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Biomarqueurs vocaux pour la détection automatique de symptômes en psychiatrie

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05/04/23, ISPED, Bordeaux

$\frac{1}{8}$ de la pop.
trouble mental

20 ans
de diminution d'espérance de vie

$\frac{1}{3}$ dépression
sans soins de santé mentale structurés

RÉGULIER

ÉCOLOGIQUE

OBJECTIF

“Gold-standard diagnostic and assessment tools for depression and suicidality remain rooted, almost exclusively, on the **opinion of individual clinicians** risking a range of **subjective biases**. Currently there is no **objective measure**, with **clinical utility**, for either depression or suicidality”

BESOIN DE DIAGNOSTIC OBJECTIF

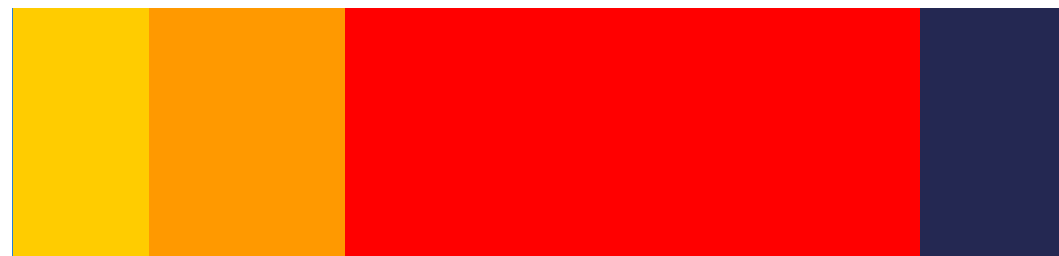
28 professionnels de santé

14,9% définition des maladies

21,6% caractéristiques des patients

63,5% facteurs liés aux cliniciens

87% diagnostic = pas fiable



BESOIN DE DIAGNOSTIC OBJECTIF

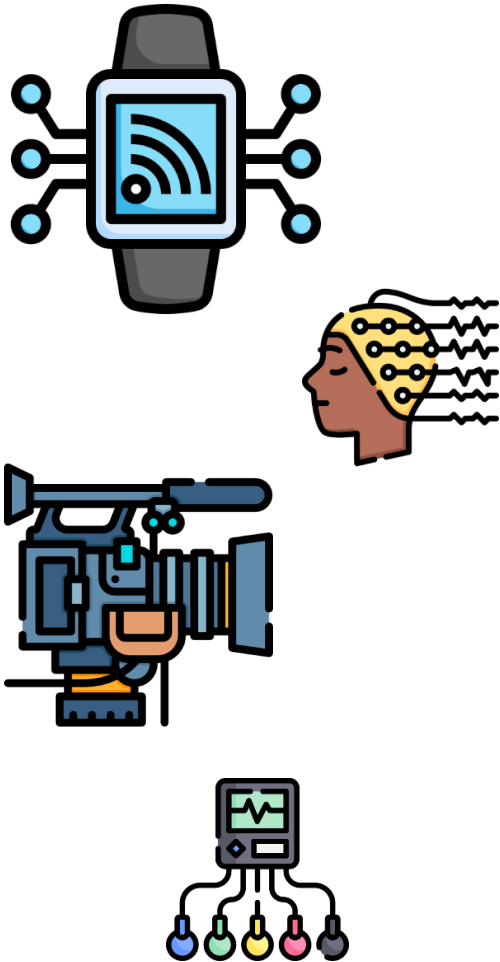
Table 6.—Diagnoses Given to Patient F

	American Psychiatrists (N = 133)	British Psychiatrists (N = 194)
Schizophrenia	92 (69%)	4 (2%)
Simple	0	1
Catatonic	1	0
Paranoid	27	1
Latent	8	0
Residual	3	0
Schizo-affective	33	1
Unspecified	20	1
Personality Disorder	10 (8%)	146 (75%)
Paranoid	1	2
Affective (cyclothymic)	1	8
Explosive	0	2
Hysterical	4	105
Asthenic	0	2
Antisocial	1	8
Unspecified	3	19
Affective Psychosis	10 (8%)	7 (4%)
Neurosis	19 (14%)	37 (19%)
Alcoholism or Drug Dependence	2	0

RÉGULIER

ÉCOLOGIQUE

OBJECTIF



Mesure « physiologique »

Non invasif

Passif

Smartphones

80% de la pop mondiale.

125 études

68 dépression

23 schizophrénie

21 tb. bipolaires



12 PTSD

6 Anxiété

3 TCA

1 TOC

1

Transp~~er~~ence



2

Validité scientifique

179 applications

2 publications

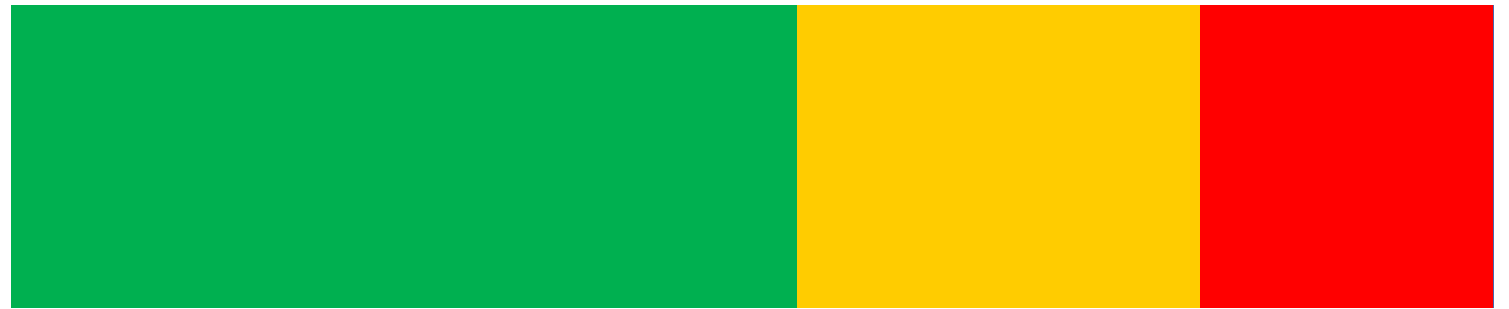


53% preuves

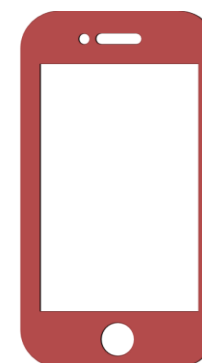
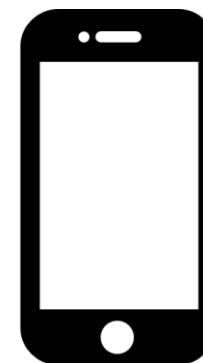
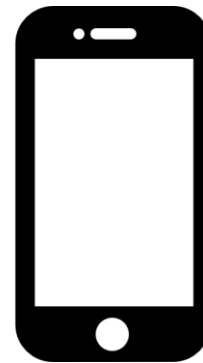
73 applications

49 affirmations

27% pas clair



20% pas de preuve



- 1 ~~Transparence~~
- 2 Validité scientifique
- 3 Relation thérapeutique

RELATION THÉRAPEUTIQUE



OPTIMISATION DE SOI

RESPONSABILITÉ

TEMPS CLINIQUE

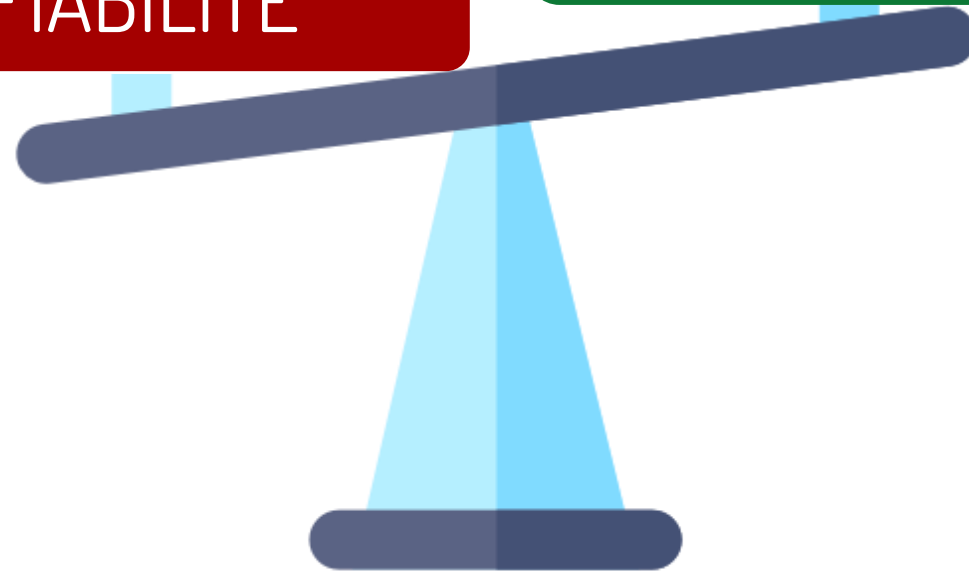
TRANSPARENCE

FIABILITÉ

EMPOWEREMENT

NOUVELLES
DONNÉES

PLUS DE
DONNÉES



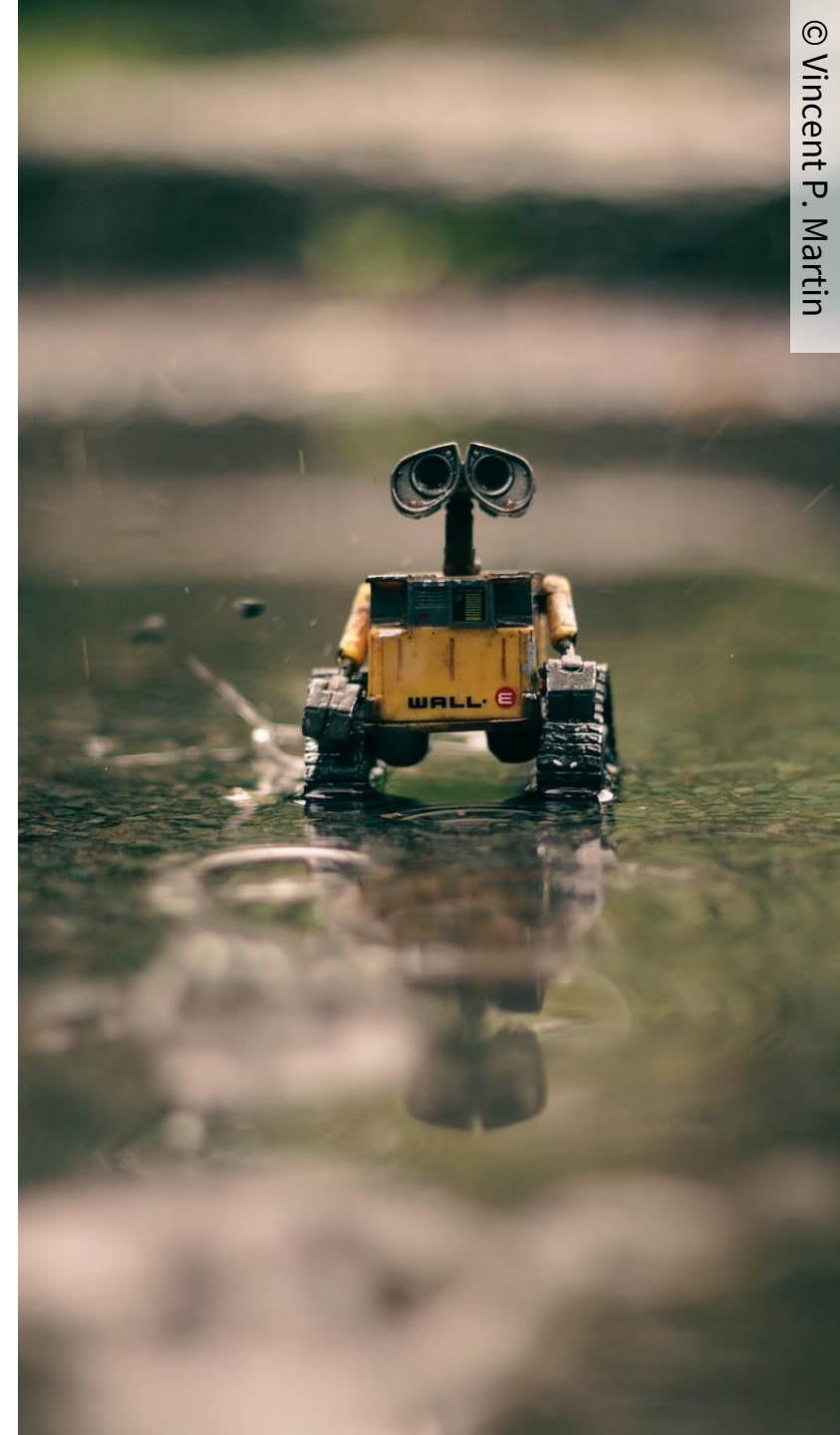
« Vous avez XX chance d'être anxieux »

**« Vous avez sûrement une
dépression »**

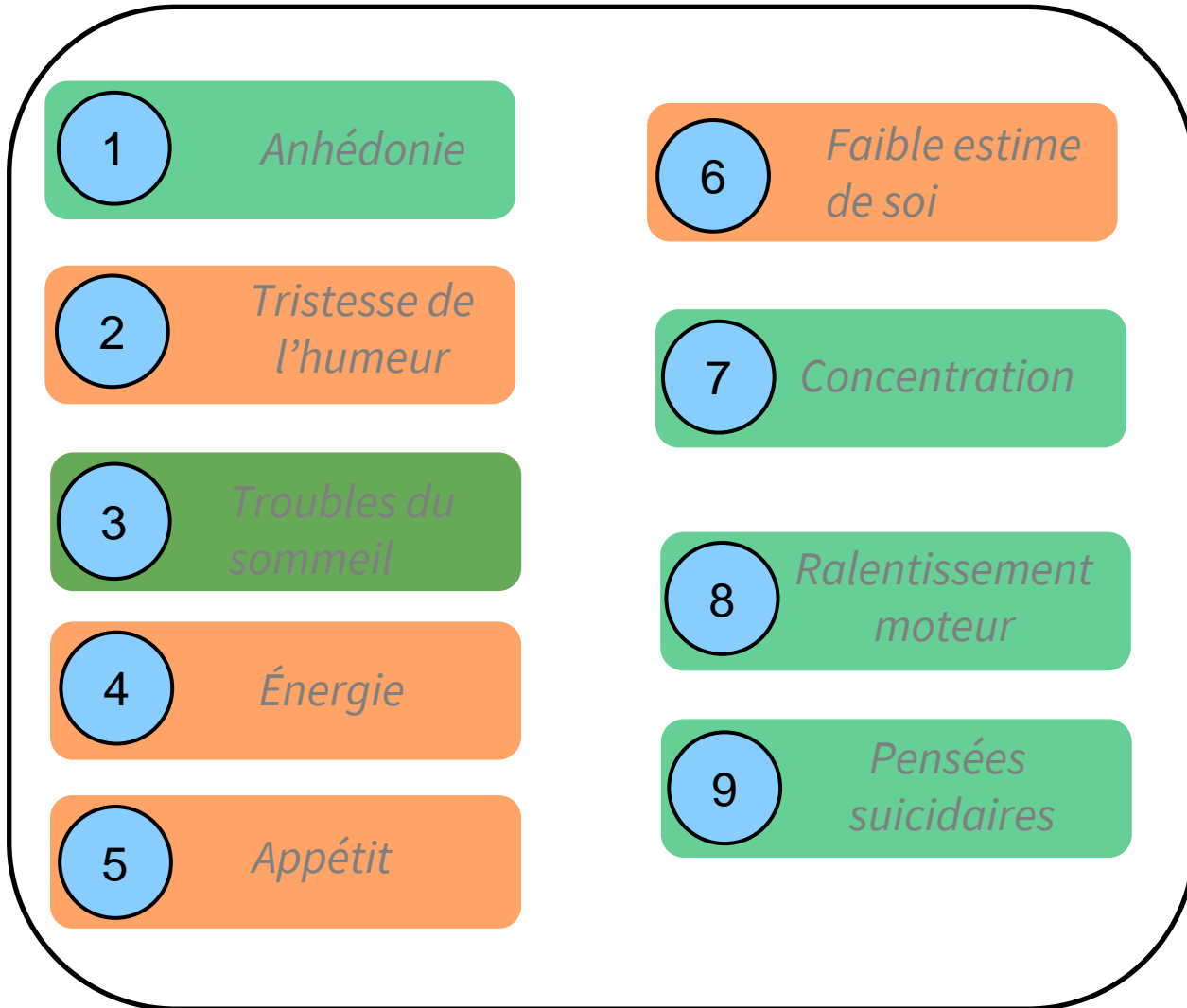
« Vous êtes bipolaire »

LE RENDEZ-VOUS MANQUÉ

- Diagnostic = limites **épistémologiques**
 - Temporelles
 - Culturelles
 - Hétérogénéité



HÉTÉROGÉNÉITÉ



Dépression =

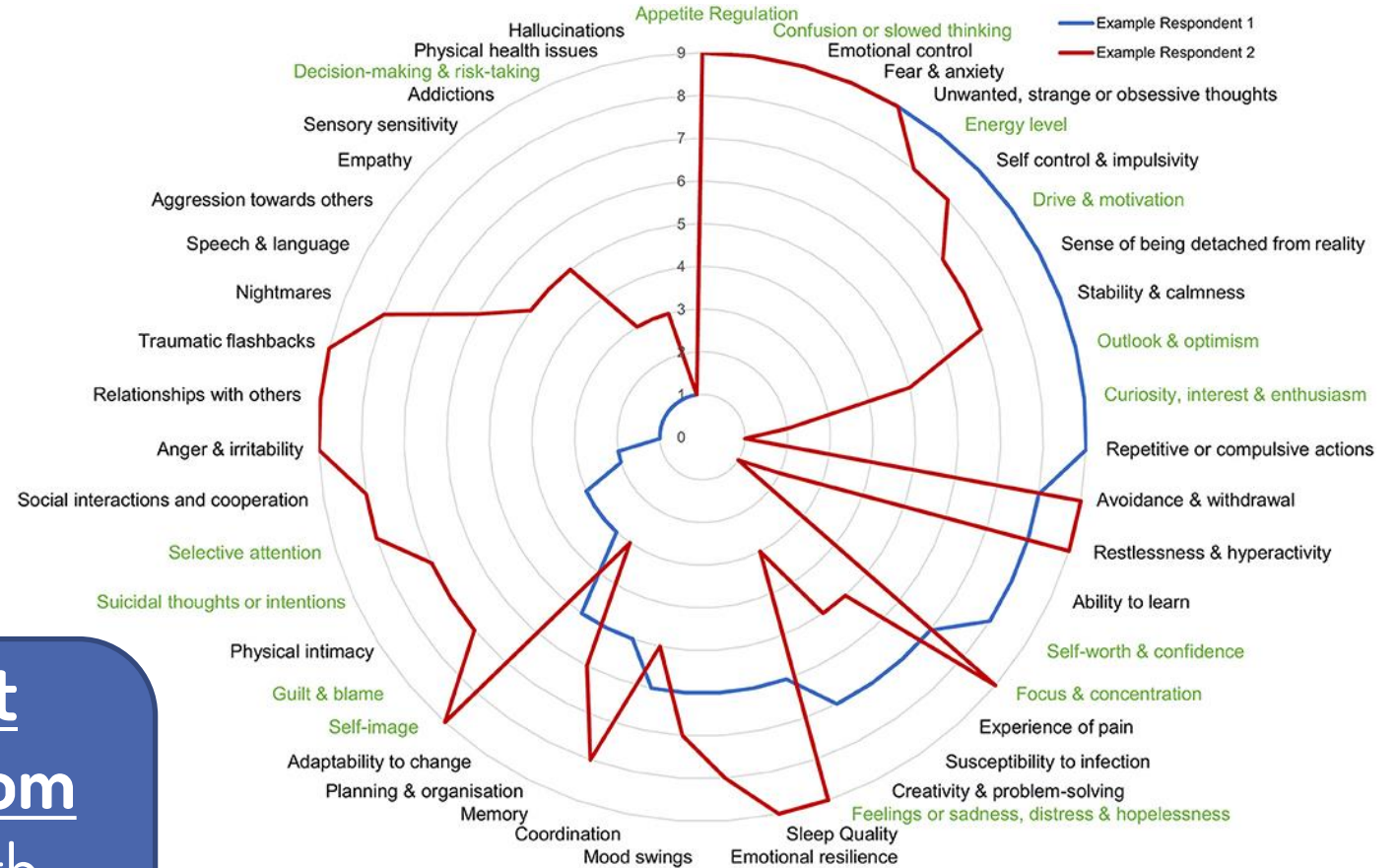
- Au moins 5
- Avec n°1 ou n°2

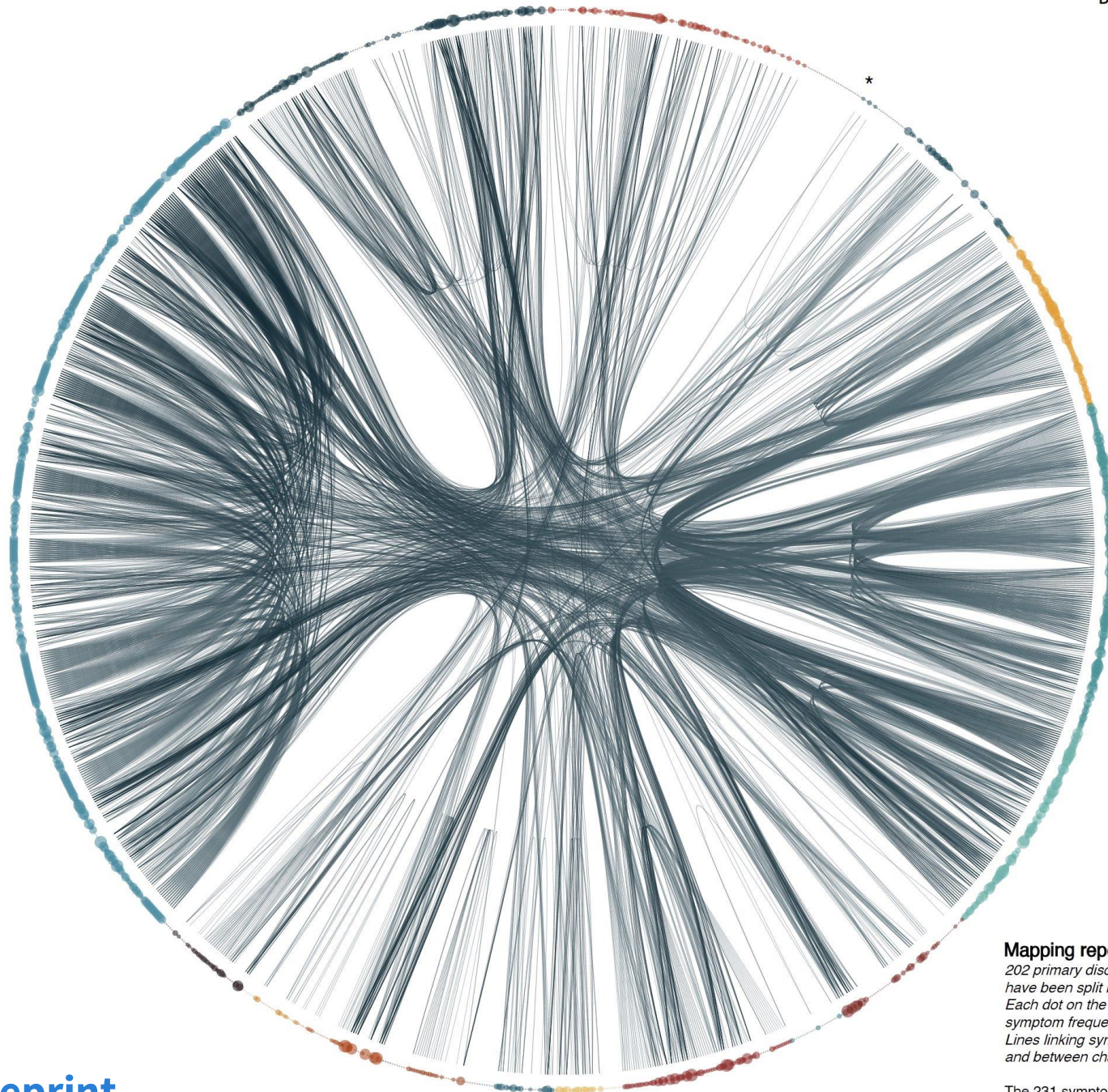
326 profils

DIAGNOSTIC vs. SYMPTÔMES

- ▶ **107349** patients
- ▶ **10** troubles les plus prévalents
- ▶ **47** symptômes

« DSM-5 disorder criteria do not separate individuals from random when the complete mental health symptom profile of an individual is considered »




DSM-5 Chapter (clockwise from *)

- Ch1 – Neurodevelopmental Disorders
- Ch2 – Schizophrenia Spectrum and Other Psychotic Disorders
- Ch3 – Bipolar and Related Disorders
- Ch4 – Depressive Disorders
- Ch5 – Anxiety Disorders
- Ch6 – Obsessive–Compulsive and Related Disorders
- Ch7 – Trauma– and Stressor–Related Disorders
- Ch8 – Dissociative Disorders
- Ch9 – Somatic Symptom and Related Disorders
- Ch10 – Feeding and Eating Disorders
- Ch11 – Elimination Disorders
- Ch12 – Sleep–Wake Disorders
- Ch13 – Sexual Dysfunctions
- Ch14 – Gender Dysphoria
- Ch15 – Disruptive, Impulse–Control, and Conduct Disorders
- Ch16 – Substance–Related and Addictive Disorders
- Ch17 – Neurocognitive Disorders
- Ch18 – Personality Disorders
- Ch19 – Paraphilic Disorders

Mapping repetition among all symptoms in the DSM-5

202 primary disorders and specifiers are represented; diagnostic criteria have been split into 1419 constituent symptoms.

Each dot on the circumference is a symptom; the size represents symptom frequency.

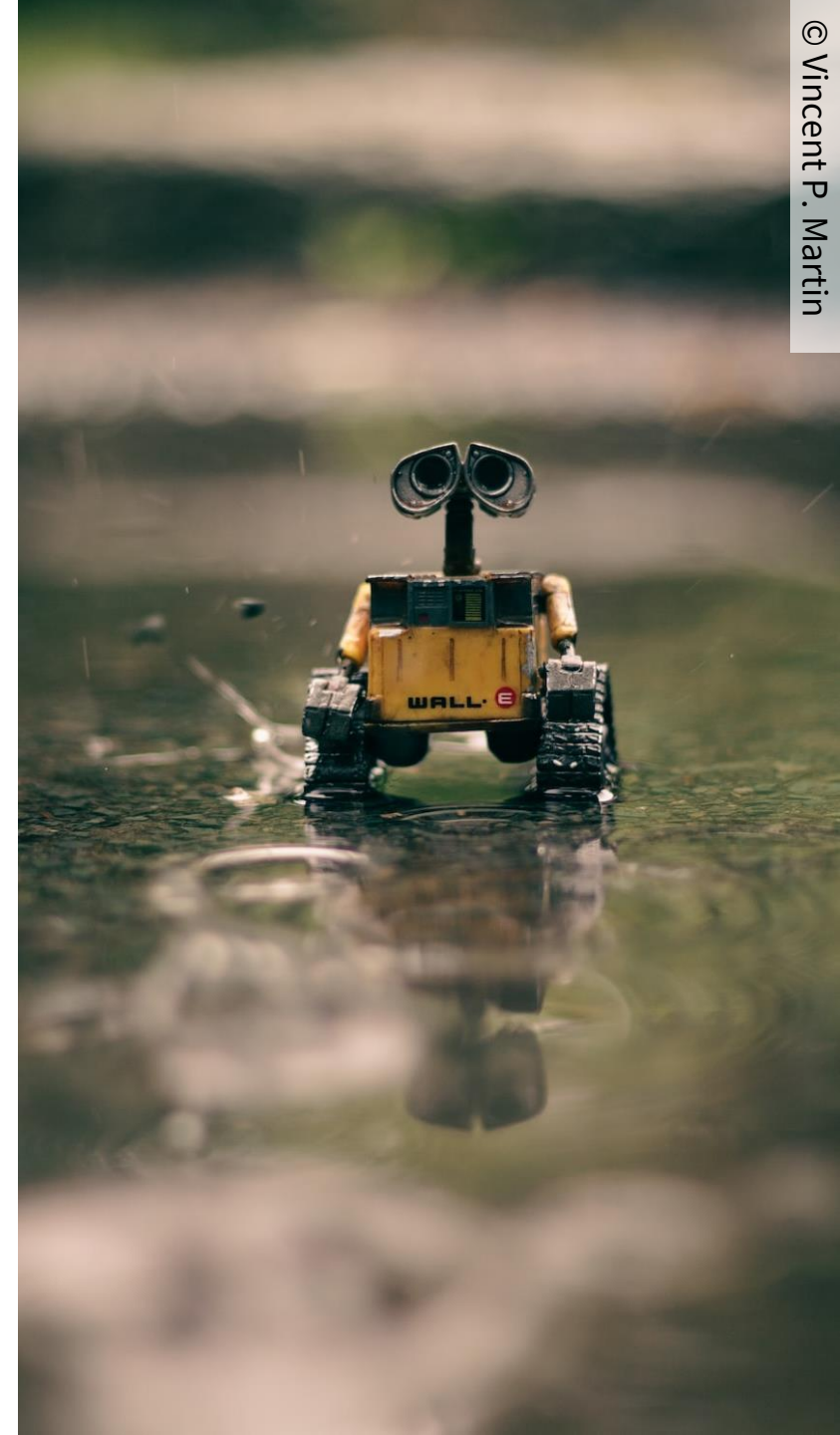
Lines linking symptoms map the repetition between diagnoses, within and between chapters.

The 231 symptoms that repeat at least once (mean [SD] repetition = 4.4 [3.41]) comprise 72.0% of the psychopathology described in the DSM-5.

LE RENDEZ-VOUS MANQUÉ

- ▶ Diagnostic = limites **épistémologiques**
 - ▶ Temporelles
 - ▶ Culturelles
 - ▶ Hétérogénéité
- ▶ Diagnostic = **reconnaissance sociale** et **dialogue**

« [...] one of its most important goal is to **facilitate communication among clinicians, researchers, administrators and patients** [...] by establishing a common language.” *Derek Bolton, 2012*



QUE FAIRE ?

Intérêt = **symptômes & signes**

Traitement = **symptômes & signes**

SOMNOLENCE



1/4 des accidents
mortels sur autoroute en France¹

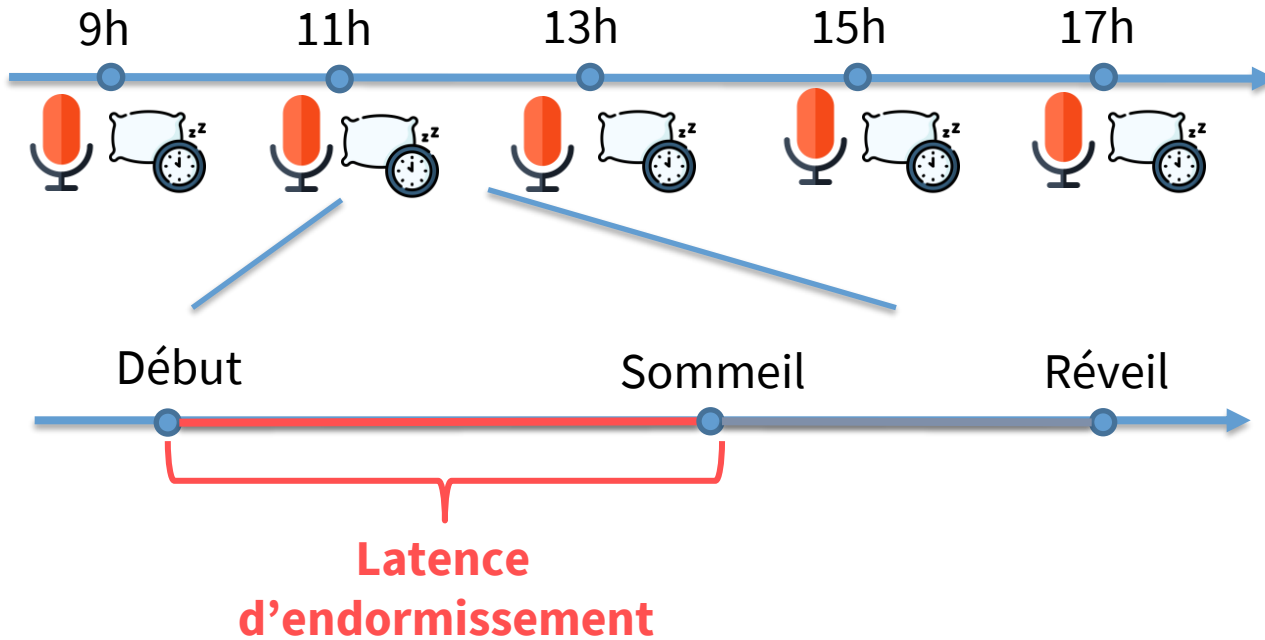
43% des pilotes
(n=500, 2012)² **31%** copilote

1/4 de la pop. générale
(États-Unis d'Amérique)

[Kolla et al. 2020](#), *Sleep Health*

¹<https://www.preventionroutiere.asso.fr/2016/03/30/somnolence-au-volant/>

²<https://www.bbc.com/news/health-19837178>

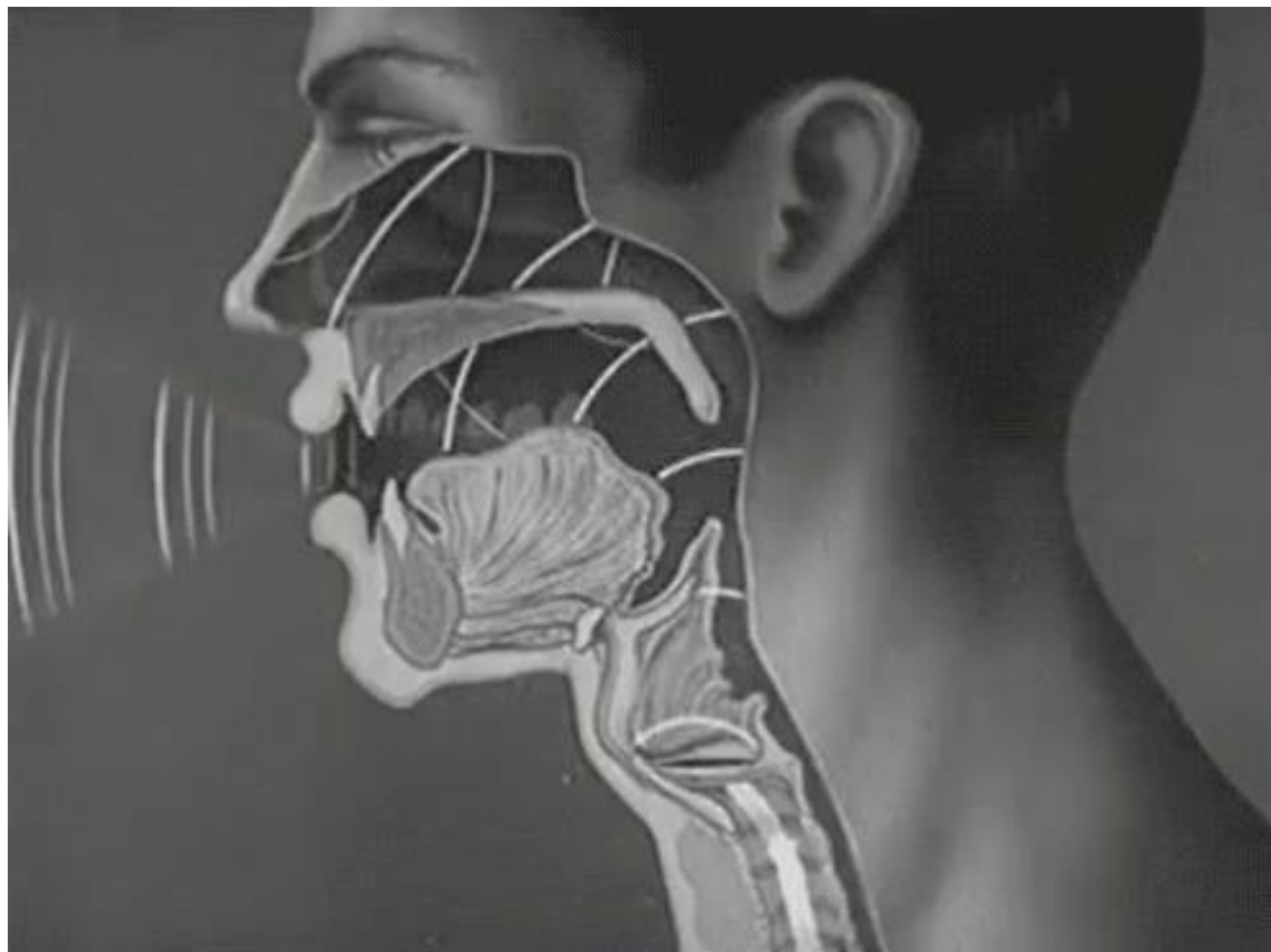


Base TILE

TILE = Test Itératif de Latence d'Endormissement

125 patients

750 enregistrements



<https://fuckyeahmedicaldiagrams.tumblr.com/post/13093912072>

Quand le mystère est trop impressionnant, on n'ose pas
« il »

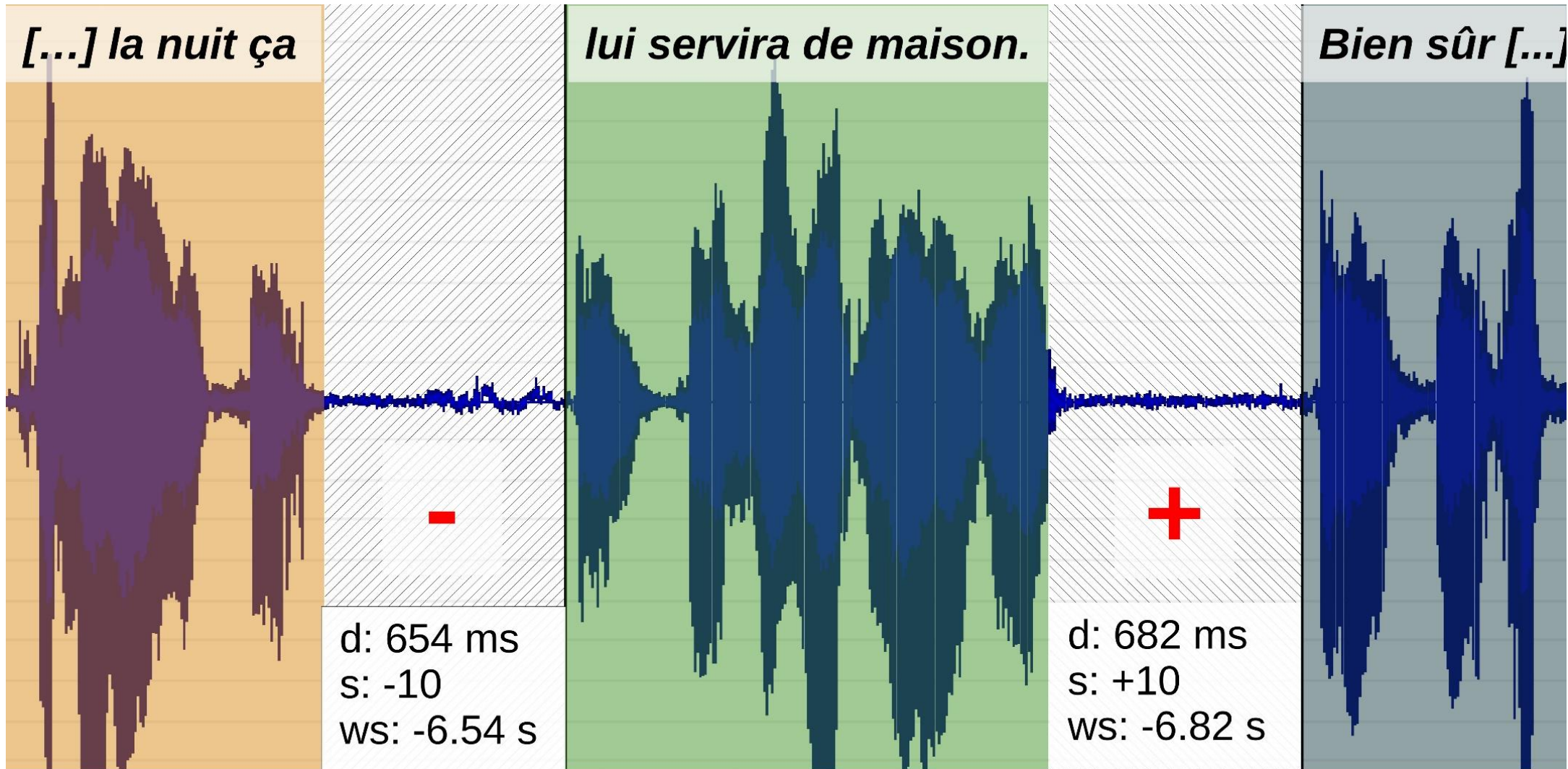
désobéir. Aussi absurde que cela me semblât à mille milles
« semblais »

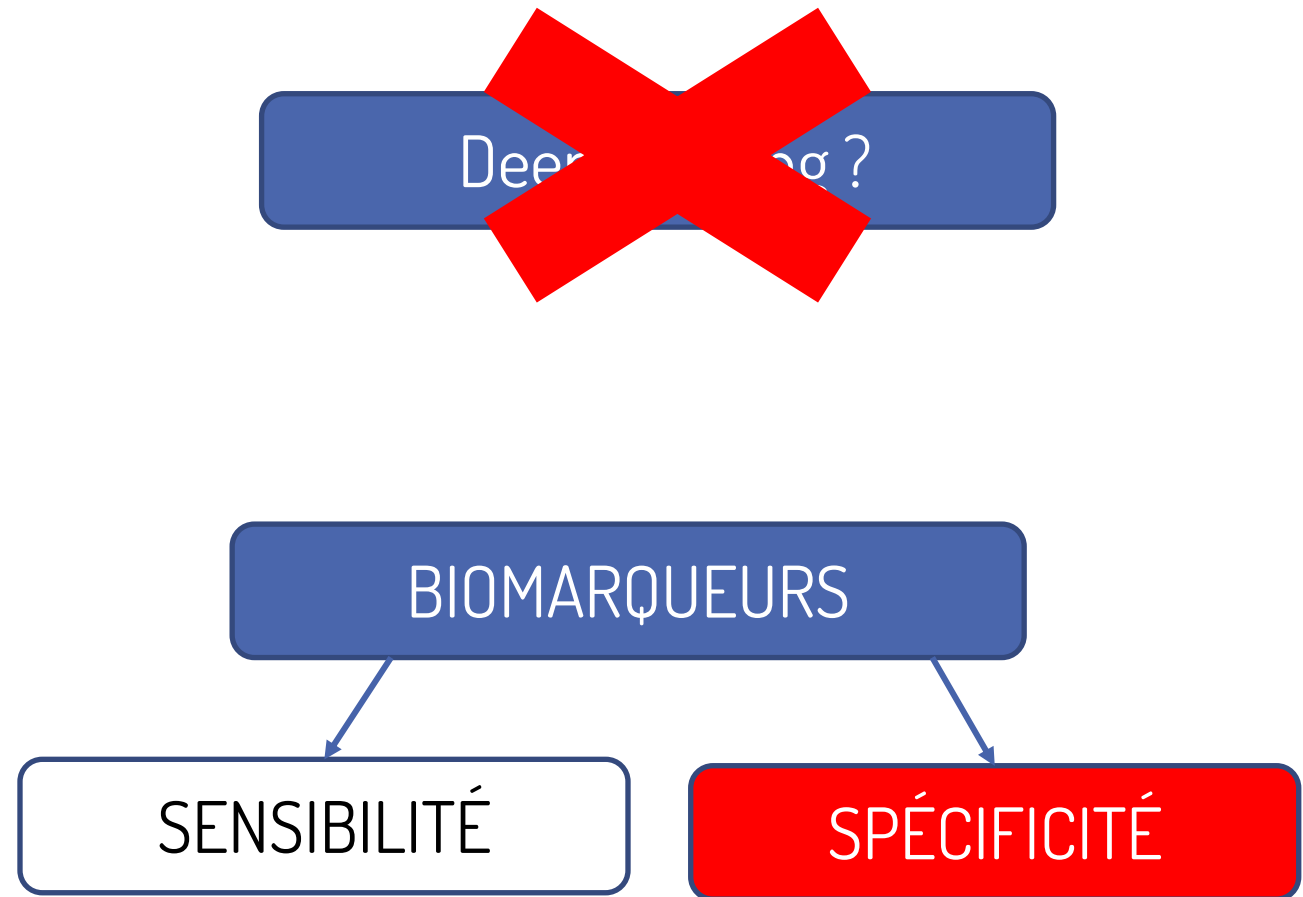
de tous les endroits habités et en danger de mort, je sortis
<ach>

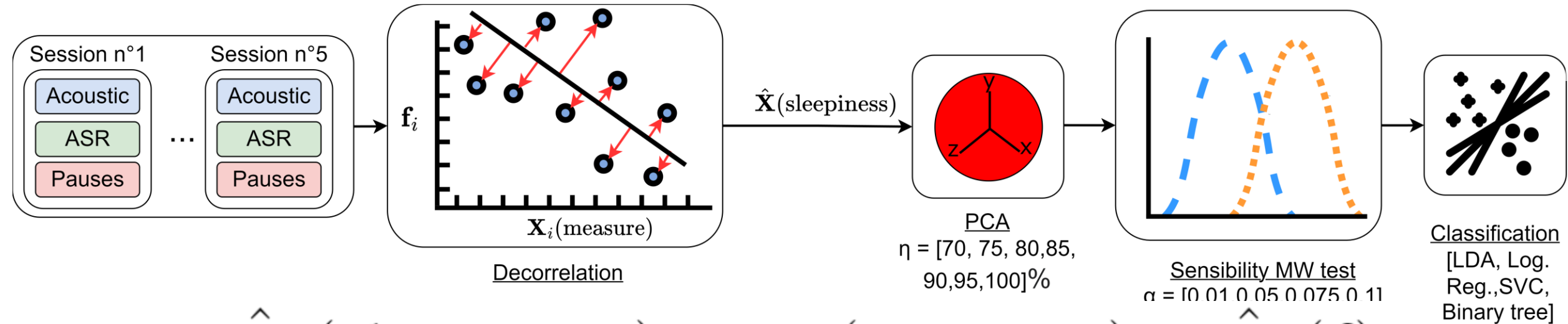
de ma poche une feuille de papier et un stylographe.



PAUSES DE LECTURE





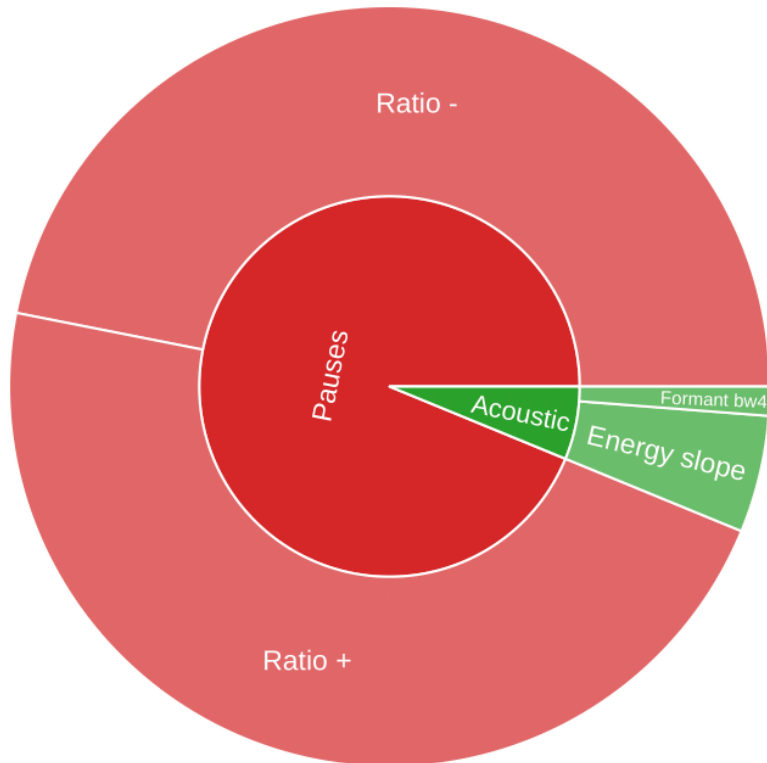


$$\hat{X}_i(\text{sleepiness}) = X_i(\text{measure}) - \hat{X}_i(\mathbf{f})$$

F0	Sexe	Age	IMC	Tour de cou	Socio-Édu.	Dépression	Anxiété
ρ (sig) before	-0,29 **	-0,76 ****	-0,34 ***	-0,57 ****	0,30 **	-0,27 **	0,14 ns
Coef.	-0,57	-75,5	-0,12	-0,13	0,19	-1,22	-
ρ (sig) after	0,06 ns	-0,12 ns	0,02 ns	-0,07 ns	0,06 ns	0,03 ns	0,15 ns

Somnolence Physiologique

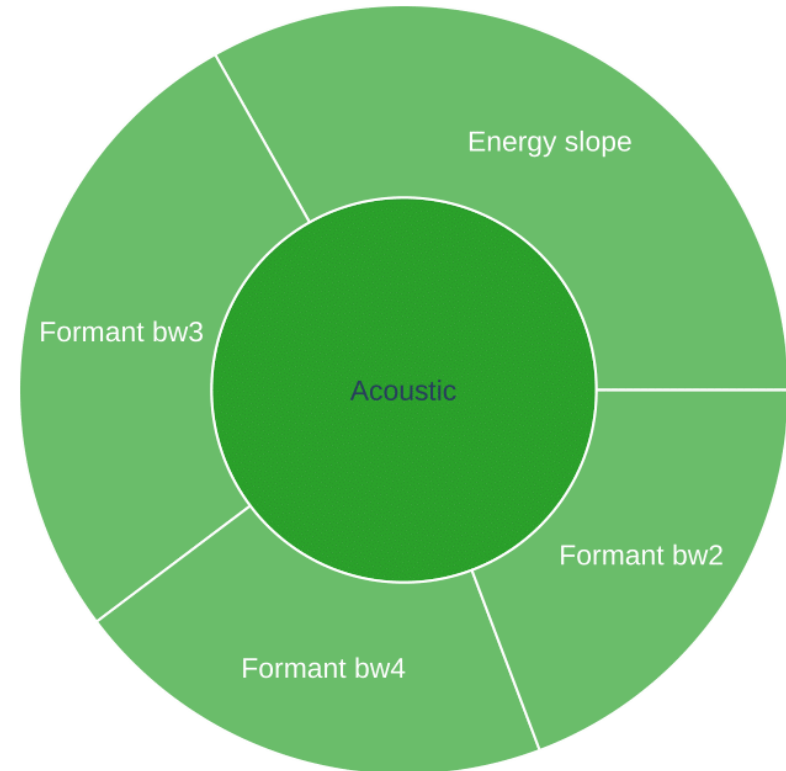
UAR = 81.5%



$$\text{UAR} = 0.5 \times \text{TP}/\text{P} + 0.5 \times \text{TN}/\text{N}$$

Somnolence Subjective

UAR = 76.6%



WHAT'S NEXT?

SOMVOICE

C. BEAUMARD

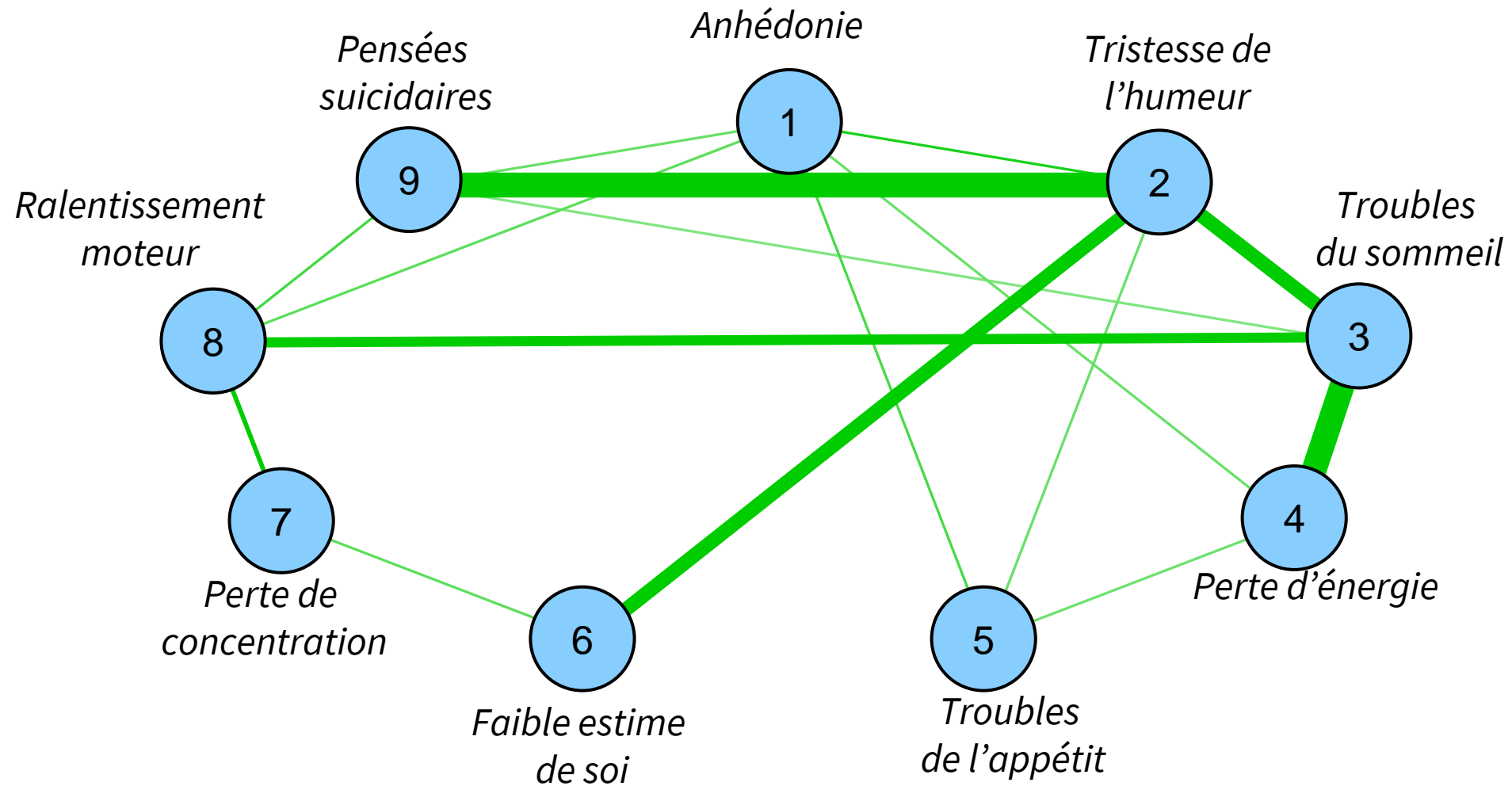
SCHWAS

MEDISPEECH

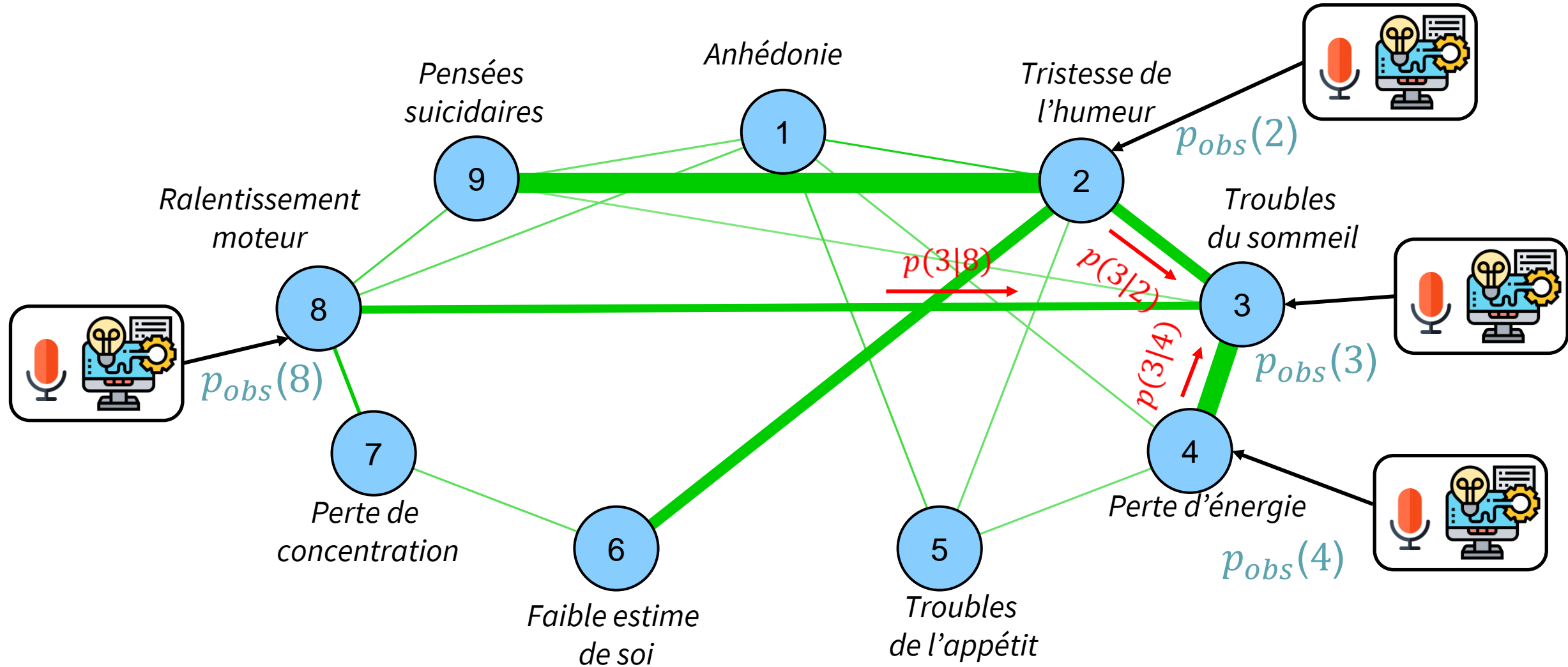
RÉSEAUX DE SYMPTÔMES



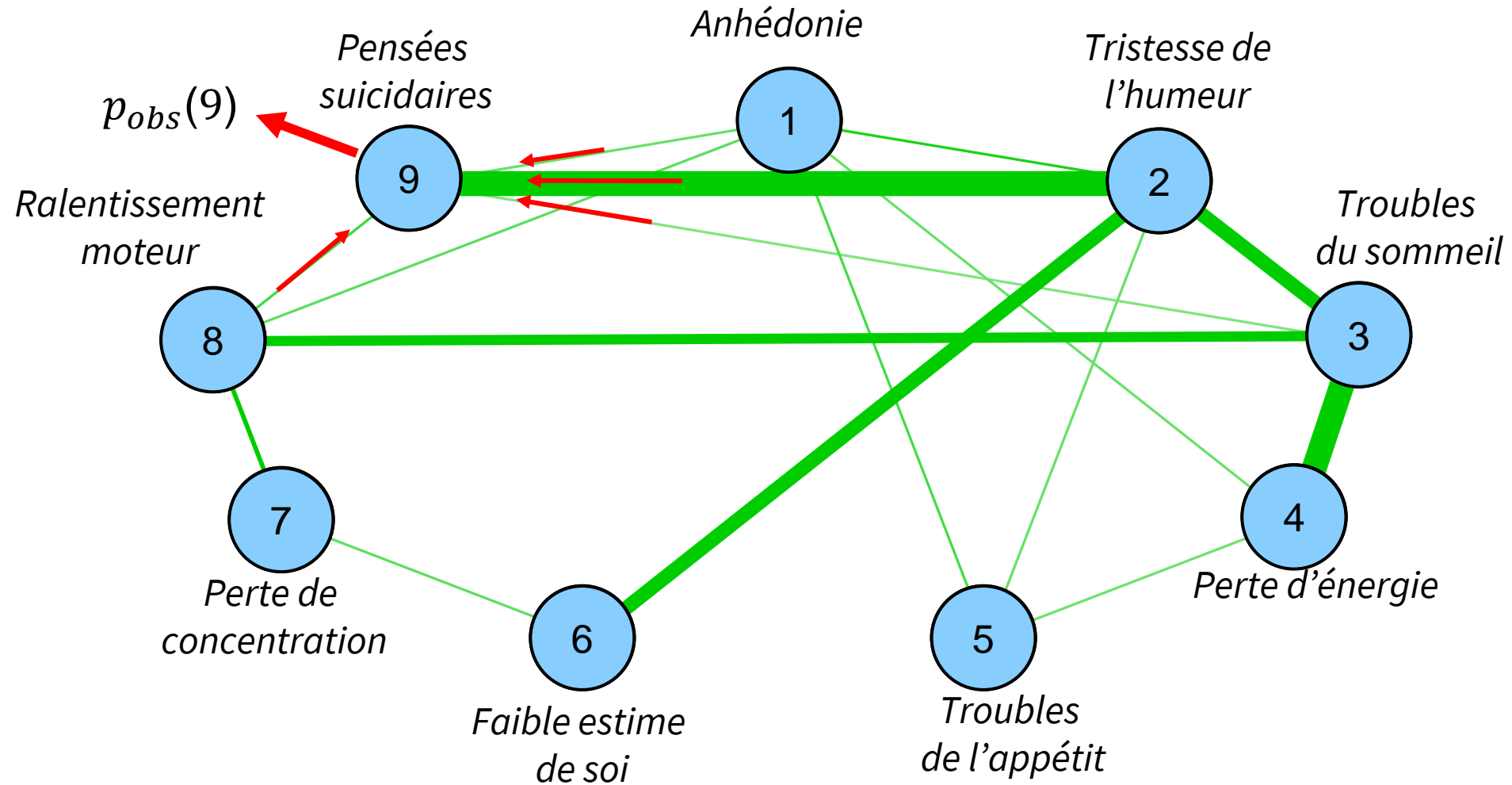
RÉSEAUX DE SYMPTÔMES



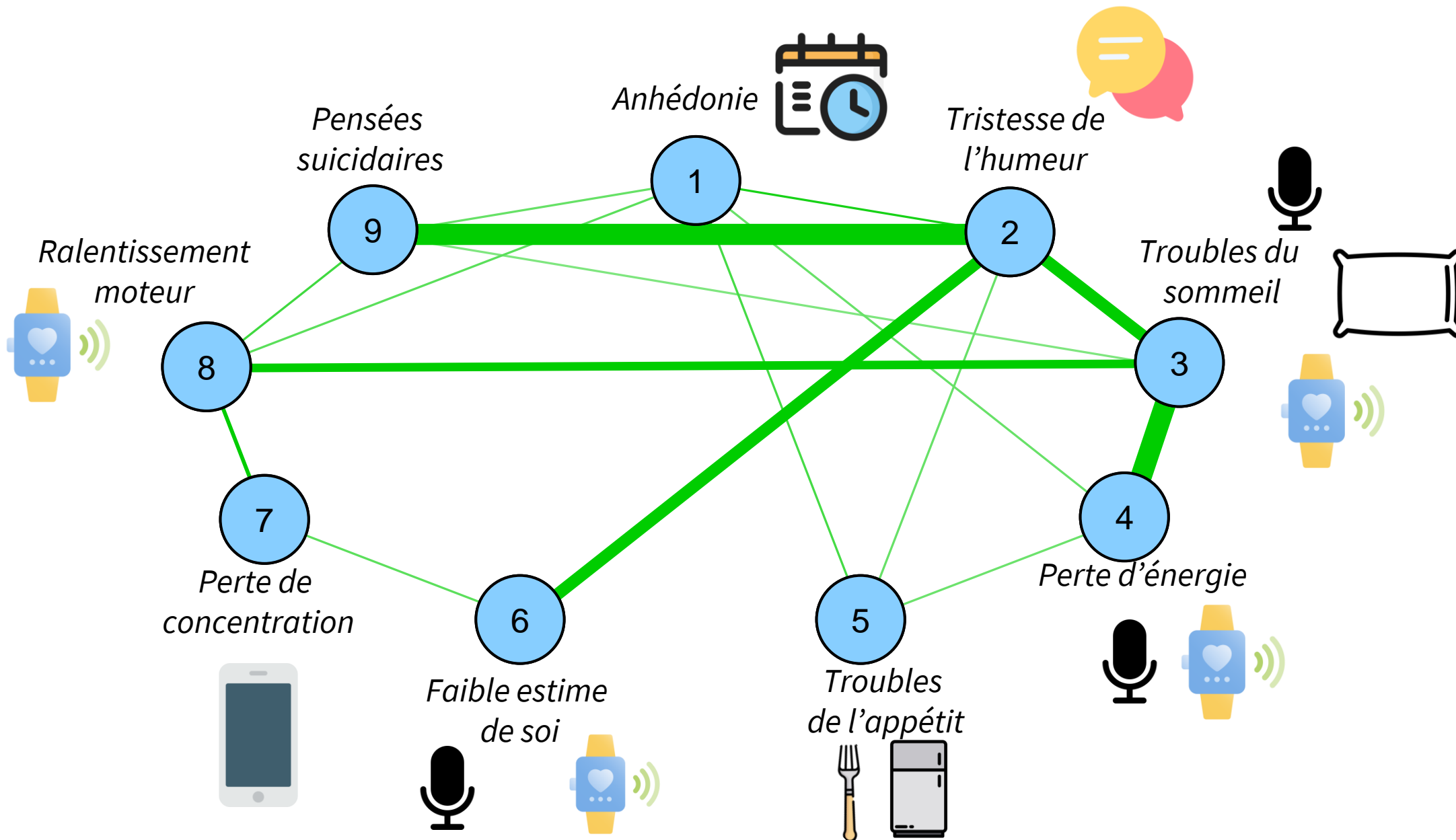
ESTIMATION DE SANTÉ GLOBALE

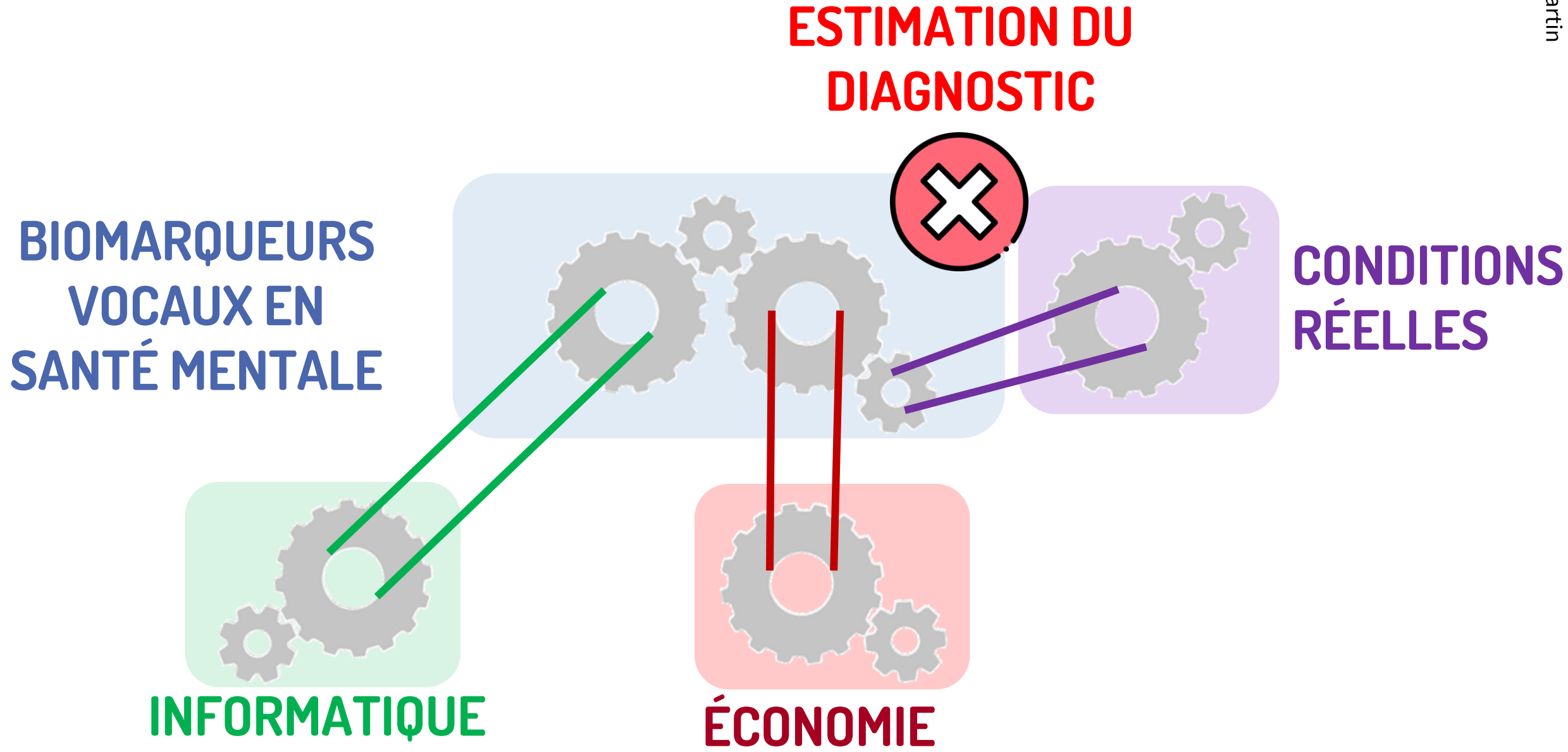


SYMPTÔMES INACCESSIBLES



MULTIMODALITÉ

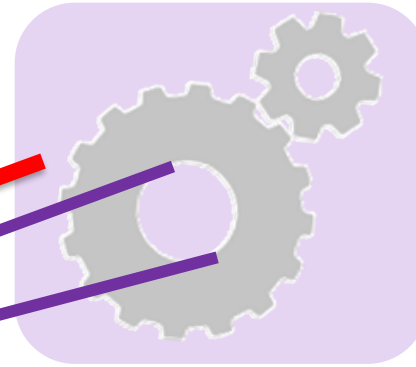
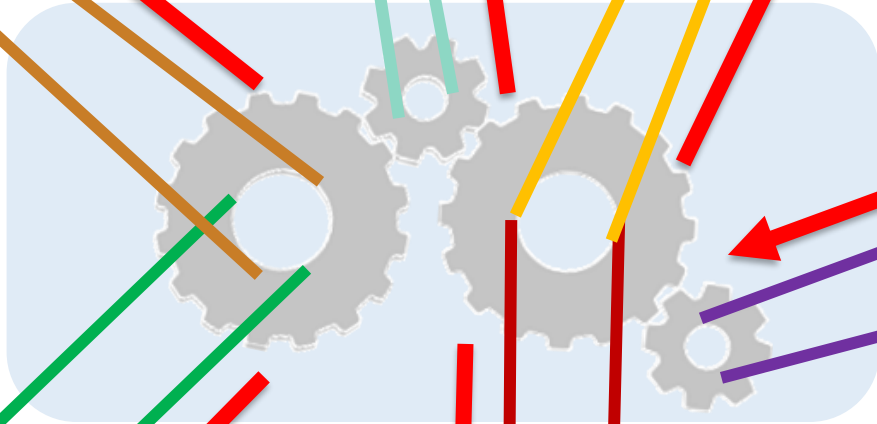
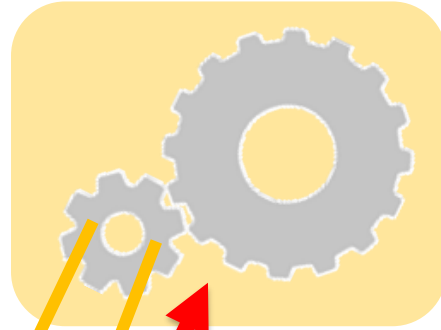
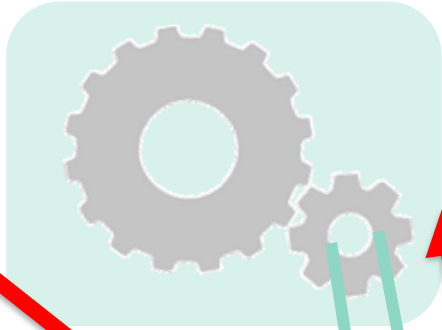
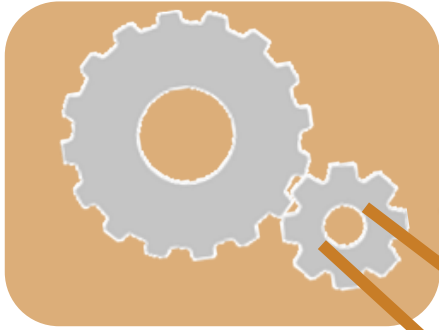




ÉPISTÉMOLOGIE

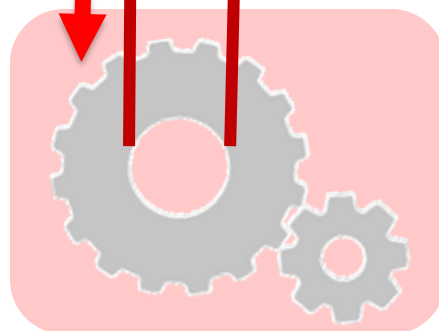
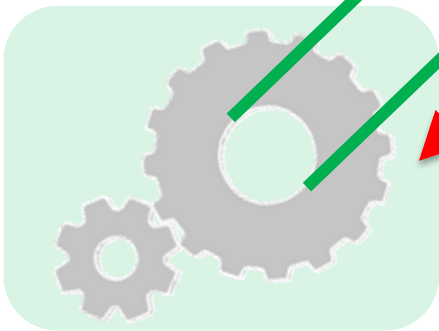
SOCIOLOGIE

ÉTHIQUE



BIOMARQUEURS
VOCAUX EN
SANTÉ MENTALE

CONDITIONS
RÉELLES



INFORMATIQUE

ÉCONOMIE

ESTIMATION DES
SYMPTÔMES

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