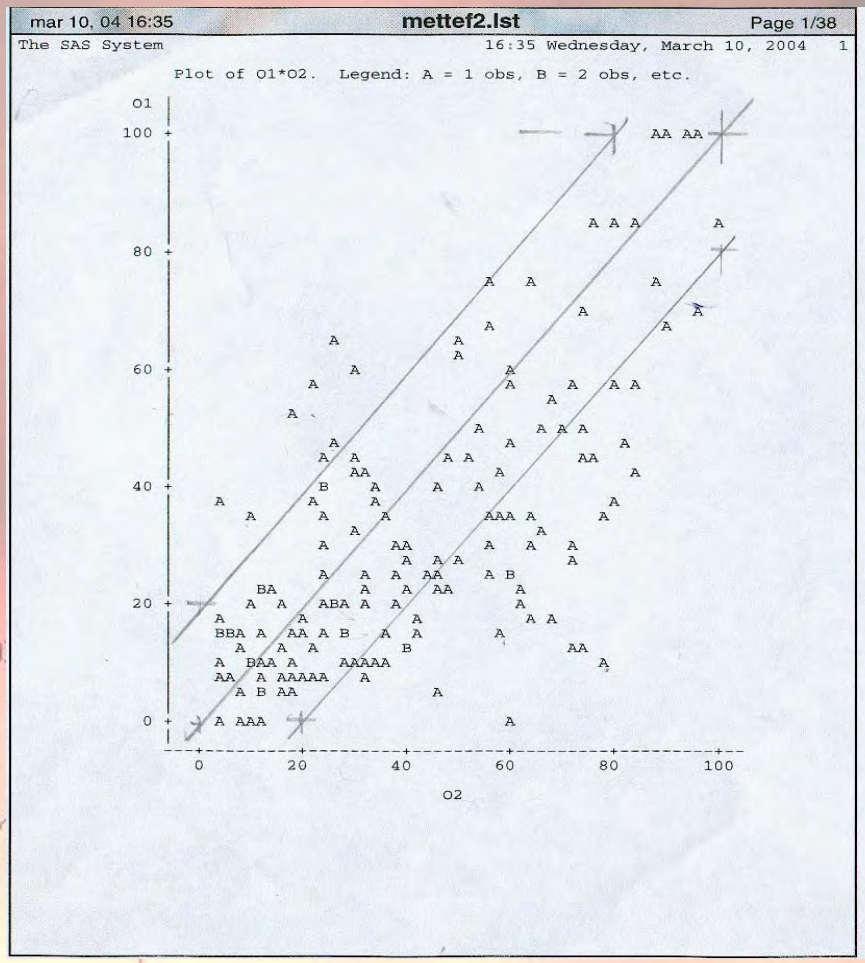
Overall severity
Roughness
Breathiness
Pitch

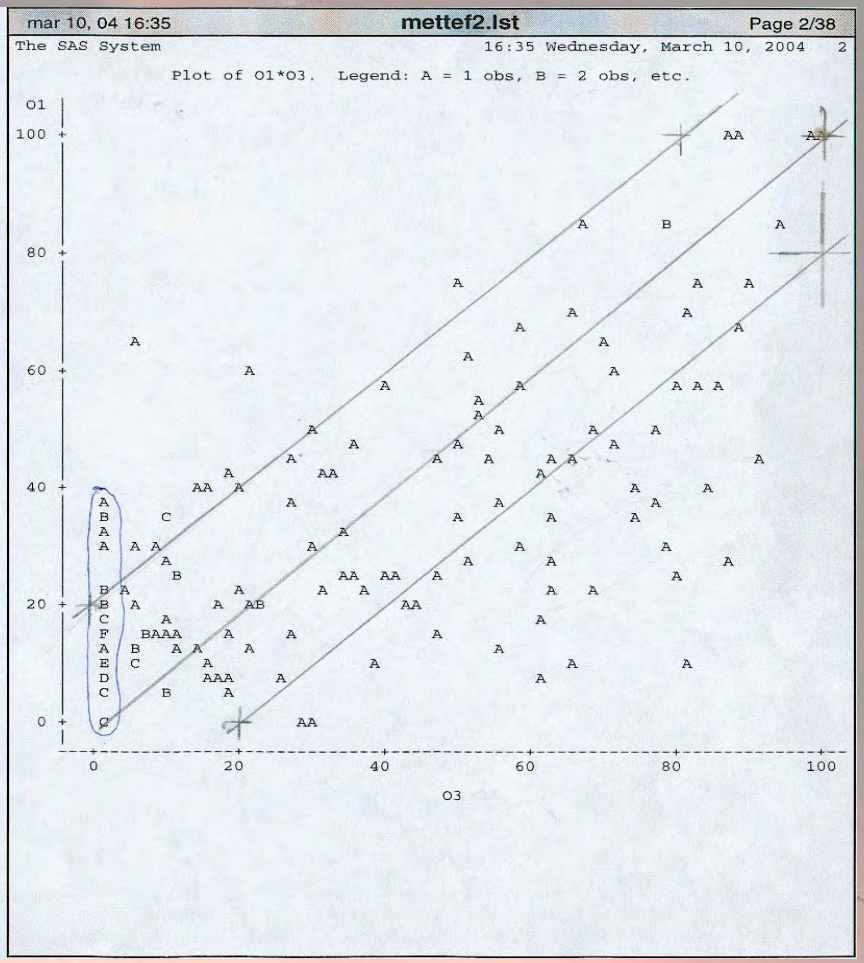
Strain
Loudness

Friedmann two-way analysis of variance of rank (Cochran- Mantel-Haenszel score test) p-value for CHI-square test of variation of investigators

variabel	Test with all 3 (p-value)	Test 1 vs 2 (p-value)	Test 1 vs 3 (p-value)	Test 2 vs 3 (p-value)	
Overall severity	<0.001	<0.001	0.68 ns	<0.001	
Roughness	<0.001	<0.001	0.001	0.37 ns	
Breathiness	<0.001	<0.001	<0.001	0.008	
Strain	0.90 ns	0.57 ns	0.52 ns	1.00 ns	
Pitch	<0.001	0.0002	<0.001	0.57 ns	
Loudness	0.21 ns	0.06 ns	0.16 ns	0.41 ns	

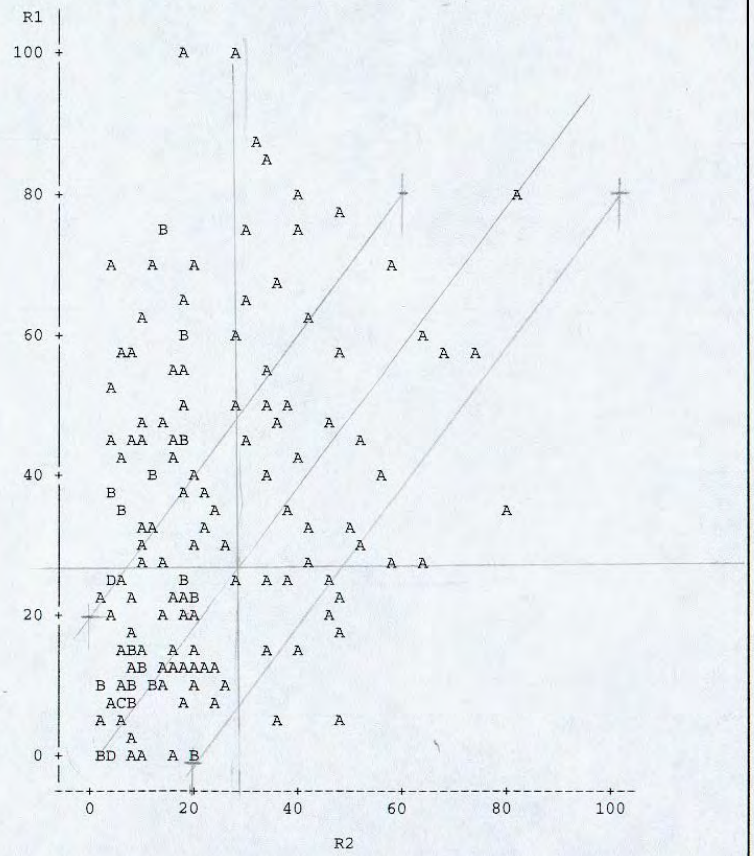
Plots


mar 10, 04 16:35
mettef2.lst
Page 1/38
The SAS System
16:35 Wednesday, March 10, 2004 1
Plot of O1*O2. Legend: A = 1 obs, B = 2 obs, etc.
O1
O2


mar 10, 04 16:35
mettef2.lst
Page 2/38
The SAS System
16:35 Wednesday, March 10, 2004 2
Plot of O1*O3. Legend: A = 1 obs, B = 2 obs, etc.
O1
O3

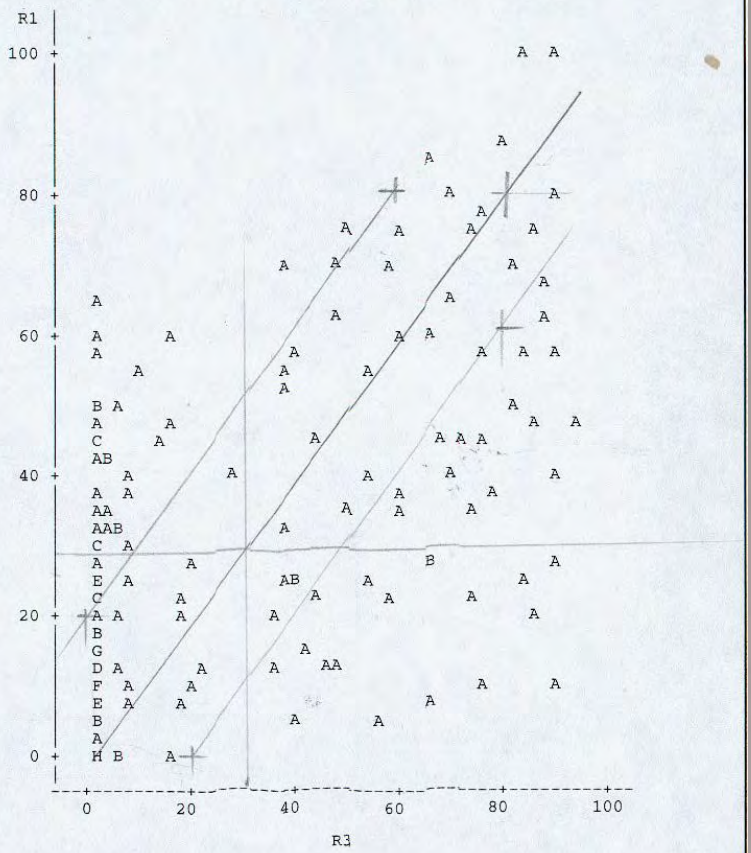
The SAS System 16:35 Wednesday, March 10, 2004 3

Plot of R1*R2. Legend: A = 1 obs, B = 2 obs, etc.



The SAS System 16:35 Wednesday, March 10, 2004 4

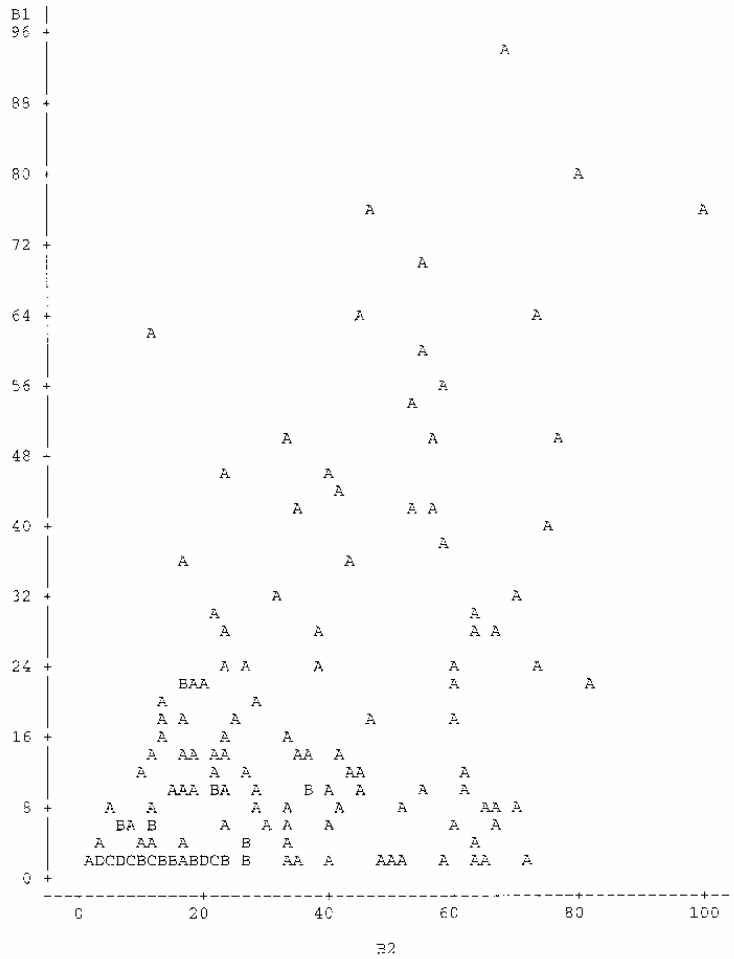
Plot of R1*R3. Legend: A = 1 obs, B = 2 obs, etc.



Lx 180

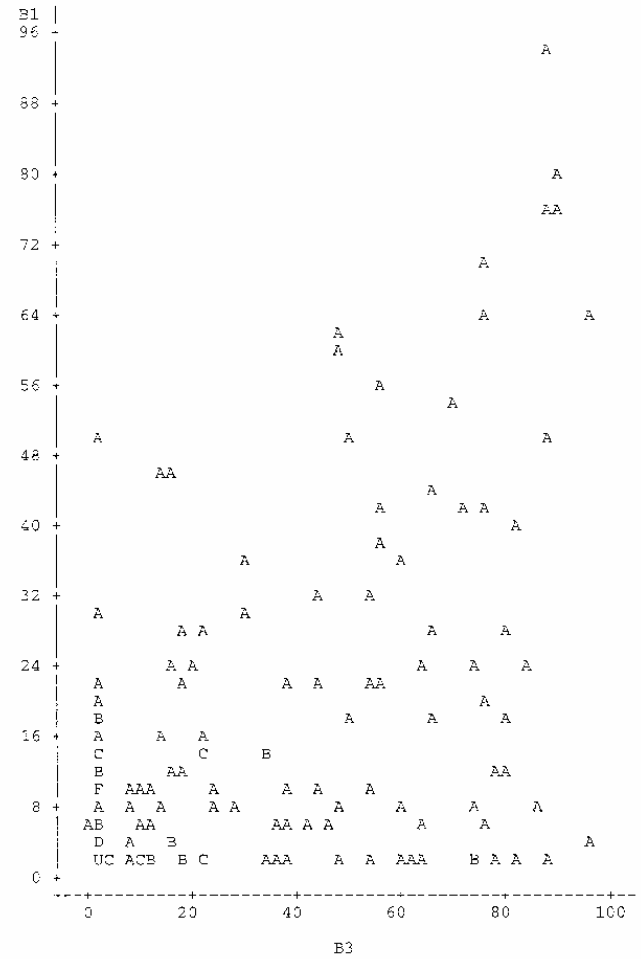
The SAS System 16:35 Wednesday, March 10, 2004 5

Plot of B1*B2. Legend: A = 1 obs, B = 2 obs, etc.



The SAS System 16:35 Wednesday, March 10, 2004 6

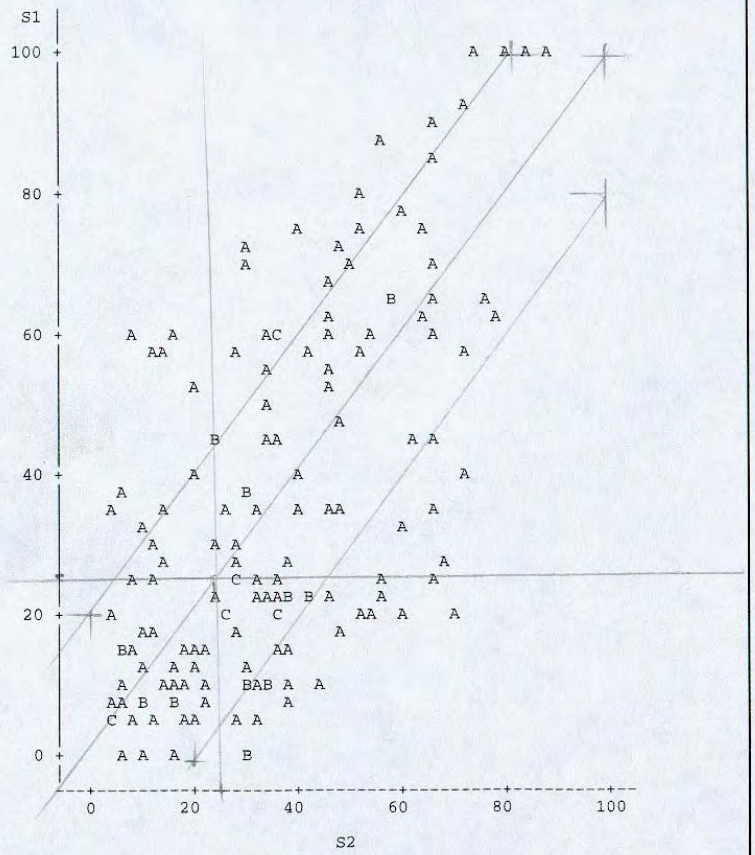
Plot of B1*B3. Legend: A = 1 obs, B = 2 obs, etc.



Lx 180

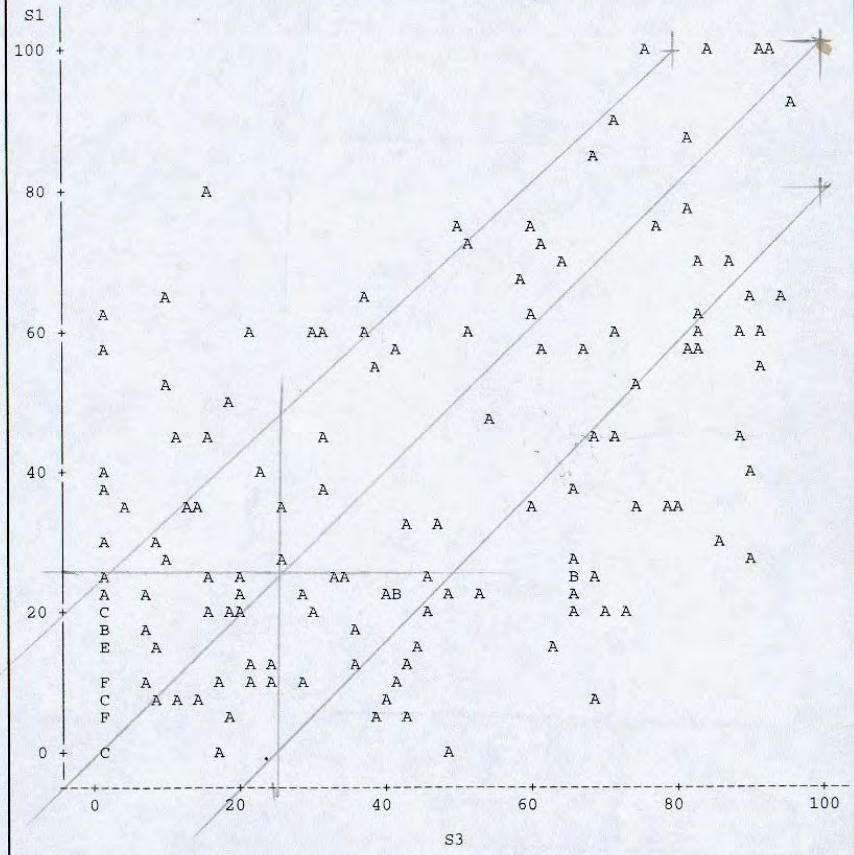
The SAS System 16:35 Wednesday, March 10, 2004 7

Plot of S1*S2. Legend: A = 1 obs, B = 2 obs, etc.



The SAS System 16:35 Wednesday, March 10, 2004 8

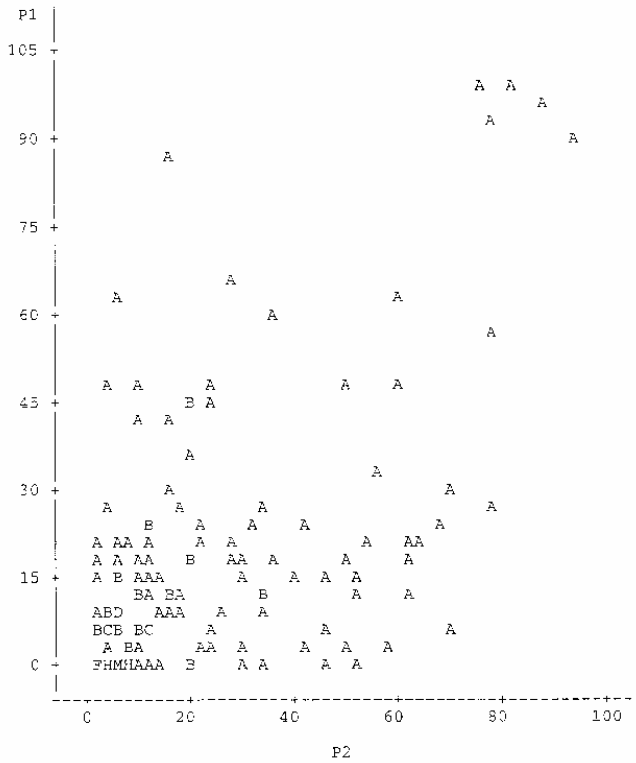
Plot of S1*S3. Legend: A = 1 obs, B = 2 obs, etc.



Lx 180

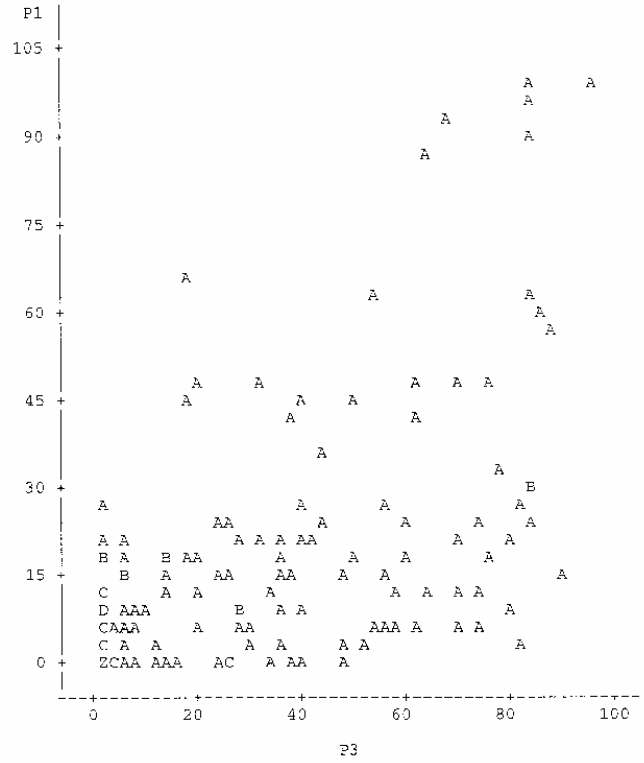
The SAS System 16:35 Wednesday, March 10, 2004 9

Plot of P1*P2. Legend: A = 1 obs, B = 2 obs, etc.



The SAS System 16:35 Wednesday, March 10, 2004 10

Plot of P1*P3. Legend: A = 1 obs, B = 2 obs, etc.

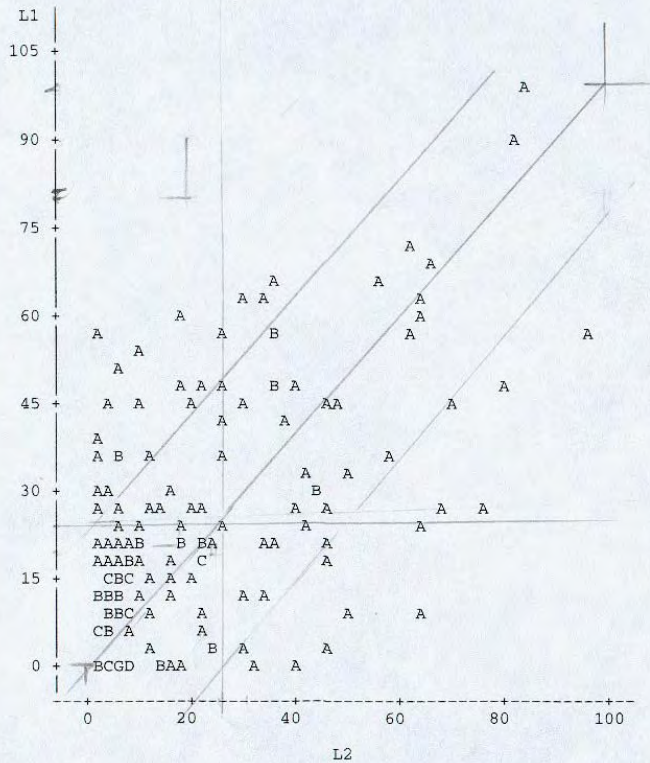


NOTE: 2 obs hidden.

Lx 180

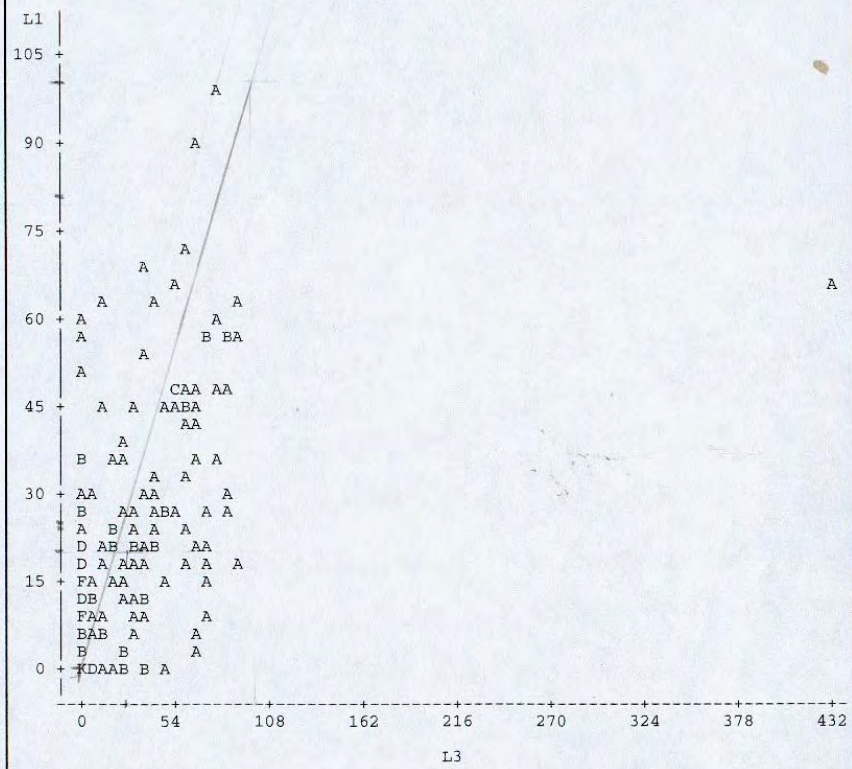
The SAS System 16:35 Wednesday, March 10, 2004 11

Plot of L1*L2. Legend: A = 1 obs, B = 2 obs, etc.



The SAS System 16:35 Wednesday, March 10, 2004 12

Plot of L1*L3. Legend: A = 1 obs, B = 2 obs, etc.



Based on this visual evaluation, the three parameters could be musicality dependent:

The Pearson Correlation Coefficients to document differences of scores for 1-3 were:

For Overall Severity:	For Roughness:	For Breathiness:	For Strain:
1-2: .67.	1-2: .36	1-2: .50	1-2: .62
1-3: .69	1-3: .53	1-3: .50	1-3: .60
2-3: .68	2-3: .49	2-3: .64	2-3: .57

For Pitch:	For Loudness:
1-2: .56	1-2: .57
1-3: .58	1-3: .47
2-3: .53	2-3: .43

Score differences

Concordance (correspondence) is a little bit higher with this survey (52-74%)

Score difference For overall severity Number and percentage	Inv1-inv2	Inv1-inv3	Inv2-inv3
difference < -20	45 29%	33 21%	14 9%
difference in intervals (–20 , +20)	**103 66%**	**103 66%**	**105 67%**
difference >20	8 5%	20 13%	37 24%
Number of difference	53	53	51
Mc Nemar test for bias (p-value)	<0.01	>0.05 ns	<0.01

Inv2 has higher measurements than inv1 and inv3

Score differens For Roughness Number and percentage	Inv1-inv2	Inv1-inv3	Inv2-inv3
difference < -20	11 7%	33 21%	52 33%
difference in intervals (–20 , +20)	**92 59%**	**81 52%**	**90 58%**
difference >20	53 34%	42 27%	14 9%
Number of difference	64	75	66
Mc Nemar test for bias (p-value)	<0.01	>0.05 ns	<0.01

Inv2 has lower measurements than inv1 and inv3

Score differens For Breathiness Number and percentage	Inv1-inv2	Inv1-inv3	Inv2-inv3
difference < -20	57 37%	50 32%	27 17%
difference i intervals (–20 , +20)	**95 61%**	**101 65%**	**101 65%**
difference >20	4 3%	5 3%	28 18%
Number of difference	61	55	55
Mc Nemar test for bias (p-value)	<0.01	<0.01	>0.05 ns

Inv1 has lower measurements than inv2 and inv3

Score differens For strain Number and percentage	Inv1-inv2	Inv1-inv3	Inv2-inv3
difference < -20	27 17%	42 27%	36 23%
difference i intervals (–20 , +20)	**101 65%**	**90 58%**	**96 62%**
difference >20	28 18%	24 15%	24 15%
Number of difference	55	66	60
Mc Nemar test for bias (p-value)	>0.05 ns	=0.05 ns	>0.05 ns

No bias between investigators

Score difference For pitch Number and percentage	Inv1-inv2	Inv1-inv3	Inv2-inv3
difference < -20	27 17%	52 33%	42 27%
difference in intervals (–20 , +20)	**115 74%**	**99 63%**	**101 65%**
difference >20	14 9%	6 4%	13 8%
Number of difference	41	57	55
Mc Nemar test for bias (p-value)	>0.05 ns	<0.01	<0.01

Inv3 has higher measurements than inv1 and inv2

Score difference For loudness Number and percentage	Inv1-inv2	Inv1-inv3	Inv2-inv3
difference < -20	17 11%	40 26%	41 26%
difference in intervals (–20 , +20)	**115 74%**	**101 65%**	**103 66%**
difference >20	24 15%	15 10%	12 8%
Number of difference	41	55	53
Mc Nemar test for bias (p-value)	>0.05 ns	<0.01	<0.01

Inv3 has higher measurements than inv1 and inv2

Discussion and Conclusion:

Scores in the GRBAS test have here been used for

Testing of musicality,
Testing of dysphonia and
Evaluation of statistical graphs and plots.

The finding is:

That musicality of the person carrying out the GRBAS test could be taken into account

The problem with scores is that you cannot know whether the distances between the scores are the same, so averaging with p values is not a token of statistical truth.

Still a comparison between scores before and after treatment of one patient by the same listener gives information of treatment effect-

In the future more valid sound measurements will hopefully be used instead of scores.