SUBJECTIVE SENSATION OF DIFFERENCES IN NASAL RESISTANCE

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THE PERMANENT ERROR

- Numerous publications are dealing with the correlation between nasal obstruction and its subjective sensation, but all of them try to find a linear regression between respective parameters on score systems or VAS (Visual analogue scales)
- A relation between Quality of Life (QOL) and nasal obstruction is doubtless
- BUT: The strength of a sensory impression is proportional to the logarithm of strength of the stimulus (Gustav Theodor Fechner 1801-1887)

THE ORIGIN: WEBER-FECHNER´S LAW

Ernst Heinrich Weber 1834:
The just noticable difference of weights of a hand-held item is about 5%:

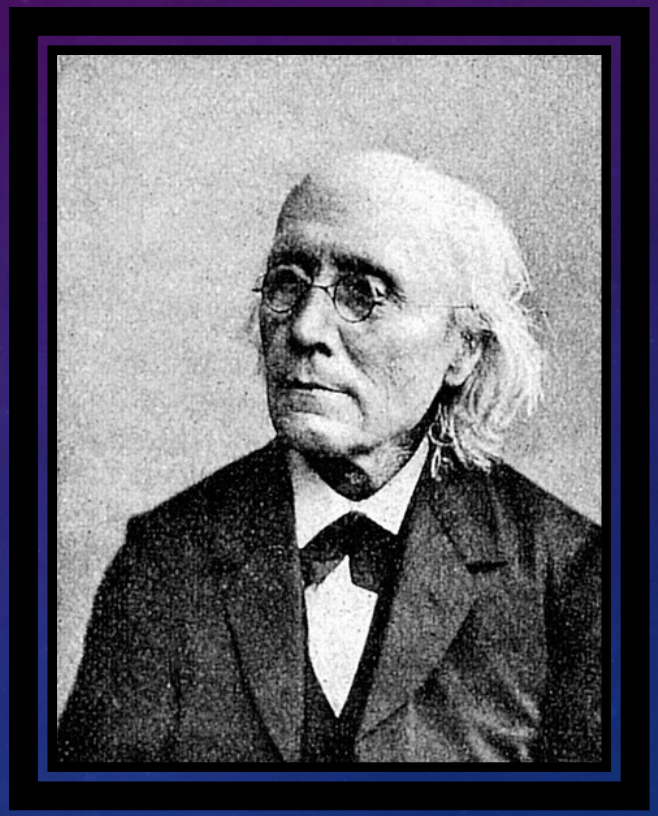
$$k = \frac{\Delta R}{R}$$

Gustav Theodor Fechner 1860:

$$\Delta E = c * \frac{\Delta R}{R}$$

WEBER-FECHNERS LAW:

$$E = c * log \frac{R}{R_0}$$



The relationship between stimulus and perception is logarithmic.

SENSATION OF IMPAIRED BREATHING
=
SENSATION OF ELEVATED POWER TO BREATH

Numberless papers are reporting a missing correlation between objective measurement results and sensing of nasal obstruction
– not any considers Weber-Fechners law

(see André, Vuyk, Nolst-Trenité et al. 2009)

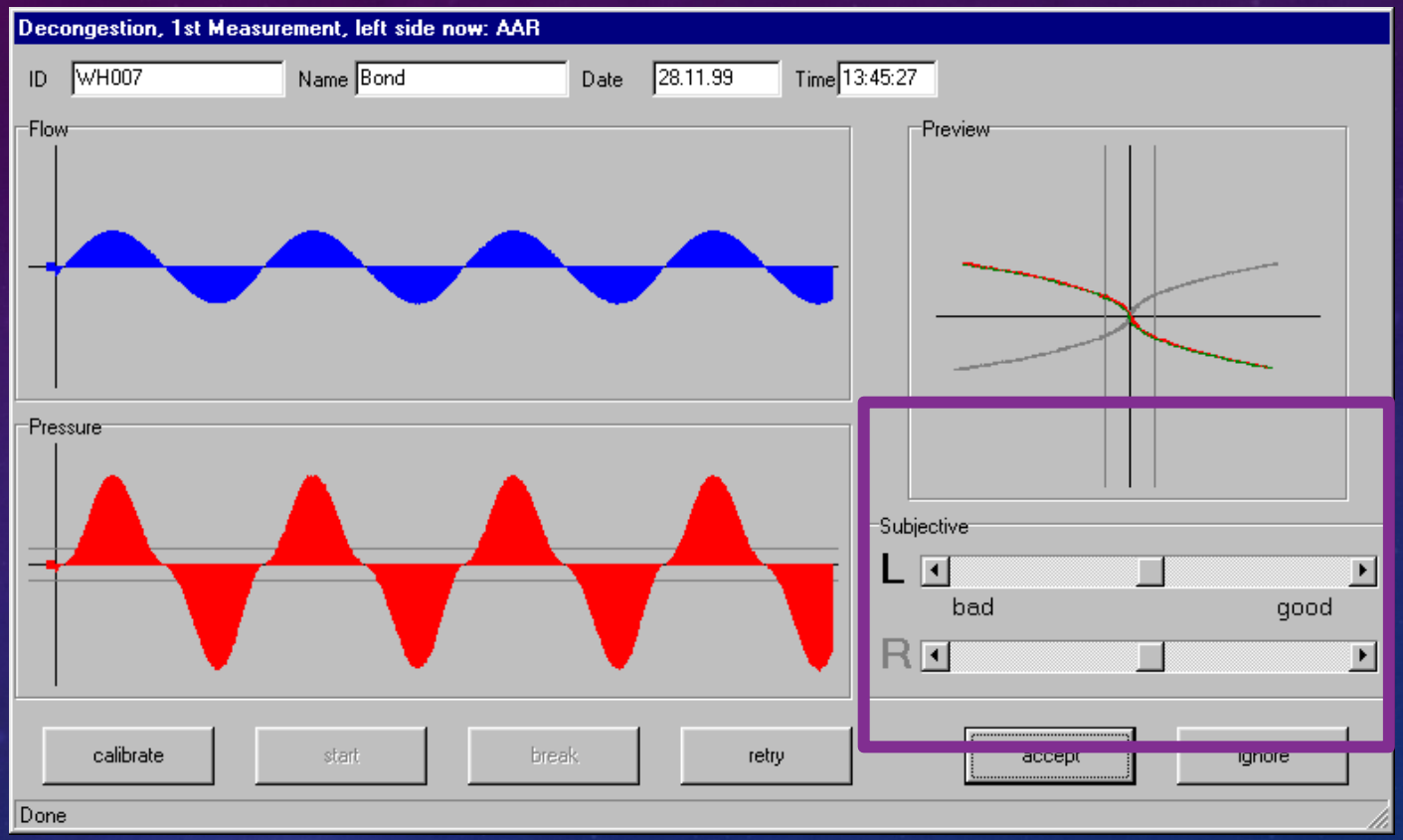
STUDIES

Implementing a

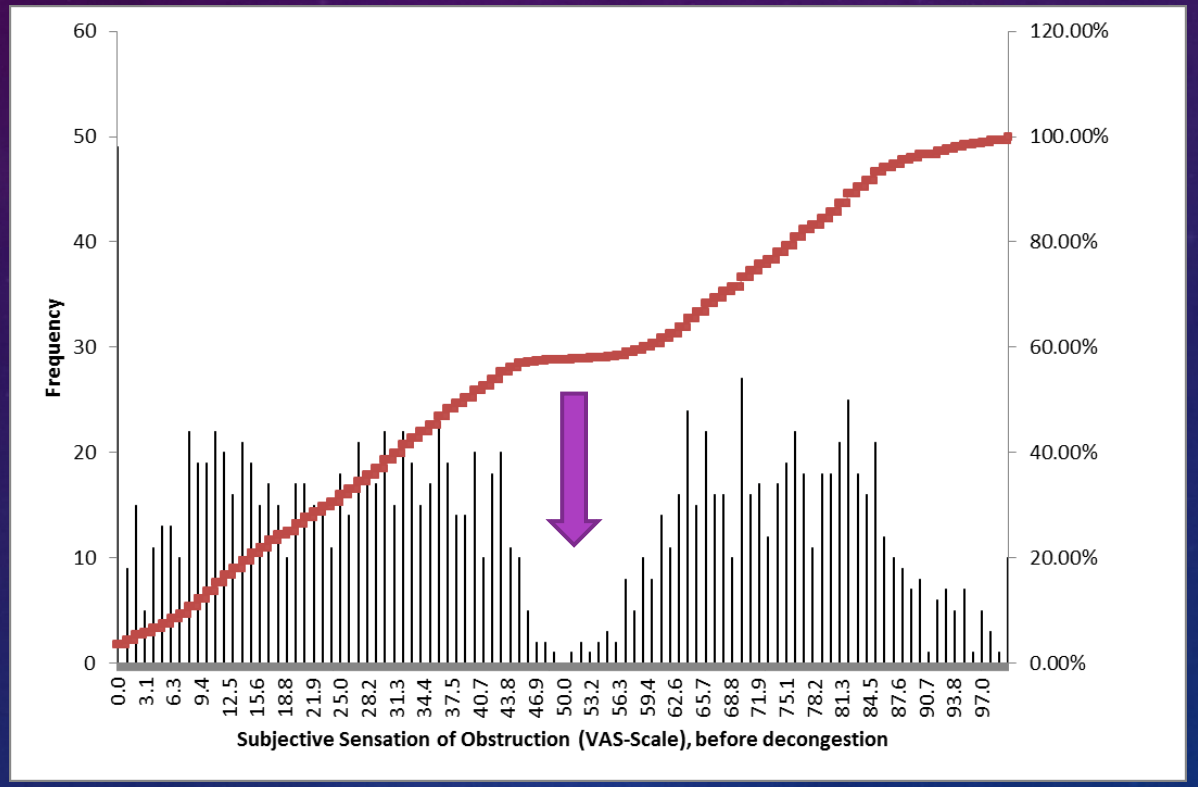
Visual-Analogue-Scale (VAS)

into the rhinomanometry program

(4RHINO, Rhinolab)

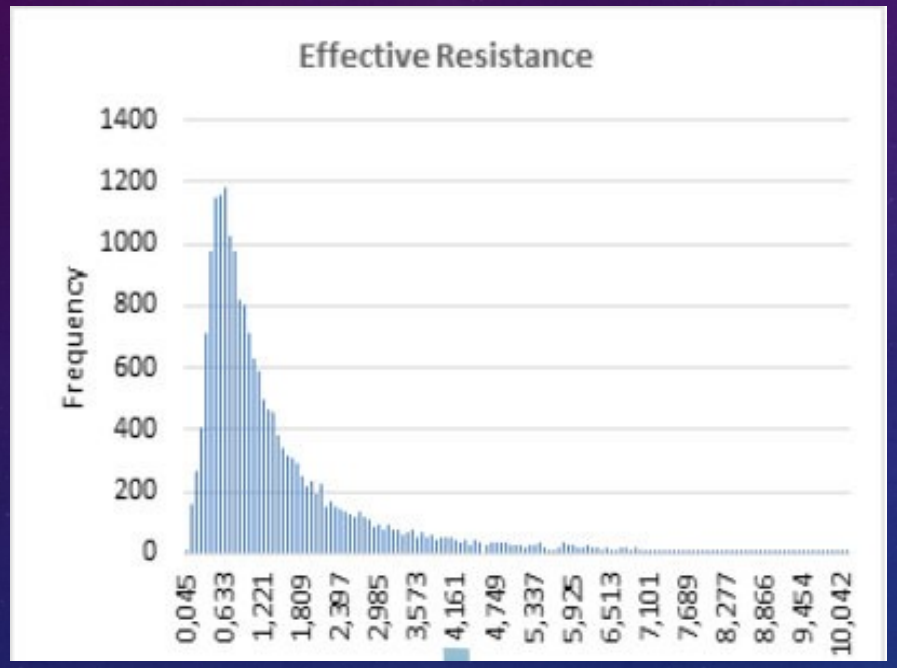


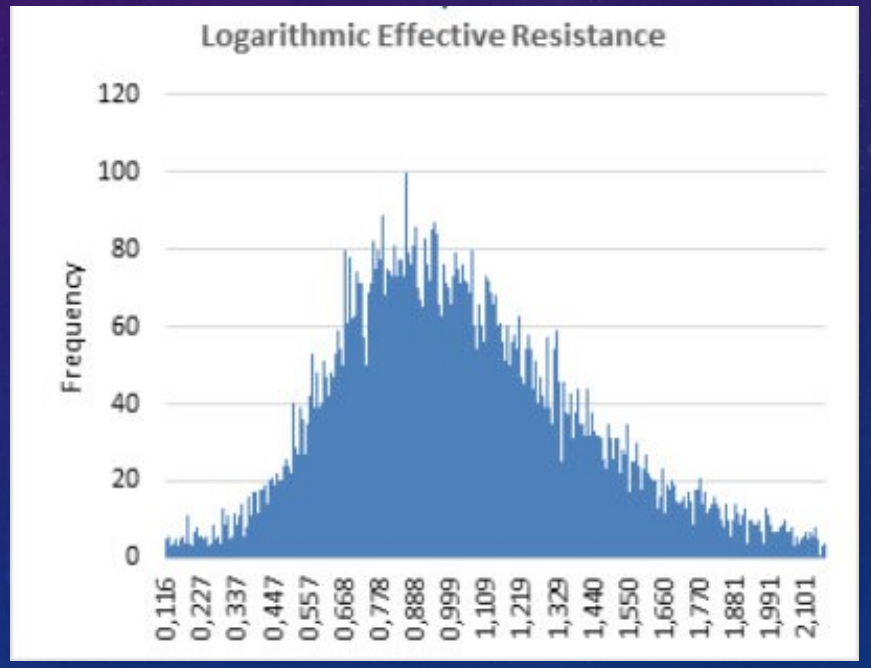
DISTRIBUTION OF VAS-VALUES



Steady distribution with gap around the startpoint

LOGARITHMIC TRANSFORMATION OF EFFECTIVE RESISTANCE





CORRELATION VAS/4PR-VALUES

	before decongestion	*after decongestion*
Flow 150 Phase 1	0.495	0.469
Flow 150 Phase 2	0.500	0.443
Flow 150 Phase 3	-0.495	-0.505
Flow 150 Phase 4	-0.508	-0.509
VR, inspiration	-0.391	-0.332
VR, Expiration	-0.318	-0.450
Log VR, inspiration	-0.543	-0.529
Log VR, expiration	-0.529	-0.513
Effective resistance, inspiration	-0.377	-0.315
Effective resistance,expiration	-0.367	-0.344
Effective resistance	-0.387	-0.323
Log Effective Resistance, inspiration	-0.549	-0.535
Log Effective Resistance, exspiration	-0.530	-0.521
Log Effective Resistance	-0.553	-0.546

Previous studies:

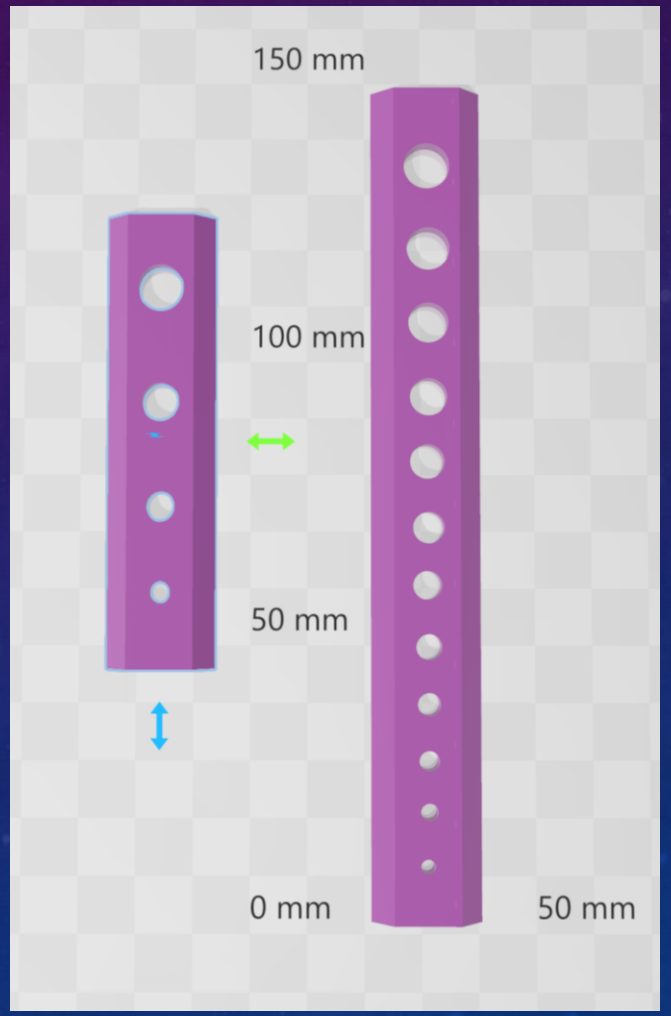
R = 0.59, N = 810 (Vogt et al. 2000)

R=0.65, N = 72 (Vogt & Shiraz 2005)

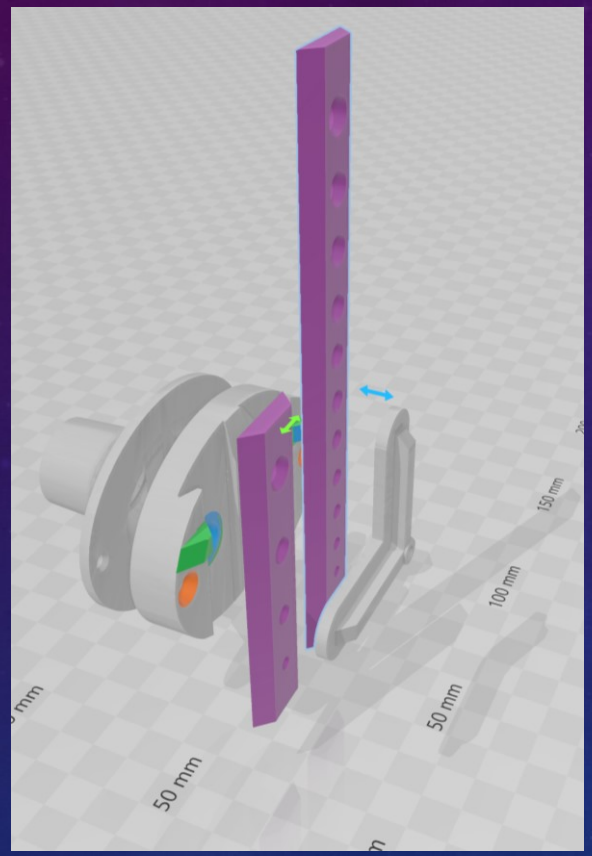
R = 0.62, N =1580 (Vogt, Shah, Moesges 2010)

RESISTANCES AND DIAMETERS

- Resistances of streaming channels are depending on length, width and surface properties. In equal length and identic surface properties resistances are depending only on width.
- The range of diameters of holes with equal longitudinal extend of 3.5 mm and smooth surface corresponding with the cross sectional are and measured resistances in the human nose was determined between 3.5 and 8mm.
- Holestrips have been 3D-printed.

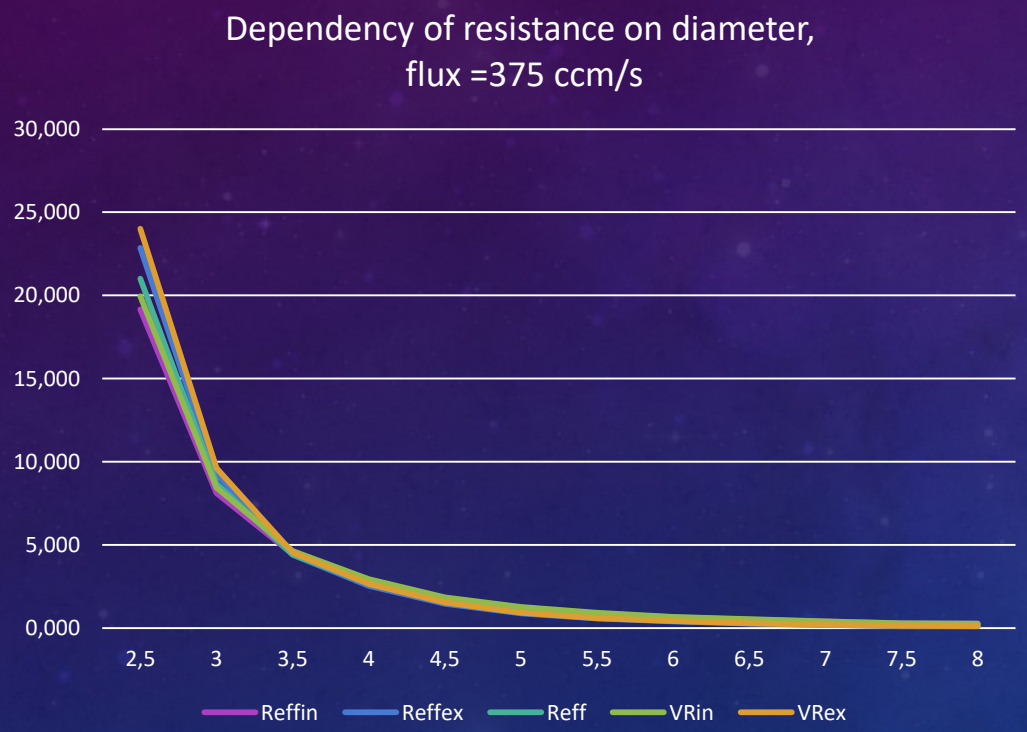


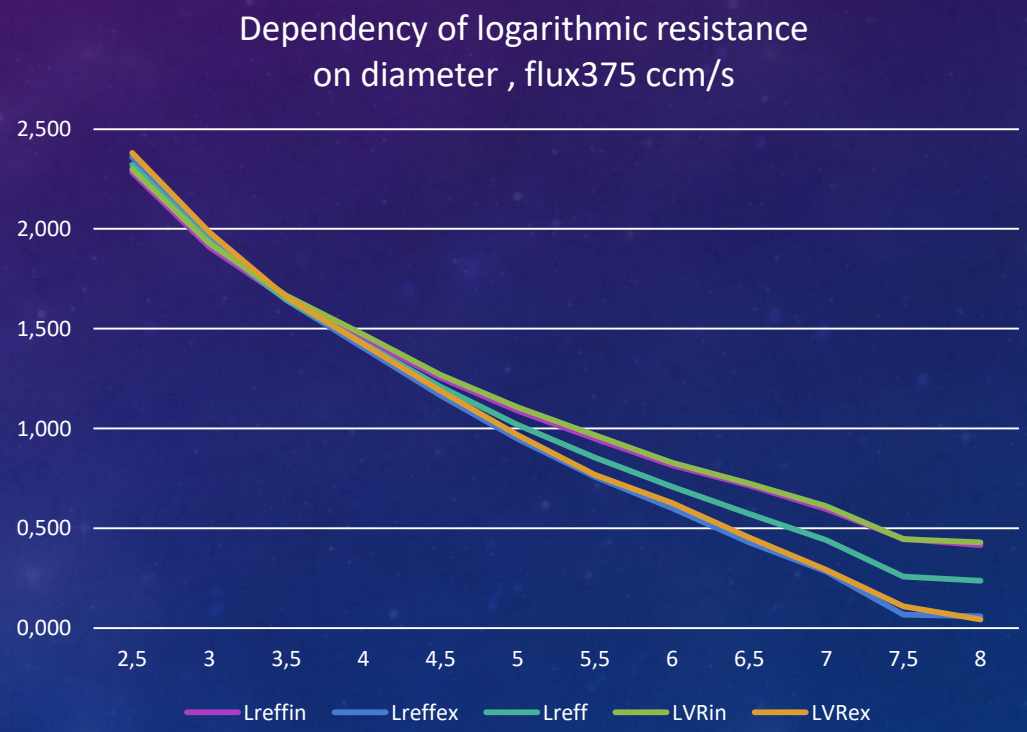
THE RESISTANCE SIMULATOR „TSCHUFKIN“



3D - Printing - file

RESISTANCE AND DIAMETER





PROTOCOL

- 1. Participating „normal“ noses ; i.e. rhinomanometric classes I and II
- 2. BREATH NASALLY through one of 4 reference holes and repeat it with one of the 8 test holes
- 3. The answers for notification of a difference are „yes“, “maybe“or “no“
- 4. Mark it in the record
- 5. Repeat it with all other holes
- 6. Repeat the entire procedure by ORAL BREATHING

NASAL

Diameter	Reference strip 3,5	5	6,5	8
2,5	2	2	2	2
3	2	2	2	2
3,5	0	2	2	2
4	2	2	2	2
4,5	2	2	2	2
5	2	0	2	2
5,5	2	0	2	2
6	2	2	0	2
6,5	2	2	0	2
7	2	2	2	0
7,5	2	2	0	0
8	2	2	0	0

ORAL

Diameter	Reference strip 3,5	5	6,5	8
2,5	2	2	2	2
3	2	2	2	2
3,5	1	2	2	2
4	2	2	2	2
4,5	2	0	2	2
5	2	1	2	2
5,5	2	2	0	2
6	2	2	0	2
6,5	2	2	0	2
7	2	2	0	0
7,5	2	2	0	0
8	2	2	2	0

INVITATION

- We cordially invite you to take part in this volunteers study!
- We can provide you with the technique for free!
- Please contact us: rhinovogt@t-online.de