ICT in the Elderly

In Alzheimer's Disease & related disorders


What is A Robot ? Or, Who is me?
Just 40 years !!
Care • Research • Technology The Hague, The Netherlands 6-9 September 2011


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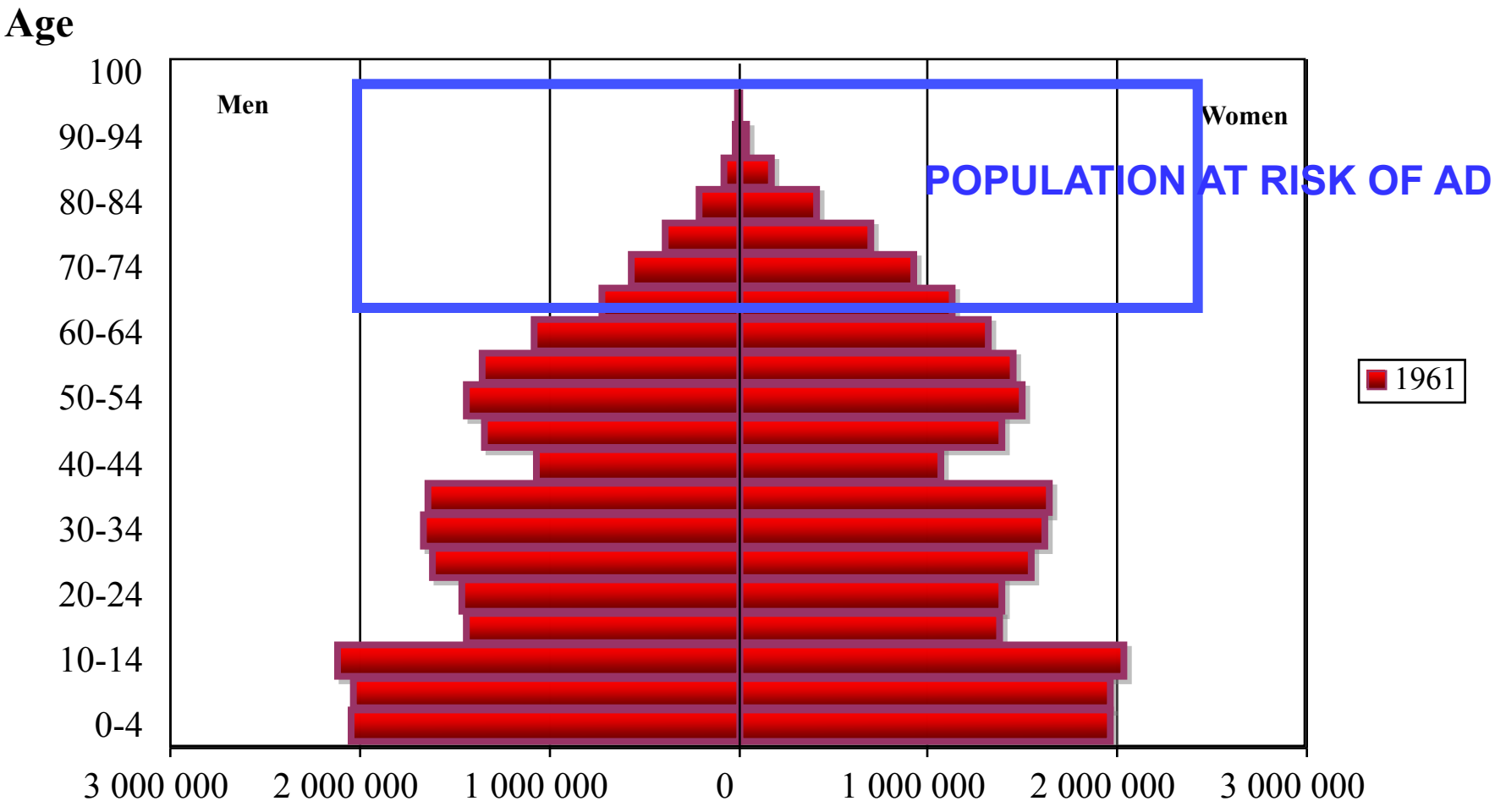
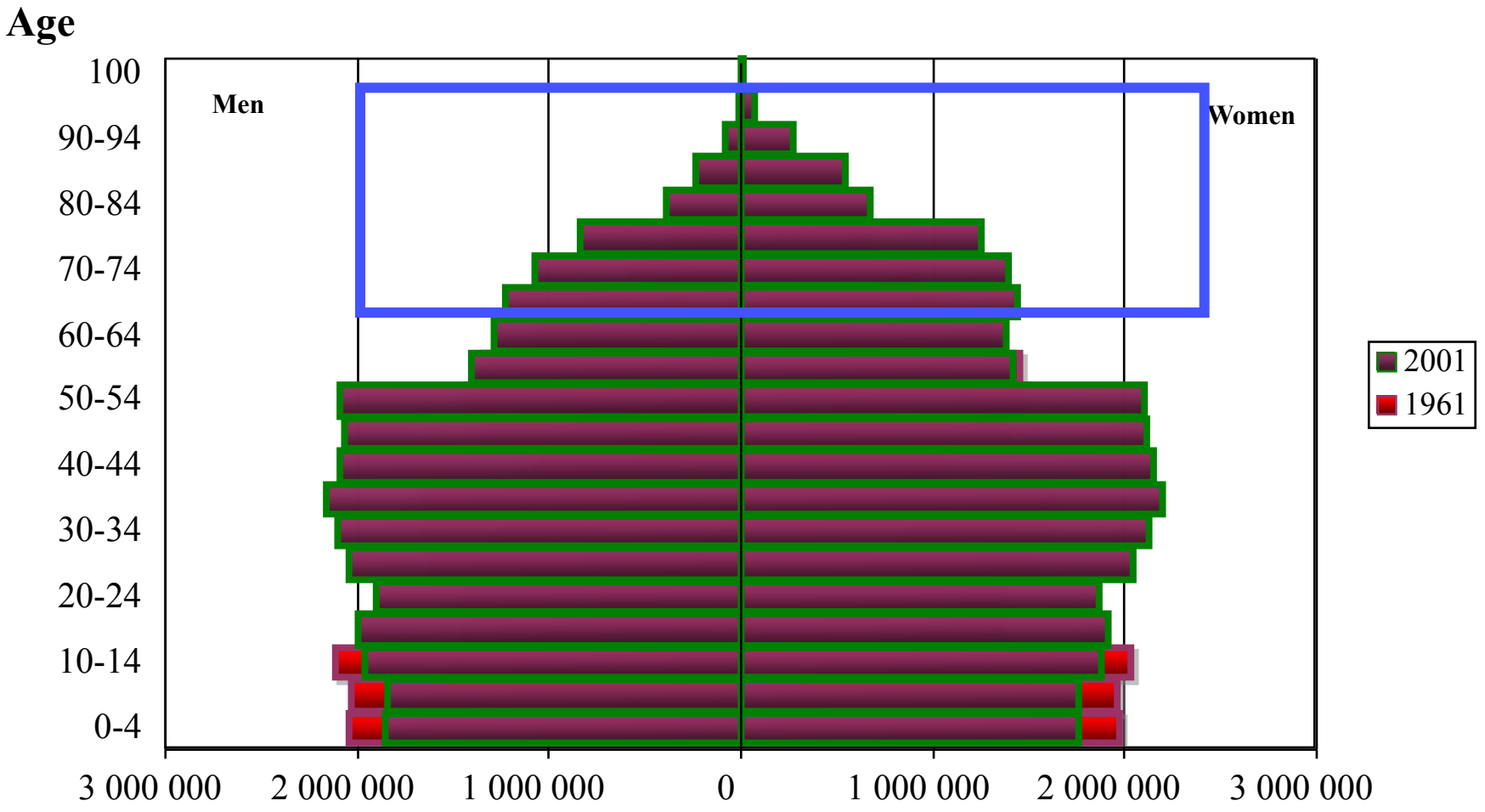
Demographics 1961



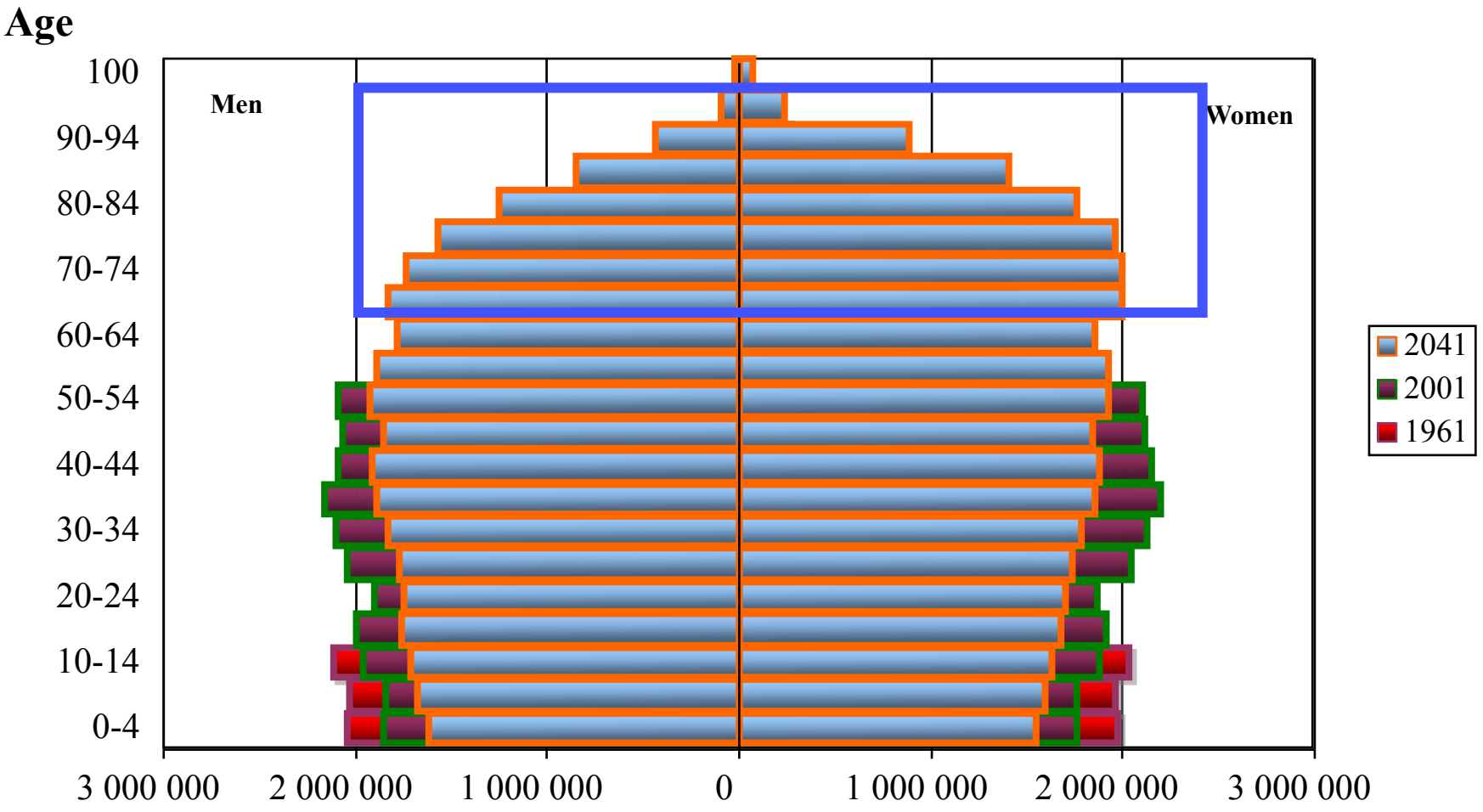
Source: according to J Gaymu INED, lINSEE.

Demographics 2001



Source: INSEE demographic projections

Demographics 2041 (projection)



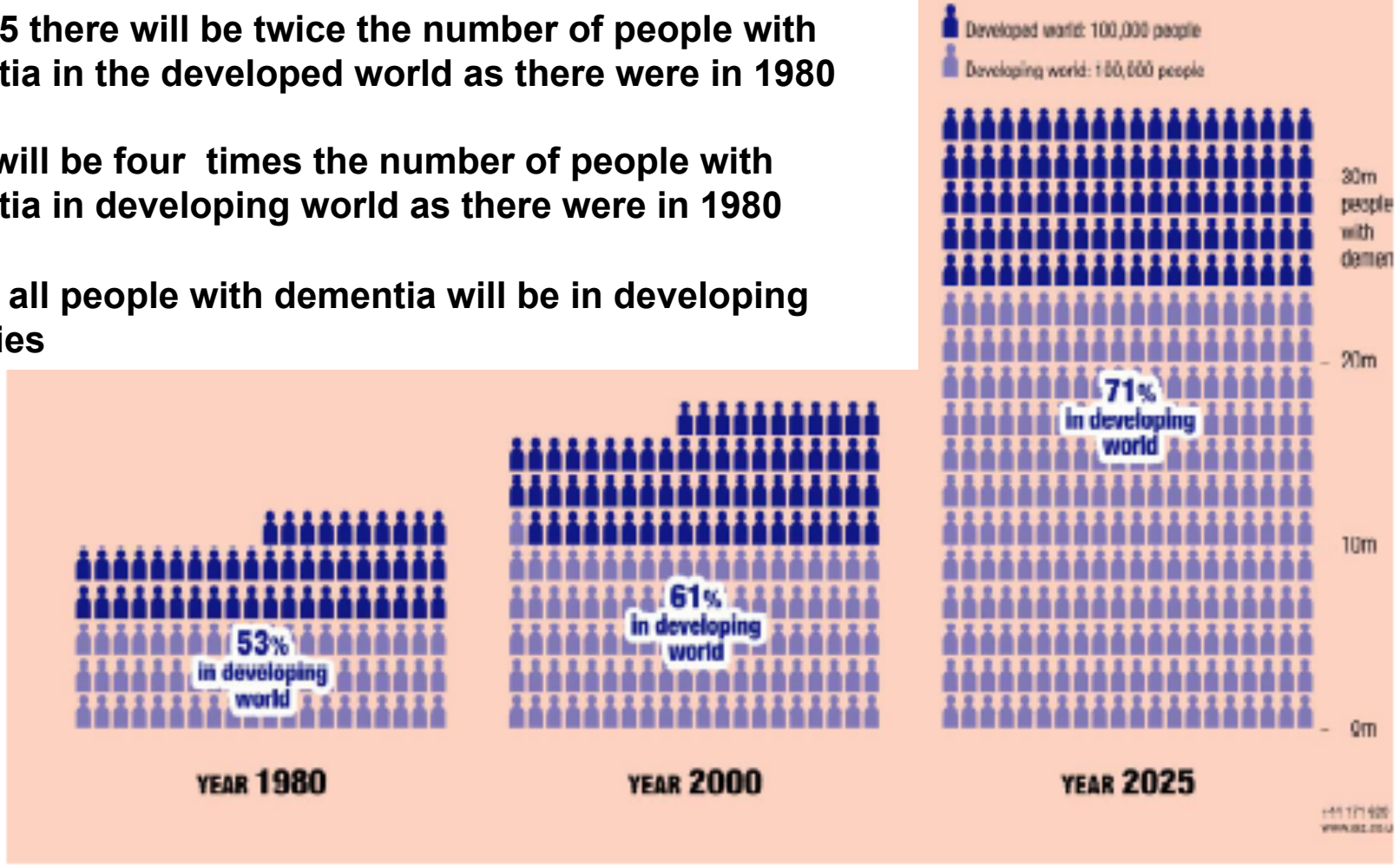
Source: INSEE demographic projections

Estimated Millions of People with Dementia: 1980 - 2025

By 2025 there will be twice the number of people with dementia in the developed world as there were in 1980

There will be four times the number of people with dementia in developing world as there were in 1980

71% of all people with dementia will be in developing countries



Potential effects on prevalence of interventions to delay onset of AD

Depending on the efficacy of a prevention program, we could expect to delay the mean age of diagnosis and to have a major public health impact

E.g.: intervention initiated in 1998, efficacy estimated 10 years later

Efficacy	RR	Delay	AD saved (n)	$ saved
0	1	-	-	-
5%	0,95	6 months	100 000	0,5 billion
10%	0,90	1 yrs	210 000	10 billions
25%	0,75	2 yrs	570 000	27 billions
50%	0,50	5 yrs	1 115 000	52 billions

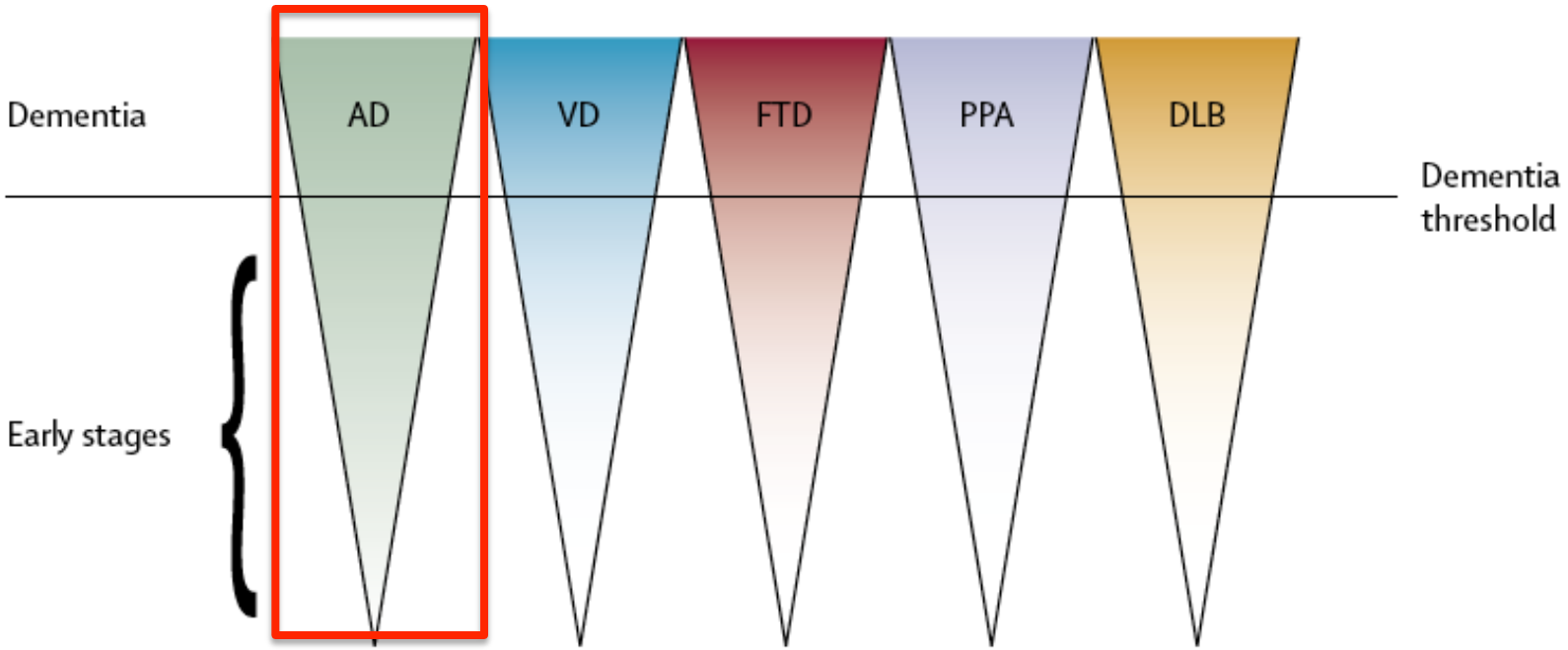
Brookmeyer 1998 2007

ASSESSMENT

PREVENTION

CARE – EXTERNAL AIDS

Starting points



Discussion

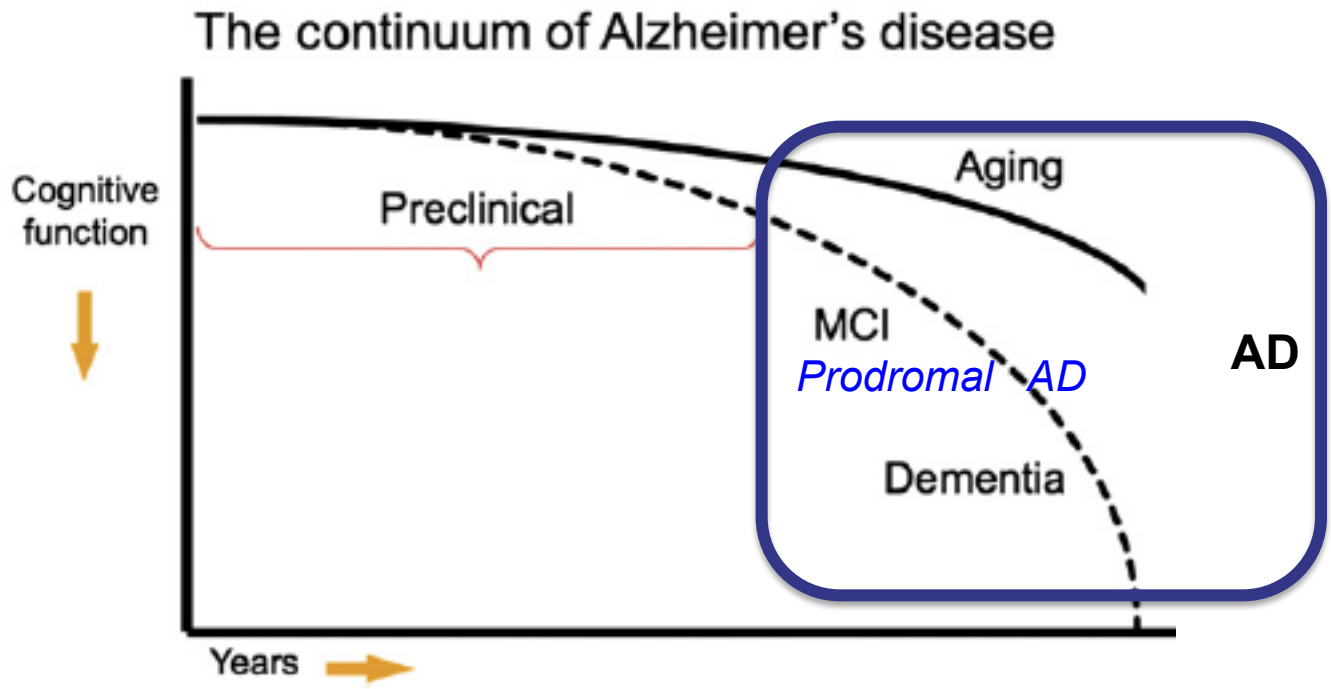
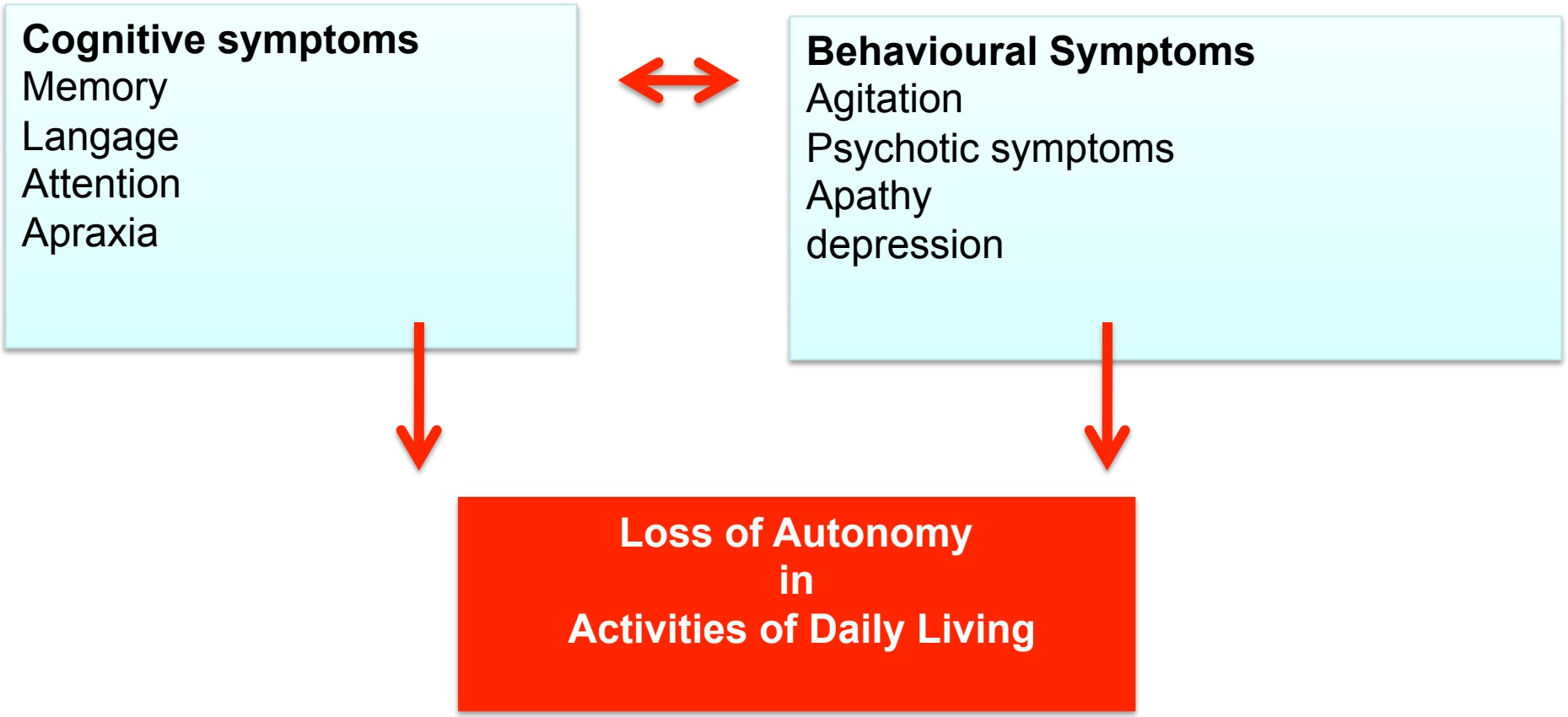
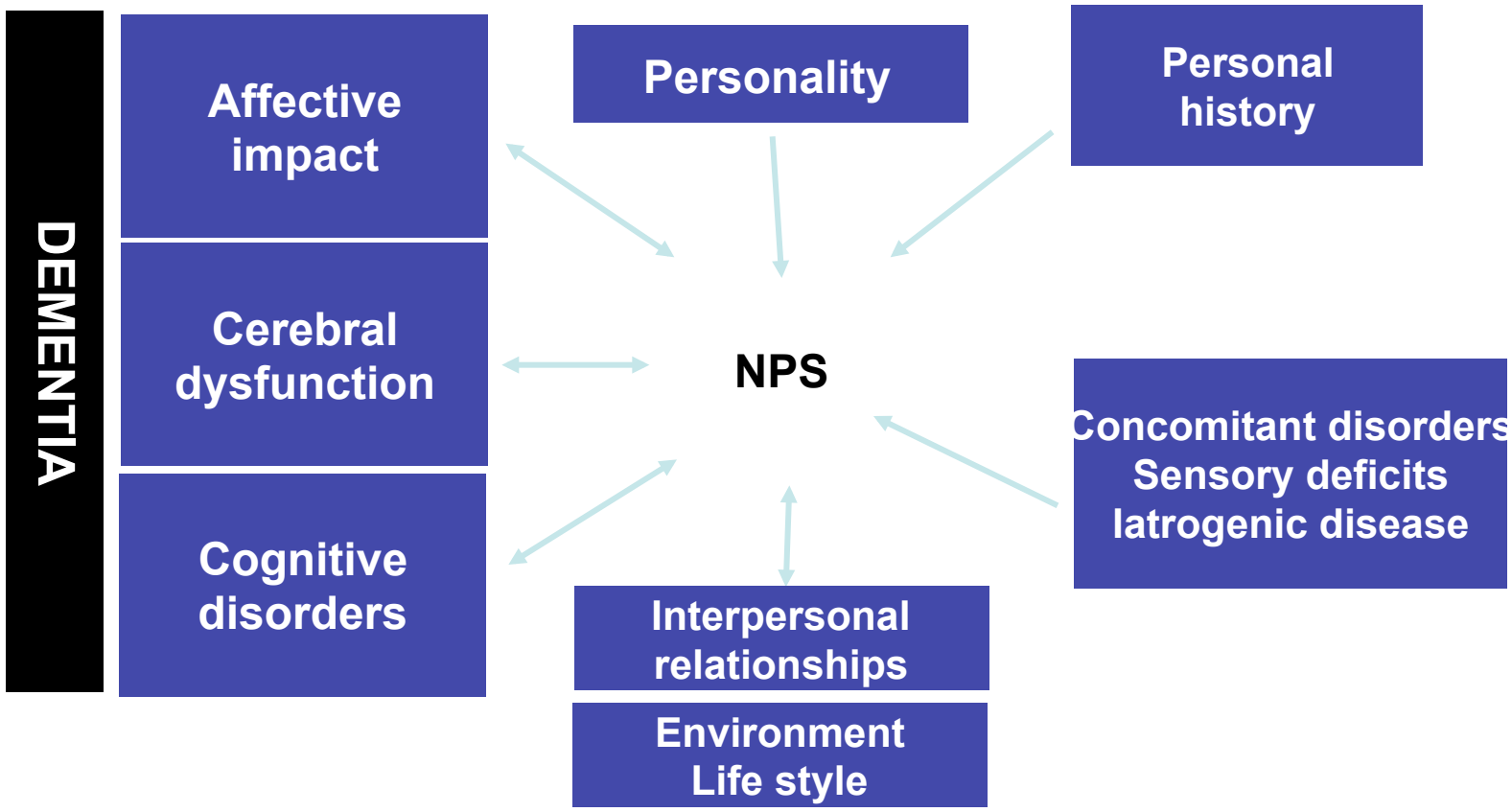


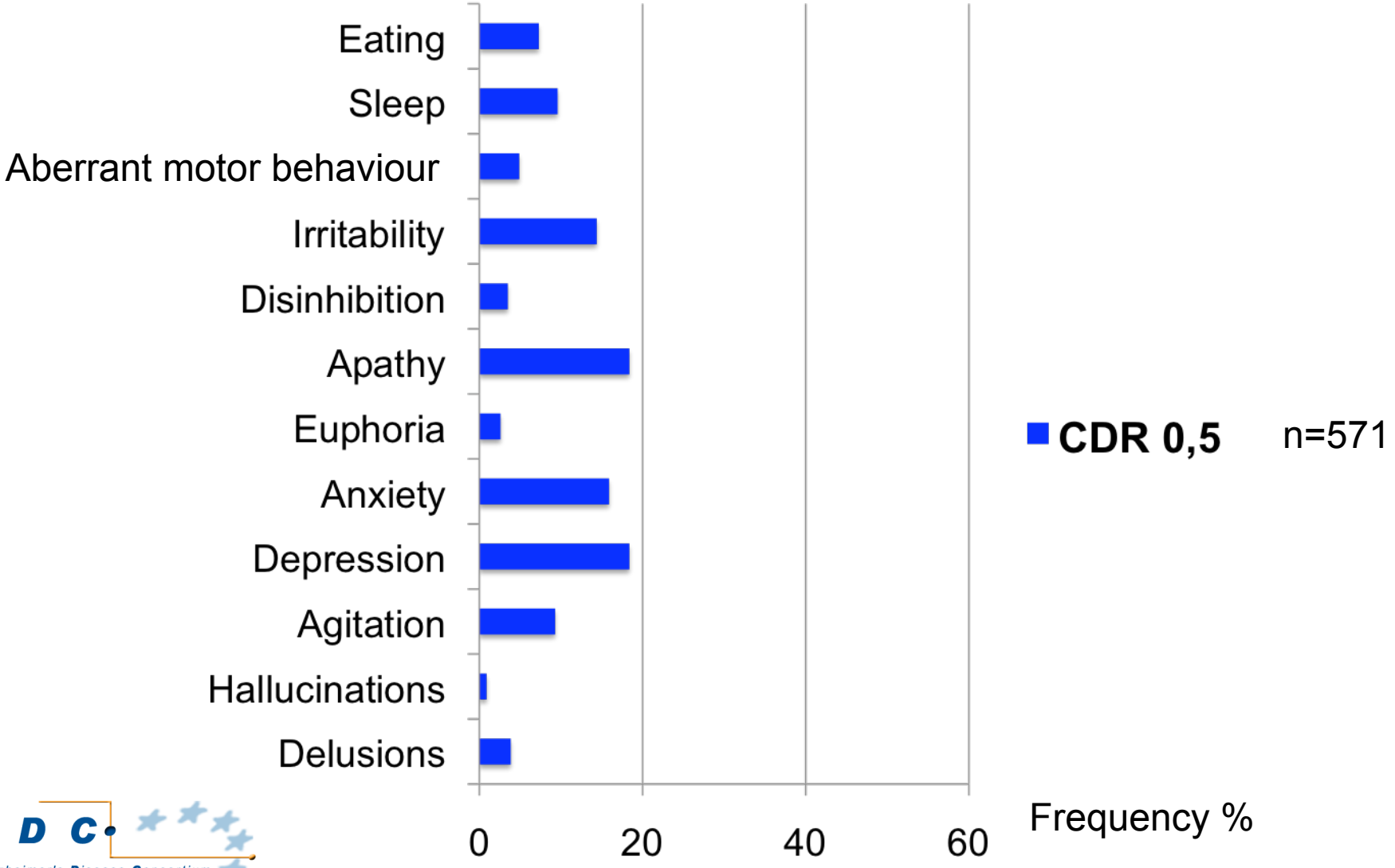
Fig. 1. Model of the clinical trajectory of Alzheimer's disease (AD). T

International Working group for New Research Criteria for the diagnosis of AD


Cognitive symptoms
Memory
Langage
Attention
Apraxia
Behavioural Symptoms
Agitation
Psychotic symptoms
Apathy
depression
Loss of Autonomy
in
Activities of Daily Living

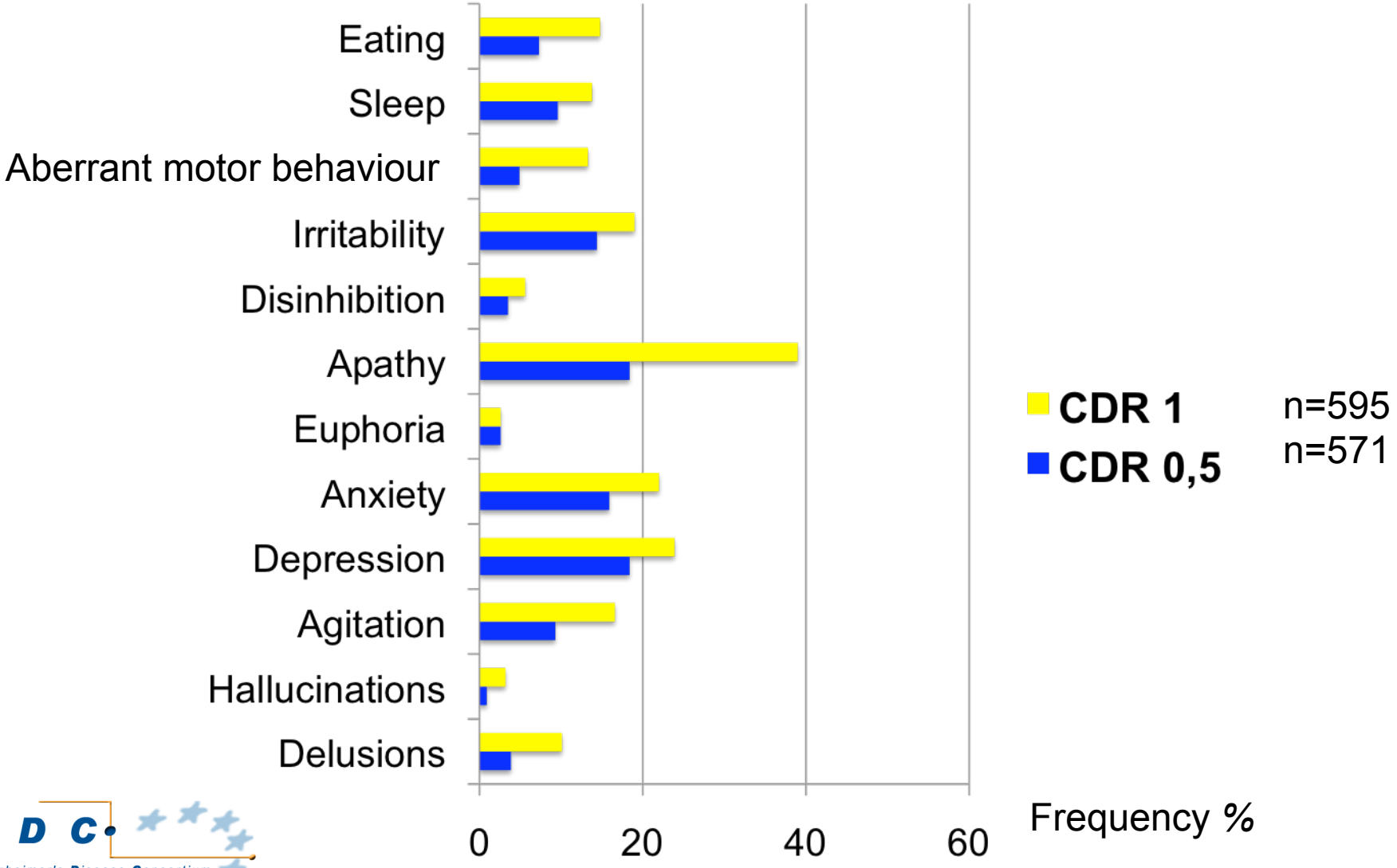

DEMENTIA
Affective impact
Cerebral dysfunction
Cognitive disorders
Personality
Personal history
NPS
Concomitant disorders
Sensory deficits
Iatrogenic disease
Interpersonal relationships
Environment
Life style

Neuropsychiatric symptoms become more frequent with the disease progression



EADC
European Alzheimer's Disease Consortium

Neuropsychiatric symptoms become more frequent with the disease progression



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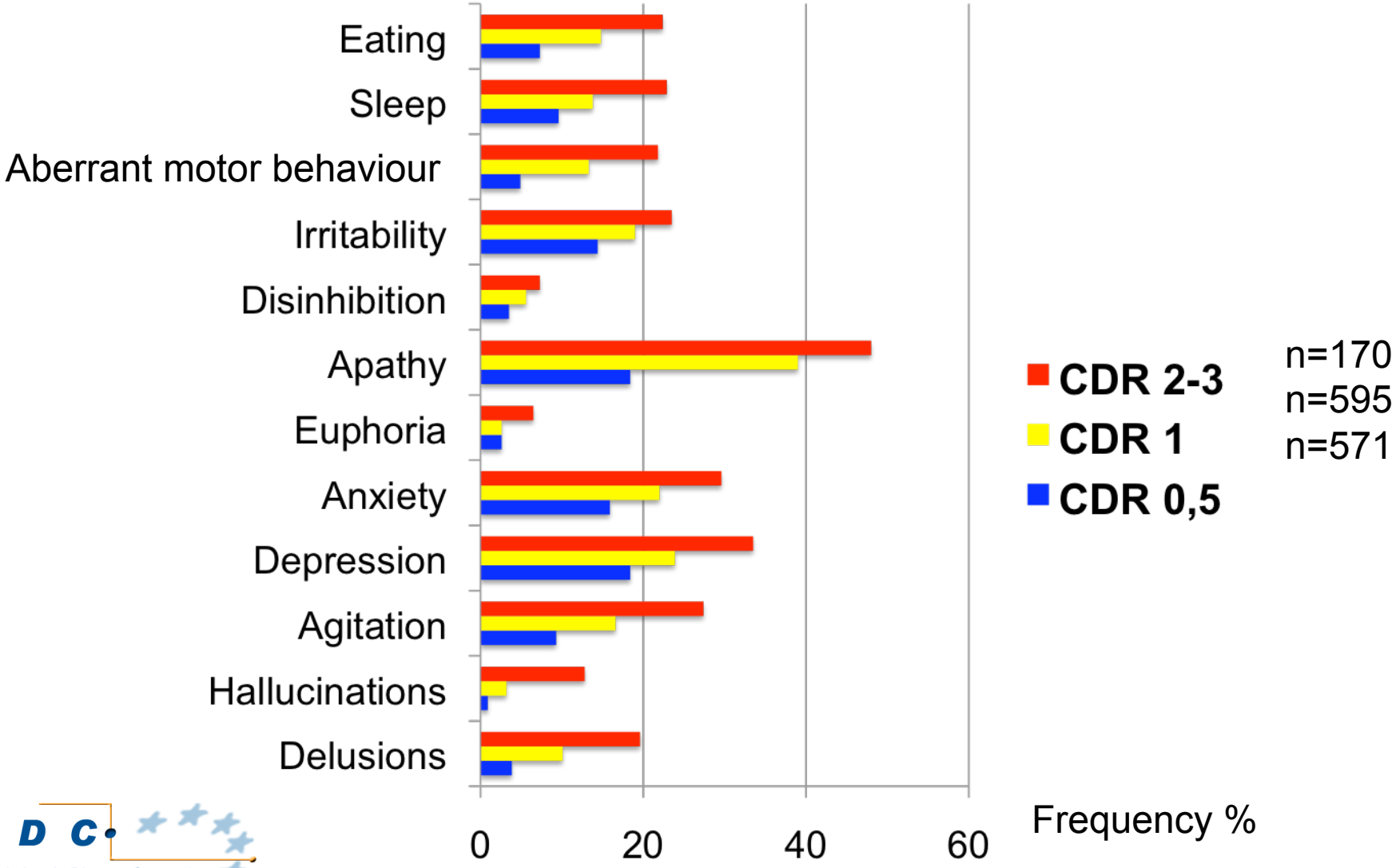
Neuropsychiatric symptoms become more frequent with the disease progression



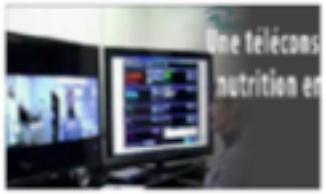

GEN. 1
GEN. 3
VOLTS
KILOAMP
AMPERES
FIELD AMP
MAIN ENGINE NO.4
MAIN ENGINE NO.3
PORT MOTOR SPEED
NO. 1 GEN. VOLTAGE
NO. 2 GEN. VOLTAGE
NO. 3 GEN. VOLTAGE
DECREASE
INCREASE
MOT. VM
PROPULSION CONTROL 3W39AI
MADE FOR
BUREAU OF SHIPS
BY
GENERAL ELECTRIC COMPANY
SERIAL NO. 793007
1940
BACK RPM
1/3 65
2/3 130
FULL 100-100
EMERGENCY
HANDLE IN VERTICAL POSITION
INDIVIDUAL RHEOSTAT OPERATION

PAD

La Personne

Consultation de Prévention Dépendance

Auto Evaluation — **Bilan assisté à distance** — **Bilan Face à face**



Orientation: Prévenir, mettre en place des stratégies d'adaptation

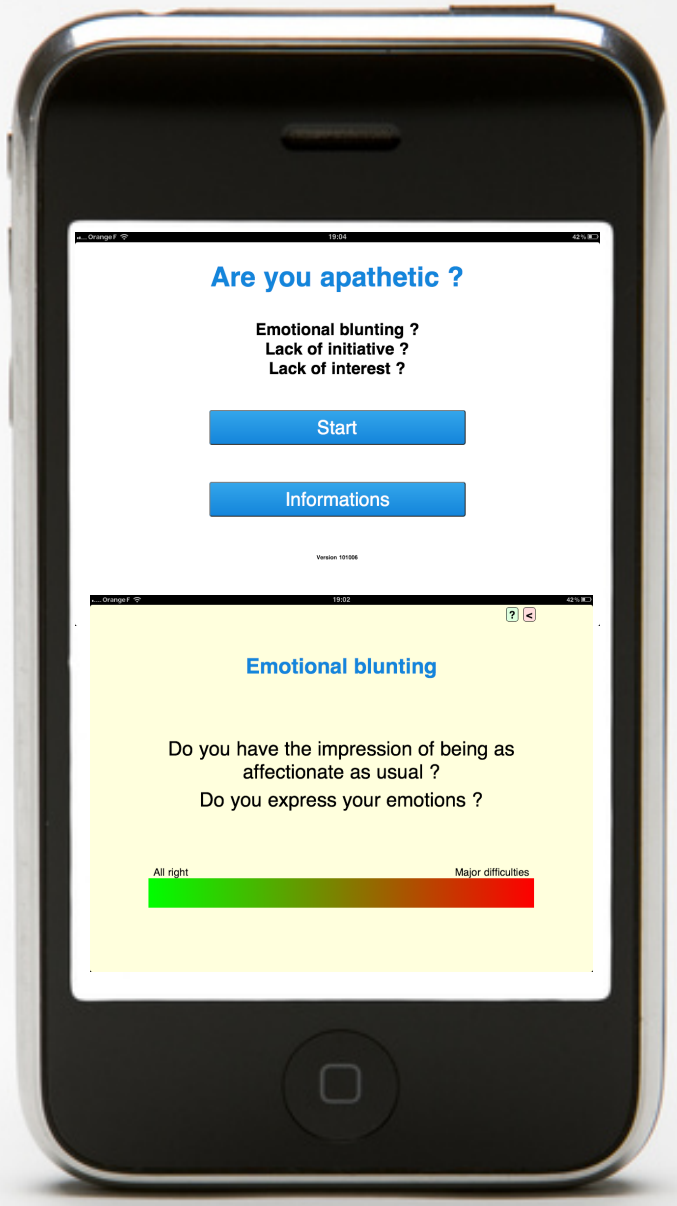
Diagnostiquer les points forts et les points faibles avant que surviennent les limitations.

Motiver c'est à dire de pousser la personne à agir pour trouver avec elle des solutions

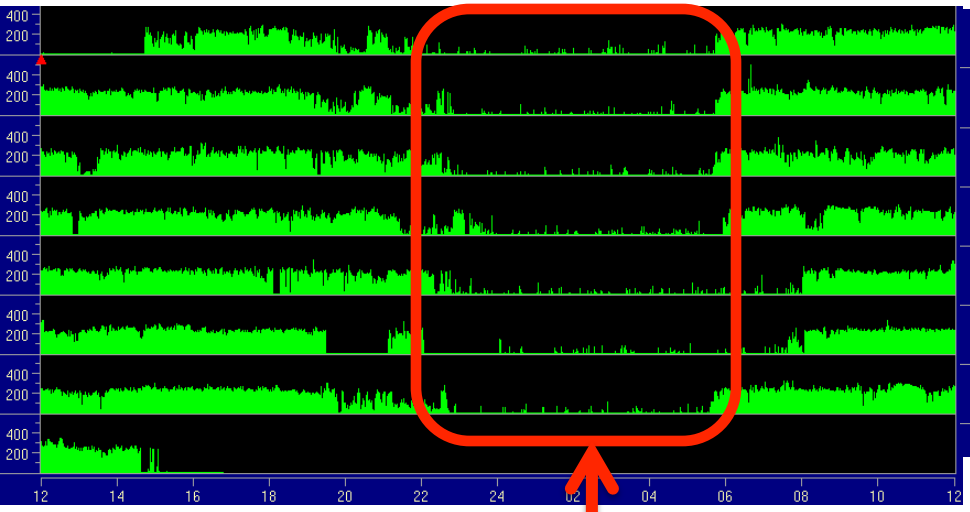
Reconnaître les produits et les services permettant de « simplifier » la vie des personnes âgées

INFORMATION & COMMUNICATION TECHNOLOGIES

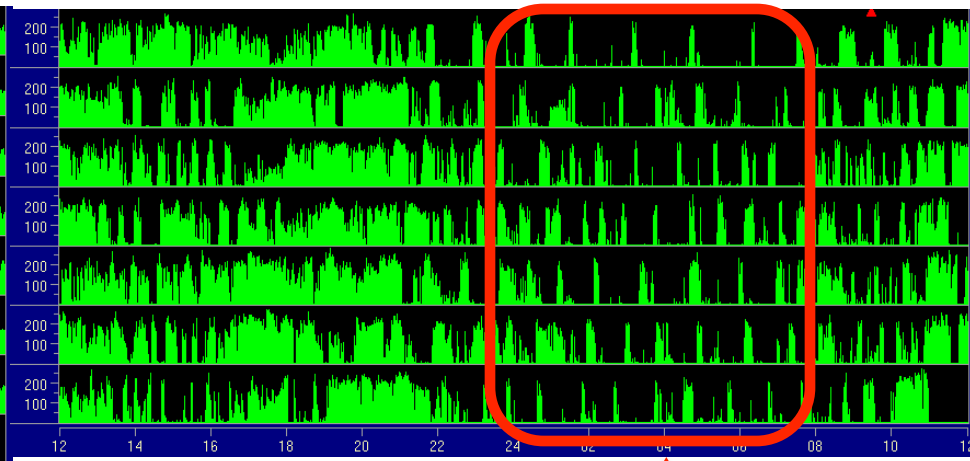
Initiative	***lack of initiative***
Interest	***lack of interest***
Emotion	***Emotional blunting***



INFORMATION & COMMUNICATION TECHNOLOGIES



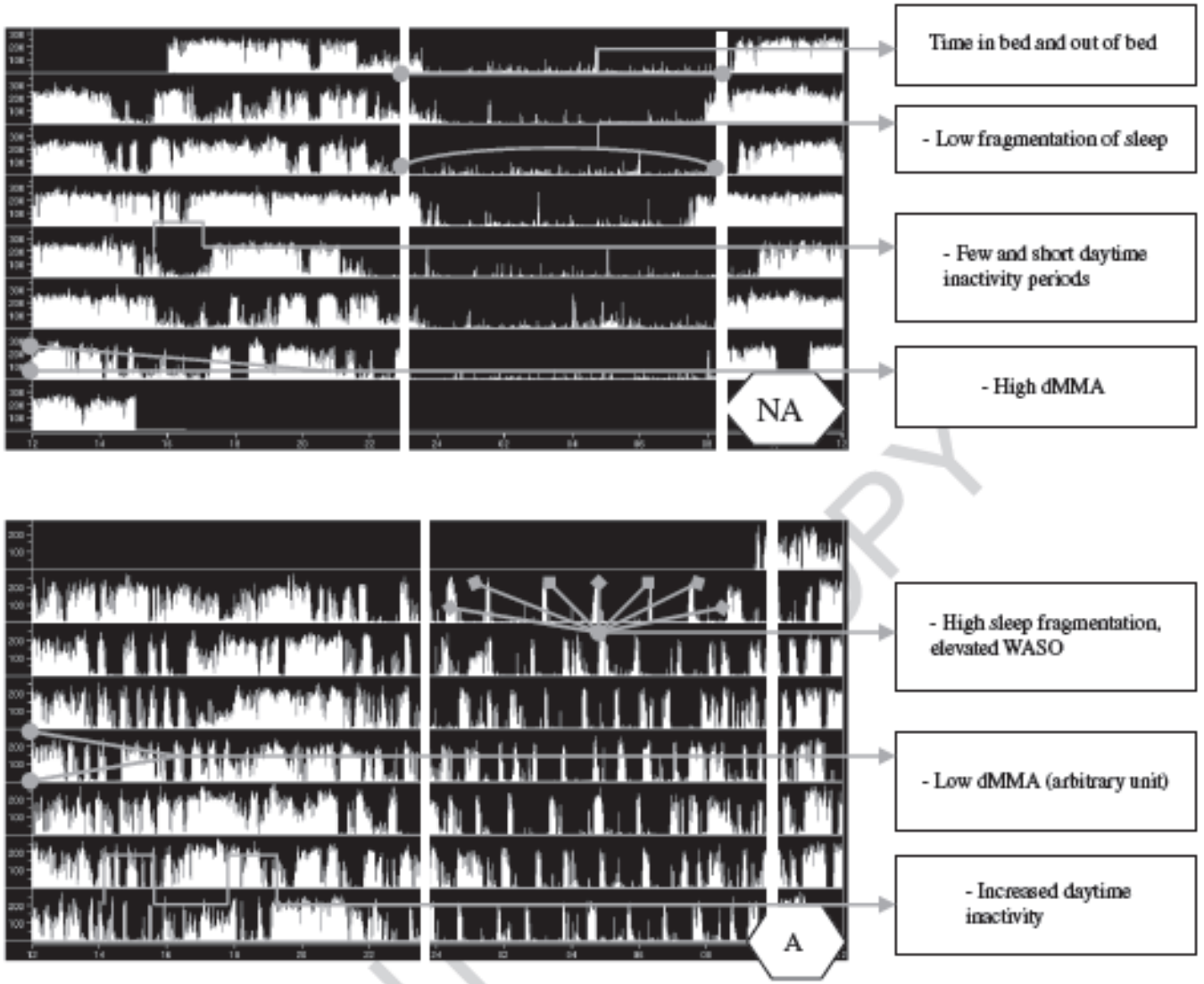
♂, 75 YO
MMSE= 21



♂, 72 YO
MMSE= 20

ACTIGRAPHY: Piezoelectric accelerometer designed to record arm movement in three dimensions

Actigraphy to assess apathy and sleep disturbance



Mulin et al., JAD 2011

Gait and Dementia

Adult Changes in Thought Study ACT Study (31)	2288 community-dwelling Aged 65 and older MMSE > 25-26 Follow-up 6 years	10-foot walk Score of performance	Dementia: HR for each 1-point increase in score: 0.79 (0.70-0.89) AD: HR for each 1-point increase in score: 0.81 (0.71-0.94)
Sydney Older Persons Study, SOP Study (32)	630 community-dwelling 75 years and older Follow-up 6 years	5-meter returned walk Highest vs lowest gait speed group	MCI with low gait speed presented higher risk of progression to dementia OR 5.6 (2.5-12.6)
Women's Health and Aging Study WHAS-I (33)	558 community-dwelling Women Aged 65 and older MMSE >24 Follow-up 3 years	4-meter walk Highest vs lowest gait speed group	Low gait speed was associated with combined (cognitive and physical) decline. OR of 0.46 (0.22-0.97) per 0.24 ms^{-1} increase
The Oregon Brain Aging Study OBA Study (34)	108 community-dwelling 65 years and older MMSE > 24 Follow-up 6 years	15 foot returned walk Highest vs lowest gait speed group	Slow gait speed predicted onset of dementia, with an increased risk of 1.14 for every second of increase in walking time
OBA Study (35)	N=85 65 years and older MMSE > 24 3-year follow-up	15 foot returned walk	18 participants developed cognitive impairment. OR 1.26 (1.01-1.6) for every 1-second increase in baseline gait speed

Gait speed and Institutionalisation or Hospitalisation

Study	Characteristics of participants	Gait Speed	Outcomes
Health Aging and Body Composition study, Health ABC study (19)	N=3047 Mean age 74.2 Well-functioning older persons 4.9 years of follow-up	6 meter walk Slow gait speed group (< 1.0 ms^{-1})	Hospitalisation RR 1.48 (1.02-2.13)
Health ABC study (20)	N=3024 Well-functioning older persons 6.9 years of follow-up	6 meter walk Slow gait speed group (< 1.0 ms^{-1})	Hospitalisation RR 1.26 (1.00-1.58)
Medicare Health maintenance organisation, HMO, and Veterans Affairs, VA (24)	N= 487 > 65 years Cognitively intact No mobility disability 1-year follow-up	4 meter walk Fast walkers >1 ms^{-1}	Risk of hospitalisation: OR 0.62 for every 0.2 ms^{-1} increase
Hong Kong Chinese cohort (27)	N=2032 Aged 70 and older Community-dwelling Well-functioning 3-year follow-up	16-feet walk Highest vs lowest gait speed group	Institutionalisation Men: OR 1.09 (0.99-1.19) Women: OR 1.03 (1.00-1.06)
Estudio de Evaluación Funcional del Anciano, EFA (43)	N= 102 Community dwelling Well functioning 2-year follow-up	10 meter walk Lowest vs highest group: <0.7 ms-1 ⇔ 1.1 ms^{-1}	Gait speed was an independent predictor of hospitalisation with a RR of 5.9 (1.9-18.5)

Gait speed and falls

Study	Characteristics of participants	Gait Speed	Outcomes
Epidemiologie de l'Osteoporose, EPIDOS (42)	7575 community-dwelling Well-functioning Women Aged 75 and older MMSE >21 Follow-up 1.9 years	6-meter walk Highest vs lowest gait speed group	Gait speed was an independent predictor of fall-related femoral neck fracture RR 1.4 (1.1-1.6) for every SD decrease
Estudio de Evaluación Funcional del Anciano, EFA (43)	N= 102 Community dwelling Well functioning 2-year follow-up	10 meter walk <0.7 ms-1⇔ 1.1 ms^{-1}	Gait speed was an independent predictor of falls with a RR of 5.4 (2-14.3)
Hong-Kong prospective study (44)	N= 1517 Community dwelling Well functioning 1-year follow-up	5 meter walk Highest vs lowest gait speed group	Gait speed was an independent predictor of falls with a RR of 0.23 (0.11-0.5)
General Sick Fund Members (45)	N= 283 Community dwelling 1-year follow-up	5 meter walk <0.5 ms-1⇔ ≥0.5 ms^{-1}	Slow gait speed (<0.5 ms^{-1}) was an independent predictor of falls with a RR of 1.41 (1.16-1.73)

Sweet Home

http://cmrr-nice.fr/sweethome/

Les plus visités | Démarrage | Dernières nou... | https://intellage... | The Whole Brain... | Apple France | Marque-pages

Sweet Home

- Home
- Partners
- Objectives
- Experimentation
- Publications
- Intranet

"Technology-assisted assessment for elderly people with and without Alzheimer Disease"

Centre Hospitalier Universitaire de Nice

Inria INVENTEURS DU MONDE NUMÉRIQUE

MICA

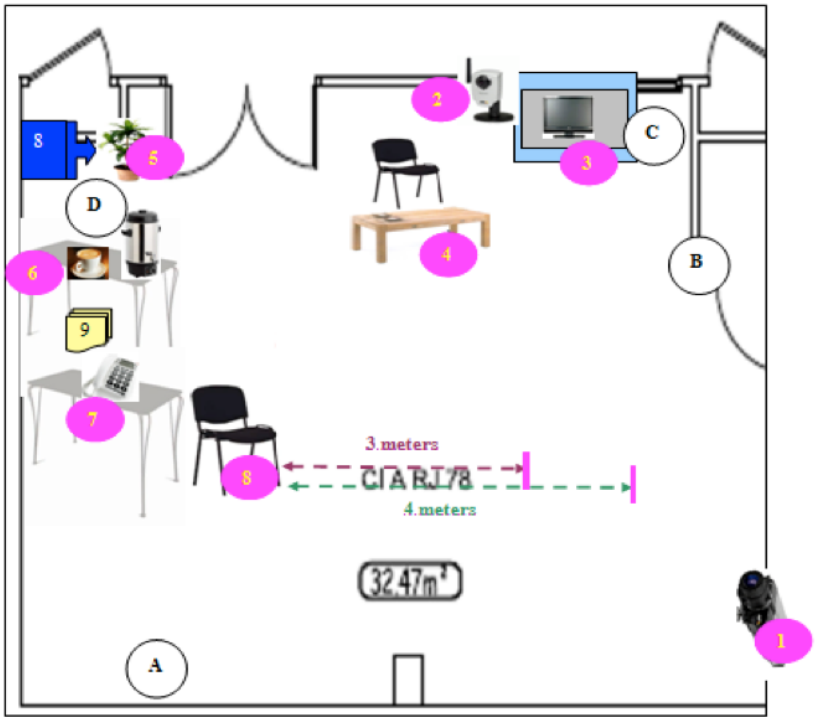
SWEET-HOME is a project founded by french research agency ANR, in the scope of the "TecSan 2009 call".

The main objective is to develop and assess a technological solution for evaluation of elder people with Alzheimer Disease. This solution is based on multi-sensor analysis, including video et audio recordings.

On this website, you will find information about the solution we develop, as well as the experimentations we are carry out in Nice.

A place for the assessment

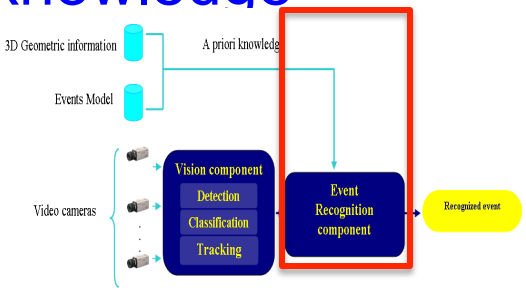
- Set up the 2 video cameras according to the activities planed during the video tape recording;
- Give global explanations of the session and have the participant sign the informed consent (Cf. information review, informed consent)
- Fix on the actigraphs (MotionPod®, Actiwatch®, Motionlogger®) and explain the participant the video tape recording script including the activities list and their achievement order;
- For the equipment calibration, the participant will be asked to stand still for 10 seconds.



1 Video camera 1
2 Video camera 2
3 TV
4 Coffee table
5 Plant
6 Coffee corner
7 Phone
8 Arm rest chair
8 Watering can
9 « ABCD » folder

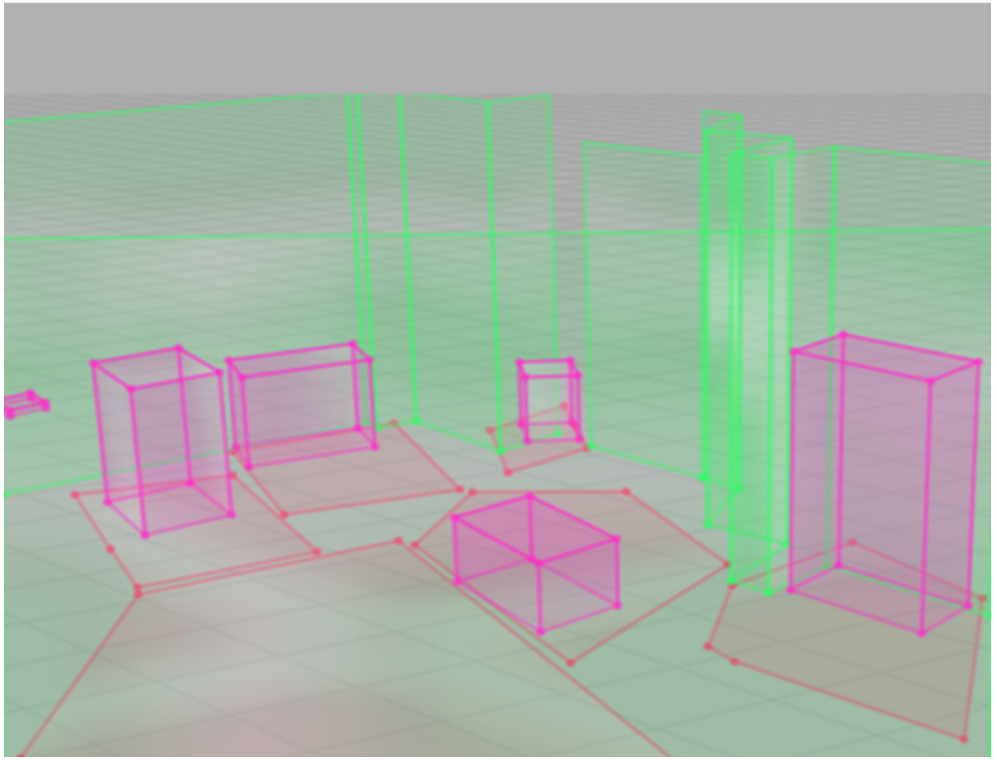
Event Recognition Component

A priori knowledge



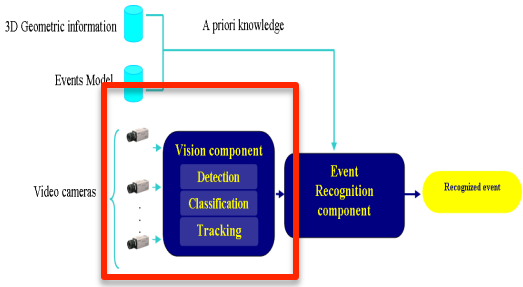
- Different types of contextual objects :
  - - Walls,
  - - 3D Equipment,
  - - 2D Zones of interest

Green: Walls, **Pink**: 3D Equipment, **Red**: 2D Zones of interest.



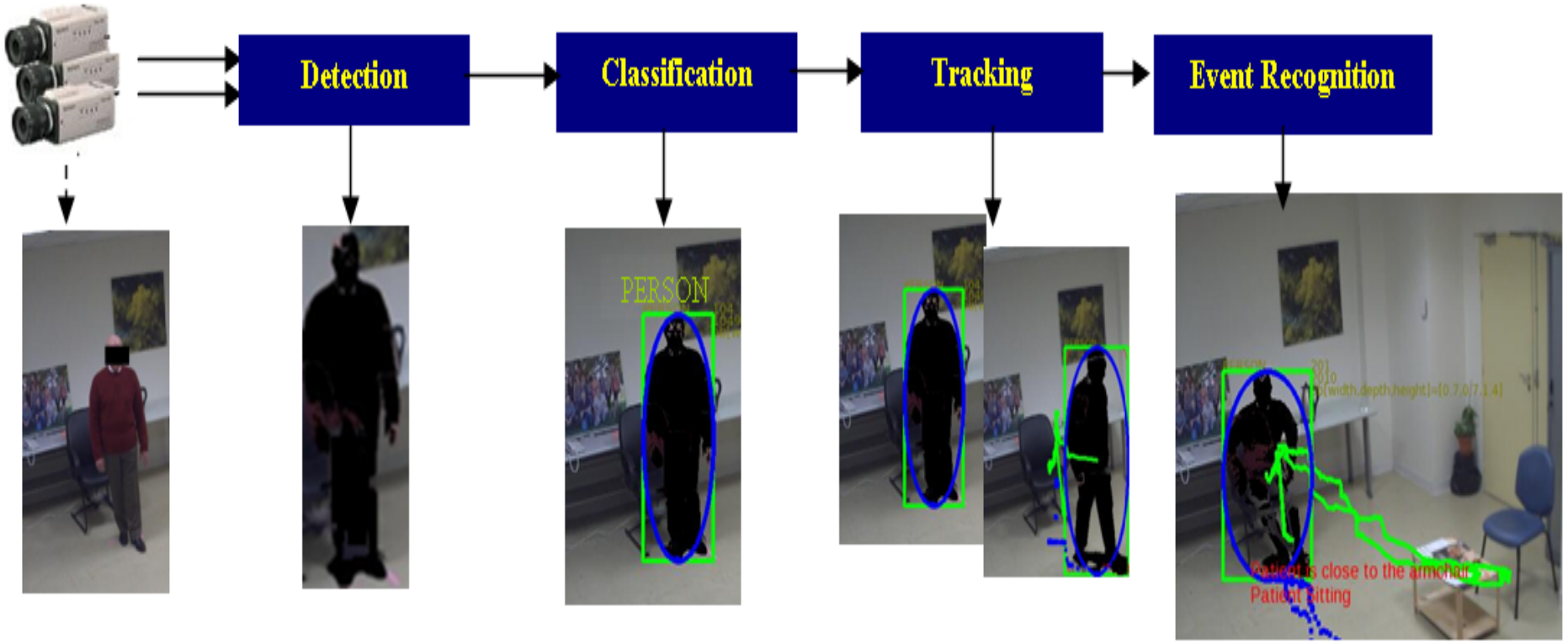
Sweet Home

Vision component



Vision component (detection, classification, tracking):

detect the person in the scene and to track his different movements over time.



Scenario

- **Total length: 1 hour**

- Step A (directed activities): 10 minutes
- Step B (semi directed activities): 20 minutes
- Step C (free activities): 30 minutes

Step A: directed activities

- (timed and systematically demonstrated to the participant)
- based on the short physical performance battery (the examiner stays in the room for scoring)

- ***Balance testing***
  - Side by side stand, one's feet together
- ***Speed of walk testing***
  - The examiner asks the participant to walk through the room, from the opposite side of the video camera for 4 meters and then to go back.

- ***Repeated chair stands testing***
  - The examiner asks the participant to make the first chair stand, from sat to stand position without using his arms. The examiner will then ask the participant to do the same action 5 times in a row.

Step B: semi directed activities

- ***1.Walk to the coffee table, sit down and read something for 2 mn***
- ***2.Walk to the desk where the kettle is and make warm some water.***
- ***3.Walk to the phone and compose this number: xxxxxx.***
- ***4.Take the watering can and water the plant.***
- ***5. Walk to the television and turn it on with the remote control.***
- ***6. Walk to the coffee table, take the playing cards and classify them by color (reds with reds, blacks with blacks).***
- ***7. Take the green "ABCD" folder on the desk with the A, B, C, D sheets in it.***
- ***8. Match the A, B, C, D sheets from the folder to one's dispersed all over the room; A with A, etc…***
- ***9. Put the "ABCD" folder back on the desk.***
- ***10. Get out of the room.***

Step C: Free activities

- There are several things in the room which allow various activities. To promote moving there are dispersed in different places:
- Magazines, news papers, book of photos
- Drinks (coffee, tea, fruit juice)
- Dominos, playing cards
- Phone
- Television
- Plant which once can water
-
- *NB: The participant is asked to answer if the phone rings during this step (the phone rings 30 minutes after the examiner gets out of the room).*
-
- The participant is verbally informed of what he can do and where things are in the room. Activities are suggested but there are no instructions or task to do.
- Before living the participant alone, he is told that an examiner is at his disposal just behind the door to answer his possible questions and that he can leave the room or interrupt this step before its end if he wants to.

Step A: directed activities

Indicators: Speed of execution, cadence, length of walk

Step B: semi directed activities

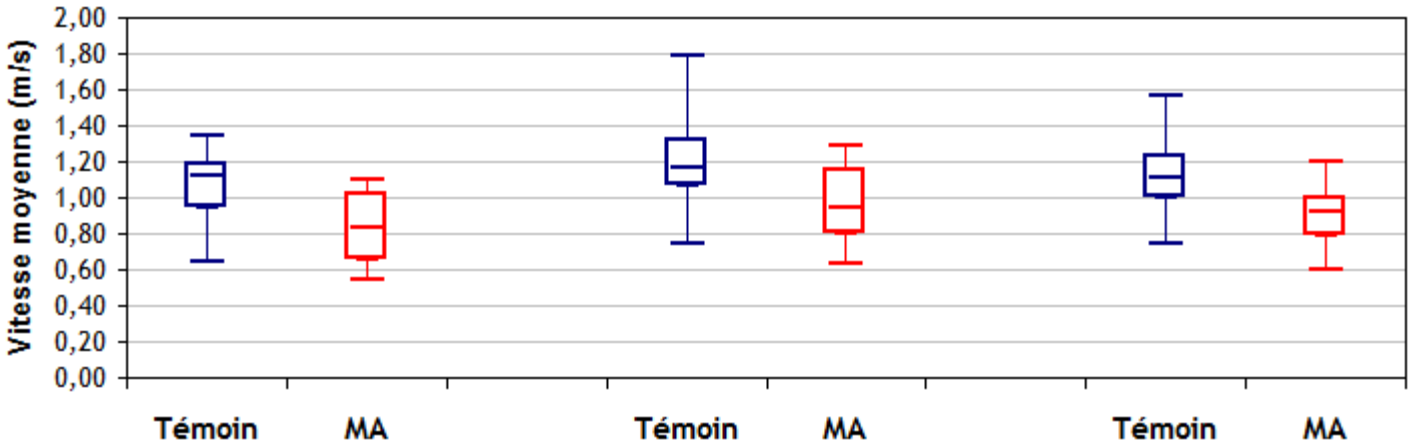
Indicators: Speed of execution (m/s), number of error (standard unity) and omission (standard unity).

Step C: Free activities

Indicators: Speed of execution (m/s), number of activities (standard unity), percentage of working time (%), number of transfer (standard unity)

Test de la vitesse de marche

Distribution empirique de la vitesse de marche (m/s)



Légende:

Boxplot: 5ème, 25ème, médiane, 75ème et 95ème percentile sont représentés

Variable intérêt *Test Mann-Whitney*	**Vitesse moyenne aller**	**Vitesse moyenne retour**	**Moyenne vitesse aller-retour**
p-value	0.019 (*)	0.087	0.030 (*)

(*) p-value<5%

Semi directed activities

V 1 - AD

Activity	Right order	Error of order	Omission	Speed of execution (mm:ss)
1- read	✓			2:20
2- warm water	✓			0:28
3- compose phone number X			✗	
4- Plant watering			✗	
5- Turn on TV		✗		0:31
6- play card		✗		1:06
7-match A, B, C, D			✗	

V 2 - AD

Activity	Right order	Error of order	Omission	Speed of execution (mm:ss)
1- read	✓			2:18
2- warm water	✓			1:16
3- compose phone number X		✗		1:04
4- Plant watering			✗	
5- Turn on TV			✗	
6- play card		✗		0:57
7-match A, B, C, D		✗		3:36

V 3 - Control

Activity	Right order	Error of order	Omission	Speed of execution (mm:ss)
1- read	✓			1:45
2- warm water	✓			0:15
3- compose phone number X			✗	
4- Plant watering	✓			0:05
5- Turn on TV	✓			0:25
6- play card	✓			0:55
7-match A, B, C, D	✓			0:19

Development of the index of efficacy:

Parameters	**Control subjects (N=10)**	**AD ambulatory patients (N=16)**
Ratio of efficacy, mean [CI(95%)] **(*)**	0.71 [0.68, 0.74]	0.61 [0.54, 0.68]
Omission of at least one activity, N(%)	0 (0%)	2 (12.5%)
Repetition of at least one activity, N(%) **(*)**	0 (0%)	6 (37.5%)
Incorrect order, N(%)	0 (0%)	4 (25%)
At least one failure to complete one activity at the first time, N(%)	1 (10%)	7 (43.75%)

Index of autonomy:
Σ Time spent doing activities ⁄ Total time in the room
adjusted
By a coefficient k

Development of the functional impairment score

- ✓ Σ Time spent doing activities ⁄ Total time in the room
- ✓ View of video by 2 raters without clinical information
- ✓ K adjusted: impact of 4 parameters:
  - Nb omission
  - Nb repetition
  - Order
  - failures
- ✓ Expert committee to define the impact
- ✓ $S\,(k_1, k_2, k_3, k_4)\,(j) = [\Sigma] \times [\, k_1^{a1(j)} \times k_2^{a2(j)} \times k_3^{1-a3(j)} \times k_4^{a4(j)}\,]$
- ✓ 50000 combinations of parameter were drawn using a random number generator and identified comparable k1, k2, k3, K4

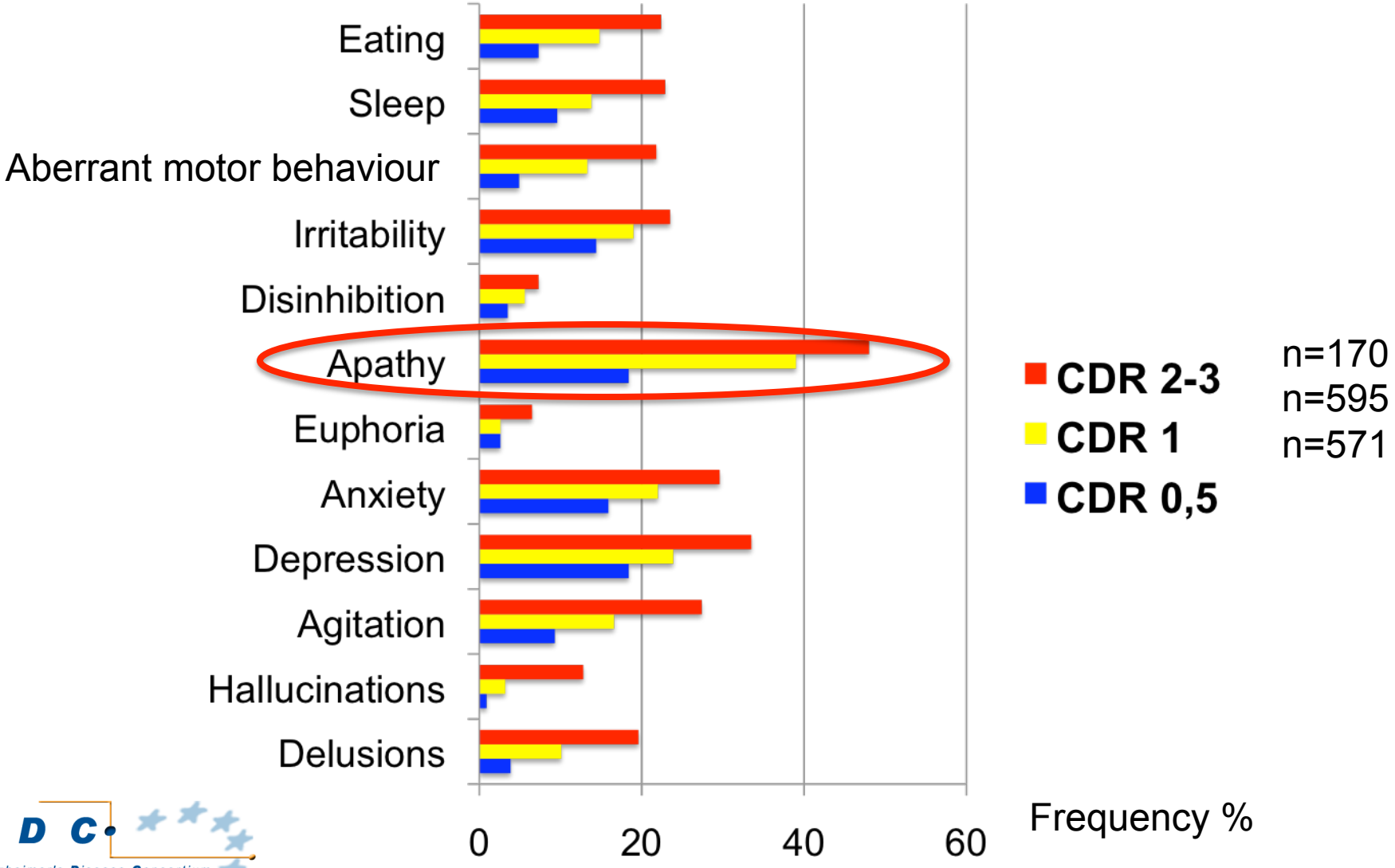
Functional impairment score:

Spearman's rho	Total population (N=26)
MMSE vs.	
- a) $Index_0$ = Ratio of efficacy	0.55 (*)
- b) $Index_1$ = Ratio of efficacy× k_1^{a1}	0.59 (*)
-c) $Index_2$ = Ratio of efficacy× k_1^{a1}× k_2^{a2}	0.70 (*)
-d) $Index_3$ = Ratio of efficacy× k_1^{a1}× k_2^{a2} × k_3^{1-a3}	0.77 (*)
- e) Functional Impairment Score = S (κ_1, κ_2, κ_3, κ_4)	0.81 (*)
IADL-E vs.	
- a) $Index_0$ = Ratio of efficacy	-0.53 (*)
- b) $Index_1$ = Ratio of efficacy× k_1^{a1}	-0.62 (*)
-c) $Index_2$ = Ratio of efficacy× k_1^{a1}× k_2^{a2}	-0.64 (*)
-d) $Index_3$ = Ratio of efficacy× k_1^{a1}× k_2^{a2} × k_3^{1-a3}	-0.65 (*)
- e) Functional Impairment Score = S (κ_1, κ_2, κ_3, κ_4)	-0.65 (*)

(*) Represent a significant correlation ($p < .05$) between the functional impairment score considered and the medical evaluation tool.

Functional impairment score according to the « correction »

Neuropsychiatric symptoms become more frequent with the disease progression



ELSEVIER European Psychiatry 24 (2009) 98–104

Original article

Proposed diagnostic criteria for apathy in Alzheimer's disease and other neuropsychiatric disorders

P. Robert [a,*], C.U. Onyike [b], A.F.G. Leentjens [c], K. Dujardin [d], P. Aalten [c], S. Starkstein [e], F.R.J. Verhey [c], J. Yessavage [f,g], J.P. Clement [h], D. Drapier [i], F. Bayle [j], M. Benoit [k], P. Boyer [l], P.M. Lorca [m], F. Thibaut [n], S. Gauthier [o], G. Grossberg [p], B. Vellas [q], J. Byrne [r]

Loss of or diminished motivation in comparison to the patient's previous level of functioning and which is not consistent with his age or culture.

These changes in motivation may be reported by the patient himself or by the observations of others.

B - Presence of at least one symptom in at least 2 of the 3 following domains for a period of at least four weeks and present most of the time

B1 – ACTION

Loss of, or diminished, goal-directed behaviour

B2 - COGNITION

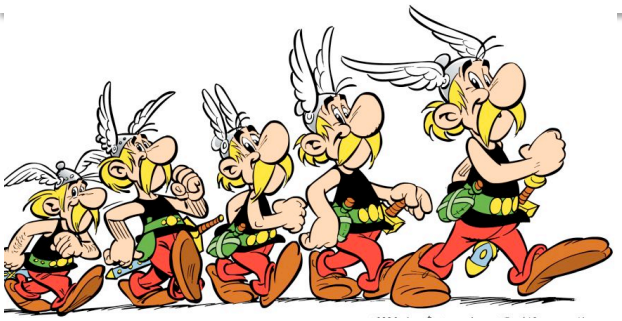
Loss of, or diminished, goal-directed cognitive activity

B3- EMOTION

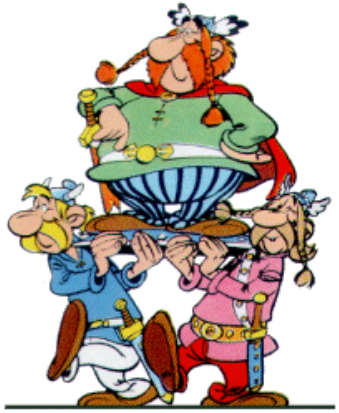
Loss of, or diminished, emotion

In each Domains, two types of symptoms:

Symptom 1: pertains to self initiated or internal …



Symptom 2 : Pertains to the patient's responsiveness to external stimuli



Apathy Diagnostic Criteria

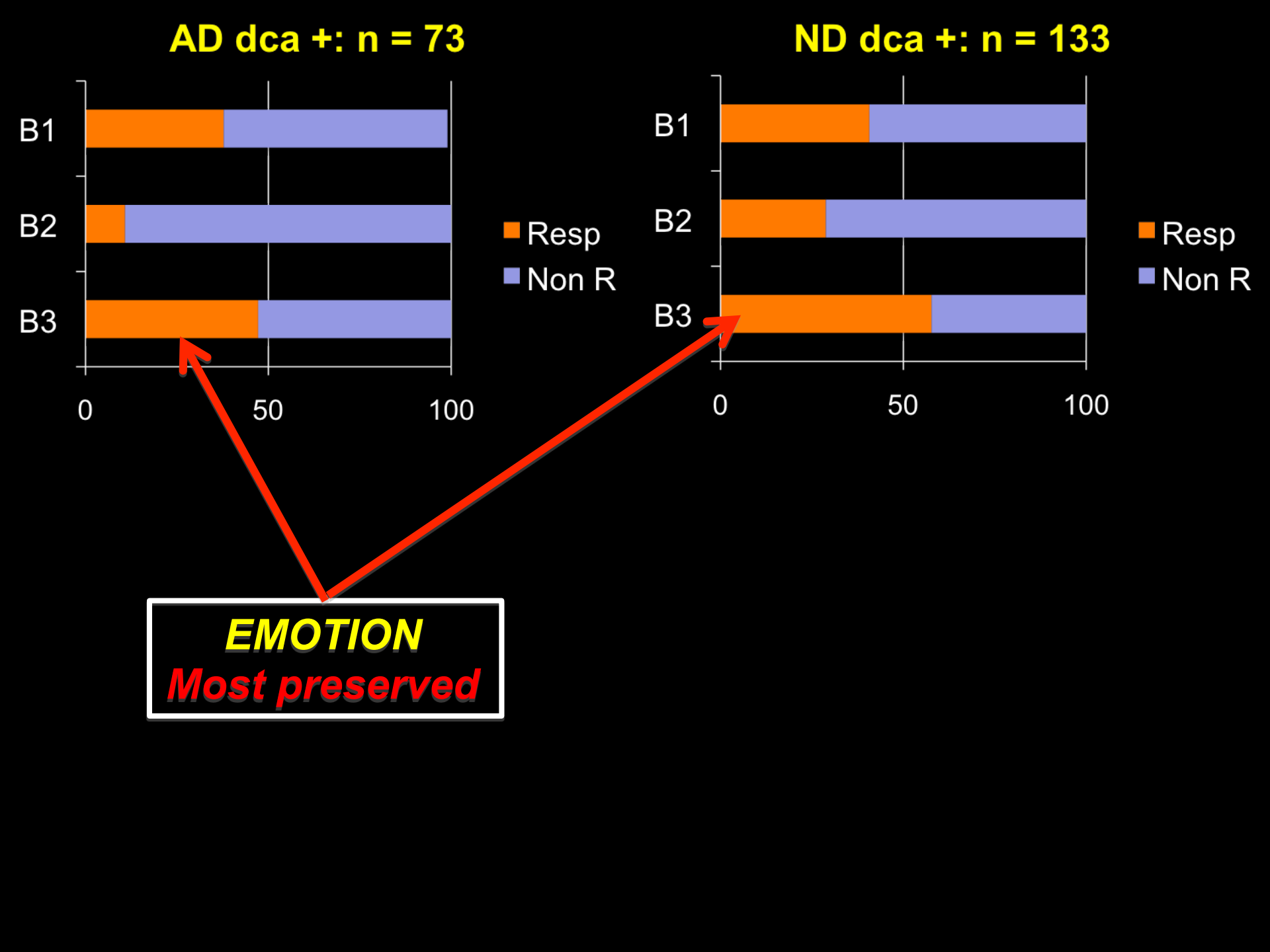
Loss of Initiative	ACTION
Loss of Interest	COGNITION
Emotional blunting	**EMOTION**

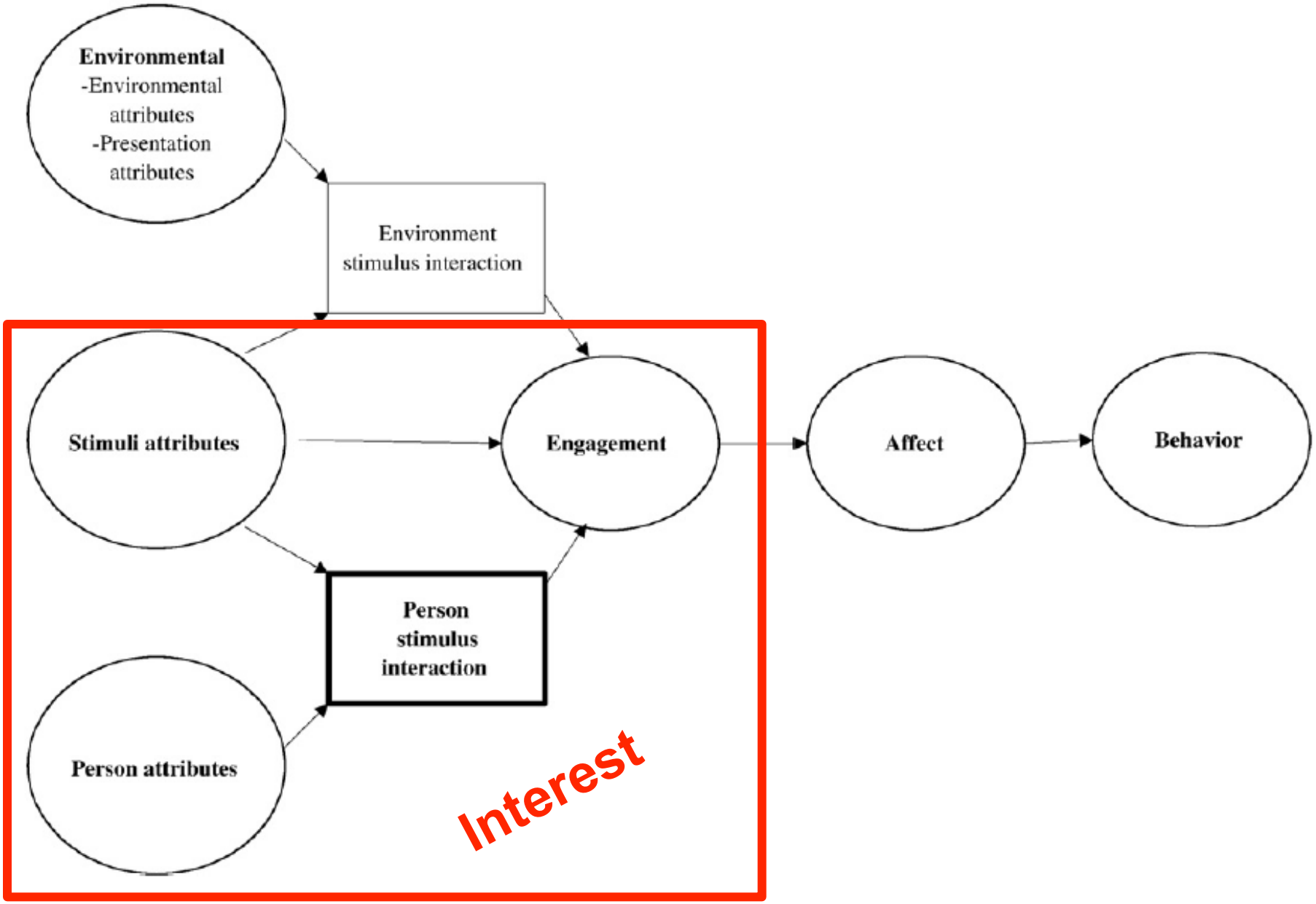
Responsiveness to external stimuli

Therapeutic target

Response

No Response


AD dca +: n = 73
B1
B2
B3
0
50
100
Resp
Non R
ND dca +: n = 133
B1
B2
B3
0
50
100
Resp
Non R
EMOTION
Most preserved


Environmental
-Environmental attributes
-Presentation attributes
Environment stimulus interaction
Stimuli attributes
Engagement
Affect
Behavior
Person stimulus interaction
Person attributes
Interest

Psychiatry Research 177 (2010) 216–222

Contents lists available at ScienceDirect

Psychiatry Research

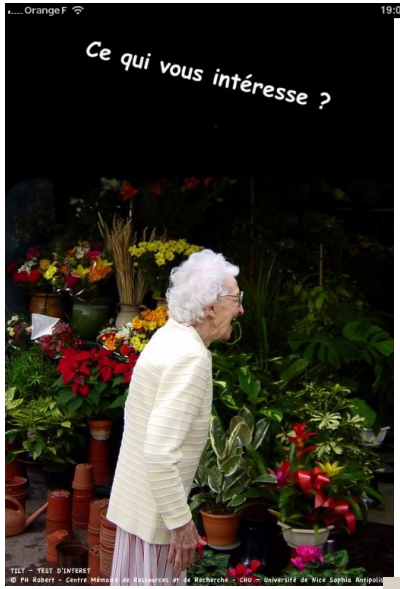
journal homepage: www.elsevier.com/locate/psychres

The underlying meaning of stimuli: Impact on engagement of persons with dementia

Jiska Cohen-Mansfield [a,b,c,*], Khin Thein [a], Maha Dakheel-Ali [a], Marcia S. Marx [a]

Engagement: defined as the act of being occupied or involved with an external stimulus

*Abstract:……*Interventions that involve objects or tasks with meaning specific to the person with dementia will be more likely to engage that person



ENQUETE « *CE QUI VOUS INTERESSE* »

Réalisation : *RER 06 (Réseau EHPAD Recherche des Alpes Maritimes)* *
Coordination : *Centre Mémoire de Ressources et de Recherche du CHU de Nice / Equipe Universitaire CobTek*
Partenariat : *Centre National de Références (CNR), Landbeck France, MCS*

Etablissements du RER 06 participants* :

Palais Belvédère	*Groupe Belage*	*Groupe ORPEA*
Mas d'Amélie	- Amaryllis	Mimosa
ONAC	- Clos des Oliviers	Jardin d'Inès
Clos de Cimiez	- Résidencia	Maison Bleue
Villa Hélios		
La sofiata	*CCAS*	*CHUN*
Escalinada	- Anciens Combattants	- Long Séjour et EHPAD
Victor Nicolaï		
Résidence Sergentino	*Groupe EkiDRA*	
	- Résidence Victoria	

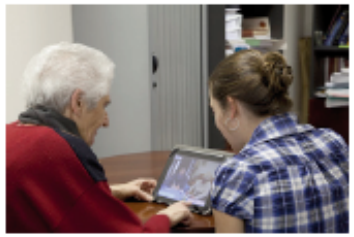
Vivre en maison de retraite (EHPAD) ne doit pas être synonyme de diminution de la qualité de vie. En ce sens, une connaissance approfondie des intérêts et motivations des résidents est donc nécessaire. Ceci est d'autant plus vrai pour les résidents présentant une maladie d'Alzheimer ou une pathologie apparentée. En effet, ces maladies s'accompagnent très généralement de troubles du comportement dont le plus fréquent est l'apathie ; syndrome caractérisé par un trouble de la motivation. Une bonne connaissance des intérêts individuels du résident est donc primordial pour l'engager, de la meilleure façon possible, dans une activité répondant à son projet de vie.

L'enquête « *Ce qui vous intéresse* » est une première étape dans cette démarche. Il s'agit d'un sondage dont l'objectif est d'évaluer quels sont les intérêts retrouvés chez les résidents vivant en EHPAD. L'enquête a utilisé [illegible]a version électronique) qui permet d'appréhender 40 activités de la vie quotidienne [illegible]matiques (travail, loisir, famille, personnel). Chaque activité est illustrée par une [illegible]ignée sur une tablette électronique (Ipad). Le résident devait appuyer sur le bouton [illegible]tivité et sur "non" dans le cas contraire.

[illegible] entre le 17 janvier et le 8 avril 2011 dans 18 établissements des Alpes Maritimes [illegible]idents (117 hommes et 484 femmes) d'âge moyen 86 ans (de 56 à 104 ans).

[illegible]t retrouvés dans l'ensemble de la population sont :
[illegible]pas (chez 83 % des résidents),
[illegible]z 76 % des résidents),
[illegible]ion (chez 76 % des résidents).
, "Déguster un bon repas" reste l'intérêt le plus fréquent.
[illegible]t suivi par "Regarder la télévision" puis par une activité physique (se baigner, faire [illegible]hez les femmes il est suivi par "Bien s'habiller" et "Etre avec ses petits enfants". [illegible] les moins fréquemment, il faut citer "Jouer à des jeux vidéo" (6 %).
[illegible] de détérioration cognitive (évaluée pour une partie de la population par le Mini [illegible]on repas" reste l'intérêt le plus fréquemment retrouvé.
[illegible]cularité du résident (genre, âge, détérioration cognitive), le partage d'un repas [illegible]ensus. "Bien manger" et "Bien vieillir" sont-ils des concepts interdépendants ? En [illegible]dispensable à prendre en compte dans la prise en charge du résident.
[illegible]ne les nouvelles technologies comme les tablettes électroniques sont bien acceptées [illegible] un moyen ludique à ne pas négliger pour leur permettre d'exprimer leur point de

[illegible] le 5 mai 2011 à la réunion pour les EHPAD PACA EST
[illegible]ctualités#ARS



Basic Principles

- Consider the impairment
- Use common sense
- Extrapolate from sensory / physical impairment / other diseases
- Use international best practice
- Work with research
- Be motivated

R. David
V. Joumier
J.H. Lee
J. Piano
P.H. Robert

R. Romdhane
N. Zouba
M. Thonnat
F. Bremond

I. Leroy

L. Friedman
J. Zeitzer
J. Yesavage