Critical review – ECAP6004

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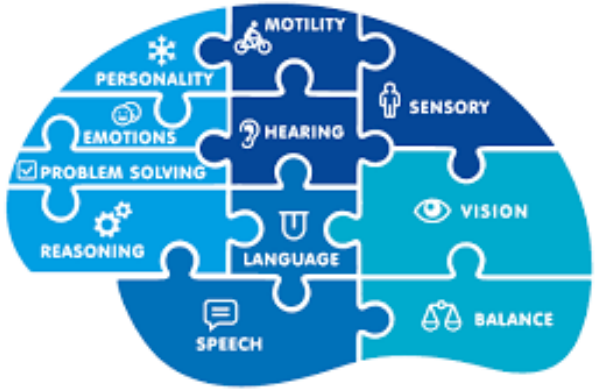
Satoh, Yuba, T., Tabei, K., Okubo, Y., Kida, H., Sakuma, H., & Tomimoto, H. (2015). Music Therapy Using Singing Training Improves Psychomotor Speed in Patients with Alzheimer's Disease: A Neuropsychological and fMRI Study. *Dementia and Geriatric Cognitive Disorders Extra*, *5*(3), 296–308. https://doi.org/10.1159/000436960

- Non pharmaceutical approach
- Mild to moderate Alzheimer's
- Music therapy over 6 month
- Home and hospital intervention
- Measured through fMRI and neuropsychological assessments
- Psychomotor speed and information processing areas

The Paper



BRAIN PARTS FUNCTIONS

- Masayuki Saroh
- Others relate to the papers research
- “Dementia and Geriatric Cognitive Disorders Extra”
- Reviewed

Music therapy using singing training improved psychomotor speed in patents with Alzheimer's disease: A neuropsychological and fMRI study

- Title and abstract give first impressions (Tullu, 2019)
- Title is concise but long

- Abstract is descriptive and key elements included
- Easy to determine suitability

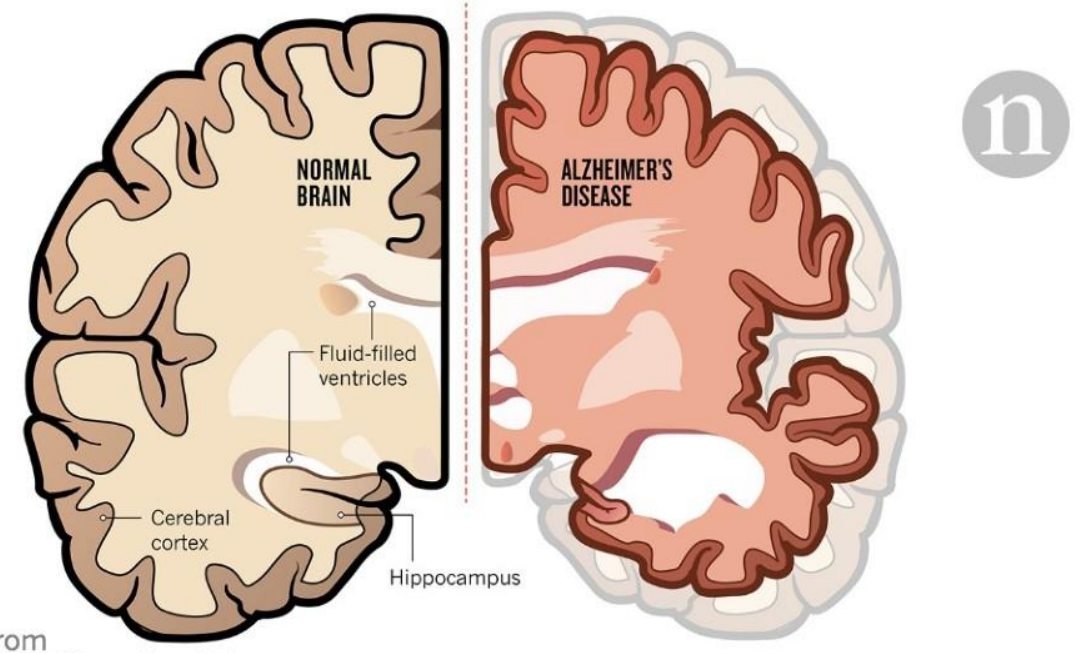
Introduction

- Background literature sets the scene for the overall study.
- An overall agreement within the field for additional research surrounding music therapy (Moreno-Morales et al., 2020)
- Guidelines for grading systems hold flaws (Baker et al., 2010)
- No consideration for individual differences

Introduction Continued

- Hypothesis is not present
- A clear hypothesis is a statement of prediction or expectation (Danyanand, 2018).
- There is a result but no prediction.

Method – Participants



Adapted from illustration by Stacy Jannis/ Alzheimer's Association

- The methods section is the most important aspect of research papers. It is important that they can be replicated (Kallet, 2004).
- An extensive inclusion and exclusion criteria is implemented.
- Tables are included to further clarify participants, making replication possible.
- Ethical approval granted, with both participants and caregivers giving consent.

Methods – procedure

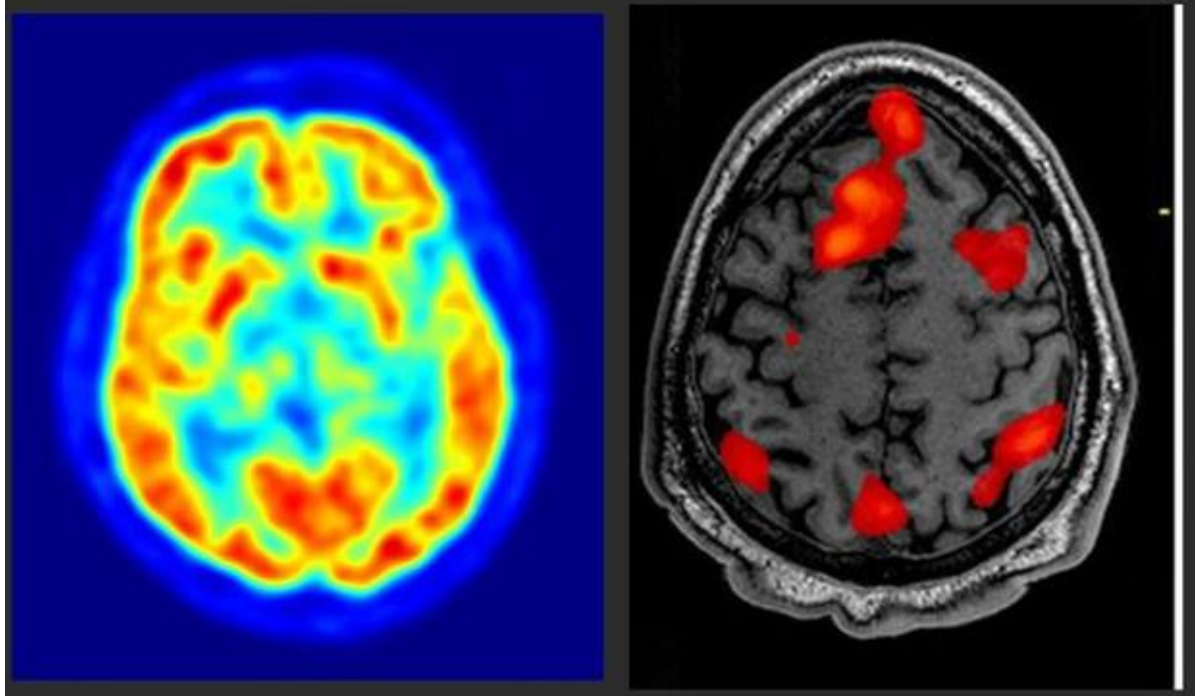
- Information needs to be scored through a further paper – source of information not made simple to find.
- Normal in some cases for procedure to be printed in a further publication (Kallet, 2004).
- Karaoke machines and YUBA are the implemented instruments.
- Home based weekly practice was required, however, validity can be questioned (Demetriou et al., 2015).

Neurological assessments

- Many assessments were implemented. Although most presented through acronyms, making it unclear to the reader unless prior knowledge is in place.
- Assumed experimental design (Kirk, 2002)
- Previous dementia clinical studies are commonly experimental designs, typically surrounding medical procedures or behavioural changes (Buttula et al., 2015).

fMRI vs PET

- fMRI commonly applied specifically among cognitive studies including memory.
- fMRI is considered a strong tool in detecting responses, however has its negatives.
- PET scans are also applied throughout cognitive studies with a similar accuracy result as fMRI (Mottaghy et al., 2000).
- PET highlights frontopolar activations.
- fMRI preferred due to cost, accessibility, resolution and area coverage (Varvatsoulias, 2013).

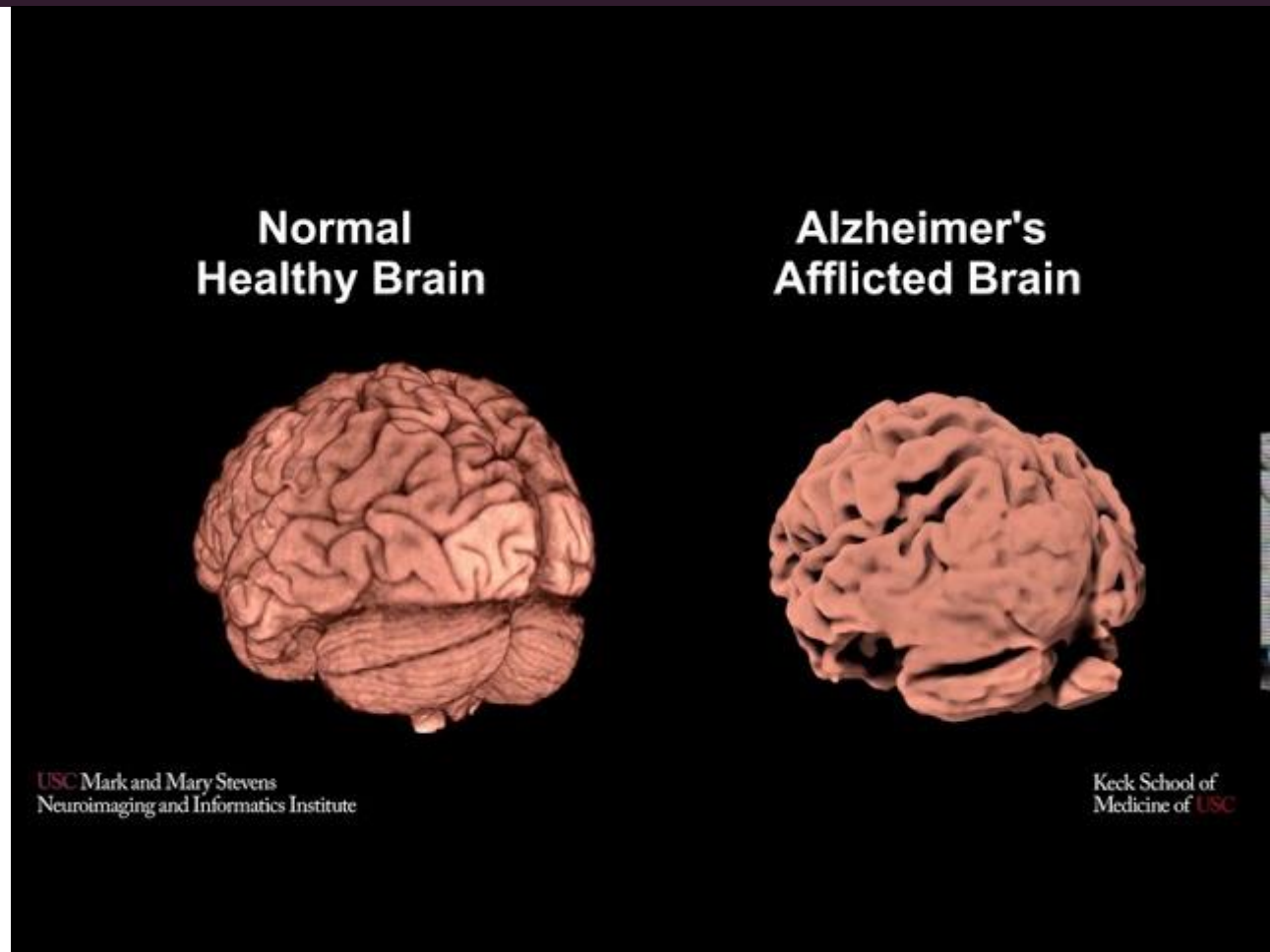


PET Scan

fMRI Scan

Results

- Strong beginning, with significant findings in sleep, and some memory improvements.
- Initial literature review supports the findings.
- Researchers struggled with fMRI.
- Notable difference with two participants
- Tables and photographs were used, promoting proper presentation of data (Fox & Jennings, 2014).



Discussion

- Strong emphasis on the first to show psychomotor improvement
- Studies since publication have also found similar improvements (James et al., 2023).
- Further information on the positive cognitive and performance significance described.

Limitations

- Subject size
- Educational history
- Time period
- Dementia progression

- fMRI issues

- Perfection almost impossible (Brookmeyer & Abdalla, 2020)
- Conclusion

Final comments

- Overall well written paper
- Insight into music therapy and memory
- Better understood by knowledgeable readers
- Sections detailed
- Paper presents intrigue and insight

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Slide 2

The study being presented is a neuropsychological, non pharmaceutical approach, considering the benefits of music therapy on mild to moderate dementia patients. The participants of two conditions are subject to the therapy for 6 months with home and hospital based intervention. Measures are monitored the use of fMRI and neuropsychological assessments to review participants psychomotor speed and information processing.

Slide 4

The title alongside the abstract gives the first impressions to a reader, with these two areas often being the only parts that are read (Tullu, 2019).

The title therefore ideally needs to be direct, interesting and not lengthy while being descriptive, will a recommendation of around 10 words (Bavdekar, 2016). The current title presents as slightly long however is concise and detailed.

The abstract gives a brief yet in-depth description of the overall study, an individual can easily conclude if the paper is suitable for their reading. The key elements of background, methods, results and conclusions are included. (Alexandrov & Hennerici, 2007).

Slide 5

The introduction begins with an in-depth description surrounding music therapy. A strong beginning as it highlights on the focus of the whole paper. The section provides insight as to why the topic is being studied and the importance of the requirement of scientific evidence being implemented surrounding the topic. Further literature agrees with this acknowledgment, with many commenting on its need for further trials and evaluations to enable implementation and develop music therapy within dementia treatment (Moreno-Morales et al., 2020). This section includes an addition surrounding aerobic exercise, it is used as an explanation towards the grading for non-medicated treatments. However, its addition seems misplaced and adds confusion to the section. It may have been of value to remove this section, and in replacement, acknowledging that although music therapy is currently raked grade C1, there are flaws to the guidelines, for example, guidelines are generally developed surrounding patient views as opposed to effectiveness of intervention, and an over reliance of randomised controlled trials, reducing their legitimacy (Baker et al., 2010).

The introduction continues with a section surrounding karaoke, again a strong representation of the studies intentions. The authors assume that all individuals would find the task “joyful and interesting” However, neglect to consider individual differences. It is unlikely that each patient would find enjoyment through the same genre of music, this is highlighted by Nair et al., (2013) who acknowledges the challenge of having groups agreeing to a particular music when preference is considered.

Slide 6

The final sections, concentrate on an overview of dementia, the possible positives that can be applied through music therapy, and the hypothesis. Although the section is clear in what the present study is hoping to provide in the outcome, this would only be apparent to a reader who is knowledgeable on article style. The introduction fails to provide a clear research question or hypothesis. A clear hypothesis is essential to give the reader knowledge into the possible outcome, based around existing literature and theories (Shelke, 2020). The hypothesis is a statement of prediction or expectation (Danyanand, 2018).

Instead, the conclusion within the introduction presents as a brief overview of the procedure undertaken. An explanation of the investigation undertaken. There is no prediction, instead there is a result.

Slide 7

The methods section is considered the most important aspect of research papers. The information needs to be clear and descriptive for validity. It is important that the methods can be replicated for evaluation and enough information is present for final judgement on the results and conclusion (Kallet, 2004).

The participants chosen is presented clearly, in addition to an extensive inclusion and exclusion criteria. Appropriate inclusion and exclusion criteria is important for the impact of results. It is generally considered that participants should hold desired criteria to the research while avoiding characteristics that could interfere with study success (Patino & Ferreira, 2018)

Tables are added to further the clarity of the participants. The reader can gain full information throughout, meaning it would be easily possible to replicate. Ethical approval was granted, and both subject and caregiver provided consent in line with ethical guides, patients unless otherwise evidenced are considered capable of consent, however the information surrounding the research must be given fully and clearly, and the participant must be competent and willing, prior to consent (Novek & Wilkinson, 2017).

Slide 8

Following, the methods outline the duration and implementation of music therapy. Again, the information is clear, and could be replicated. However, there is missing information. It is unclear what information may not be included, and the authors point the reader in the direction of another paper for this information. Unfortunately, during time of publication this additional paper is not yet published, making it very difficult for this information to be found. It would have been beneficial for this information to be included, whether it be within the main methods or attached within an appendix. Nevertheless, it is argued by Kallet, (2004) that in some cases intense discussion is required here, and publishing in a separate publication may be required. Voice training was implemented by professionals. YUBA is known as a method implemented generally to improve on singing skills and has been tested mainly surrounding children and adults with cochlear implants (Yuba et al., 2009). A karaoke machine was also used within the hospital assessments however, it is not clear what additional value the machine brings alongside voice training.

Additionally, participants caregivers were asked to report home practice weekly, there is no guarantee that the hours requested were carried out this is due to issues surrounding validity and reliability such as, miss-calculations by the caregivers (Demetriou et al., 2015). A karaoke machine was lent for home practice.

Slide 9

The neuropsychological assessments carried out include several measurements, this section is not clear to the reader, with many acronyms used and only some explained. However, this could be due to an assumption of knowledgeable readers. The assessments were undertaken by both participants and carers. Although it is not clear within the paper, the study matches the criteria for an experimental design, with strict inclusion criteria for its conditions, and an aim to establish the relationship music contributed to Alzheimer’s (Kirk, 2002). Experimental designs have been implemented within several dementia studies, with the application of said design being commonly applied within clinical studies as they typically involve specific interventions generally surrounding medical procedures or behavioural changes (Buttula et al., 2015).

Slide 10

fMRI was used to monitor brain function. A combination of fMRI and behavioural data is commonly applied within cognitive studies, and the application within memory studies allowed for the undertaking of training programmes to help anyone with memory loss improve their function including Alzheimer's (Clay, 2007). fMRI is considered a strong tool in detecting responses to cognitive tasks surrounding neuroscience. However, results rely heavily on correct strategy combination and is therefore encouraged to be used without high complexity (Amaro & Baker, 2006).

A PET is also suitable for the current study, when compared within a memory recall study both PET and fMRI held the same mean accuracy. Use of PET also presented frontopolar activations whereas fMRI failed, additionally fMRI data is sensitive to movement. However overall fMRI is generally a preferred option within neuroscientific experiments due to area coverage, resolution, cost and accessibility (Mottaghy et al., 2000) (Varvatsoulias, 2013).

Slide 11

Results began strong, highlighting the strengths and significant findings surrounding general performance and neuropsychological assessments, positive findings within this area include memory improvement such as one patient remembering the name of a family member and another returning to phone use. The initial literature review supports these findings, there are also several additional research studies who also support the findings. Owens, (2014) considered the impact of music therapy on dementia through case studies, the findings within also include beneficial outcomes ranging from communication encouragement to memory stimulation.

The fMRI results were difficult to achieve, with difficulty surrounding understanding, however two participants were able to complete the task following the 6 month intervention. No information regarding fMRI was introduced within the initial literature review, making it unclear what was hypothesised. Overall the results section was clear, and information was backed up with tables, and photographs of the fMRI scans. Data presentation, alongside a brief description as is shown within this paper is key to proper presentation surrounding a results section (Fox & Jennings, 2014).

Slide 12

The discussion begins by adding further literature to the possible benefits surrounding music therapy. It then provides an overview of the results, the paper identifies as the first to show psychomotor speed improvement without a need for pharmaceuticals. There have been several studies surrounding this area since its publication. James et al., (2023) conducted a recent study on the on influence of music over 6 months to determine psychomotor speed improvements with mild cognitive impaired patients. This study also presented positive impacts on cognitive and psychomotor performance within its participants.

Slide 13

The discussion ends by considering its limitations. Including subject size, educational history between control and active participants, time period, and the progression of dementia being mild within its participants. The addition of the difficulties conducting fMRI could be added to this area. In consideration to the limitations, Brookmeyer and Abdalla, (2020) consider the sample size for Alzheimer’s would need to be in its thousands, along side early intervention, with at least five year follow ups to be considered ideal. Making this an almost impossible task for any single study.

The conclusion is a brief overview of the study, succinct and to the point.

Slide 14

To conclude the paper overall is well written, concise and can be replicated simply. It gives an early insight into the benefits of music therapy to that of memory and the relationship that may be present. There are some areas of confusion, which are likely to be better understood by a knowledgeable reader of neuroscience. Each individual section provides detailed and in depth information related to that area. The paper presents intrigue and insight that can only be beneficial overall.