What is dysarthric speech ? The neurologist' point of view

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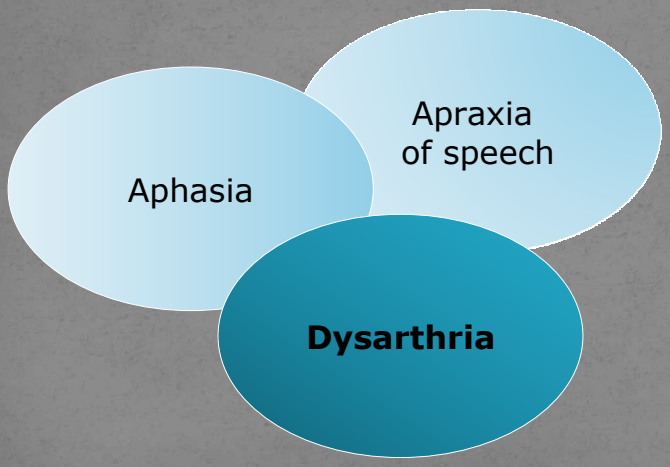
Questions of the neurologist

1. Is it dysarthria ?
2. Can it help me for the neurological diagnosis ?
3. Does it help us to understand brain function ?
4. How should I analyse dysarthria ?
5. How do I treat it ?

Q1. Is it dysarthria ?

What is dysarthria ?

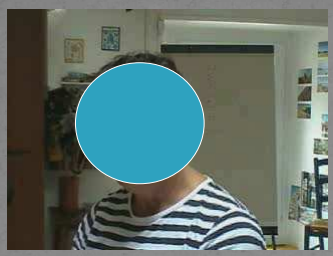


Check list

- Is the problem neurologic ?
- If the problem is not neurologic, is it nonetheless organic ? For example, is it due to dental or occlusion abnormality, mass lesion of the larynx or is it psychogenic ?
- If the problem is or is not neurologic, is it recently acquired or longstanding ? For example, might it reflect unresolved developmental stuttering, articulation disorder or language disability ?
- If the problem is neurologic, is it a MSD or another neurologic disorder that is affecting verbal expression (aphasia, akinetic mutism ?)
- If a MSD is present, is it a dysarthria or apraxia of speech ?
- If dysarthria is present, what is its type ?

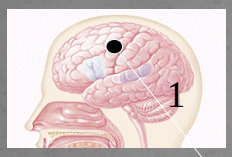
Duffy JR (2005)

What is dysarthria ?



- Great heterogeneity
  - Severity
  - Numerous etiologies

Main causes of dysarthria

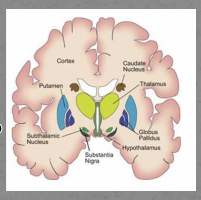


1

Corticospinal tract

3

4



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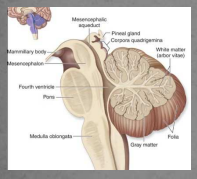
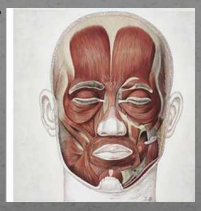
Peripheral nerve

2





- Stroke
- Neurodegenerative
  - PD
  - Parkinsonian Sd
  - Cerebellar ataxia
- Trauma
- MS
- Tumor.....

Q2. Is it an aid for the diagnosis of the neurological condition ?

Q2 : aid for the diagnosis ?

- Most neurologists think that they can recognize the type of dysarthria just by listening, but ….
- Perceptual classification studies are insufficient
  - Zyski et al.
    - 16 parameters : 20%, 3 parameters : 55%
  - Ozsancak et al. (2006) :
    - PD vs CBD vs Controls : 47% vs 37 % vs 93%
  - Fonville et al. (2008)
    - Neurologists = Residents ≈ 35 %
  - Van der Graal et al. (2009)
    - Neurologists = Residents = Speech therapists ≈ 40 %

⇒ Diagnosis based on perceptual features is weak
⇒ It is generally based on the context of other disturbances at the neurological examination or imaging

❑ When dysarthria is the prominent symptom

- ALS
- Myasthenia gravis

❑When speech is atypical for a given condition

- Too severe, too early : PSP, MSA
- Concomittant abnormalities :
  - Stridor (MSA), involuntary sighs or palilalia (PSP), orofacial apraxia (CBD)

Q3. Does it help us to understand brain function ?

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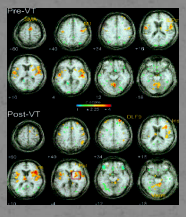
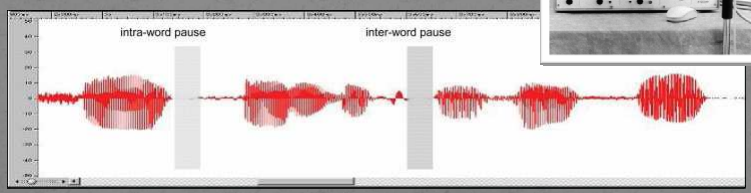
- Functional imaging



- Instrumental analysis



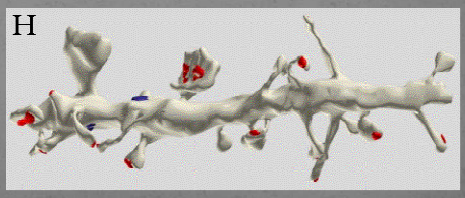
Q3. Does it help us to understand brain function ?

- *Neural plasticity*
  Kleim and Jones
- *Neural plasticity and speech*
  Ludlow et al.

JSHR 2008

Neural plasticity : 10 rules of Kleim and Jones

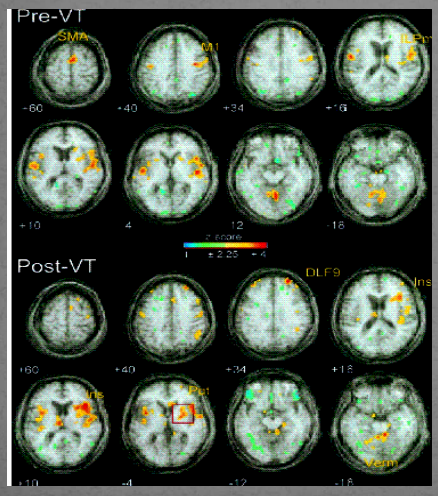
1. Use it or lose it
2. Use it and improve it
3. Specificity
4. Repetition matters
5. Intensity matters
6. Time matters
7. Salience matters
8. Age
9. Transference
10. Interference



Neural plasticity and speech

- *Does oromotor strength training tranfer to aid the return of speech production ?*
- *Do training paradigms developed for spinal systems pertain to craniofacial bulbar systems ?*
- *Can speech production skills be relearned in brain-injured adults ?*
- *Should emphasis be placed on invoking alternate brain mechanisms for speech recovery or is the return of function needed in the original substrates?*

Neural plasticity and dysarthria



- Liotti et al. Neurology 2003, 60 : 432-440.

Q4. How do I analyse my patient's dysarthria ?

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A. The clinical questions

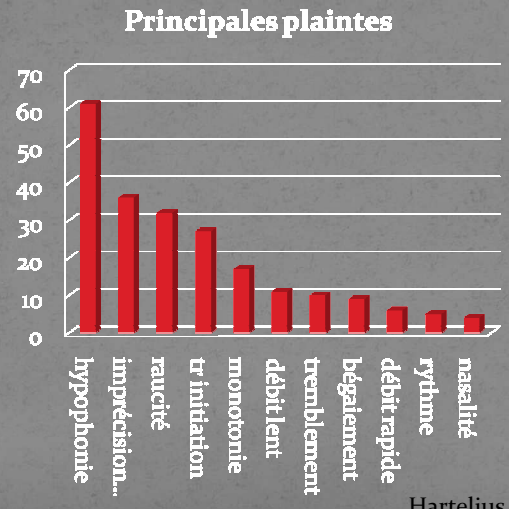
B. Undertanding underlying pathogeny

C. Tools
   - Clinical
   - Instrumental analysis

The clinical questions

- How severe is the patient's dysarthria ?
- How to describe the speech of the patient ?
- What is the underlying dysfunction of the speech effectors ?
- What does the patient think about his speech ?

Self assessment of dysarthria



Hartelius & Svenson, 1994

Voice Handicap Index

		J	PJ	P	PT	T
F1	On m'entend difficilement à cause de ma voix		X			
P2	Je suis à cours de souffle quand je parle		X			
F3	On me comprend difficilement dans un milieu bruyant		X			
P4	Le son de ma voix varie au cours de la journée	X				
F5	Les membres de la famille ont du mal à m'entendre quand je les appelle dans la maison			X		
F6	Je téléphone moins souvent que je le voudrais	X				
E7	Je suis tendu(e) quand je parle avec d'autres à cause de ma voix					
F8	J'ai tendance à éviter les groupes à cause de ma voix			X		
E9	Les gens semblent irrités par ma voix		X			
P10	On me demande : " Qu'est-ce qui ne va pas avec ta voix ? "	X				
F11	Je parle moins souvent avec mes voisins, mes amis, ma famille à cause de ma voix		X			
F12	On me comprend difficilement quand je parle dans un endroit calme	X				
P13	Ma voix semble grinçante et sèche		X			
P14	J'ai l'impression que je dois forcer pour produire la voix			X		
E15	Je trouve que les autres ne comprennent pas mon problème de voix			X		
F16	Mes difficultés de voix limitent ma vie personnelle et sociale	X				
P17	La clarté est imprévisible		X			
P18	J'essaie de changer ma voix pour qu'elle sonne différemment	X				
F19	Je me sens écarté(e) des conversations à cause de ma voix	X				
P20	Je fais beaucoup d'effort pour parler		X			
P21	Ma voix est plus mauvaise le soir	X				
F22	Mes problèmes de voix entraînent des pertes de revenus	X				
E23	Mes problèmes de voix me contrarient		X			
E24	Je suis moins sociable à cause de mon problème de voix	X				
E25	Je me sens handicapé(e) à cause de ma voix		X			
P26	Ma voix m'abandonne en cours de conversation		X			
E27	Je suis agacé(e) quand les gens me demandent de répéter	X				
E28	Je suis embarrassé(e) quand les gens me demandent de répéter		X			
E29	A cause de ma voix je me sens incompétent(e)	X				
E30	Je suis honteux (se) de mon problème de voix	X				

3 domains

- physical : 10 items
- functional : 10 items
- emotional : 10 items

Total : 120 pts

Score ↑ ⇒ Handicap ↑

Jacobson et al., 1997

Q5. How do I treat dysarthric patients ?

Dysarthria and treatment

- When to treat ?
  - Vascular :
    - spontaneous regression…
  - Parkinson :
    - Too often late SLT
    - Arguments for an early start
- How to treat ?
  - Drugs
  - SLT
  - Combined therapies

Table 1. Variability in the effects of levodopa on dysarthria in PD

	Improvement	Steady-state	Worsening
Intelligibility	Rigrodsky and Morrison, 1970 (21 patients, perceptual rating of speech components)[39] Fetoni et al, 1997 (nine patients, UPDRS)[38] Wolfe et al, 1975 (17 patients, perceptual rating of speech components)[40]	Quaglieri and Celesia, 1977 (30 patients; 14 without any surgery, qualitative rating of global speech)[36] Wolfe et al, 1975 (17 patients; perceptual rating of speech components)[40]	Marsden and Parkes, 1976 (case reports; clinical observations)[37] Critchley, 1976 (case study; perceptual evaluation)[37] Anderson et al, 1999 (case study; perceptual count of speech dysfluencies)[9] Benke et al, 2000 (24 advanced patients; psycholinguistical tests for perceptual speech assessment)[36] Goberman et al, 2003 (nine patients; perceptual count of speech dysfluencies)[41]
Laryngeal level	Mawdsley and Gamsu, 1971 (20 patients, two with previous thalamotomy, acoustical recordings for phonation duration)[34] Jiang et al, 1999 (15 patients, electroglottographic recording)[42] Sanabria et al, 2001 (20 patients, acoustics for phonatory parameter analysis)[43] Gallena et al, 2001 (six early stage patients, laryngeal electromyography)[44] Goberman et al, 2002 (nine patients, acoustic recording for phonatory parameter analysis) [45]	Jiang et al, 1999 (15 patients; acoustics, airflow and electroglottographic recording)[42] Poluha et al, 1998 (ten patients; vowel duration measurements)[46]	
Supralaryngeal level	Vercueil et al, 1999 (11 patients, airflow, rib cage and abdomen movements)[47] Leanderson et al, 1971 (seven patients, five with previous thalamotomy, labial EMG)[48] Leanderson et al, 1972 (12 patients, five studied before and after levodopa, labial EMG)[49] Nakano et al, 1973 (18 patients, early introduction of levodopa, orofacial EMG)[50] Cahill et al, 1998 (16 patients, lip pressure measurements)[51] Svensson et al, 1993 (nine patients, jaw movement kinematics)[52]	Solomon and Hixon, 1993 (14 patients; 14 healthy people, chest wall kinematics and oral pressure)[53] De Letter et al, 2003 (ten patients; tongue force measurements)[54]	Vercueil et al, 1999 (one patient; airflow, rib cage and abdomen movements)[47] Gentil et al, 1998 (14 patients; lips and tongue force measurements)[55] Gentil et al, 1999 (case study; PD for 13 years, lips and tongue force measurements)[56] De Letter et al, 2003 (ten patients; tongue force measurements)[54]

(Pinto et al. 2004)

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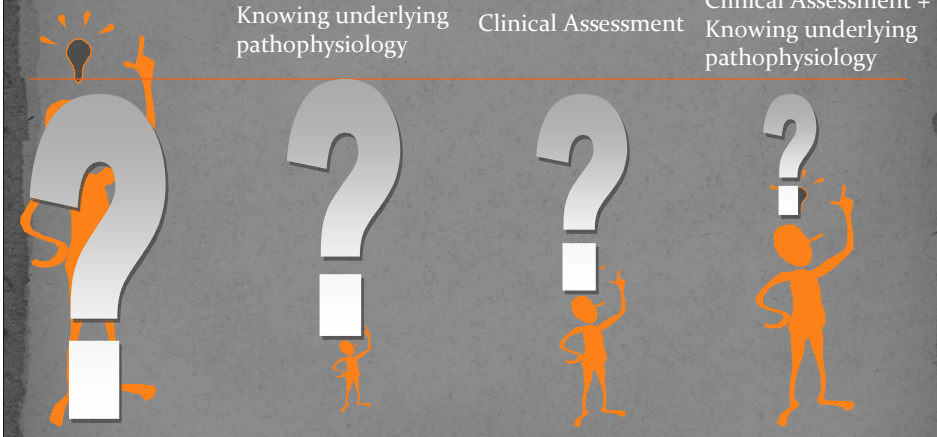
+ ?

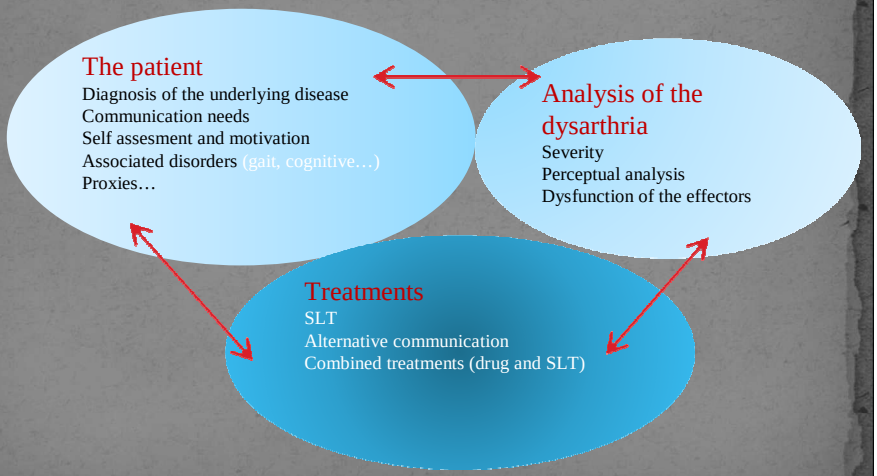
LSVT-Loud ®

Conclusion

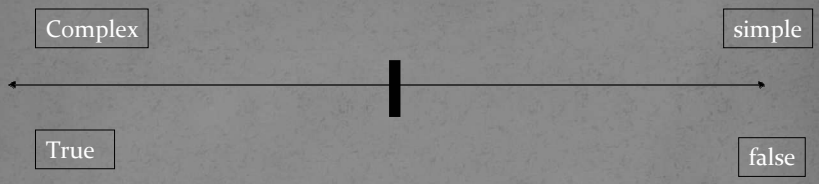
Dysarthria in clinic



Dysarthria in clinic : the point of view of the neurologist



The neurologist and MSD research



- 2 examples :
  - Classification of types of dysarthria
  - SLT : LSVT®