**Working Notes**

A major factor that will dissuade use of the VA is incapability. Patients cannot be expected to understand the limitations of the VA, meaning a robust and capable tool should be created initially to encourage adoption.

Alexopoulos *et al.* (2002) describe the relationship between depression in the elderly and comorbidity with other ailments including Alzheimer’s and dementia. They found evidence in literature that early to mid-life depression increases the risk factor of Alzheimer’s and that late-life depression is a potential indicator of dementia.

Kemp, Ball, and Perkins (2013) examine the boundary between formal and informal care, noting the conflicting viewpoints in literature regarding how the two interact. They suggest a complementary and evolving “convoy” of care that adapts to changing needs as opposed to a supplanting model wherein formal care assumes responsibility when informal care cannot.

Even healthy elderly users have difficulty using these products comfortably (A. Reis*et al.* 2018). These products are primarily cloud-based, leaving users unable to utilize many of their features if disconnected from the internet.

In addition to aiding fully cognitive elders in daily life, the discussed technologies have many benefits for people living with dementia and AD.

Few participants in the studies reviewed by Siegel and Dorner (2017) expressed concerns over digital privacy.

It has been extensively shown that non-pharmacological approaches to treating dementia such as cognitive behavioural therapy, reality orientation, and validation therapy are prospective solutions.

Before considering the needs of users living with dementia, it is important to consider the challenges faced by all elderly users of technology. Elderly users of technology are often referred to as digital immigrants.

Any AL technology should also involve the design inputs of caregivers to ensure that the product mollifies their concerns. As caregivers may be called upon to intervene when AL technology malfunctions, it should be designed to be as intuitive as possible during these critical scenarios.

Damant *et al.* (2016) categorise technologies as Mainstream ICT – consisting of mobile phones, the internet, and other technology used by the general public – and Remote Care – vital sign monitors, cognitive and physical fitness trackers, and other assistive technologies.

A review by Koumakis *et al.* (2019) found recurring evidence of the benefits of technology in improving the lives of people living with dementia and their care-givers. They found examples of mobile applications for diagnosing and monitoring patient conditions, supporting patient daily activities through reminders, location tracking, and educating care-givers.

The global aging population is a common motivator of research into the needs of elders. The prevalence of Dementia in this population has placed dementia care at the forefront in the design of these care solutions.

(Dixon *et al.* 2020)

Galende *et al.* (2021) conducted a literature review with unknown parameters.

(Lockerbie and Maiden 2020) The created framework was designed to be interpretation of existing dementia quality of life work by Lawton (1994).

Inclusion Criteria: English, Academic Papers only

Additional commonly referenced material was found manually.

Most dementia cases are present in countries with low income. Sufferers in these countries would not directly benefit from the development of the proposed voice assistant; however reducing the dependency on human care-workers in developed countries will open the possibility of aid for lower income countries.

Studies on dementia are often done in high income countries, how effective the techniques developed are for low income countries is uncertain.

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| --- | --- |
| Results | 215 found |
| Duplicates | 26 exclusions |
| English language only | 0 exclusions |
| Relevant title/abstract | 88 exclusions |
| Accessible | 21 exclusions |
| Academic Papers | 29 exclusions |
| Final count | 51 papers |

Lord et al. (2020) build a theoretical model to describe the requirements of any home-based dementia support from a systematic review of studies up to August 2018. The concepts identified fall under: Values and Approaches, Strategies, and Delivery. Within these categories, they express the need for treatments to be personal, respectful, and consistent for both patients and carers. They also highlight two successful interventions in line with their model that enabled extended autonomy and home-care of persons living with dementia: Maximising Independence at Home (MIND) and the New York University Spouse Caregiver Intervention (NYUCI). These interventions focus on group education and therapy for patients and family, supporting the idea of social activity prolonging patient cognisance.

* The current state of voice synthesis is also lacking and can be hard to relate to for users who require companionship
  + Research shows that companionship is important
  + Historically, users have been able to relate to even less advanced AI.
* Virtual assistant can offer brain-training exercises that could help elderly users keep focused
* Ethical concerns – Collecting and storing data
* Product implementation?: Raspberry Pi or Mobile

Considerations to make for users living with dementia:

* Poor speech makes speech detection difficult
* Poor understanding of technology and confusion means commands may be complex or indirect
* Certain terminology or phrasing should be used
* The current state of voice synthesis is also lacking and can be hard to relate to for users who require companionship
  + Research shows that companionship is important
  + Historically, users have been able to relate to even less advanced AI.
* VA can offer brain-training exercises
* The ability to perform critical tasks without requiring an internet connection. Current options are primarily cloud-based, leaving vulnerable users unable to utilize them if web connection goes down.
* Be able to infer a task from a less explicit statement. For example, a confused question such as, “Where did Alice go?” while Alice is not present should be treated as a command to call Alice.
* a clear description of the stages of the life cycle undertaken
* a description of how verification and validation were applied at these stages
* a description of the use of tools to support the development process
* a description of any research hypothesis

Themes:

* Dementia
* Challenges
* Quality of Life
* Independence
* Usability
* Carer

Many studies of dementia care make note of the burden placed on informal care-givers. As such, this group is often considered when developing frameworks for dementia care plans. The proposed VA could offer benefits and relief to this group as part of its design.

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| --- | --- |
| Functional | |
| FR1 | Speech to text for staggered speech |
| FR2 | Natural language processing |
| FR3 | Text to speech output |
| FR4 | Offline functionality |
| FR5 | Minimal user input needed (i.e. yes or no questions) |
| Non Functional | |
| NFR1 | Set Reminders |
| NFR2 | Cognitive training exercises |
| NFR3 | Music therapy |
| NFR4 | Consistent personality |

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| --- | --- |
| Intro | 500 |
| Lit Review | 1500 |
| Methods | 500 |
| Requirements | 100 |
| Basic Voice Assistant | 1500\* |
| Feature 1 | 1500\* |
| Feature 2 | 1500\* |
| Feature 3 | 1500\* |
| Results | 500 |
| Evaluation | 500 |
| Conclusion | 300 |
| Further Research | 100 |
| \* | |
| Intro | 100 |
| Research | 500 |
| Design | 300 |
| Implementation | 300 |
| Evaluation and Discussion | 300 |