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Review Article

Mindfulness, Emotive Cognitive Balance and the Good Alzheimer Diseases: Towards a New Paradigm?

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Abstract

Psycho-affective states or traits such as stress, depression, anxiety and neuroticism are known to affect sleep, cognition and mental health and well-being in aging populations and to be associated with increased risk for Alzheimer's Disease (AD). Mindfulness training, by virtue of enhancing emotional control, also has the potential to increase immune system. Of course, an interesting line of future research would be the examination of whether it is the increase in emotion regulation capabilities that fosters greater cognitive control or the development of cognitive control capacity that is a necessary pre-requisite for increased emotional regulation. This line of studies has important implications for primary and secondary prevention interventions in healthy elderly people and elderly people affected by Alzheimer's disease and other dementias.

Alzheimer's Disease

The world's population is aging: those aged 60 and over are expected to make up nearly a quarter of the world's population by 2050, [1,2]. The risk of developing neurodegenerative diseases such as dementia increases as people live longer. The World Health Organization (WHO) recently reported that globally, approximately 47 million people have dementia, and an expected increase to nearly 75 million people in 2030 and 132 million people by 2050- People who develop dementia mainly express concerns about memory loss, but also have difficulties with communication, loss of control and autonomy [3,4].

Alzheimer's Disease (AD) may constitute about 60% to 70% of dementia cases as the most common form/cause of dementia [5], while Mild Cognitive Impairment (MCI) can be considered as a prodromal stage of AD. The cost burden associated with dementia in 2015 was $ 818 billion, equivalent to 1.1% of the world's Gross Domestic Product (GDP) with a chain effect on the whole range of patients, families, health workers, health resources, health systems, society and economics. This public health priority is compounded by no effective current cure for dementia or treatment that would alter its progressive trajectory.

The Importance of Emotion and Decision Making

One of the greatest exponent in the field of studies on the neuronal bases of cognition and behavior is Antonio Damasio, neurologist, neuroscientist. He affirms that the emotion are the basis of the good functioning of the mind, unlike a cultural tradition that has always devalued emotions because they would disturb the serenity of reason. Damasio affirms: "if man loses the emotional ability is not able to be reasonable", highlighting the reciprocal action of the body and brain, two necessarily divisible elements which constitute a unique and not dissociable organism. Reason could not function properly without emotions, or without the close connection with the body, which constantly offers the basic material with which the brain constructs the images from which thought originates. Damasio demonstrates how emotions are cognitive dimensions. The new theory of the interconnection between the emotional world and rationality refutes the scientific tradition that confines emotions in the oldest and least developed subcortical centers and therefore neglects their connection with thought, and so, denying the Cartesian conception of the mind-body dualism [6].

Consciousness Emotion and Feelings

For the US neurologist, Damasio, in fact, emotion, feelings and consciousness are framed within an integrated vision of the subject and an approach that sees the body as theater of the mind, a body, and therefore an organism, always committed to the own survival, tending to the construction of one's own well-being and therefore to maintaining a balance that is always mobile and perpetually to be reconquered in homeodynamic process of the subject, in his search for optimal homeostasis, "Speaking of homeostasis", Damasio does not mean the tendency of the organism to settle down around a neutral point but its propensity always in place - that's why we talk about "Dynamic" - to tend towards well-being. In this regard Damasio is clear when he says that «the goal of homeostasis is to offer a better state of life than neutrality, a state that we humans, prosperous thinking creatures, we identify with good health and "well-being"». Within this vision, then, emotions and feelings are seen as allies of rationality at the service of man, becoming an essential part of rational mechanism, especially in relation to decision making and to operate choices; without emotions and feelings a subject would no longer be able to give a practical orientation to one's life or to organize one's time and one's own. In agreement with Damasio's conclusions over the course of two decades, scientific literature has come to important discoveries that have revealed the importance of emotions in decision-making processes.

These conclusions have been reached through clinical observation studies and the use of the most modern investigation technologies such as Neuroimaging.

The results of these studies can be summarized as follows: 1) the identification of cortical and sub-cortical activities and pathways

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in the recognition of faces and objects; 2) the identification of the neuronal areas involved in emotional processes; 3) the demonstration that emotions are involved in making decisions; 4) the identification of limbic regions and brainstem as possible brain areas having a role in Alzheimer's [7,8-15,6].

All these considerations have some consequences in considering and treating person with dementia and Alzheimer disease.

Mindfulness and Aging

A central focus of the field of cognitive aging involves securing the quality of life of elderly. This requires, first, an examination and understanding of age-related changes in the fundamental processes of controlled regulatory behavior and secondly, the design and development of intervention programs to reduce such age-related decline in the controlled processes. The centerpiece of this controlled regulatory processing may be theoretically differentiated into the complementary processes of emotional control [16] and cognitive control. The training of mindfulness constitutes an appropriate approach to cultivating cognitive benefits in older adults, for the reason that this practice enhances the socio-emotional-equilibrium and well-being. The basis of this positive effect are the studies on neuronal brain also through neuroimaging. Many existent studies that showed the basis of the evidence of the effect of mindfulness training in primary and secondary prevention in elderly.

Mindfulness and the Aging Brain

The unique capacity for flexible, consciously controlled, dynamic behavior distinguishes the human species from all others, providing us with the seeds of adaptability and creativity and granting us a communicable sense of free will and a degree of control over the environment [17].

Psycho-affective states or traits such as stress, depression, anxiety and neuroticism are known to affect sleep, cognition and mental health and well-being in aging populations and to be associated with increased risk for Alzheimer's Disease (AD). Mental training for stress reduction and emotional and attentional regulation through meditation practice might help reduce these adverse factors.

Cognitive and emotional control change, behaviorally and neurally, [16] as a function of age and a mindfulness-based model may have the potential to counteract such nuanced age-related alterations in controlled regulatory processing.

Keeping in perspective the growing interest in intervention studies that "train the brain", it is important to take in consideration the efficacy of mindfulness training and its application on aging as primary secondary e tertiary prevention. While these threats to internal validity of a randomized controlled trial have been well-known for a while [18,19], much of the training literature (and not just the mindfulness literature) tends to ignore the possible influence of participant motivation on task performance [20]. Boot carried on an in-depth critical discussion of this issue. Many studies provide a critical cost-effective, pragmatic approach to generating hypotheses about the outcome and the mechanisms underlying a training approach, investigative efforts moving forward need to examine the effects of mindfulness interventions, relative to more active control programs. By developing more refined methods of facing on age-related changes in cognitive, affective, and neural functioning, the investigations move closer towards understanding the complex metamorphosis of the aging brain and our powerful role in relationship to it.

Effects of Mindfulness Based Interventions (MBIs)

Mindfulness Based Interventions (MBIs) is the practice of purposefully directing attention and in a non-judgmental way observing the unfolding of each moment as it takes place: it brings an element of one-focused concentrative attention to the object of the present-moment (thoughts, sensations, feelings, other events). It has the potential to improve emotional-cognitive control and the neural circuits associated with it and achieve socio-emotional balance in the elderly with important implications for decision-making, social-functioning, psychopathological development, homeostatic processes and the overall quality of life [21-24].

There are two central themes that run through the MBIs program. One of them is the integration of mindfulness into everyday life. Mindfulness, in this context, refers to the ability to collect the dispersed mind and intentionally direct it to the present moment, along with the ability to attend to each experience with kindness and compassion. Relating to one's own experience with a greater sense of acceptance, openness, and warmth, rather than resisting or avoiding one's own experience, promotes the freedom to make wiser decisions. Because of negativity bias and the tendency towards self-criticism, it is particularly important to balance these tendencies with the development of radical self-acceptance and kindness.

The second central theme of MBIs consists of theoretical and experiential knowledge about how our emotions work. This aspect involves learning how to transform difficult emotions such as anger, fear, resentment, and how to cultivate emotional habits associated with psychological flourishing, such as gratitude, love, compassion and forgiveness.

Exploring one's own limiting beliefs about what emotions are and how they work, what forgiveness, compassion and love are, what the role of intentions is, can facilitate changes in psychological and behavioral habits that promote freedom, happiness and well-being in oneself and others. All the teachings and practices of the MBIs program are based on these two foundations. Observational studies in Transpersonal Psychology show that two important functions derive from spiritual practice: the first is in the centering of oneself in an inner dimension, reaching a state of concentration with a deep state of relaxation and sometimes of inner silence (Transpersonal Psychology - Observer) [25]; the second, connected to the first, is the ability to observe one's psychic contents. This position allows to intervene on one's own experiences (including psychic contents and intrapsychic conflicts), integrating them. By becoming aware of one's own psychic content and intrapsychic conflict, the person can become able to rework and integrate them through the ability to detach [26-28].

Mindfulness and Cognitive-Affective Control in the Healthy and Affected by Neurocognitive Disorders Elderly

The characteristic of the human being of being flexible in his

adaptation to the environment through an awareness that involves all his cognitive abilities in particular a conscious attention turned inside and outside makes him unique [17]. This flexibility enables the human being to cope with the trials of life including the threat often experienced in connection with the onset of a disease.

Psycho-affective states or traits such as stress, depression, anxiety and neuroticism are known to affect sleep, cognition and mental health and well-being in aging populations and to be associated with increased risk for Alzheimer's disease (AD). Mental training for stress reduction and emotional and attentional regulation through meditation practice might help reduce these adverse factors.

Cognitive and emotional control change, behaviorally and neurally, [17,29,16] as a function of age and a mindfulness-based model may have the potential to counteract such nuanced age-related alterations in controlled regulatory processing.

The study of mindfulness within aging, capitalizes on a fundamental finding of the socio-emotional aging literature, namely the preferential change in motivational goals of older adults and elderly from ones involving future-oriented wants and desires to present-focused emotion regulation and well-being.

By virtue of improving mental concentration and sustained attention, the practice of mindfulness (MBI) gradually cultivates the development of attentional skills that promote the maintenance of objectives, while reducing the distractions not only from external competing stimuli, but also from internal interruptions and wandering of the mind. In this way, awareness qualitatively improves our ability to engage in a more conscious top-down cognitive control, gradually promoting a state of vigilance and sustained attention over time [30,31]. Extending this to the domain of emotional regulation, awareness practice has the potential to improve general well-being, especially by employing awareness at every level in every action and perception in the present moment [32]. Teaching people to cultivate an openness to attention now (mental presence) by taking the position of an impartial, non-judgmental observer, the practice of mindfulness (mental presence) promotes the development of the regulation of emotions, reducing emotional reactivity [26]. The elderly, with their preference for engaging in emotional regulation efforts, are therefore likely to benefit from a training program that claims to further improve and strengthen their emotional regulation skills and, by doing so, also improve the various aspects of cognitive control which declines with aging.

The reviewed evidence suggests that mindfulness may be advantageous for promoting cognitive, emotional, and physical health within the context of advanced aging [33,26]. Moreover, these beneficial effects are conferred to those with little to no psychological symptoms as well as those with diagnosed psychological or medical conditions [34,35]. Few studies investigates the relationship between mindfulness, meditation, cognition and stress in people with Alzheimer's Disease (AD), dementia, mild cognitive impairment and subjective cognitive decline. All studies reported significant findings or trends towards significance in a broad range of measures, including a reduction of cognitive decline, reduction in perceived stress, increase in quality of life, as well as increases in functional connectivity, percent volume brain change and cerebral blood flow in areas of the cortex [36].

Further, the goal maintenance account of cognitive control asserts the involvement of the Lateral Prefrontal Cortices (LPFC). To summarize, cognitive control capacities involving the meticulous and sustained recruitment of the Lateral Prefrontal Cortex (LPFC) are compromised in older adults and elderly, with deficits in goal maintenance lying at the crux of such cognitive control capacities. Much of the systematic, scientific study of cognitive training interventions provide modest support for the increase in overall cognitive capabilities of affected by cognitive impairment elderly or older adults, with limited benefits to tasks of everyday functioning [37,35,38].

In fact training programs designed to specifically target enhancement of specific cognitive control abilities show limited transfer effects, presumably because of an inability to enhance moment-to-moment attentional control and simultaneously reduce distractions from internal and external disruptions. These distractions are directly linked to the lack or difficulty of emotional control. In fact, the mood tone, the depressive state can greatly affect the attentional span and capacity [37].

Recent reviews of the current state of cognitive training literature in the elderly underscores the importance of designing interventions that produce both far-reaching transfer effects and enable an understanding of the mechanisms behind such enhanced functioning [17,35,39]. In addition, much of the training literature thus far is restricted by its failure to tap into the unique socio-emotional motives, which guide the behavior of older adults; therefore, such studies suffer from limited transfer effects. Therefore, an ideal training program should include multimodal intervention techniques, which involve potential lifestyle changes. These lifestyle changes affect the socio-emotional sphere for the emotional well-being and satisfaction of seniors who are healthy and/or affected by Alzheimer's disease and other dementias with transfer effects to the domains of cognitive functioning that directly affect daily functioning [17,40,41]. These aspects are particularly important precisely in the elderly with cognitive impairment in the context of the development of a mechanistic model that explains the role of mediation variables and show the most promising effects. Therefore, it is hypothesized that promoting emotional balance positively affects cognitive control processes. So according to Damasio's thesis, an emotional rebalancing may have transferability effects in daily life of an elderly person, and in the elderly with cognitive impairment and AD [42]. In order to determine whether a training program that enhances emotional well-being is circuitously able to influence the inter-related processes of cognitive control, the study of mindfulness in the elderly in general and in cognitive decline elderly is crucial [43,44,22].

On the basis of the considerations made above we hypothesize that the MBI practice may be useful as secondary prevention on cognitive impairment in patients affected by Alzheimer's disease [42,45].

The clinical perception supports that non-pharmacological-interventions, especially MBI, may be helpful in the long-term global management of the patients affected by Alzheimer Disease (AD) and Mild impairment [46]. Given the limited symptomatic

benefits against degeneration of AD Patients (AD-P) delivered by pharmacotherapy [47] the provision of non-pharmacological-treatment (as MBI) in addition to standard outpatient care is an asset of good clinical practice [48]. Some studies affirm that cognitive stimulation interventions for AD-P have limitations in being effective, showing that specific cognitive abilities training programs had limited transfer effects, presumably because of an inability to enhance moment-to-moment attentional control and simultaneously to reduce distractions from internal-external disruptions [35,39,17]. Instead MBI showed: transfer effects in promoting significant improvements in activities of daily living, cognition and in reducing neuropsychiatric symptoms [33,49,50]. A study showed a trend toward reduced hippocampal atrophy in AD-P who completed a MBI program compared to those assigned to usual care [51]. Both behavioral and neuroimaging studies, have determined that MBI, involving concentrative attention are indeed associated with: (1) an enhanced capacity to maintain a task-vigilant alert state, in which distractions arising from internal representations are prevented from interfering with task-set maintenance or task performance [30,44]; (2) better performance on tasks of executive control which require resolution of response competition through reduced interference from goal-irrelevant, external stimuli and memory enhancement [48,45, 50]. Thus, it might be theorized that MBI is directly related to the controlled-attention component and therefore the cognitive control of working memory, the successful functioning of which is thought to directly support executive control abilities and reduce response interference.

Several studies have highlighted the effectiveness of mindfulness in reducing symptoms of stress and negative affects and attribute these effects to its ability to modify the regulation of emotions with evidence suggesting that emotion regulation is directly involved during the active execution of mindful exercises. Awareness has been linked to emotional intelligence precisely because, thanks to the conscious and non-judgmental attention to emotions, improving behavioral self-regulation, increasing emotional differentiation [52] and reducing the routine tendency to react emotionally to transient thoughts and physical sensations, the practice of mindfulness decreases negative affects, stress and mood disorders and protects against symptoms of anxiety and depression, including ruminative thinking [53,54,50,21-24,55].

In fact, core components of mindfulness have been integrated into clinical usage in therapeutic models ranging from Dialectical Behavioral Therapy to Mindfulness-Based Cognitive Therapy [56]. While there is unequivocal, evidence for the role of mindfulness its shared focus on perceptual clarity to one's emotional state.

So the consequence is to suggest that a program for AD-P with MDI, could be a model for future interventions due to the following effects: emotional rebalancing and therefore an increase in mood with the overcoming of the depressive state often linked to the condition of the disease; the development of effortless attention, cognitive ability closely linked to both cognitive impairment and mood; transfer effects in promoting significant improvements in activities of daily living [33,57].

Hypothesis and Future Prospects

A central focus of the field of cognitive aging involves securing the quality of life of older adults. Psycho-affective states or traits such as stress, depression, anxiety and neuroticism are known to affect sleep, cognition and mental health and well-being in aging populations and to be associated with increased risk for Alzheimer's Disease (AD). Mental training for stress reduction and emotional and attentional regulation through meditation practice might help reduce these adverse factors.

There has been a proliferation of cognitive-training studies investigating the efficacy of various cognitive training paradigms as well as strategies for improving cognitive control in the healthy and affected by cognitive impairment elderly but few studies on patients affected by Alzheimer' Disease [58]. In fact these studies showed that MBI is an opportunistic approach to cultivate cognitive benefits in older adults and elderly, based on the effect on a positive cognitive and emotional control embedded in the practice of mindfulness [22,21,43].

A review suggests that the main reach of MBI over AD development involves the management of stress and inflammation: MBI may be effective especially at the beginning of the disease. Both behavioral and neuroimaging studies, have determined that training in MBI, involving concentrative attention are indeed associated with: (1) an enhanced capacity to maintain a task-vigilant alert state; (2) better performance on tasks of executive control and memory enhancement [30,31].

There are little reviews on the effectiveness of mindfulness interventions in reducing stress with Alzheimer's disease Patients and related major neurocognitive disorders. So the role mindfulness training plays in mitigating despair, preserving hope, giving meaning and reducing stress and the MBI transfers effects promoting significant improvements in activities of daily living, cognition and in reducing neuropsychiatric-symptoms in AD-P [44] should be investigated in future studies.

We hypothesize that the increase in emotion regulation capabilities fosters greater cognitive control or the development of cognitive control capacity that is a necessary pre-requisite for increased emotional regulation: this is an interesting line of future research. In fact we hypothesize that AD-Patient who completed the program of MBI training would experience improvements in well-being and mood and cognitive performance (attention and memory). MBI training may improve the AD-P quality of life. So the consequence of our dissertation is to suggest that a program for AD-P with MDI, could be a model for future interventions and future studies should investigate the hypothesized the following effects: emotional rebalancing and therefore an increase in mood with the overcoming of the depressive state often linked to the condition of the disease; the development of effortless attention, cognitive ability closely linked to both cognitive impairment and mood; improvement of memory. It is considering the It would be interesting in future research to systematically examine the evolution of enhanced cognitive and emotional capacity in both cohort of Alzheimer's patients at different stage of the disease in order to systematically differentiate the effect of mindfulness training on these inter-related capacities as a function of stage of the Alzheimer' s disease. Of course, an interesting line of future research would be the examination of whether it is the increase in emotion regulation capabilities that fosters greater cognitive control or the development

of cognitive control capacity that is a necessary pre-requisite for increased emotional regulation. Research has just started to answer this question of a temporal evolution of cognitive and emotional control capacities in the context of mindfulness practices [59], with studies providing preliminary evidence supporting cognitive control capacities as precursors to the development of enhanced emotional regulation. However, it would be important to examine the relative change in emotional and cognitive control capacities in an aging population that places greater emphasis on emotional regulation skills. It would be interesting in future research to systematically examine the evolution of enhanced cognitive and emotional capacity an older cohort in order to systematically differentiate the effect of mindfulness training on these inter-related capacities as a function of age.

Based on these considerations, we hypothesize that training with mindfulness may constitute not only a primary prevention of mental and physical health in the elderly but also a secondary prevention of cognitive impairment in the patient suffering from Alzheimer's dementia and other dementias. Studies in this field with verification of the effects of treatment over a long period are hoped for. It is also hoped that these studies including mindfulness practice can be implemented in the early stage of Alzheimer's disease, for the greatest benefit of patients. We believe that training with mindfulness should not be short (2 or 3 months) but long treatments are desired to have constant transferability effects over time. Moreover The training with MBI must be included in a picture of the patient's daily life that takes into account his/her lifestyle with an intervention that helps the patient to modify it so as to implement the positive adaptation to the disease condition and a good quality of life.

One last consideration: as described above, the review showed that cognitive stimulation interventions for AD-P have limitations in being effective, showing that specific cognitive abilities training programs had limited transfer effects if no null. We think that these poor transferability effects of cognitive training workouts may be because these cognitive interventions neglect the emotional aspect and in particular do not deal with emotional rebalancing not coping with the stress of the disease condition.

We hypothesize that an emotional rebalancing may make it possible to use all cognitive functions for optimal health management and implement effective secondary prevention in the case of patients with Alzheimer's dementia and other dementias.

Mindfulness training deals with the emotional aspect by increasing mood and maintaining effortless attention to the present moment and, in agreement with Damasio [6], an attention in which the emotional component is fundamental [42, 60-64].

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