

Speech audiometry: from diagnosis to hearing aid

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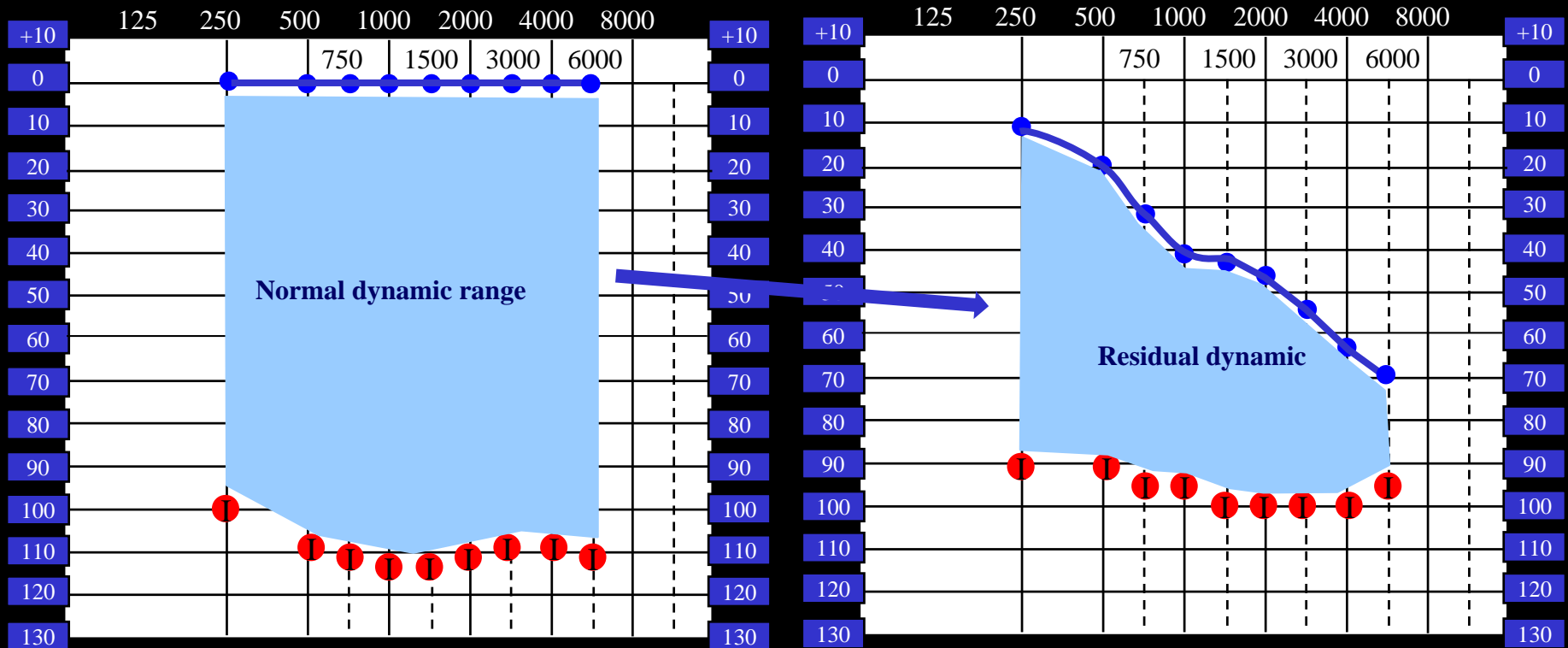
CHRU de Lille



Hearing aid

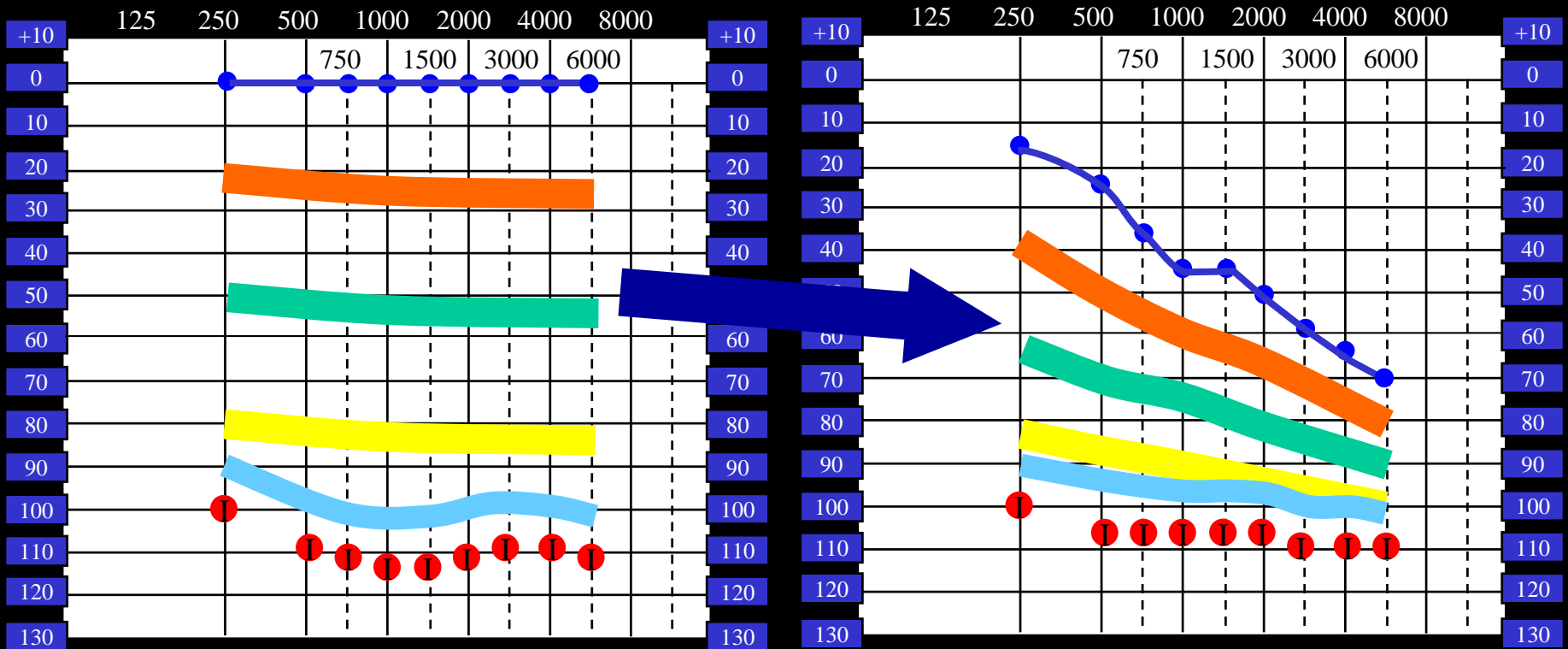
- ENT diagnosis
- Medical history
- **Hearing testing (pure tone & speech)**
- Choice of the device
- Fitting of the device
- **Efficacy control & follow-up**

Main goal of the hearing aid



- Amplification
- Compression
- Max output levels

Need to maintain the sensation levels



Speech audiometry in silence



- Residual noise in the booth & Calibration
- Variables:
 - speech material: sentences, spondees, disyllabic or monosyllabic word, logatomes,
 - presentation level: threshold, supraliminar
 - presentation mode: lipreading, open or close set...

dB SPL / dB HL

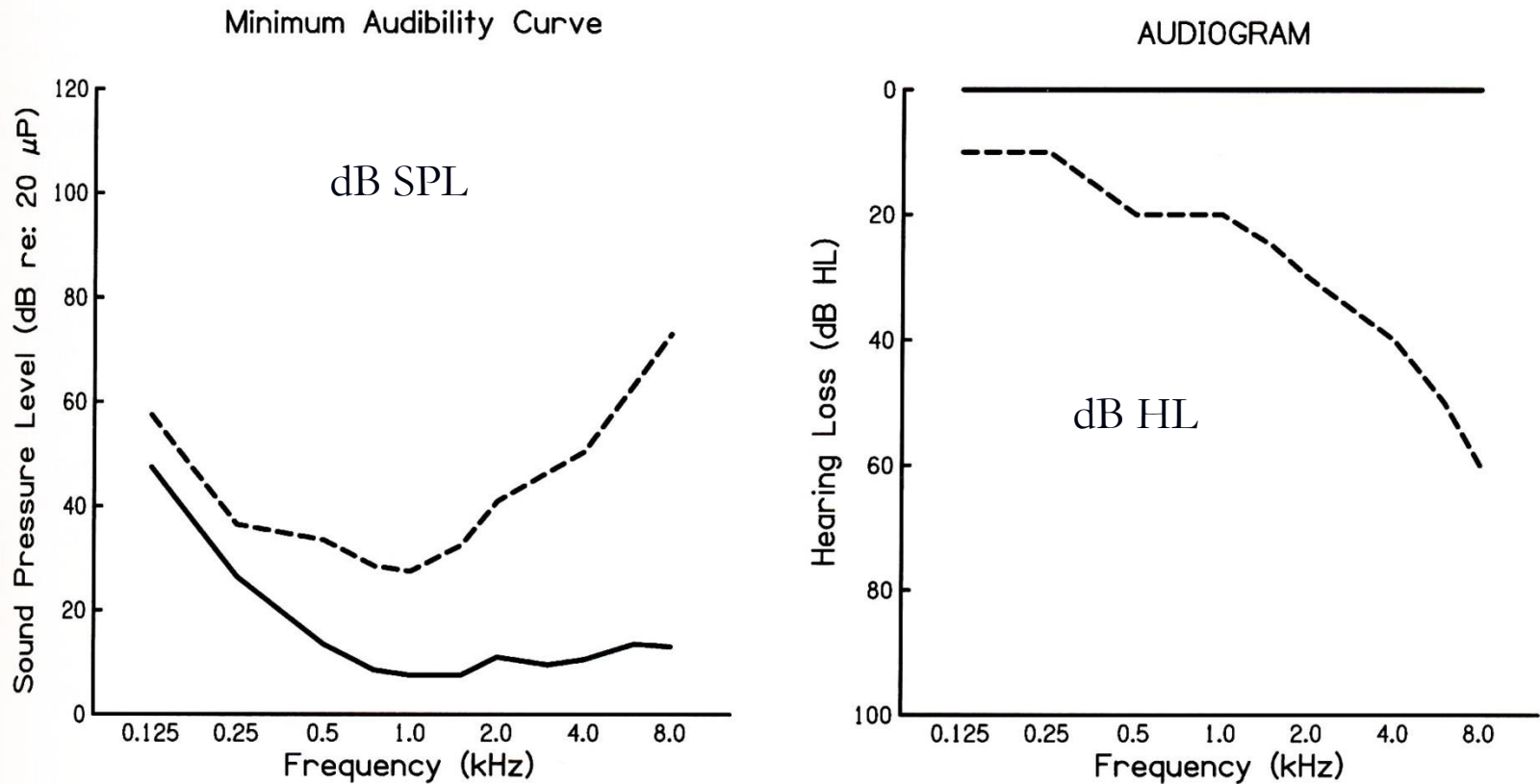
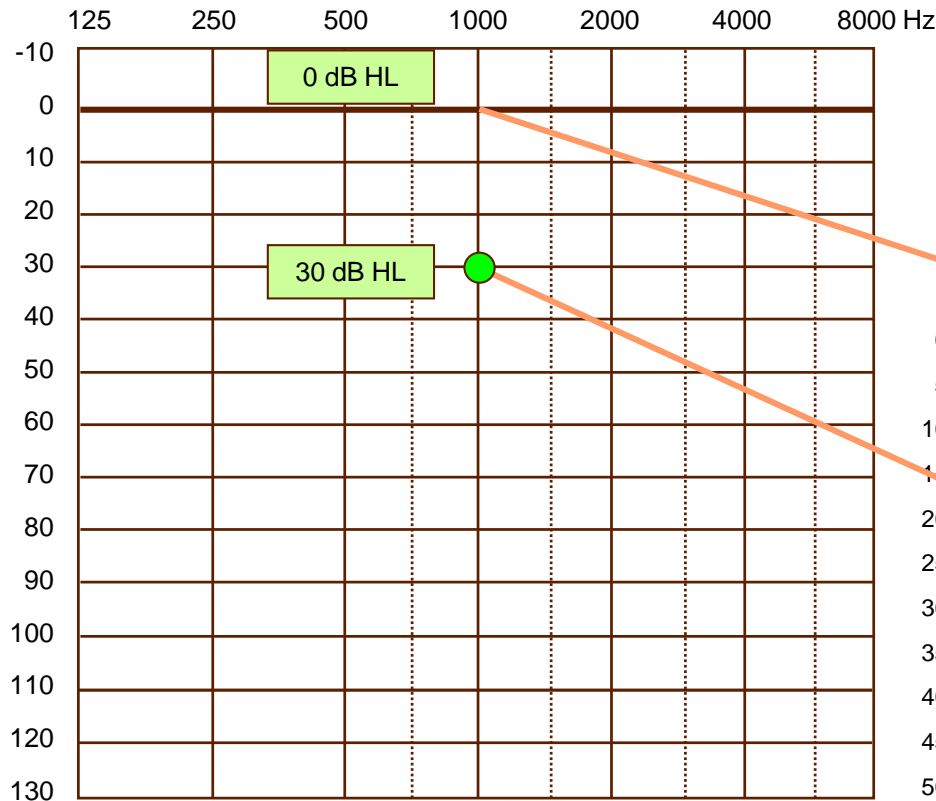
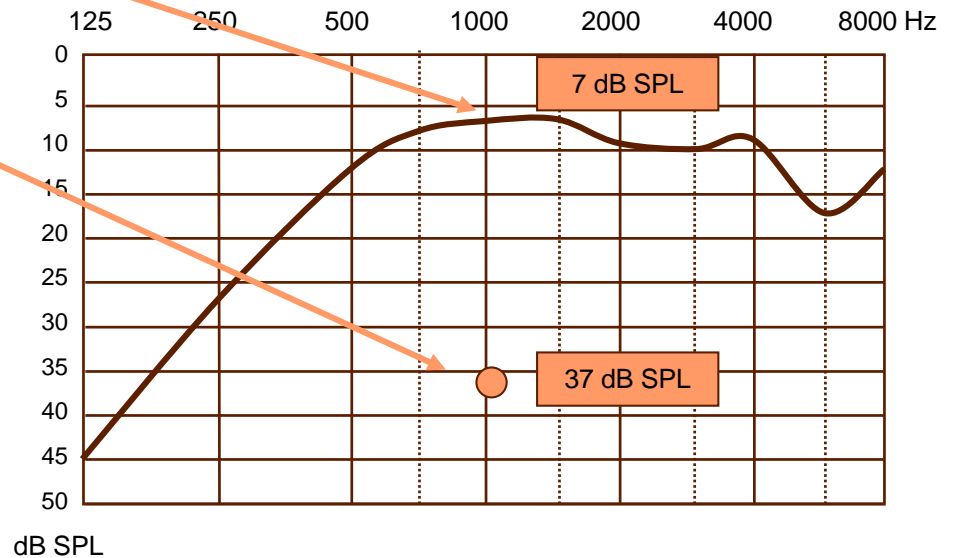


FIGURE 3.1 Thresholds in dB sound pressure level (SPL; left panel) and dB hearing level (HL; right panel) as a function of frequency. The solid line represents average normal hearing; the dashed line represents a person's threshold who has a high-frequency hearing loss.

Normal thresholds with TDH39 re dB SPL



RETSPLs TDH 39 with 6cc coupler type NBA-9A



dB HL

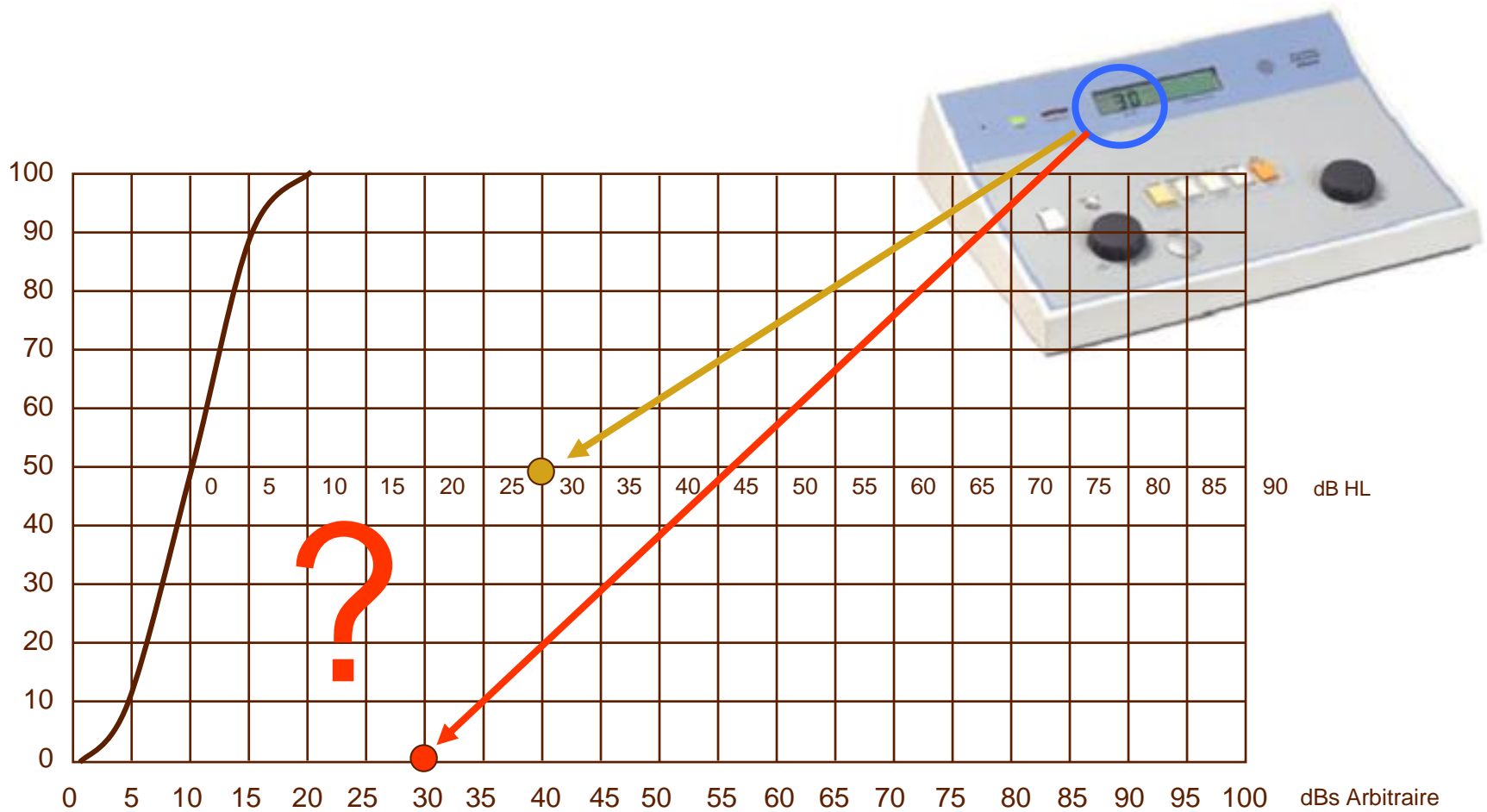


125	250	500	750	1000	1500	2000	3000	4000	6000	8000
45	25.5	11.5	8.0	7.0	6.5	9.0	10.0	9.5	15.5	13

Source : American National Standard Specifications for Audiometers (ANSI S3.6-1996)

thanks to F Le Her

Speech audiometry calibration

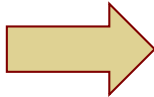


Speech audiometry calibration

Type de Matériel	Valeur en dB SPL
Ecouteurs TDH 49 et 50	20.0
Ecouteurs TDH 39	19.5
Ecouteurs d'insertion dans coupleur HA1 ou 2cc	12.5
Ecouteurs d'insertion dans simulateur d'oreille	18.0
Ecouteurs Sennheiser HDA200	19.0
Vibrateur sur la mastoïde	55.0
Vibrateur sur le front	63.5
Champ libre binaural Azimut 0°	14.5
Champ libre Monaural Azimut 0°	16.5
Champ libre binaural Azimut 45°	12.5
Champ libre Monaural Azimut 45°	11.0

Valeurs de référence pour un signal de parole correspondant au 0dB HL en fonction des transducteurs utilisés (RETSPLs selon ANSI S3,6-1996)

Sound sources (noise) Examples with distance	Sound pressure Level L_p dB SPL
Jet aircraft, 50 m away	140
Threshold of pain	130
Threshold of discomfort	120
Chainsaw, 1 m distance	110
Disco, 1 m from speaker	100
Diesel truck, 10 m away	90
Kerbside of busy road, 5 m	80
Vacuum cleaner, distance 1 m	70
Conversational speech, 1 m	60
Average home	50
Quiet library	40
Quiet bedroom at night	30
Background in TV studio	20
Rustling leaves in the distance	10
Hearing threshold	0



45.5 dB HL f.field

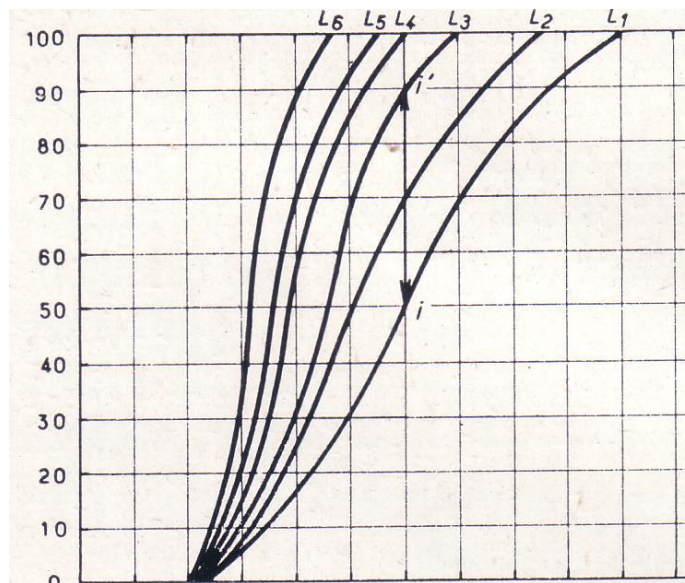
Speech material

Context

Sentences → Dissyllabic → Monosyllabic → Logatomes

central → level of processing → ear

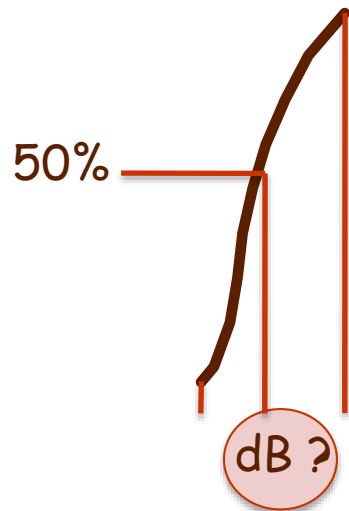
Performance-intensity function slope



from Fournier (1950)

Threshold & Score

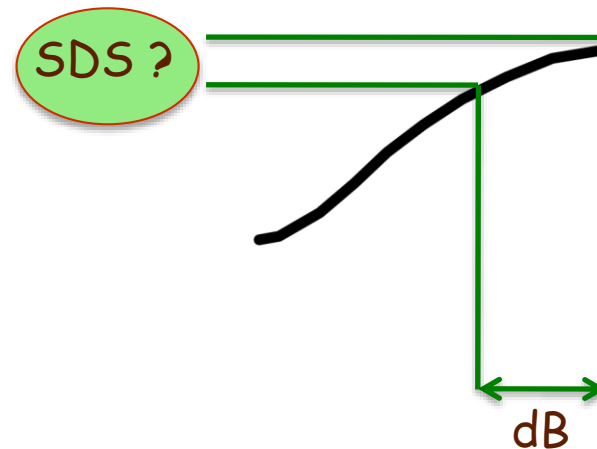
Liminar test: threshold in dB



Dissyllabic words, sentences

Threshold (SRT)

Supraliminar test: Score en %



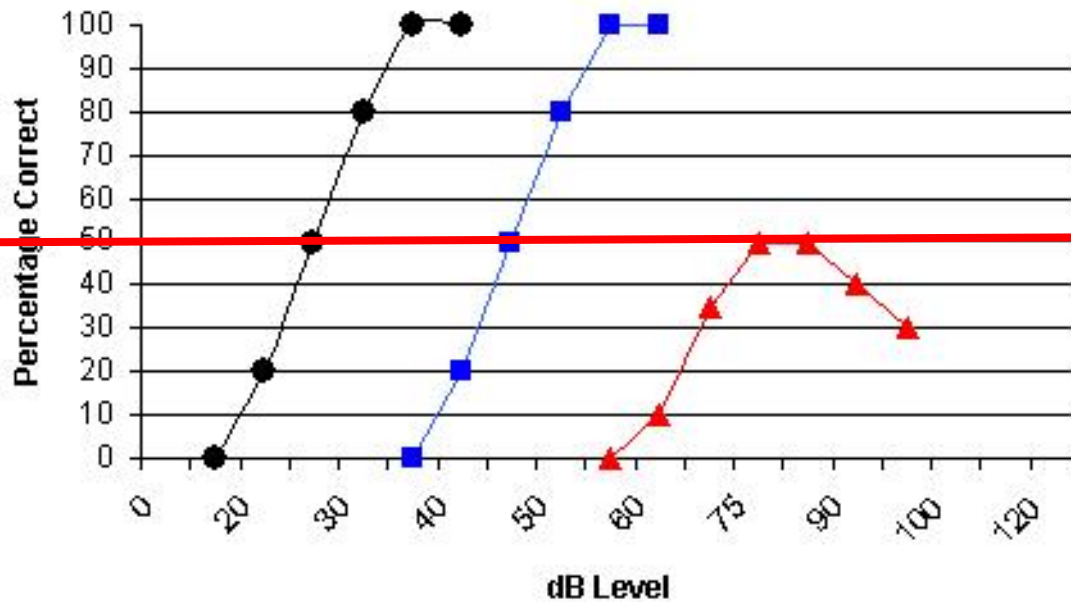
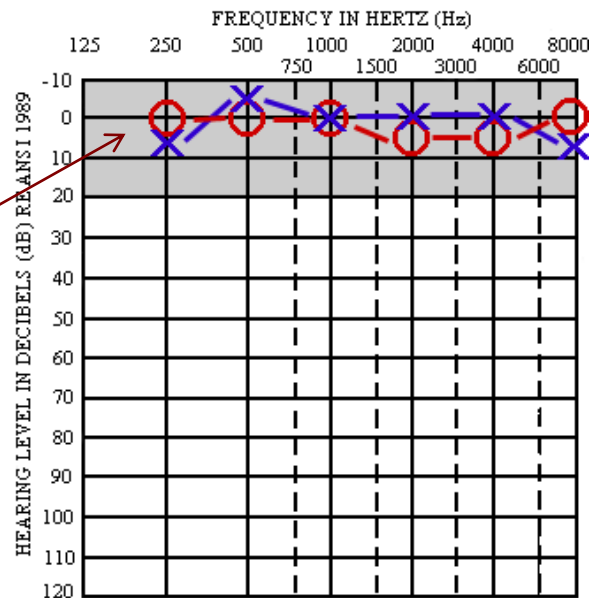
Monosyllabic words, logatomes

Score (SDS)

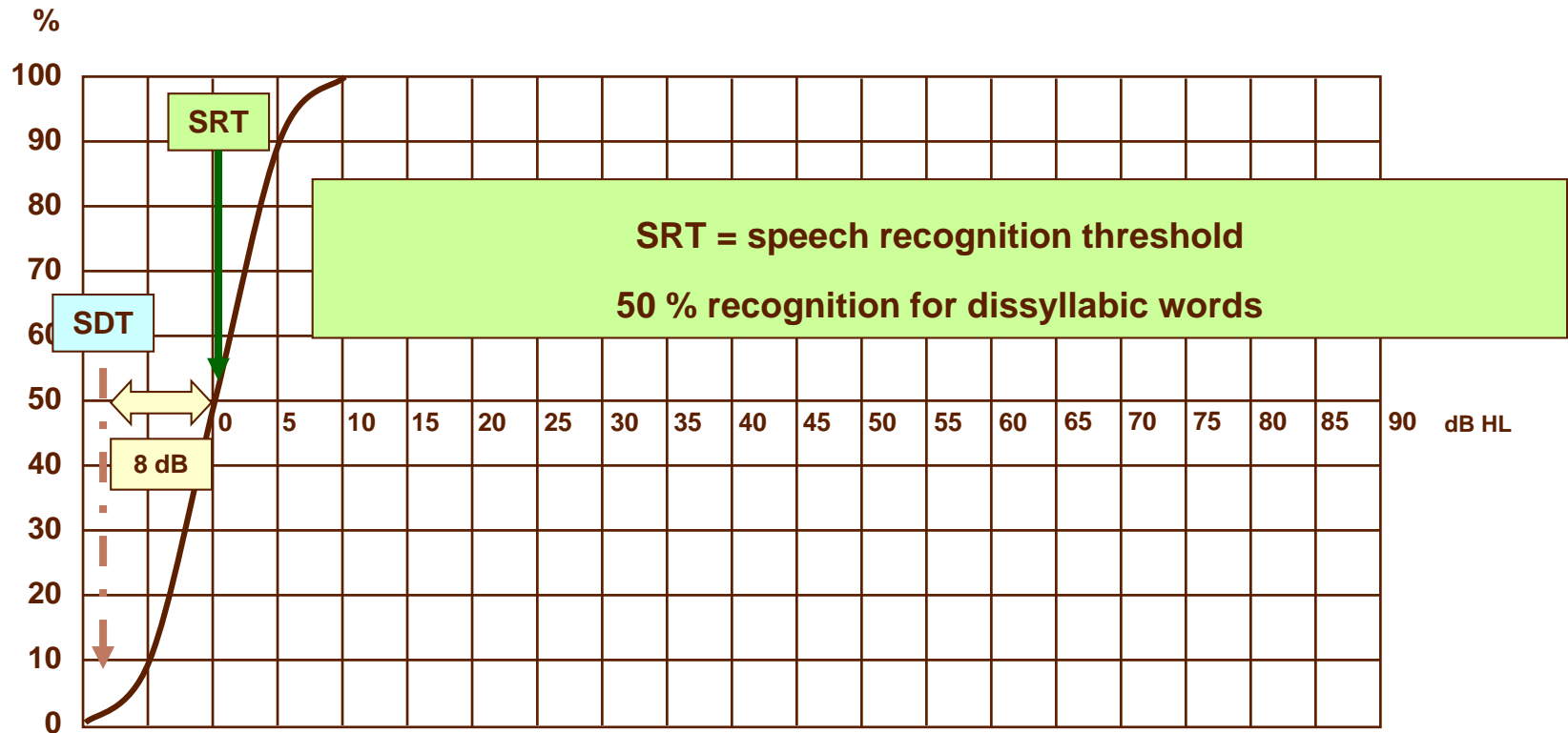
Threshold

Threshold definition

50 %

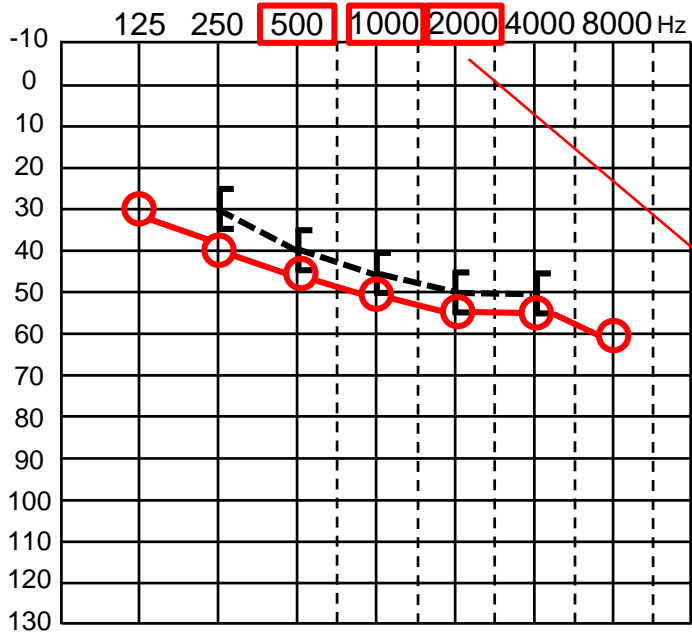


Speech audiometry

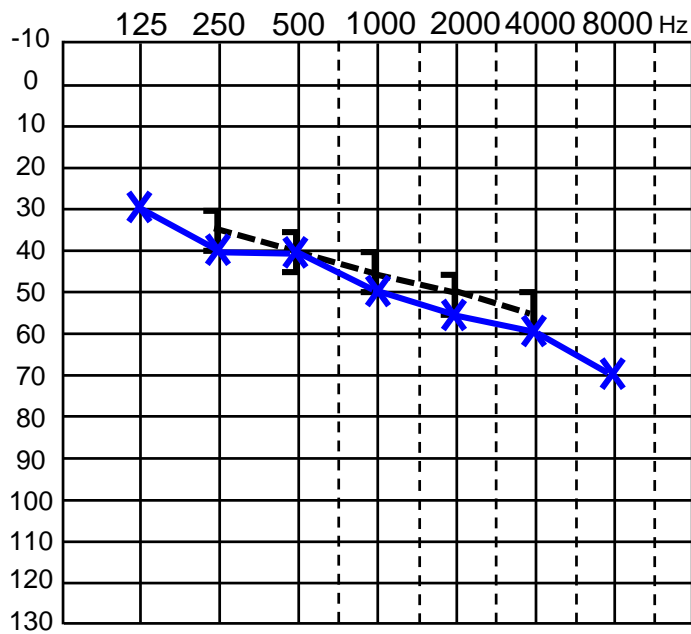


SRT & PTA within +/- 6 dB

O.D.

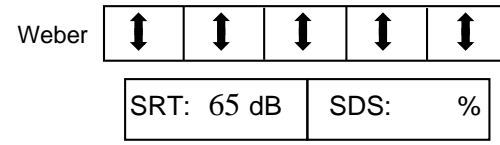
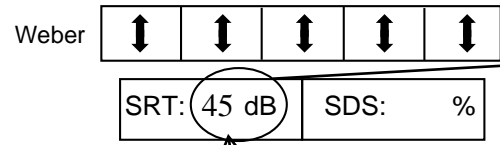


O.G.

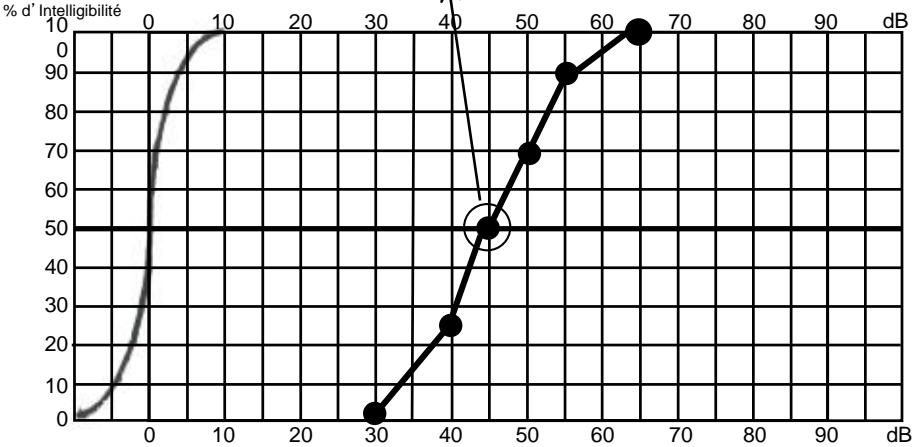


50 dB

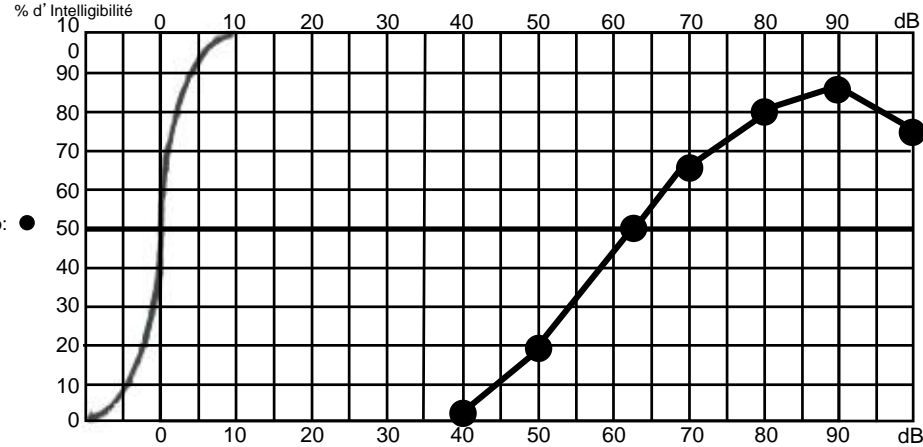
< 7 dB



O.D.

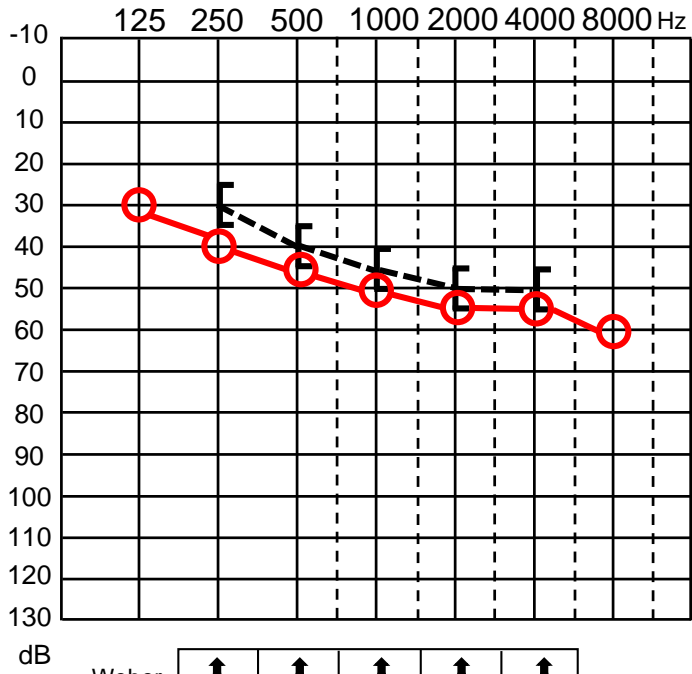


O.G.



Mono:
 Dissyllab: ●
 Phrase:

O.D.

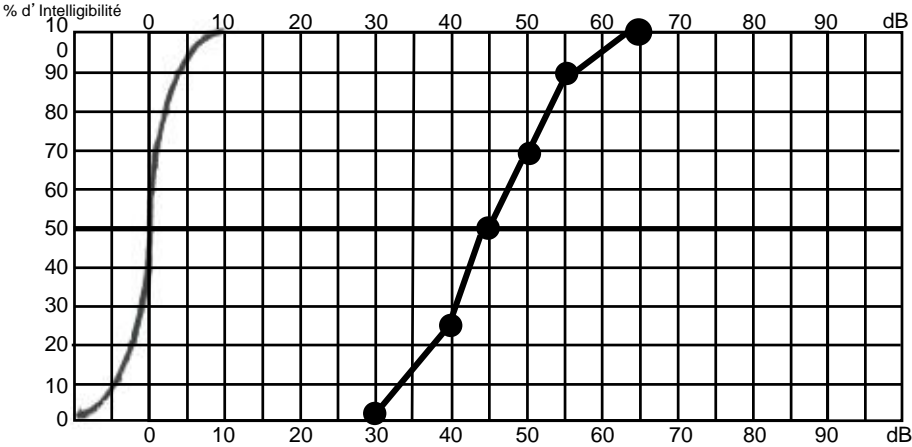


Weber

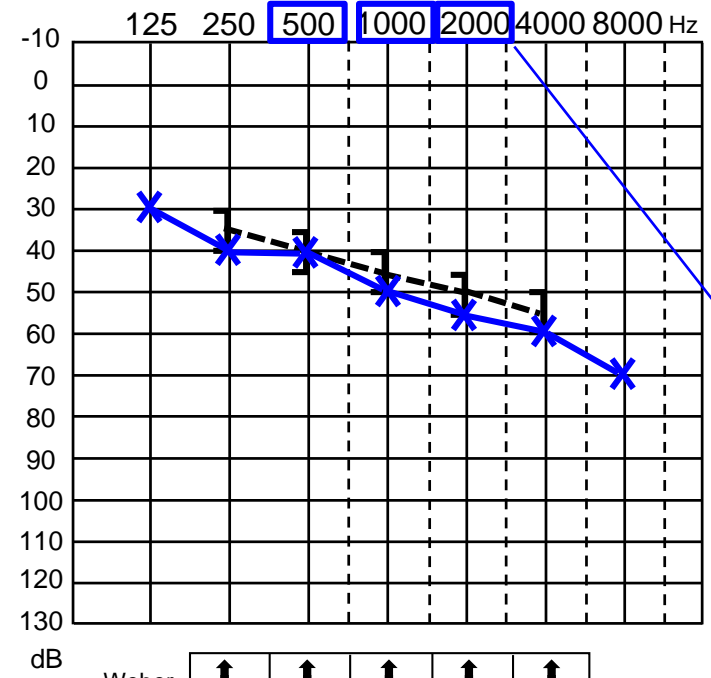
↕	↕	↕	↕	↕
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SRT: 45 dB SDS: %

O.D.



O.G.



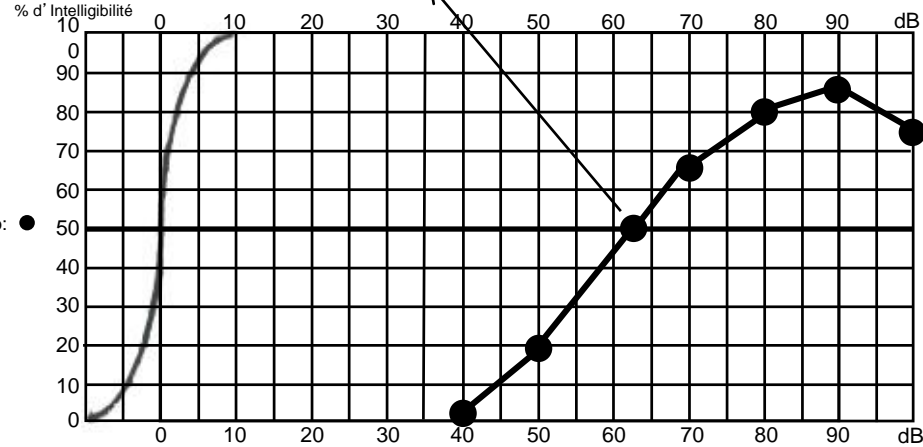
Weber

↕	↕	↕	↕	↕
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SRT: 65 dB SDS: %

> 10 dB

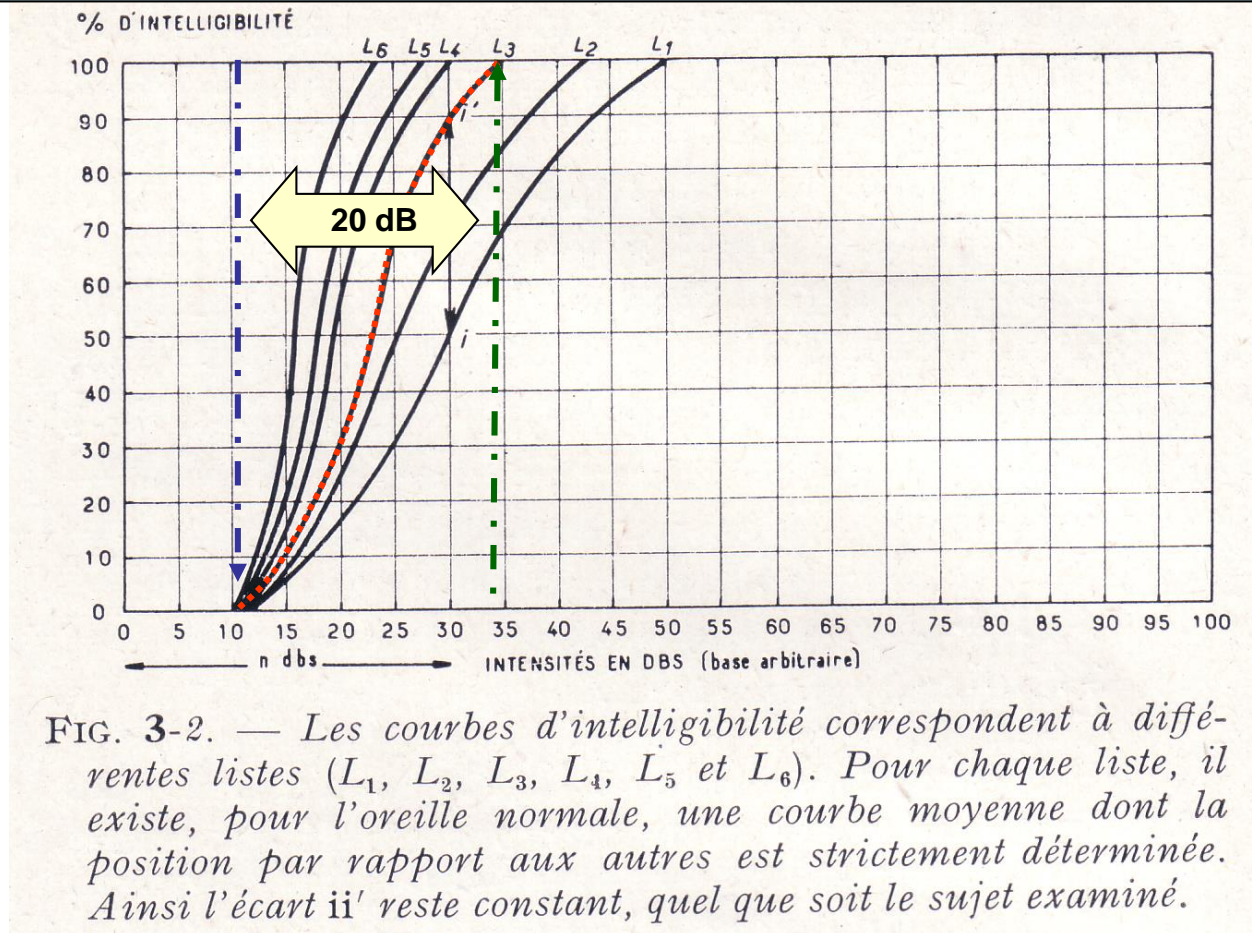
O.G.



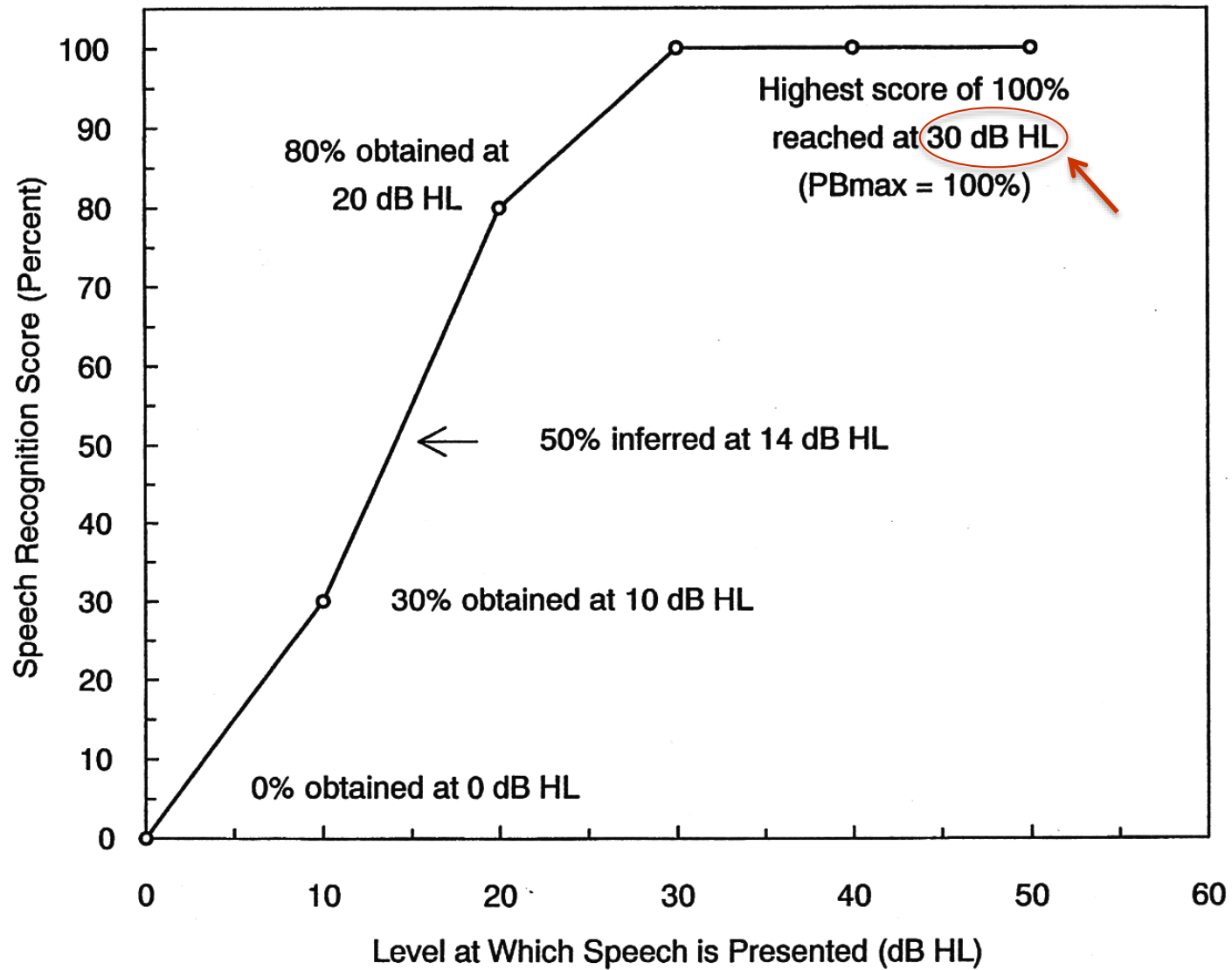
Mono:
 Dissyllab: ●
 Phrase:

Score

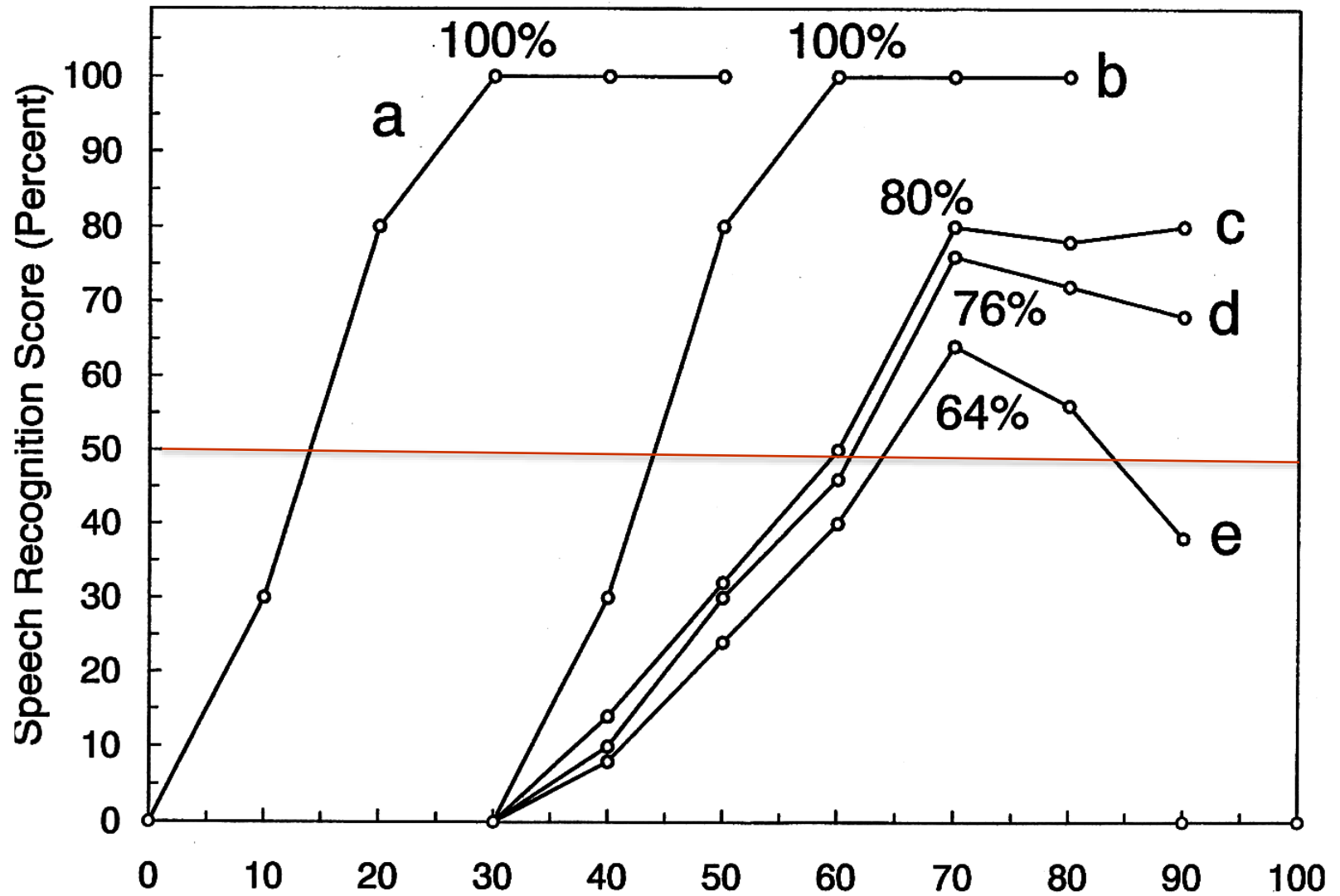
Normal PI function for disyllabic words



L_1 = logatomes, L_2 = monosyllabiques, L_3 = dissyllabiques, L_4 = phrases, L_5 = phrases, L_6 = texte continu

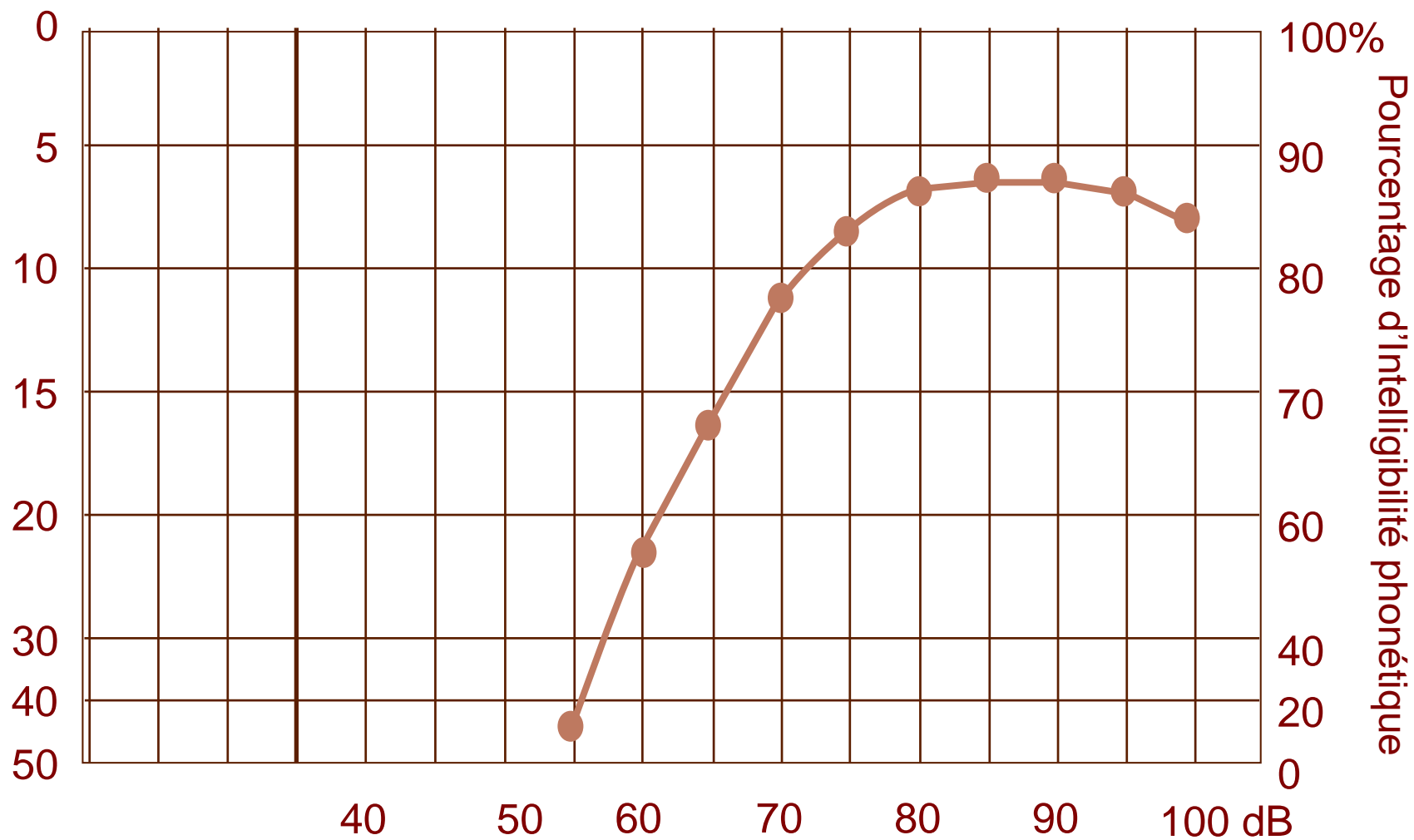


Performances for Monosyllabic words (GELFAND, 1997)

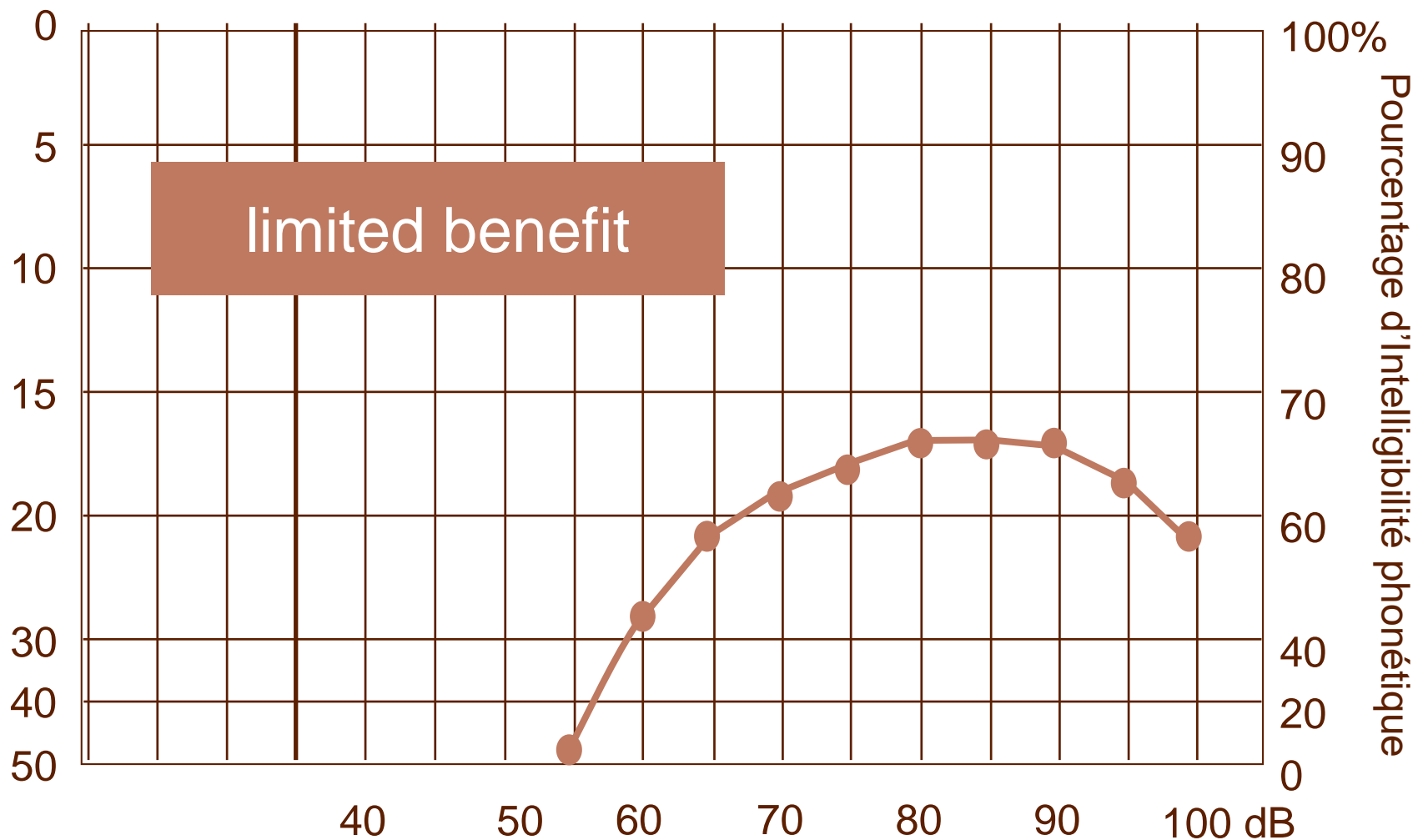


Optimal level of testing ?
 SRT+35 dB, MCL ?

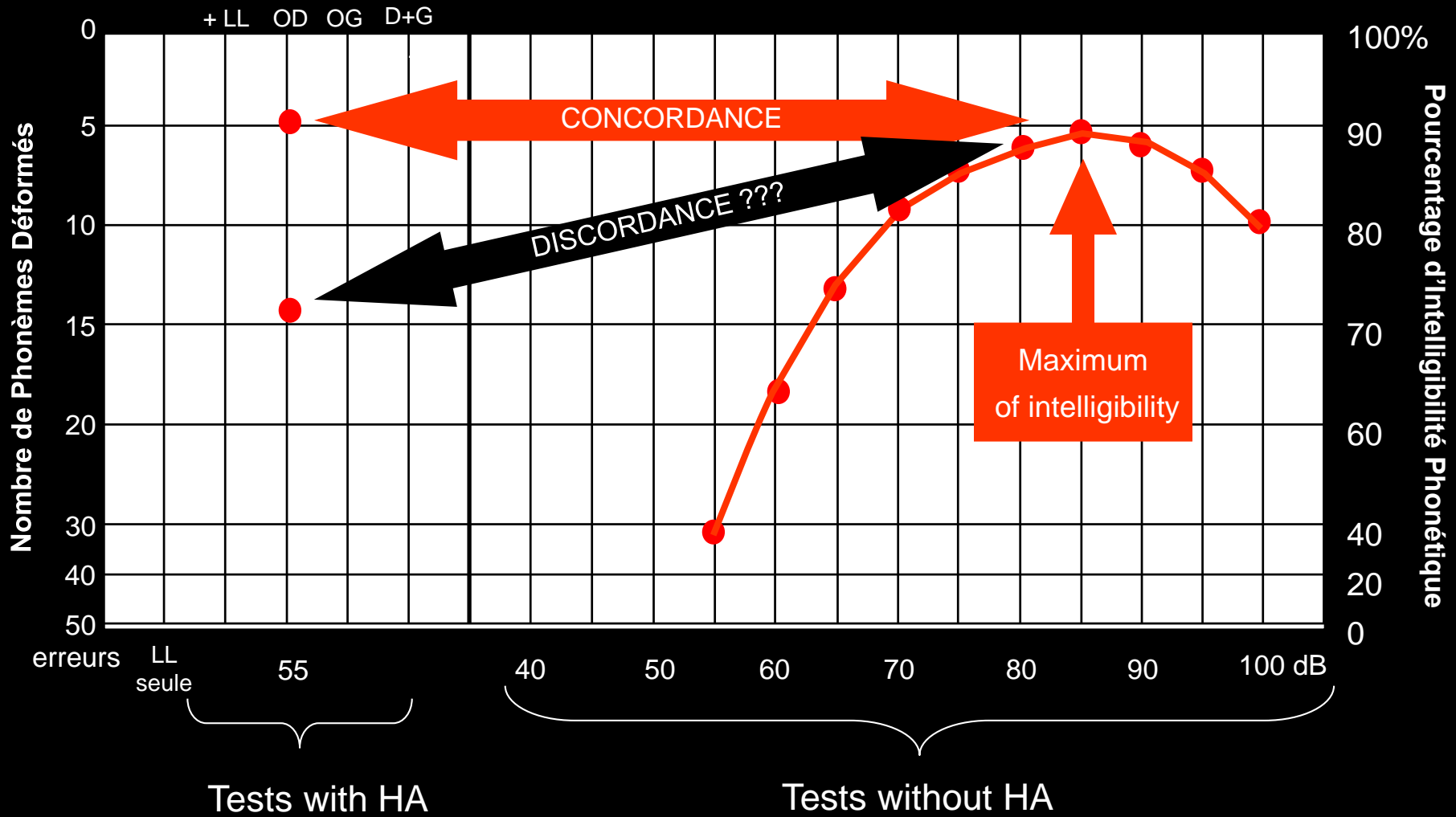
Hearing aid prognosis



Hearing aid prognosis



How to control
the hearing aid benefit
with speech audiometry?



Indication for cochlear implant

