

Prevention from Ageing: A Brief Survey

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Abstract

This brief note reviews the major risk and preventative factors discovered so far. The purpose of the note is to bring the awareness of active health aging, prevention strategies and potential treatments.

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Introduction

There are many ageing studies. In America, Baltimore Longitudinal Study of Aging (BLSA) and Einstein Aging Study (EAS) are the largest ones funded by the National Institute of Health (NIH). The BLSA is the America's longest-running scientific study of human aging which started in 1958 [1], while the EAS started in 1980 [2]. The main purpose of both studies is to identify risk or prevention factors for human ageing.

Human ageing can be caused by various factors, including physical decline, social disdain and cognitive decline, etc. According to Wikipedia [3], ageing study breaks from the traditional field of gerontology by highlighting how biological ageing is mediated by cultural construction, and by emphasizing the self-representation of the elderly. Gullette [4] in 1990s first called for ageing studies focusing on social sciences and she published a book in 2004 on Aged by Culture [5]. In the past more than fifteen years, the field of ageing studies have brought a growing multidisciplinary research attention [6,7]. In 2010, the European Network in Aging Studies (ENAS) [6] was formed which connects researchers interested in the study of cultural aging. In 2013, the North American Network in Aging Studies (NANAS) [8] was established. According to, NANAS is the North American version of the ENAS.

Biological Ageing

There are many biological drivers of ageing. Stipp [9] pointed out that mitochondria are our cells' energy dynamos, a key driver of ageing. Gomes et al. [10] found that declining NAD⁺ induces a pseudohypoxic state disrupting nuclear-mitochondrial communication during aging in a mouse model. Furthermore, Sinclair and his team [11] from Harvard University discovered that injection of NMN (nicotinamide mononucleotide) just for a week can restore elderly mice to a youthful state in terms of the level of NAD⁺. Recently research suggests that it is possible to reverse mitochondrial decay with dietary supplements that increases cellular levels of NAD, but there is no published human clinical result yet. In 2016, Scientific American published a paper by Weintraub [12] entitled "Aging is reversible—at least in human cells and live mice". By tweaking genes that turn adult cells back into embryonic like ones, Weintraub and his team reverses the aging of mouse cells in vitro, hence extend the life of a mouse. This change is a process of so-called epigenetic changes. In living mice, the researchers activated four genes known as Yamanaka factors which rejuvenated damaged muscles and the pancreas in a middle-aged mouse, hence reverse the changes made to gene regulators. Matt Kaeberlein [13] from University of Washington also support that epigenetic reprogramming is possible ultimate way to reverse aging. Dai et al. [14] provided detail technique of synthesis and assay of SIRT1-Activating Compounds. Leslie [15] reported that the brain's hypothalamus, a brain region Figure 1 that is known to regulate body temperature and other internal conditions, promotes aging. Latorre et al. [16] discovered that small molecule modulation of splicing factor (a class of genes) expression is associated with rescue from cellular senescence. They showed that splicing factors are progressively switched off as we age.

Leisure Activities Preventing from Ageing

Though identifying risk factors such as biological/genetic causes is meaningful for treatment purpose, but it is passive approach and expensive too. Awareness and active health maintenance is more important than treatment. From the prevention point of view, anti-aging study has shown that some leisure activities can prevent from aging. Among the leisure activities, there are two major categories: Cognitive activities such as reading and board gaming, and physical activities such as ballroom dancing [17,18], table tennis playing [19,20] and other physical activities [19,21].

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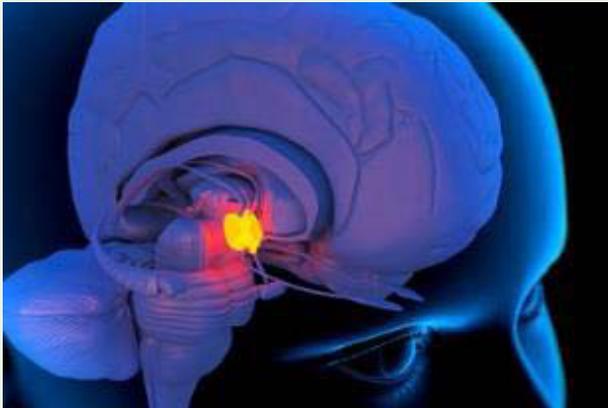


Figure 1: In the hypothalamus, a command center deep in a brain.



Figure 2: In ballroom dancing-tango.



Figure 3: In playing table tennis and can clearly increase in motor skills and cognitive awareness.

Among the physical activities, Verghese et al. [17] analyzed the EAS cohort 1 patients and found that ballroom dancing is the only significant physical activity in preventing dementia. Stevens [18], Qian and Khan [19] analyzed the second cohort of patients from EAS found that ballroom dancing Figure 2 is not significant, while brisk walking is. Alzheimer's Weekly [20] reports that playing table

tennis can clearly increase in motor skills and cognitive awareness. Larbi [22] reasons that by anticipating an opponent's shot, a player uses the prefrontal cortex for strategic planning. The aerobic exercise from the physical activity of the game stimulates the hippocampus, the part of the brain that is responsible for allowing us to form and retain long-term facts and events. Lobjois et al. [23] studied the effect of aging and tennis playing. Kondric et al. [24] conducted a review on the physiological demands of table tennis. In 2014, Los Angeles Times reported that aging players keep on the ball with pinpong at age of 76 [25]. Recently NIH calls for proposals on physical activity and weight control interventions among cancer survivors: effects on biomarkers of prognosis and survival with clinical trial optional) at <https://grants.nih.gov/grants/guide/pa-files/PAR-18-892.html> and <https://grants.nih.gov/grants/guide/pa-files/PAR-18-893.html>.

Conclusion

In summary, aging has become an important issue worldwide. Researchers have discovered many risk factors genetically, environmentally, cognitively and physically. This brief review focuses on summarizing the fundamental genetic decaying factors and possible physical factors for prevention since prevention is always better than treatment. The most important thing is the awareness of aging and their related risk and prevention factors so that we can live a healthy and meaningful life.

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Footnote: The author is also a distinguished guest professor, College of Mathematics, Physics and Electronic Information Engineering, Wenzhou University, Wenzhou, Zhejiang, China.

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