

## REPORTE DE CASO

# Memory for music and Alzheimer's Disease. Case report

## Memoria para la música y enfermedad de Alzheimer. Reporte de caso

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### ABSTRACT

It is increasingly described that memory for music is preserved in people living with Alzheimer's disease (AD). This article illustrates a case example of well-preserved memory for music in one non musician adult with AD at its moderate to advanced stage. During the four-year course of adapted music lessons he displayed an outstanding and increasing ability to learn new songs over time, despite his overall deterioration deepened due to the progress of the disease. Addressing the question if adults in late stages of AD are able to learn and recall new musical material, this case is relevant given the novel findings seen during this course of work, which can have implications in treatment planning, intervention design and to further explore the mechanisms of memory for music particularly in AD.

**Keywords:** Alzheimer's Disease; Memory; Music.

### RESUMEN

Cada vez se encuentran más descripciones sobre la preservación de la memoria para la música en personas que viven con la enfermedad de Alzheimer (EA). Este artículo reporta el caso de un adulto no músico con EA en etapa moderada a avanzada con buena preservación de la memoria para la música. A través de cuatro años de clases adaptadas de música, mostró una mejora progresiva en la habilidad para aprender canciones nuevas a pesar de su deterioro general también progresivo debido a la enfermedad. Al abordar la cuestión de si los adultos en etapas avanzadas de EA pueden aprender y recordar material musical nuevo, este caso es relevante por los hallazgos novedosos obtenidos en este trabajo, ya que pueden tener implicancias en la planificación de tratamientos, el diseño de intervenciones y para estudiar en mayor profundidad los mecanismos de la memoria para la música particularmente en EA.

**Palabras clave:** Enfermedad de Alzheimer; Memoria; Música.

### INTRODUCTION

Alzheimer's Disease (AD) is a neurodegenerative condition with early manifestation of cognitive impairments more pronounced in memory domains and behavioural disturbances. There is no cure for this disease, which worsens as it progresses and eventually leads to death.<sup>(1)</sup>

Alzheimer's Disease International informed in 2019 there were over 50 million people living with dementia globally. This not-for-profit organisation also estimates AD will increase to 82 million in 2030 and 152 million by 2050, showing the enormous impact on socio-economic conditions worldwide.<sup>(2)</sup>

Therefore, identifying effective interventions for cognitive stimulation towards functioning improvement can be fundamental for the global health system.

A growing body of evidence suggests that memory for music is well-preserved and robust in people with AD particularly for music learned before the onset of the disease.<sup>(3,4,5,6,7,8)</sup>

It has been suggested that there is a preserved ability to learn new musical material even in advanced stages of the disease. Outcomes from several studies show that adults with AD are able to develop a sense of familiarity and learn new songs.<sup>(9,10)</sup>

However, little has been explored regarding the improvement of the ability to learn new songs under long-term influence of adapted music lessons with live music making.

This case example illustrates not only the well-preserved memory for music in one adult with moderate to advanced AD but also his increasing ability to learn new songs over time during a four-year course of adapted music lessons, which makes this case relevant to present given these observations. The four-year course of adapted music lessons was provided by a music educator with a degree in music therapy. The work was analyzed from video recordings. It is written following the CARE guidelines.

## CASE REPORT

Abraham is a right-handed non-musician 84-year-old man with 13 years of education, fluent in several languages who was the founder director of a company until retirement. In 2009, he began to show memory difficulties and both naming and attentional lapses that worsened progressively. He was diagnosed with AD in 2011, at the age of eighty. In 2015, his neurologist reported a score of 24 on the Mini-Mental State Examination,<sup>(11)</sup> disorientation to time, episodic memory for immediate and deferred recall, and executive functions perseverations. Other cognitive functions were preserved and displayed no depressive symptoms.

He has a supportive family that consists of his wife, two daughters, one son, and eight grandchildren. He describes himself as a music lover with preference for folk music, jazz standards and classical music. His family sought out music lessons to provide him with activities that he would enjoy, as a source of cognitive stimulation as well as a way for him to be active while maintaining not only his positive affect but his life spirit.

Adapted music lessons began in November 2015. He displayed ability to sing in tune with engagement, confidence, sensibility, and spontaneous self-expression. In addition, his rhythmic, melodic and harmonic sense, phrasing and memory for both music and lyrics were intact.

Lessons included singing and instrumental improvisations. During the first six months, only his preferred songs were used. Afterwards, novel musical themes from his favourite musical genres were offered to introduce new challenges aiming at increasing his curiosity, motivation, initiative and overall cognitive functioning. At the time, Abraham began to show signs of cognitive declination such as repetition and perseveration in his musical choices as well as difficulties in remembering he had a newborn granddaughter, his grandchildren's names and who were their parents. Recall and problem solving in music as well as his enthusiasm, motivation and interest in making music remained intact.

Lessons were divided in three moments:

1) warm up: breathing and vocal exercises

2) new song: divided into two tasks

a) reading lyrics to identify its meaning

b) singing together with his music instructor (divided into three sections)

b1) learning one line of the song at the time

b2) singing an entire novel verse or chorus

b3) singing a whole song alternating between Abraham and his instructor while singing verse/

chorus

3) closure: singing together with his instructor a familiar song of Abraham's choice.

Table 1 summarizes the timeline of the changes in his musical memory: as the overall declination exacerbates, memory for music seemed to improve throughout 46 months of work. Overall declination was described by his family and through neurologist follow ups.

## DISCUSSION

This case report brings awareness on the benefit of working with live music and novel musical material with adults with moderate to severe AD. Abraham's revealing experience of discovering novel music instead of reminiscing familiar music involved decision-making, initiative, collaborative work, attention span, meaningful emotional interactions, sense of humor and increased motivation to approach and overcome new challenges.

Despite it is widely described that people with AD are able to recall music learned before the onset of the disease,<sup>(3,4,5,8)</sup> and have a preserved ability to develop a sense of familiarity or learn songs when exposed systematically to new musical material,<sup>(9,10)</sup> there seems to be more to explore regarding memory for novel music in adults with AD. There is an outstanding contrast between Abraham's ability to learn new songs and his overall declination. Surprisingly, the length of time that Abraham needed to learn a new song decreased as

**Table 1.** Timeline of changes in musical memory

Date	Novel musical material	Memory for music	Overall declination
March 2016	Song 1	Challenge in learning new melodic motifs	Able to recall names, what he did in previous classes (partially)
October 2017	Song 1	Difficulties to store and/or recall the songs after 19 months of work.	Cyclical singing. Not able to stop after the song ends, starting all over once again. Episodes of irritability and verbal aggression. Full supervision for daily life activities. Gait instability
March 2018	Song 1	Sings a capella, able to fully recall the song with printed lyrics without assistance	
June 2018	Song 2	Able to recall melody of the chorus after two repetitions of song. Needs cues to recall melody of verses Memory for music seems to improve	Mood: stable. Smiles, displays kindness, eager to engage in every encounter.
September 2018	Songs 1 and 2	Recalls melody without assistance or cues Memory for music: improving	Fluctuations in mood. Not able to recall what he did before the lesson began.
November 2018	Song 3	Recalls melody of verses after 4 repetitions. Continues to recall songs 1 and 2	
January 2019	Songs 1, 2 and 3	Recalls songs without assistance or cues	Doesn't recall how he learned the song. Ability for turn taking and divided attention.
May 2019	Song 4	Learns song within three lessons, with musical cues	Eager to learn new material. Enjoys new challenges
June 2019	Song 4	Recalls music of chorus during first three repetitions with musical cues	Pronounced balance instability and mood fluctuations.
July 2019	Songs 1 and 2	Recalls without assistance or cues	Articulated: refined use of words to reflect how he feels, what he wants
	Song 4	Recalls partially the chorus with cues	
August 2019	Song 1, 2 and 4	Recalls songs without assistance or cues	Maintain skills for taking turns and for divided attention
September 2019	Song 5	Learns song in one lesson Recalls melody without assistance during following weeks	Communicates assertive choices (i.e. musical genre) Eager to learn new material. Enjoys new challenges Active declination towards advanced stage of AD
December 2019	Song 5	Recalls melody. Can sing it a cappella	Difficulties for face recognition Kind, warm and gentle at welcoming and goodbye Sudden mood changes
	Song 1, 2, 3 and 4	Continues recalling without assistance or cues. Can sing it a cappella	Communicates clear choices (i.e. musical genre)

challenges in other areas of functioning increased. This latter outcome provides encouraging support to further explore if memory for music in people with AD might improve by working with an adequate approach.

Many questions then arise: Is memory for new music spared in AD? Is Abraham an exception or we might expect similar responses in other subjects with AD? And further: if such memory improvement is found among AD population, is it due to the number of repetitions during exposure to the song and/or the meaningful emotional musical experience might foster this cognitive improvement despite of the stage of the disease?

It remains unclear as to how this improvement in musical memory can transfer or have impact in other areas of functioning. The insights gained from this case report may give birth to more interest in pursuing lines of research related to better understand the mechanisms in which new musical memories are stored and recalled as well as on the potential benefit in other areas of cognitive functioning due to this intervention.

Findings emerging from this case report can support approaches that use musical experiences with novel live music as an intervention for memory impairment related to AD.

## CONCLUSION

When faced with the question if adults with moderate to severe AD are able to learn and recall new musical material, the major revelation from this case report is that in addition to show the ability to learn and recall new musical material, the subject improved these abilities over time while his deterioration deepened due to the progress of AD. This finding might be a window to new possibilities for people with AD which needs further exploration.

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## CONFLICTS OF INTEREST

None.

## FINANCING

None.

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