Can we delay the onset of dementia by studying English as a second language?

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Abstract

The University of Tasmania Wicking Dementia Research and Education Centre (WDREC) considers dementia to be the number one world health issue of the 21st century affecting individuals, families and communities (2019). Extensive research in this field has come to the same conclusion. The biggest factor in the onset of dementia is old age, and Japan has one of the oldest populations in the world, with a median age of 47 years, rising to 55 in 2050. In purely financial terms dementia had a societal cost in Japan of 14.5 trillion yen in 2014, and is set to rise to 24.3 trillion yen by 2060, Sado et al. (2018). Research has found that perhaps 30% of dementia cases can be delayed for some years due to the identification of a number of modifiable risk factors, one of which is the study of a second language. Clearly, anything that can help delay the onset of dementia will be of great benefit to people and communities, and help reduce the financial burden caused by the disease. This paper seeks to clarify current research to find out if studying English as a second language in Japan can help delay the onset of dementia. Research findings are mixed, which is not helped by irresponsible media reporting. However, it does seem to suggest that studying a second language can assist in helping to protect against dementia by increasing cognitive reserve.

What is dementia?

Dementia is a terminal disease and is caused following damage to, or loss of, nerve cells and their connections in the brain. According to Kinoshita (2019) there are 4 major causes of dementia in older adults shown in table 1 below,

Table 1. The major causes of dementia

Disease name	Occurrence
Alzheimer's disease	67.6%
Vascular dementia	19.5%
Frontotemporal dementia	8.6%*
Lewy Body disease	4.3%

* The figure of 8.6 % for frontotemporal dementia includes other diseases such as Parkinson's disease, Creutzfeldt-Jakob disease, Huntington's disease, and traumatic brain injuries.

These different forms of dementia often co-exist and manifest as a degeneration in the brain affecting cognitive skills, personality and behavior. Cognition is "*the mental act or process by which knowledge is acquired, including perception, intuition and reasoning*", New Collins Dictionary.

The causes of dementia range from old age, a build up of naturally occurring proteins (amyloid beta and tau) forming plaques and tangles in and around nerve cells, destroying connections in the brain. The majority of cases are not inherited genetically, but those that are tend to occur during the 40–60 year age range. As the brain ages, cells are slowly lost and this process typically begins 10/20 years before a diagnosis of dementia is made. It is during this period that symptoms of mild cognitive impairment (MCI) first appear.

Mild cognitive impairment (MCI)

MCI affects much more people than dementia and is often misinterpreted as actually being dementia. Estimates suggest that between 4%–19% of all people over 65 years of age are affected by some form of MCI, depending on definition and interpretation. Livingston et al. (2017) compiled research that suggests between 22%–39% of those diagnosed with MCI will develop dementia within 3–10 years. They describe it as "*an intermediate stage between healthy ageing and early dementia, which sometimes reverts to healthy cognition*".

MCI can manifest itself as problems with memory, language, thinking and

judgement that are not usually observed in people of a similar age. This definition is a bit vague as it is difficult to pinpoint what exactly is *normal* cognition for each age. It could manifest as a self-awareness that one's mental abilities have recently slipped, or it may be some slight change that friends or family notice in an individual. This is a grey area yet MCI is clearly an important phase in brain ageing.

How many people are affected by dementia?

In his TEDtalk 2017, Cohen said that Alzheimer's disease alone affected around 40 million people worldwide, and by 2050 was projected to affect 150 million people. Japan has the highest prevalence of dementia among the 36 OECD countries (Organization for Economic Cooperation and Development). In 2017, the OECD forecast the number of dementia sufferers in Japan to rise from 2.3% in 2017 to 3.8% of the country's population by 2037.

Cases of dementia are set to rise rapidly worldwide. According to the WHO Director-General, Dr. Ghebreyesus (2019) "*In the next 30 years, the number of people with dementia is expected to triple. We need to do everything we can to reduce our risk of dementia*".

The reporting of dementia prevention

There continues to be a mass of research undertaken on the causes, cure and prevention of dementia. Scientists are looking to find a drug that will cure dementia and to be able to publish the first breakthrough paper. New, attention grabbing headlines in the media are appearing more frequently, but the language used is not consistent with research results. This is one reason why the title for this paper was chosen. Below are five examples of the reporting of research into dementia,

(i) A letter in the *Journal of Alzheimer's Disease* entitled "Dementia (Including Alzheimer's Disease) can be Prevented" was presented at the G8 summit in London on 11th December, 2013 and was signed by 109 scientists from 36

countries, Smith & Yaffe (2014). In it they say "*There is already sufficient evidence to justify immediate action*".

However, the words *"can be prevented"* mean *to keep from happening or to stop.* This does not appear to be an accurate reflection of any research findings to date. It would be more accurate to phrase such statements to say,

Certain measures, if undertaken in tandem with each other, may help delay the onset of dementia for an unspecified period of time.

(ii) In 2014, Norton published in the *Lancet Neurology* journal that approximately one third of Alzheimer's disease may be preventable. This statement is not true. If by 'preventable', Norton meant to say *preventable from occurring immediately but not preventable from occurring at all* then why not use the words 'delay the onset'.

(iii) The World Dementia Council was not looking for sensational headlines when they announced their "Dementia Risk Reduction Statement" in 2015, "*Regular physical activity and management of cardiovascular risk factors (e.g. diabetes, obesity, smoking, and hypertension) are associated with a reduced risk of cognitive decline and may reduce the risk of dementia. Further, a healthy diet and lifelong learning/cognitive training may also reduce the risk of cognitive decline*".

Using the words *may reduce the risk of dementia* is an accurate reflection of research findings.

(iv) In his 2017 TED talk, Cohen demonstrated a drug test on worms with dementia that appeared to cure the symptoms of the disease in the animals. His lecture was entitled "Alzheimer's is not normal aging – and we can cure it", but this kind of language is just hopeful rhetoric. He is not saying that there is a cure but goes on to emphasize that if we all become more aware of the threat of dementia, actively campaign and put pressure on politicians to fund more research, then possibly a cure can be found. So his aim was to secure more funds for his research

and he used a false claim to attract our attention.

(v) A final example of a similar headline was published by Geissler (2019) on the front page of the British newspaper *Daily Express* proclaiming "Study proves you can fight off dementia". However, aside from the front page headline the article did report responsibly inside the paper saying "*Adherence to Life's Simple 7 recommendations in middle age was associated with a lower risk of dementia later in life*".

Is there a cure?

There is currently no cure for dementia. Furthermore, given the nature of the disease pathology, and despite thousands of researchers looking into curative pharmacology, a drug that can cure dementia is not expected soon.

According to Cohen (2017), the American government spends 10-times as much money on researching a cure for cancer than it does on Alzheimer's disease. This is despite the fact that both are the cause of a similar number of deaths, and the effects of Alzheimer's disease costs twice as much as the effects of cancer.

There is great hope for the science of gene silencing. This is the regulation of gene expression in a cell to prevent the expression of a malignant gene.

On 22nd October, 2019 the BBC announced that an American company *Biogen* had created a drug that could potentially slow down the onset of dementia in Alzheimer's. While this is big news, there is still no cure for any form of dementia. Consequently a great deal of attention has shifted from a curative approach to a preventative approach to help reduce the risk of dementia.

Dementia risk reduction

The World Dementia Council (WDC) produced a dementia risk reduction statement in 2015 stating that in addition to looking for a cure and improving diagnosis "*A*

risk reduction approach must also be an important area of focus".

Australia has become one of the world leaders in combating dementia through risk reduction with their "Your Brain Matters" program funded by the Australian government.

The program outlines 5 general steps to promote brain health,

(i) Look after your heart.
(ii) Be physically active.
(iii) Mentally challenge your brain.
(iv) Follow a healthy diet.
(v) Enjoy social activity.

Japan - Xinhua (2019) reported the words of Japanese Prime Minister Shinzo Abe "*While placing an emphasis on the viewpoint of people with dementia and their families, we will make coexistence and prevention the two wheels of a cart to strongly propel measures against dementia*".

On 18th June, 2019, Japan approved a new dementia program focused on coexistence and prevention but fell short of identifying any numerical targets. The new proposal aims at establishing more places where senior citizens can get together and jointly take part in activities such as exercise, eating together and enjoying hobbies. The programs will promote such pursuits at facilities accommodating senior citizens, aiming to have 8 percent of those aged 65 or older taking part, compared to 4.9 percent in 2017. This is one of the world's most progressive national strategies in dealing with dementia and is called the "New Orange Plan."

The New Orange Plan is organized by the Ministry of Health, Labor and Welfare in Japan with the assistance of government agencies, medical institutions, nursing facilities, and community health centers. The purpose of the plan is to,

- Raise awareness and promote the understanding of dementia.
- Provide healthcare and long-term care services in a timely and

appropriate manner as the stages of dementia progress.
- Reinforce measures for younger onset dementia.
- Create age and dementia friendly communities.
- Promote research and development (IROOPTM, Orange Platform) and disseminate the results.
- Prioritize the standpoint of persons with dementia and their families.

Kinoshita (2019).

In drawing up the New Orange Plan, the Japanese government purposefully avoided using the word 'prevention' for fear of offending families who already had family members with dementia and might feel blame. The omission of the word 'prevent' is a big problem because, with no curative therapy available, the New Orange Plan just lays out ways to cope with the problems of dementia once they arise. Prevention is needed in Japan more than any other country in the world and people of all ages, with or without dementia, should be positively encouraged to undertake measures already known to reduce the risk and/or onset of dementia. These are known as the modifiable risk factors.

Modifiable risk factors

In 2015, Baumgart published a summary of the evidence on modifiable risk factors for cognitive decline and dementia,

Lifestyle risk factors	Cardiovascular risk factors
Regular exercise	High blood pressure in midlife
Cognitive training	Midlife obesity
Smoking	Elevated cholesterol
Socializing	Diabetes / depression
Eating vegetables, fruit and fish	
Alcohol	

Other risk factors include years of formal education, traumatic brain injury, depression and sleep. According to Dr Ghebreyesus, WHO Director-General, all

risk factors are underpinned by a simple mantra, "*What is good for our heart, is also good for our brain*".

Moore et al. (2015) list seven modifiable risk factors specifically for Alzheimer's disease and says "*Research suggests that living a brain healthy life, particularly during midlife, may reduce a person's risk of developing dementia*".

1. Diabetes
2. Midlife obesity
3. Smoking
4. Depression
5. **Cognitive inactivity or low educational attainment**
6. Midlife hypertension
7. Physical inactivity

When looking at these risk factors it is easy to cherry pick those risks where one may score positively and ignore the risks where there is a low score e.g., '*I don't smoke so perhaps I have a reduced risk of dementia*'. Rosenberg et al. (2018) say this is not the recommended line of action because "*targeting several risk factors of AD and dementia simultaneously will likely lead to better preventative effects*".

Cognitive training and formal education

The Alzheimers Association Japan linked "*fewer years of formal education with an increased risk of Alzheimer's and other dementias. There is not a clear reason for this association, but some scientists believe more years of formal education may help increase connections between neurons, allowing the brain to use alternative routes of neuron-to-neuron communication when changes related to Alzheimer's and other dementias occur*".

The "brain reserve hypothesis" from Stern (2006) supported by Keage et al. (2010) showed that "*those who remain in education for longer are able to compensate for pathological burden (caused by dementia) in later life*". People with more education

appear to have heavier brains and are able to maintain reasoning and thinking despite having some neuropathology. People with lower levels of education appear less able to function normally given similar levels of neuropathology. Keage stated "*The potential protective role of education for dementia is an area of major interest… more exposure to formal education (per year) was associated with a lower risk of clinical dementia at death*".

Norton (2014) also concluded that people with more years of formal education had a lower risk of dementia than those with fewer years of formal education, but that cognitive training effects were largely inconclusive.

The WDREC report that education is one of the most significant modifiable risk factors for dementia. The EClipSE study, where 3 population studies of 100 donated brains in UK and Finland from 65+, 75+ and 85+ year olds, concluded that education is protective of later dementia, Keage (2010). The reason given is cognitive reserve.

Cognitive reserve

Cognitive reserve helps develop a greater capacity to stave off cognitive impairment. Research on cognitive reserve has proved inconclusive thus far, but WDREC concluded that it is a factor in dementia helping in,

- Neural resilience in the brain.
- Neural flexibility, the ability to recruit additional neural networks.

Livingston et al. (2017) reported on a study of 29,279 individuals from 22 longitudinal studies, which suggests that "*cognitive reserve is not a static property, but might be amenable to manipulation by cognitive interventions in later life*". This suggests that the brain is plastic, meaning that it has the ability to change throughout life.

Increased cognitive stimulation enables you to 'fix yourself'.

So the obvious questions are,

(i) How do we increase our cognitive reserve?
(ii) What are the most effective learning activities that can be undertaken to help delay the onset of dementia?

Scientists do not know the answer to these questions yet but they do agree that patterns of brain usage over a lifetime have a link to dementia. Valenzuela et al. (2008) wrote that a lifespan of mental activity predicts a diminished rate of hippocampus atrophy (the hippocampus is part of the brain helping in the consolidation of information from short-term to long-term memory, and in spatial memory, that enables navigation).

Prolonged involvement with 'new learning' seems to be a factor. One example of this is to study a second language because, in doing so, the brain is forced to change and restructure. Another example of this 'new learning' is to take up a musical instrument.

In terms of bilingualism, Bialystok (2011) make the following comment "*The advantages documented for executive control across the life span seem to contribute to cognitive reserve, allowing bilinguals to better cope with Alzheimer's disease and postpone the appearance of its devastating symptoms*".

Changing behavior

"*The existence of potentially modifiable risk factors means that prevention of dementia is possible through a public health approach*", World Health Organization 14th May, 2019.

Smoking habits have changed dramatically in western countries due to repackaging, taxation, product placement and the invention of vaping. In England a sugar tax on fizzy drinks is aimed at reducing the number of people with juvenile obesity. Changing behavior now can have very positive outcomes in the future.

It is never too late to reduce the risk of dementia. Even people diagnosed with dementia can still reduce the rate at which it progresses by remaining active cognitively, physically, socially, and by looking after vascular health, mental health and nutrition.

Japan is a very homogenous society and behavioural changes aimed at reducing the risks of dementia could be quickly taken up if, for example, shown through the national NHK broadcasting company. *Nudge theory* suggests altering peoples behavior is not so difficult, Thaler & Sunstein (2008). There is already a program in place whereby all Japanese people, but mainly older adults, are encouraged to participate in physical exercise twice a day called *radio taisou* ラジオ体操. Introducing a similar program encouraging brain health activities could prove very beneficial to an already ageing Japanese population.

Conclusion

Age causes a slowing of the brain but education helps protects against cognitive decline. There are no side effects of studying a second language, and participation in a class adds to an individual's social life, mobility and purpose.

It is important to repeat that it is never too late to reduce the risk of dementia. Even those patients with dementia can reduce the rate at which it progresses. While it is true that cognitive activity is suggested as a route towards delaying the onset of dementia, nowhere is it implied that cognitive activity alone will produce the desired delay in the onset of dementia.

Japan has the largest proportion of old aged people in its population, so has the greatest need for help with dementia. The New Orange Plan is a step in the right direction but needs to be more assertive in promoting prevention through the modifiable risk factors of dementia. One of these factors is cognitive training, and one aspect of cognitive training is learning English as a second language.

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Useful resources for dementia prevention

Alzheimers Association Japan	www.alz.org/jp
Australian government website	http://www.yourbrainmatters.org.au/
For children	mybrainrobbie.org
Glasgow based healthy cognition site	lingoflamingo.co.uk
Healthy Linguistic Diet	Healthylinguisticdiet.com
Japan's dementia site	IROOP, Orange Platform, Japan
TED talks (numerous)	
University of Tasmania MOOCs	Preventing Dementia & Understanding Dementia