Meditation: Impact on Mental health in aging and AD

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Centre Cyceron, Université Caen Normandie, Caen

www.neuropresage.fr
Insert polling question #1 here
INCREASE in the NUMBER and PROPORTION of OLDER adults from 1950 to now and to 2050 (estimation)

Source: World Population Prospects (United Nations)

Main conditions that degrade the quality of life of people as they are getting older

**DEPRESSION:**
10 to 15% of individuals aged > 65 years

**SLEEP PROBLEMS:**
Up to 50% of individuals aged > 65 years

**DEMENTIA:**
About 10% of individuals aged > 65 years

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Ohayon & Vecchierini, Sleep, 2005
Ancoli-Israel, Sleep Med, 2009

(WHO; Rogers et al., 2019; http://www.ipubli.inserm.fr/).
Repetitive negative thinking is associated with amyloid, tau, and cognitive decline

**Repetitive negative thinking** = RNT, also termed perseverative cognition, is a behaviourally measurable process that encompasses future- (worry) and past- (rumination) directed thoughts

Marchant et al., Alzheimers Dement., 2020
NEGATIVE EMOTIONS
STRESS, ANXIETY

SLEEP PROBLEMS

![Image](image_url)
Insert polling question #2 here
What is meditation?

**MEDITATION**: generic term encompassing various forms of mental training - such as mindfulness meditation or loving kindness and compassion meditation (LKCM). Meditation involves complex emotional and attentional regulatory strategies developed for various ends, including the cultivation of well-being and emotional balance (Lutz et al. 2004).

**Secular** mindfulness-based meditation is most often used in scientific research.

**Mindfulness**: cultivating a vigilant awareness of one's own thoughts, actions, emotions and motivations and directly target attention and emotion regulation ability, which is particularly important in the context of ageing.

**LKCM** : This practice aims to cultivate feelings of love or compassion for oneself and others and to be more accepting of emotions such as shame, self-criticism, or anger. LKCM additionally involves altering the content of thoughts and emotions as opposed to simply observing them in MM.
MEDITATION IN AGING:
THEORETICAL MODEL OF
THE MECHANISMS
Mindfulness meditation (MM) and loving-kindness and compassion meditation (LKCM) in the aging population could constitute a protective lifestyle not only on Alzheimer disease but also more generally on cognition, mental health, and wellbeing.
Mindfulness meditation (MM) and loving-kindness and compassion meditation (LKCM) in the aging population could constitute a protective lifestyle not only on Alzheimer disease but also more generally on cognition, mental health, and wellbeing.
HYPOTHESIS

The Medit-Ageing MODEL, by the Medit-Ageing Research Group

Mindfulness and LKC Meditations

Attention control metacognitive monitoring prosocial capacities

Automatic NEGATIVE schemes
- Rumination, conflict, avoidance, resistance

Automatic POSITIVE schemes
+ Benevolent and altruistic behaviors

AGEING

Lutz*, Chetelat* et al., Ageing Res Rev. 2021
Novelty of the Meditageing model

1) Integrating mindfulness meditation (MM) and loving-kindness and compassion meditation (LKCM) to promote healthy ageing

2) Studying meditation interventions at multiple time-scales spanning across several years to identify the different time courses of changes induced by meditation across the psychological, neural, and biological markers of ageing
The ReSource project (Singer et al., 2016)

![Study Design](image)

**b**

**Training Exercises**

- **The Core Exercises**
  - Attention
  - Interoceptive Awareness
  - Breathing Meditation
  - Body Scan

- **The Core Exercises**
  - Meta-Cognition
  - Perspective-taking on Self
  - Perspective-taking on Others

- **The Core Exercises**
  - Care / Compassion / Gratitude
  - Prosocial Motivation
  - Dealing with difficult Emotions

**The Core Exercises**

- Loving-kindness Meditation
- Affect Dyad
- Observing-thoughts Meditation

Trautwein et al., Cognition 2020
The ReSource project (Singer et al., 2016)

A Training design

B Training modules

PRESENCE
ATTENTION AND INTEROCEPTIVE AWARENESS

AFFECT
CARE/COMPASSION, PROSOCIAL MOTIVATION, DEALING WITH DIFFICULT EMOTIONS

PERSPECTIVE
META-COEPRONITION, PERSPECTIVE-TAKING ON SELF AND OTHERS

C Overall cortical thinning in retest controls over 9-month period

D Module-specific training-related cortical thickness increases
Novelty of the Meditageing model

1) Integrating mindfulness meditation (MM) and loving-kindness and compassion meditation (LKCM) to promote healthy ageing

2) Studying meditation interventions at multiple time-scales spanning across several years to identify the different time courses of changes induced by meditation across the psychological, neural, and biological markers of ageing
The Medit-Ageing MODEL, by the Medit-Ageing Research Group

HYPOTHESIS

Mindfulness and LKC Meditations

Attention control
metacognitive monitoring
prosocial capacities

Adverse, detrimental, negative factors
- Cardiovascular risk factors
- Depression
- Sleep disturbances
- Stress, anxiety
- Cognitive decline/dementia
- Frailty, disability

Favorable, beneficial, positive factors
+ Cognitive reserve
+ Brain reserve
+ Cognitive stimulation/activity
+ Social interactions
+ Well-being, happiness
+ Telomere length

AGEING

Lutz*, Chetelat* et al., Ageing Res Rev. 2021
MEDITATION IN AGING:
PRELIMINARY RESULTS
Preliminary study on 6 « expert » meditators

Collaboration Antoine Lutz

Control data from the IMAP project

<table>
<thead>
<tr>
<th>Number of years of practice</th>
<th>Number of hours of practice</th>
<th>Percentage of time (hours) in retreat</th>
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<td>24</td>
<td>22670</td>
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<tr>
<td>6</td>
<td>38</td>
<td>33500</td>
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</table>

Chételat et al., Scientific Reports, 2017
Grey matter FDG metabolism

A. Age effects in 186 healthy controls aged 20-87 yrs old

B. Mean w-score maps of the 6 elderly expert meditators

C. Significant increases in the elderly expert meditators

1. VMPF-ACC
2. Posterior cingulate cortex
3. Right Insula
C. Significant increases in the elderly expert meditators

1. VMPF-ACC
2. Posterior cingulate cortex
3. Right Insula

D. Plots of the volume residuals in the 67 elderly controls versus 6 elderly expert meditators

E. Plots of the volume residuals against age in the 186 controls and 6 elderly expert meditators

\[ p_{FDR} < 0.001 \\ p_{(FWF)} < 0.05 \]
Insert polling question #3 here
MEDITATION IN AGING:
THE MEDIT-AGEING
EUROPEAN PROJECT
SILVER SANTÉ STUDY
MEDIT-AGEING

Investigating the impact of meditation training on mental health and wellbeing in the ageing population

www.silversantestudy.fr

www.silversantestudy.eu
MENTAL HEALTH DETERMINANTS
WP 1: MEDITATION
WP 2: LIFESTYLE

MECHANISMS OF ACTION
WP 3: ATTENTION
WP 4: EMOTION

ENDPOINTS OF AGING AND AD
WP 5: COGNITION AND WELL-BEING
WP 6: BIOLOGICAL MARKERS

MEDIT-AGEING / SILVER SANTÉ STUDY: PEOPLE
Fabienne Collette
Olga Klimecki
Patrik Vuilleumier
Antoine Lutz
Frank Jessen
Julie Gonneaud
Miranka Wirth
Géraldine Rauchs
Francis Gheysen
Martine Batchelor
Titi Dolma
Pascal Delamilleure
Corinne Schimmer

People involved in the study.
# MEDIT-AGEING / SILVER SANTÉ STUDY: DESIGN

## STUDY 1: SCD-WELL

**Location:** London-UK, Cologne-GE, Barcelona-SP, Lyon-FR

### SCD patients (n=147)

<table>
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<tr>
<th>Data acquisition site(s)</th>
<th>SCD patients (n=147)</th>
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<tr>
<td></td>
<td>STUDY 1: SCD-WELL</td>
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<td>London-UK, Cologne-GE, Barcelona-SP, Lyon-FR</td>
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<table>
<thead>
<tr>
<th>Baseline</th>
<th>SCD patients (n=147)</th>
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<th>8 weeks</th>
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<td>London-UK, Cologne-GE, Barcelona-SP, Lyon-FR</td>
</tr>
</tbody>
</table>

### Randomisation

- **Baseline:** Randomisation
- **8 weeks:** Randomisation
- **6 months:** Randomisation

### Intervention

- **Baseline:** Meditation, Control
- **8 weeks:** Meditation, Control

## STUDY 2: AGE-WELL

**Location:** Caen-FR

### Expert meditators (n = 30)

- **Baseline:** Meditation
- **9 months:** Behavioural, Biological
- **18 months:** Behavioural

### Cognitively intact elders (n=137)

- **Baseline:** Active control, No intervention
- **9 months:** Behavioural
- **18 months:** Behavioural

AGE-WELL

137 healthy seniors > 65 yrs

RANDOMIZED

MEDITATION

18 mths

NON-NATIVE LANGUAGE TRAINING

NO INTERVENTION
During 18 months

- Once a week: 2 hrs group practice with expert instructors
- Every days: 20 min or more daily practice (with a tablet)
  - One entire day of intensive practice

MEDITATION
Mental training for stress reduction and emotion regulation

ENGLISH
Cognitive stimulation through foreign language learning
Effect of an 18-Month Meditation Training on Regional Brain Volume and Perfusion in Older Adults
The Age-Well Randomized Clinical Trial

Gael Chételat, PhD; Antoine Lutz, PhD; Olga Klimecki, PhD; Eric Frison, MD, PhD; Julien Asselineau, MSc;
Marco Schlosser, MSc; Eider M. Arenaza-Urquijo, PhD; Florence Mézenge, MSc; Elizabeth Kuhn, PhD;
Inès Moulinet, PhD; Edelweiss Touron, MSc; Sophie Dautricourt, PhD; Claire André, PhD; Cassandre Palix, MSc;
Valentin Ourry, PhD; Francesca Felisatti, MSc; Julie Gonneaud, PhD; Brigitte Landeau, MSc;
Géraldine Rauchs, PhD; Anne Chocat, MD; Anne Quillard, MD; Eglantine Ferrand Devouge, MD;
Patrik Vuilleumier, MD; Vincent de La Sayette, MD; Denis Vivien, PhD; Fabienne Collette, PhD;
Géraldine Poisnel, PhD; Natalie L. Marchant, PhD; for the Medit-Ageing Research Group
Trial profile

Of the 137 randomized participants, one was excluded from all analyses due to major eligibility criteria not met (not included in the analyses), one died during the follow-up, and one revealed not to have followed his allocated arm (randomized to no-intervention but attended non-native language) – those two later participants being retained in the analyses and treated by the intention-to-treat principle, as specified in the statistical analysis plan.
CO-PRIMARY OUTCOMES

STRUCTURE (volume)
ACC and Insula

Favors the other
Favors meditation

0.012, 98.75%CI -0.021 to 0.045
p=0.36

0.005, 98.75%CI -0.018 to 0.028
p=0.58

FONCTION (perfusion)
ACC and Insula

Favors the other
Favors meditation

0.022, 98.75%CI -0.007 to 0.052
p=0.06

0.022, 98.75%CI -0.011 to 0.054
p=0.09

Chételat et al., 2022, JAMA Neurol
$p=0.002$

$p=0.009$ $p=0.01$

$p=0.063$ $p=0.002$

Chételat et al., 2022, JAMA Neurol
AVANT-PREMIERES
Salle comble pour la projection spéciale en avant-première le 29 avril en présence de Matthieu Ricard! Le film avait été présenté en projection privée à Caen aux participants, en présence des scientifiques qui ont conduit l'étude européenne Silver Santé mesurant...

SORTIE SUISSE
27 septembre : sortie suisse romande, 7 décembre : sortie suisse allemande et suisse italienne, d'autres avant-premières avec débats en présence du réalisateur seront programmées dans les jours précédant ces sorties (plus d'infos sur la page Diffusion)....

FESTIVAL
„Golden Seniors“ présenté en première mondiale aux Journées de Soleure les 21 et 23 janvier, a fait salle comble lors des deux projections.
Please insert the video here: https://vimeo.com/857183117#_=_
MEDIT-AGEING / SILVER SANTÉ STUDY: DESIGN

**STUDY 1: SCD-WELL**
- London-UK, Cologne-GE, Barcelona-SP, Lyon-FR
- SCD patients (n=147)
  - Baseline:
    - Meditation
    - Control
  - 8 weeks:
    - Meditation
    - Control
  - 6 months:
    - No intervention
- Randomisation

**STUDY 2: AGE-WELL**
- Caen-FR
- Expert meditators (n = 30)
  - Baseline:
    - BEHAVIOURAL
    - BLOOD
  - 9 months:
    - BEHAVIOURAL
- Cognitively intact elders (n=137)
  - Baseline:
    - BEHAVIOURAL
    - BLOOD
  - 9 months:
    - BEHAVIOURAL
    - BIOLOGICAL
  - 18 months:
    - BEHAVIOURAL
    - BIOLOGICAL
- Randomisation

**Data acquisition site(s)**
- SCD-WELL
- AGE-WELL
Functional ‘Brain Age’

Gonneaud et al., Nature Communication, 2021
Comparison of meditation experts and controls

Difference of predicted brain age between experts and seniors

Anova, $F(1,150) = 27.79, p < 0.0001, r^2 = 0.16$
Links between brain ageing and expertise

Relation of BrainAGE to time spent in formal meditation time

- BrainAGE score
- Total number of hours spent in life in formal meditation

\[ p = 0.038 \]
\[ r = -0.471 \]

Relation of BrainAGE to time spent in retreat meditation

- BrainAGE score
- Total number of hours spent in life in retreat meditation

\[ p = 0.022 \]
\[ r = -0.512 \]

Sacha Haudry, PhD student
SCIENTIFIC PUBLICATIONS

Julie Gonneaud, Ilana Moreau, Francesca Felisatti, Elder Arenaza-Urquijo, Valentin Quirry, Edelweiss Touron, Vincent de la Sayette, Denis Vivien, Gaël Chételat. Men and women show partly distinct effects of physical activity on brain integrity.
https://doi.org/10.1002/ajnd.212302


LATEST NEWS

- 2022 closes the formal funded period for Silver Santé Study but the work continues thanks to new additional funding
- The association between physical activity and brain health partly differs between men and women.
Medit-Ageing App

Exclusion and inclusion criteria assessment
- Blood sampling
- Detailed Neuropsychological assessment
- Detailed Lifestyle assessment

Neurological and neuropsychological examinations
- 2 MRI sessions
- 2 PET sessions
- FDG-PET
- AV45-PET

SELECTION

ASSESSMENT

V1

Meditation
English training
No intervention

18 months

V2

Neurological and neuropsychological examinations

Blood sampling
Detailed Neuropsychological assessment
Detailed Lifestyle assessment
2 MRI sessions
2 PET sessions
FDG-PET
AV45-PET

ASSESSMENT

V3

COVID-19

Lifestyle & Psychological questionnaires - Lockdown period
Lifestyle & Psychological questionnaires - Post-lockdown period
Lifestyle & Psychological questionnaires - Lockdown period
Lifestyle & Psychological questionnaires - Normal period

30 months

V4

meditageing-app@cyceron.fr

silversantestudy.eu

AGE-WELL: TO BE CONTINUED
Insert polling question #3 here