Creative Music Production

Professional Project

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Does Music Increase The Memorability Of Information?

26th April 2024

Supervisors: Peter Jones and Brian Carty

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Abstract

The main objective of the thesis was to explore if music increases the memorability of information. This was achieved with extensive research in the relevant fields such as: musical techniques, optimal song duration, how background music affects memory of text, the brain processing music, music and memory, rhyme and memory, memory capacity and attention span with regards to age. Expert interviews were conducted to supplement the literature review. From these research sources and interviews two versions of one song were recorded, mixed, and mastered.

The composition process took into account that simple and repetitive melodies accompanying information put in rhyme and alliteration may be effective memory tools. Rhythm played an important role in memory as keeping a consistent beat helped the listener break down and remember the information. The rhythms of the melodies and vocal lines were composed using specific musical techniques for writing memorable music, such as chord tones, call and response, stepwise and leap motion, syncopation, and combined short and long notes. Furthermore, writing in a major key helped listeners anticipate 1) the structure of the chords and 2) the melodies.

Following the compositions, memory surveys were conducted with 72 participants, consisting of three questionnaires: A (text only), B (simple song) and C (complex song). Analysis of the results suggested that information was better remembered when combined with a simple song, in that the simple version of the song had the highest percentage of correct memory test answers. The research found that information accompanied by simple and repetitive music appeared to help participants remember the information more accurately. In contrast, the complex version of the song was associated with the poorest recollection of the information, suggesting that there needs to be a balance between arousal level, memory capacity and attention span, as music that is too complex can divide participants' attention away from the information.

Acknowledgments

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I am grateful to a number of people who supported me during the recordings and have lent their voices to my compositions; namely:

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Table of Contents

Figures & Tables

Introduction

It is well researched and documented that listeners are able to remember parts or all of a song (melody and words) even after long periods of time (Barlett and Snelus, 551) (Miller, 2). The aim of this research was to explore whether compositional musical techniques, in a constructed song with text, facilitated committing and retaining information to memory. This was a unique new approach in understanding how to compose memorable music, whilst exploring where and how the brain processes music and how music affects memory. The research examined the importance of melody, pitch and rhythm in composing a memorable song. In addition, the relevant sources informed instrument choices, key, tempo and repetitiveness of elements of the artifacts produced. Additional expert opinions were sought from a Professor of Music and a IACAT accredited Music Therapist with specialist training in Neurologic Music Therapy. Their opinions were taken into account when composing the songs and designing the empirical study. The compositions were tested in a memory survey, exploring and comparing the effects of the memorability of information with and without music. Furthermore, a more intricate and a simpler song were composed to investigate the effects of the complexity of a song on memorability of information, either positively or negatively. The research findings suggest that a song may indeed contribute to the memorability and retention of information and also identify the type song and level of its complexity that seems most likely to achieve this.

Literature Review

Introduction:

A literature review was undertaken to explore current understanding of the relationship, if any, between a musical medium and a spoken or sung message. It is hypothesised that musical accompaniment makes it easier for subjects to retain accurate recollection of the information content of a written or spoken narrative. The sources referenced in the literature review will influence the research project. The scope of the literature review covered the following topics: music theory, how the brain processes music, and music and memory, information for the compositional work and empirical study.

Music Theory:

An essential element in this research project is an exploration of composition; knowing what musical techniques to use and how to use them to make a song memorable.

A research article written by Matla *(EDMprod.com)*, provides detailed strategies on how to compose a memorable song, using specific musical techniques. Matla holds that the techniques most relevant to the research project are the use of repetition, structure, simplicity, rhythm, melody and vocals. Matla explains that the use of repetition of a simple melody allows the listener to hear the melody several times and encourages them to remember the melody subconsciously. Including lyrics further drives people to sing along, enhancing retention of the melody. This interpretation is supported by a (*iconcollective.edu*) website article, which stresses the importance of melody and rhythm. It explains how to compose a strong melody, using different musical techniques such as: stepwise[1] and leap[2] motion, using call and response[3] and using variations of rhythmic motifs, for example

[1] A melodic motion where the interval between two notes is no more than one step apart
[2] A melodic motion where the interval between two notes is greater than one step apart
[3] A call and response melody is like a conversation in music, one part of the melody is a question, that is followed by an answer, usually resolving the melody

syncopation[4], legato[5] and staccato[6] notes, and varying patterns to create a sense of tension and release.

Another musical aspect is the effect of pitch on memory. Koh finds that high frequencies are optimal for remembering words (9). He explains that it is difficult to find word associations within the low frequency range and tones. Koh states that people tend to hear others talking more distinctly, at higher rather than lower frequencies. The article also discusses whether background music is helpful or distracting for remembering information. He considers background music helpful in alleviating anxiety and improving focus during learning.

Matla and the Icon Collective provide detailed suggestions for the composition of a memorable song which were taken into consideration during the practical element of the research project, i.e. the composition of the song. Koh highlights that higher pitches are more memorable, and Matla points out the importance of repetition.

Song Duration:

Thrasher *(improvesongwriting.com)*, stresses that the optimal duration of a song for remembering as much detail as possible is 2-3 minutes. He explains that songs are getting shorter in duration:

> If you look back and take an average of the duration of number one songs during all music eras in the US, you get an average of 3.8 minutes in length. But compare that to the years since 2009, the length of #1 singles has slowly been shrinking to a current average of 3.5 minutes! (Para. 2)

According to Thrasher, the average song played on Spotify is 3 minutes and 17 seconds.

[4] A note played on the weak beat in music, e.g., the second and fourth beat
[5] A note played smoothly and connected to others
[6] A note played with no sustain and usually very fast

How Background Music Affects Memory of Text:

Two articles suggest that listening to background music may be too distracting to the average person when learning facts or information.

Birmann and Fergusen (188), examined the effects of different musical genres compared with complete silence on memory. In a study, they divided 100 participants into four different sections: silence, rock, classical and the final group chose any musical genre they liked. They established that background music had little impact on memory performance. They found that the group that was able to choose their own music remembered more, and thus believed that likeability of a song boosts mood and subsequently memory. They also observed that rock music has a negative impact on long-term memory[7].

Lehmann and Seufert (8) found that background music is a personal preference. They described people to have either a low or high capacity for memory. In their study with 81 participants, they found that people with the lowest memory capacity[8] levels were especially impaired by background music and that people with higher capacity were not affected. An interesting view, similar to the Birmann and Fergusen study, is that background music could benefit learners by influencing their mood and arousal level, thus fostering the learning process.

The sources suggest that the likeability of background music is an important factor in the effectiveness to memorising information. It is also suggested that background music may have a negative impact on information memorability. Important to note for the empirical study, is the difference in results according to memory capacity.

[7] Memories that are held or remembered in the brain over a long period of time
[8] The amount of information a person can hold in short term memory

The Brain Processing Music:

Another important aspect of the research to be considered is how the brain processes music. Understanding how sound enters the brain, what parts process certain aspects of music and how music helps memory is relevant to this research project. Whether being musically trained at a young age can have a positive influence on speech and creativity is among the research questions addressed. Papers by McCollum and Tuarez were found to provide valuable insights.

McCollum *(Kennedy-center.org)* discusses how sound is processed. He describes the entry of sound into the human ear causing the eardrum and tiny bones to vibrate. The middle ear passes the vibrations to the inner ear where 20,000-30,000 hair cells sense different tones and pitches. The inner ear then translates the vibrations into electrical signals that are carried by the nervous system to the cerebral cortex; described as a 'supercomputer'. The belt and parabelt, located on the right side of the brain, are responsible for determining rhythm and pattern. The auditory cortex mainly handles the understanding of pitch and tone. The prefrontal cortex analyses anticipation and creates expectations. The hippocampus stores memories and has an ability to remember music well.

Tuarez (28) describes the brain as an engine with an infinite learning capacity due to the flexibility of neurons and synapses and stresses that every person's brain is different. She goes into detail about two kinds of memory: 1) implicit, spontaneous learning and 2) explicit, conscious learning. She also describes the two hemispheres of the brain. The left: used most for verbal, logical, reasoning, science and maths. The right: nonverbal, holistic, intuitive, art and music.

Cheever (1214) discusses how music affects people across different periods of their lives. The point that is relevant to this research is that musical training at a young age and in general, helps language development, attention, visuospatial perception and executive function. The thickness of specific cortical regions associated with musicality correlates with the age at which individuals started musical training. Cheever found differences in the brain structure between musicians and non-musicians. There is a crossover, or shared circuits,

between playing music creatively (e.g., improvisation[9]) and language processing. This suggests that there is a positive influence on speech processing and creativity in general, when musically trained.

Lastly, a study by Paromita and Somsubhra (1033), looked at the effects of music on the brain by tracking brain activity when listening to background music. Like Cheever, this study reported benefits of a musical education on language processing and also reported on other advancements in auditory perception and verbal memory.

> From the viewpoint of utility of the approach, in today's world music has some greater significance than ever. Music tunes the heart, controls the mind set by making emotional adjustments. (1038)

These authors detail the different parts of the brain utilised when processing music. There is an infinite learning capacity and that every brain is different. However, age and musical training are important factors that will be taken into consideration during the listener survey.

[9] Playing an instrument with a piece of music without preparation and playing freely

Music and Memory:

Music and memory is the foundation of this research and is the most relevant, but equally controversial. This is a very active research front.

Ferreri and Verga (167) discuss the benefits of music on verbal learning and memory. They found that music has a positive effect on mood. They explain the positive effects of music on encoding and retrieval of verbal stimuli. However, they also found that music can divide the listener's attention and conclude that music may act as a learning device by "providing a structural temporal scaffolding framework that facilitates word learning" (171). A study was conducted, whereby a word list or a sung list was presented to participants. The initial recall was the same, but in a follow up survey, those who received the sung list had better recall. They concluded that for a song to aid memory, the music melody had to be simple, easy to learn, have symmetrical melodic contours[10] and a lot of repetition.
Another experiment was included, focussing on the learning of foreign languages. Here, it was found that singing was more effective than spoken word and that the melodic component may be the most important aspect for learning and memory. Music can attract and drive participants' attention when the stimuli are sufficiently 'simple' to allow identification. More complex music may result in divided attention and may attract participants' attention away from the information to be remembered and learned. They highlighted that the result may differ depending on whether or not the music is familiar or unfamiliar, with participants being able to memorise a sung text better if the melody is familiar.

In contrast, a study by Musliu (139), found that music during study hindered memory, but increased mood and sport performance. An experiment with 75 participants, with a similar memory test score, established that music affects memory negatively and that the participants who did not listen to any music memorised and recalled more items.

[10] Different pitches of notes create the shape of the melody

Miller's (14) work also explores this conflicting topic. Her experiment shows that participants retained information better when it was sung to them with emphasised rhythmic syllables and a metronome in the background. They also retained the information longer than the group with no musical elements. Another experiment is described involving undergraduates who were asked to recall lyrics from spoken, sung, and sung with a piano prelude. This experiment shows that participants recalled more from both sung conditions better than the spoken lyrics.

The final experiment reported by Miller was conducted to prove that text assigned with music will increase recall in the short-term and long-term memory. The 81 participants were split into two groups. One group listened to spoken words and the other listened to sung words. After two weeks and listening to the spoken and sung words eight times with a week break after 4 listens, the groups were split further into four groups. Two out of the four groups would only listen to the words, one spoken and one sung. The other two groups would be asked to either sing the words back or speak the words back. Overall, the song-retrieval (the group that sang) group had the highest accuracy and both restudy groups (the groups just listening) had the lowest accuracy.

The final source specific to the effects of music on memory for narrative, is Thaut and Hodges' (237) chapter in the *Oxford Handbook of Music and the Brain: Music and Memory*. In this source they claim that song can be a powerful memory tool. Their study was to explore which combination of properties can be used in learning situations, effects of melody on recall. They hypothesised that with repetition of the music, the melody would become familiar and improve recall. Hearing a new melody may also act as a distracter, hindering recall of lyrics.

Their experiment compare roles of melodic repetition, the effect of familiarity, role of rhythm and the chunking effect[11] of melodic phrasing in recall. They tested 100 randomly selected participants. All versions were performed by the same singer, each contained five repetitions of the stimulus. Participants were asked what they could recall after each

[11] Chunking effect: "Break down larger pieces of information into smaller chunks. Instead of trying to memorise a long sequence of notes or chords, focus on smaller groups and gradually combine them" (Dunne, see Appendix A.1)

repetition and some listened to all repetitions before being asked what they could recall. The results showed that the best recall was with the familiar melody, followed by the spoken words alone and finally by the unfamiliar melody.

All sources included show that if the music is paired with: the text that is too unfamiliar, not repeated enough or too complex, the participant will not be able to split attention and retain the information. Thaut and Hodges and Ferreri and Verga showed the strongest agreement with the hypothesis that musical devices improve learning of passages of text. Both agreeing that familiar music helps memory recall when paired with text or sung text. Musliu had the most negative results out of the sources but still expressed positive outcomes with mood and sport performance.

Rhyme and Memory:

Lea, Elfenbein and Rapp, had relevant information pertaining to the research project. They state that "psychologists have turned to rhyme as a tool for understanding human memory" (1286). An experiment concluded that when given a piece with rhyming and alliteration, not only were participants able to retain information on the alliterated words, but they were also able to remember non-alliterated words within the same piece. This proves that rhyme and alliteration of words do have a positive effect on memory.

Conclusions:

A majority of researchers found that there is a positive correlation between certain kinds of music and retention of written and verbal information. Relevant factors influencing the strength of the correlation are familiarity of melody, simplicity of melody and written message, amount of repetition and arousal level. People with early life musical training, tend to develop certain advantages throughout their lives in terms of language learning and creativity. These findings have influenced the composition of the songs, the way in which the contents were written and subsequently, the research design into how music can be used to carry a message and enable it to be retained with less effort by participants compared with text only.

Methodology

Introduction:

A variety of methods were chosen to explore whether "… Music Increase(s) The Memorability Of Information" and to explore the evidence needed to create a memorable song and a memory listener survey. Matla *(EDMprod.com),* (*iconcollective.edu*) and Koh, provide a number of pointers with regards to the composition of a memorable song: simplicity, reptation, high frequency pitches. Cheever also suggests a difference in memory according to musical training and age factors that were explored further in the research. The chosen process for the methodology was to start with expert interviews to further elaborate on the desk research. The combined findings from the literature review and the expert interviews informed the practical elements that were planned: the compositions and memory survey.

Expert Interviews:

Before the practical element of the research project was started, two expert interviews took place (see, Appendix A.1 and A.2). This was to gain more advice on the research and to have an expert perspective on compositional aspects. The first interview that took place was with Roisin Hayes, a music therapist in Co. Kildare. Her knowledge of music psychology and how it can be used with patients was very useful for the research project. The second interview took place with Dr. Sarah Dunne, a musician and educator in Co. Wicklow and Dublin. Her experience in music theory, composition and teaching was extremely valuable.

Practical Element:

The practical element consisted of composing two songs, writing the text/lyrics, and recording the songs. The vocals and guitar were recorded in the studio and the other instruments were put together outside the studio, as well as mixing[12] and mastering[13] the

[12] Changing the levels (higher or lower) of music that was recorded, usually multitrack (multiple audio tracks)
[13] The final process before releasing or distributing music, making sure the overall levels are safe for listeners and that the sonic tone of the music is as wanted

song and its variation. Using musical techniques and guidelines about effective musical mediums from the literature review and expert interviews, a song was written with one variation. In sum, the outputs of the practical element included: a text only, text with a simple melody and text with a more complex melody variation. The variation of the melody helped determine what musically makes the song memorable and what exactly helps commit the text to memory.

The first step was to write a text including information, that the ordinary person does not know. This was to ensure the survey results are based on memory and not knowledge. The story written is about a dog and their owner visiting the beach, using information sourced from Lea, Elfenbein and Rapp (see, Appendix C).

The composition of the song took place towards the end of December 2023, after the expert interviews were undertaken. The choice of instruments used for the composition were informed by the literature review, mainly Ferreri and Verga, as well as Dr. Dunne. These sources suggest that classical instrument choices are more advantageous. The complexity of the composition was informed by mainly Matla *(EDMprod.com)* ensuring the melody was memorable but not too complicated. Results from the sources indicate that simplicity, repetition and familiarity will achieve the perfect arousal level for the listener, meaning they will be able to process the information better (see, Appendix B).

The recording sessions in the studio took place in early 2024 (see, Appendix D). Most of the instruments involved in the song were recorded outside the studio. Using Logic Pro for midi instruments and microphones such as: SM58, SM57 and NTA-1 to experiment with the guitar. Vocals used in the simple and complex variation, and the guitar used in the complex variation were recorded in Studio One, provided by the Sound Training College, IADT.

Mixing and mastering was completed in ProTools and Logic Pro, which are ‘Digital Audio Softwares’. The level of the instruments are even, while having the vocals the loudest. The mastering targets were -1.0 True Peak and -14LUFS, so the loudness was normal and safe for participants.

Memorability Survey:

Following the completion of the practical elements, a memorability survey was undertaken. Three versions of a quantitative survey were distributed. The first survey was released as a control, with text only and no music. The second survey was the text and the simple melody and the third was the text and the more complex melody. Participants were asked to read the text or listen to the song and to try and remember as much of the information as possible.

A total of 72 respondents completed the questionnaires, which were evenly split between the three different surveys, further explained in the Analysis section.

Conclusions:

The methodology provided a range of relevant targets and insights about the design of the research project and whether there was support one way or the other concerning the research question: Does Music Increase The Memorability Of Information? With relevant information obtained from the sources, it became more evident how best to utilise composition, recording, mixing and mastering and a listener survey to achieve the clearest answers for the research project.

Analysis:

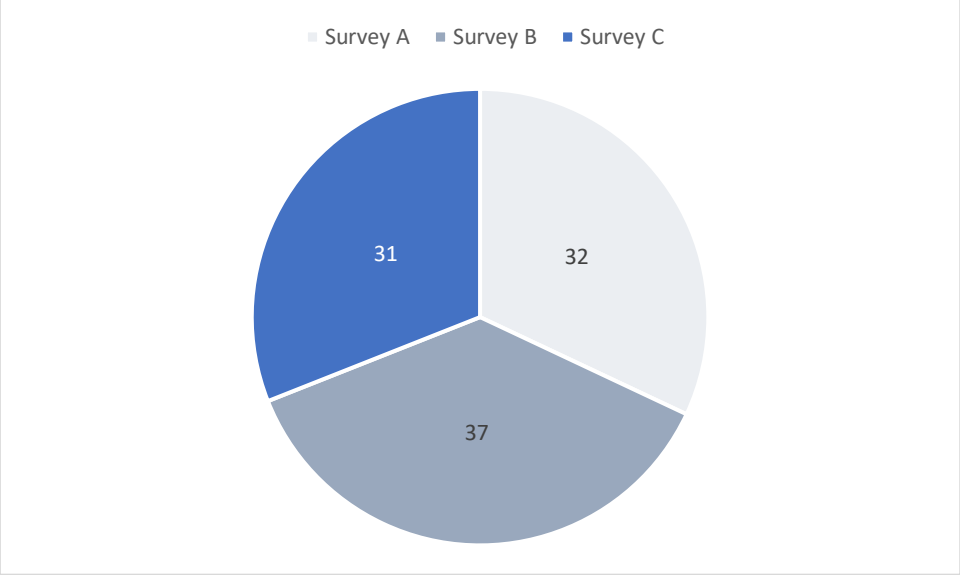
Introduction

On completion of the compositions, a memory survey was undertaken. Prior to the main survey, a pilot was undertaken to ensure that the survey memory questions were sufficiently difficult. Three surveys were created in SurveyMonkey (Survey A: text only, Survey B: simple song, Survey C: complex song; see Appendix E).

The main aim of the survey was to gauge the extent to which respondents remembered specific elements after reading the text or listening to one of two songs. The surveys also included questions about the respondents' age, gender, attitude towards music, and a seven-word memory test, to assess their general memory capacity.

Responses were collected between 8th March 2024 and 15th March 2024. Surveys were released in batches via WhatsApp and Instagram, to ensure equal responses to each survey. A total of 72 respondents completed the questionnaires. These were evenly split between the three different surveys as follows:

Figure 1: Surveys Completed (%)

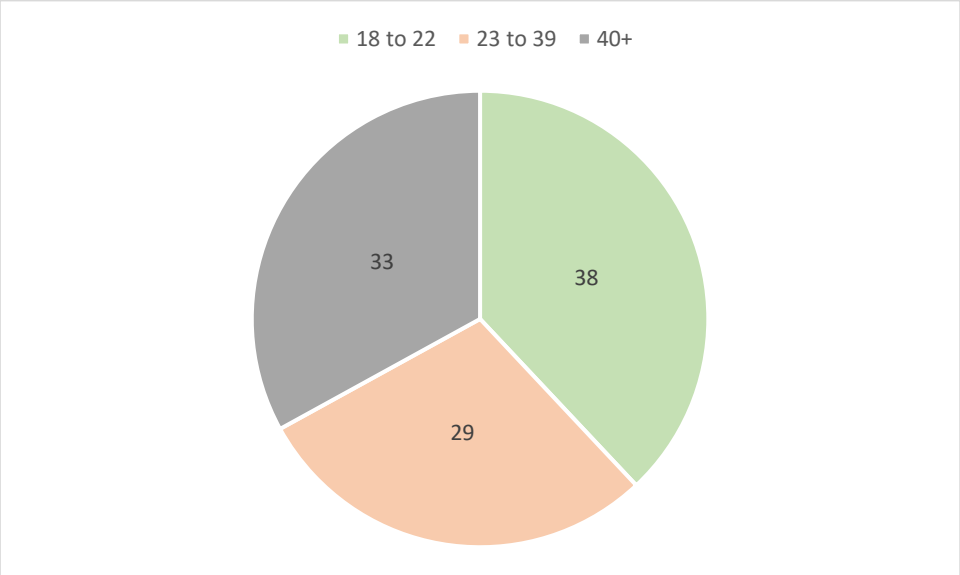


Base: All (72)

Respondent Profile

There was a good spread of different ages, the youngest respondent being 18 years old and the oldest 70 years old. Throughout the report, the following three age bands will be referred to:

Figure 2: Age Bands (%)



Base: All (72)

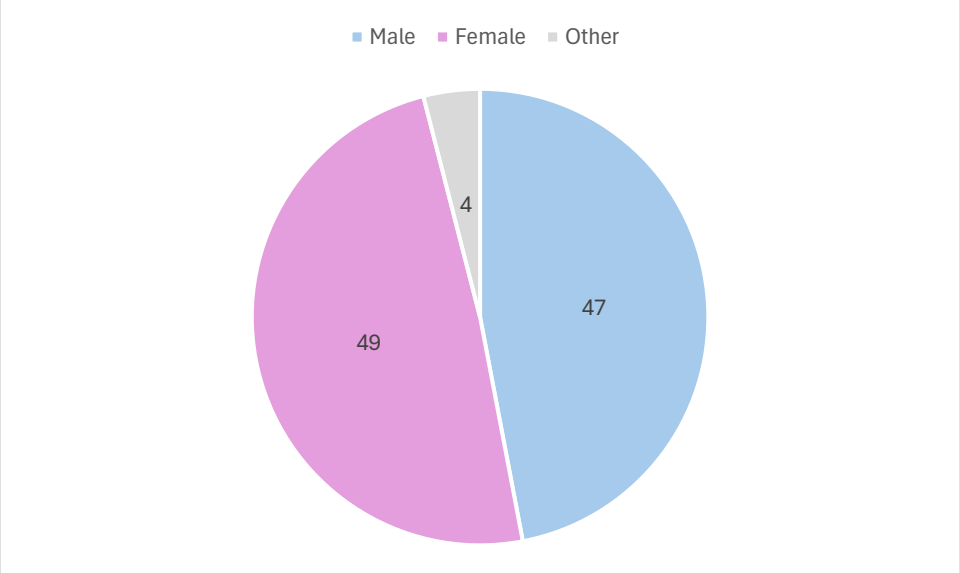
The table below indicates that the age profile for Survey A was younger, with the average age of participants being 26. The age profile of Survey B and C respondents was similar, with an average age of 38 and 37 respectively.

Table 1: Age Profile by Survey

	Base	Average age	Youngest Participant	Oldest Participant
Survey A	23	26	18	55
Survey B	27	38	19	70
Survey C	22	37	18	60

There was a relatively even split by gender, as the following chart illustrates:

Figure 3: Gender (%)



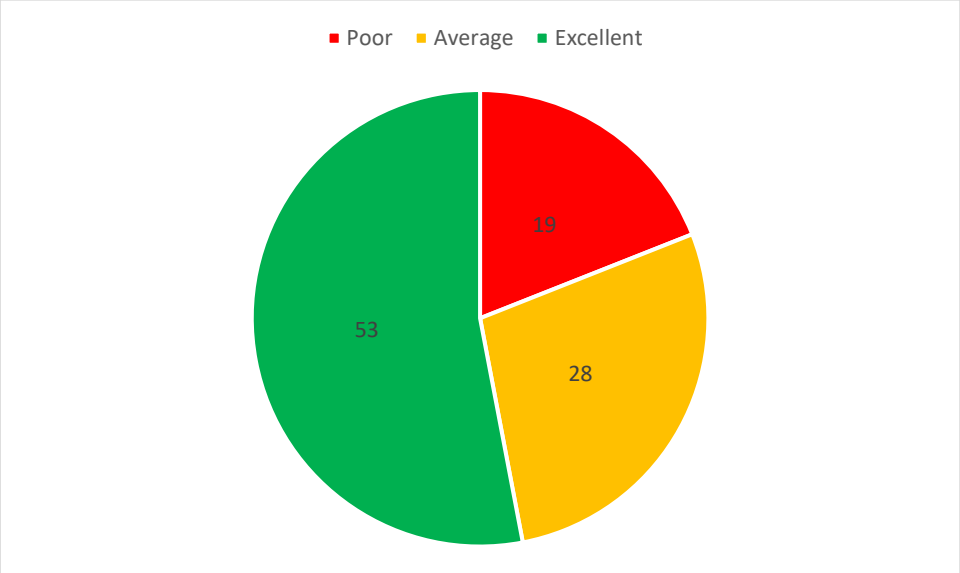
Base: All (72)

Memory Capacity

Respondents were asked to read and remember seven words, namely: window, shirt, watch, chair, tree, purple, apple. Those remembering five to seven words were classified as having 'excellent' memory capacity, those remembering three to four words were classified as having 'average' memory capacity, and the remainder, i.e., those remembering less than three words were classified as having 'poor' memory capacity.

Following a question about their attitudes towards music, respondents were then asked how many of the seven words they can remember to assess their general memory capacity. Just over half (53%) had an excellent memory, remembering five words or more, whereas nearly one in five (19%) had a poor memory, remembering only up to two of the seven words. The remainders' (28%) memory capacity was average, recalling three or four of the words.

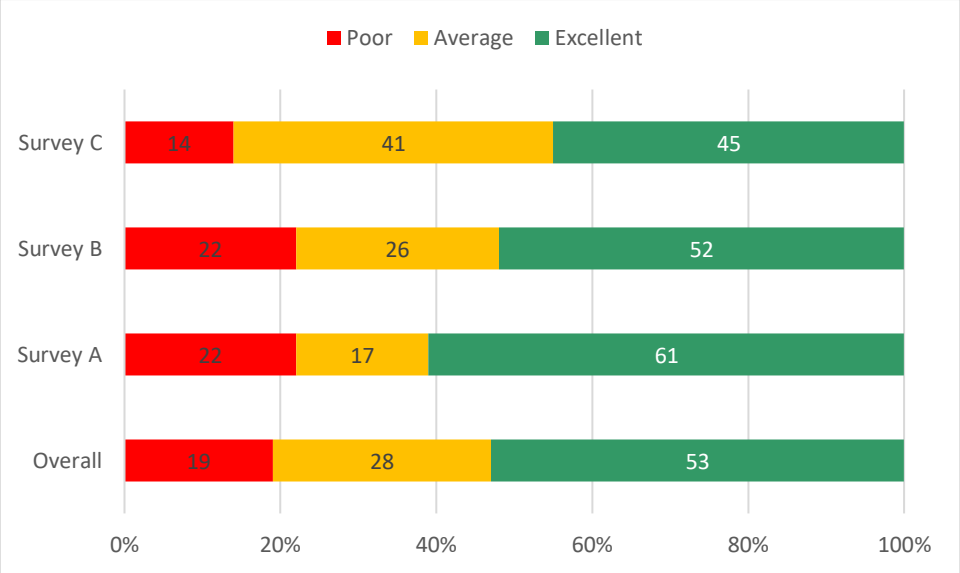
Figure 4: General Memory Capacity (%)



Base: All (72)

It is interesting to note that the memory capacity of those completing Survey A (text) was considerably higher, with 61% having an excellent memory capacity, compared to those taking part in Survey B ('simple' song) and particularly Survey C ('complex' song), with only 52% and 45% having an excellent memory, respectively.

Figure 5: Memory Capacity by Survey Completed (%)



Base: All (72), Survey A (23), Survey B (27), Survey C (22)

An analysis by age highlights that those aged 23 to 39 were most likely to have an excellent memory capacity (62%), while a third of those aged 40 or older (33%) had a poor memory.

Of the three age bands, the youngest group, 18 to 22 year olds, were most likely to have an average memory capacity (37%).

Memorability Comparison

Respondents were presented with a text or with one of two versions of the song: ***A Day at the Beach.*** (see Appendix C).

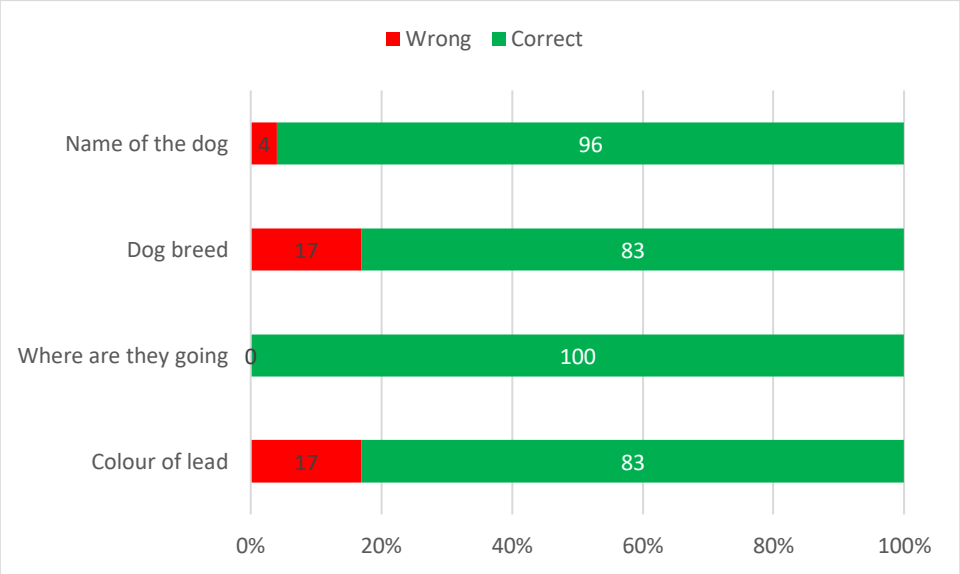
It is important to note that respondents read/listened to the chorus three times and the break four times, whereas all other information was only included once in the text/songs. The survey was designed in such a way that would allow respondents to read the text or listen to the song only once, before being asked to recall details.

Memorability of Lyrics in Chorus and Break

As expected, the proportion of those remembering the chorus and break lyrics was very high, given the number of repetitions of this information. Here, 'where are they going - the beach' had the highest recall.

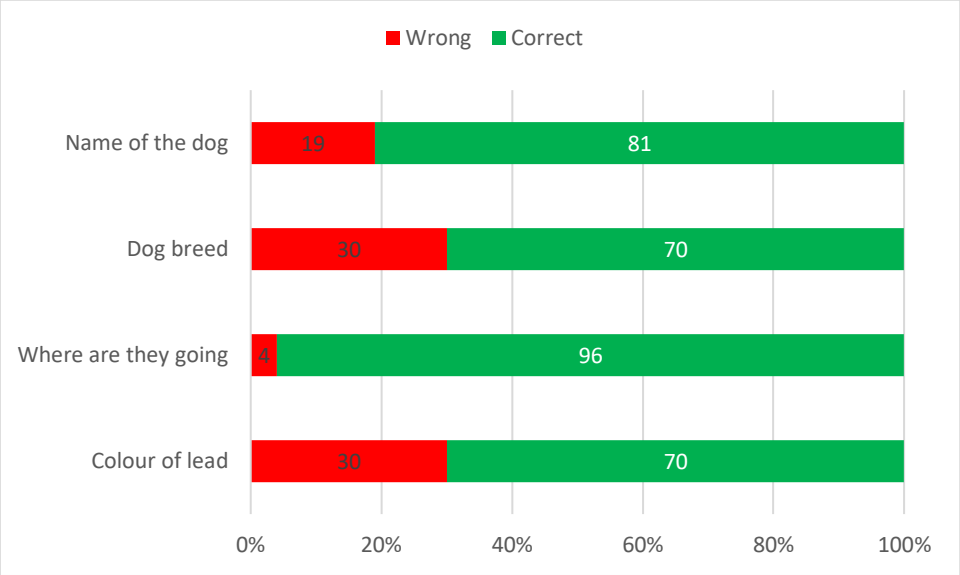
Information presented as text achieved a higher recall compared with the songs. There was little variation between results for the two songs.

Figure 6: Memorability of Lyrics in Chorus and Break – Survey A (%)



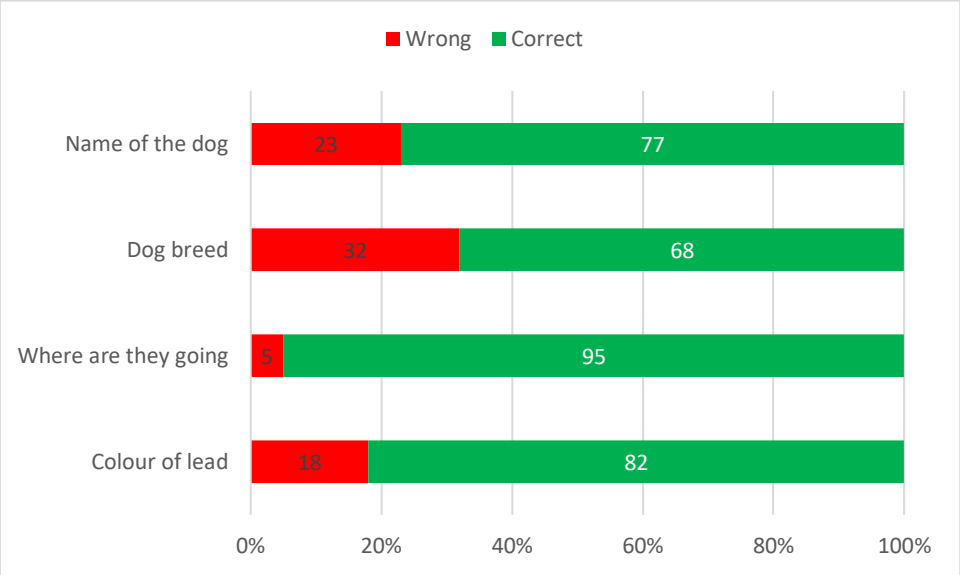
Base: Those who completed Survey A (23)

Figure 7: Memorability of Lyrics in Chorus and Break – Survey B (%)



Base: Those who completed Survey B (27)

Figure 8: Memorability of Lyrics in Chorus and Break – Survey C (%)



Base: Those who completed Survey C (22)

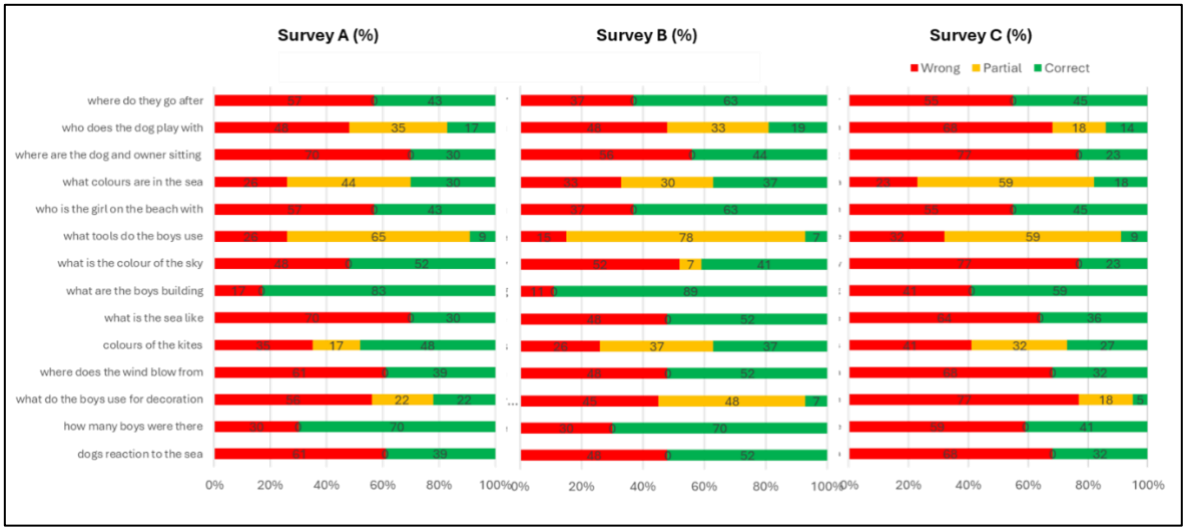
Memorability of the Lyrics in the Verses

Respondents were asked a number of detailed questions about the lyrics in the two verses.

To add to the difficulty, questions did not follow the text/songs but were mixed.

An analysis comparing the three surveys shows that Survey B, the 'simple' song, outperformed the text (Survey A) and the more complex song (Survey C).

Figure 9: Memorability of Lyrics in the Verses – A Comparison (%)



Base: All (72), Survey A (23), Survey B (27), Survey C (22)

For each question, the surveys were assigned Ranks 1, 2 or 3, depending on the proportion of correct answers achieved, i.e. the survey with the highest proportion of correct answers received Rank 1, the second highest Rank 2 and third highest Rank 3. This analysis provided the following results:

Table 2: Memorability Ranking of Surveys

	Survey A	Survey B	Survey C
Rank 1	5	10	1
Rank 2	6	4	4
Rank 3	3	0	9

In 10 of the 14 questions, Survey B ('simple' song) achieved the highest proportion of correct answers. In contrast, Survey C ('complex' song) ranked third in nine of the 14 questions, suggesting a higher proportion of incorrect or only partial answers.

In other words, respondents taking part in Survey B were better at remembering details from the 'simple' song, compared with those reading the text only (Survey A). Survey C ('complex' song) performed weakest in that respondents taking this Survey were less likely to remember the details of the verses.

Analysing results by the complexity of the information suggests that Survey B is particularly well suited for 'simple' (correct or wrong) questions – a simple song for simple facts or

information, e.g. what is the dog's reaction to the sea – she is scared. Text only (Survey A) seems more suited for remembering complex information with multiple facts, e.g. the tools the boys use to build the castle - buckets, shovels, sticks and spades.

Table 3: Memorability Ranking by Complexity of Information and Survey

	Survey A			Survey B			Survey C		
	Rank 1	Rank 2	Rank 3	Rank 1	Rank 2	Rank 3	Rank 1	Rank 2	Rank 3
Correct/wrong	1	4	3	8	0	0	0	4	4
Correct/partial/wrong	4	2	0	2	4	0	1	0	5

The table below shows the percentage of correct answers from each survey and whether the information was included in Verse 1 or Verse 2, i.e. at the beginning or end of the text/songs.

Table 4: Memorability of Information by Verses (%)

	% of correct answers	Survey A %	Survey B %	Survey C %
Verse 1	how many boys were there	70	70	41
Verse 1	what do the boys use for decoration	22	7	5
Verse 1	colours of the kites	48	37	27
Verse 1	what are the boys building	83	89	59
Verse 1	what is the colour of the sky	52	41	23
Verse 1	what tools do the boys use	9	7	9
Verse 1	who is the girl on the beach with	43	63	45
Verse 2	dogs reaction to the sea	39	52	32
Verse 2	where does the wind blow from	39	52	32
Verse 2	what is the sea like	30	52	36
Verse 2	what colours are in the sea	30	37	18
Verse 2	where are the dog and owner sitting	30	44	23
Verse 2	who does the dog play with	17	19	14
Verse 2	where do they go after	43	63	45

Base: All (72), Survey A (23), Survey B (27), Survey C (22)

The table highlights that those completing Survey A (text only) performed particularly well remembering information contained in Verse 1. However, Verse 2 information was not retained as well. This suggests perhaps a diminishing degree of concentration and/or confirms that people find it easier to remember more information when contained in a song, rather than reading a text. Although the proportion of correct answers for Verse 2 by Survey B respondents was also lower compared with Verse 1, the effect is considerably smaller,

suggesting that respondents listened more carefully to the entirety of the song, holding their interest and concentration; showing they were able to remember Verse 2 information better.

Analysis of potential Musical Distractions (Layers) in the Verses

To explore possible musical and compositional reasons why respondents completing Survey B or C found some of the information difficult to remember, an analysis of the two songs was undertaken.

Both Simple and Complex Song Versions

The Marimba Melody:

During the two verses in the simple version (Survey B), the marimba melody is prominent throughout the second line of the phrase, e.g. :

in Verse1

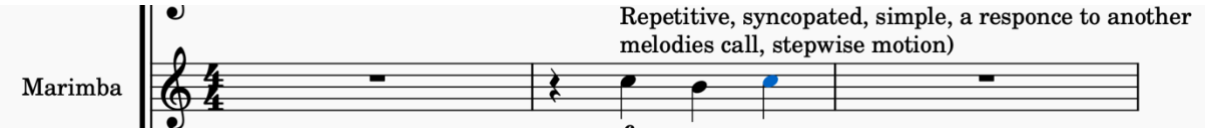
- … and spades
- … it look great
- … look over there
- … in the air

in Verse 2

- …green and blue
- … deep sea view
- …from the west side
- …is the best time.

Three interrupted lines during the verses include information asked in the memory survey. This melody can easily take away from participants' attention. This could be a possible reason why in Survey B only 37% and in Survey C only 18% of respondents could answer "What colours are in the sea?".

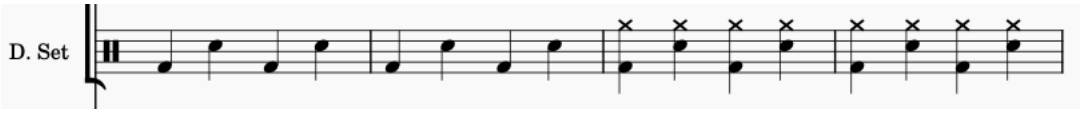
Figure 10: Marimba Melody Snapshot from Score



Drum Pattern Change

In the last two bars of Verse 1 the drumbeat introduces repeated high hats. This may have been a distraction for the participants and may explain why the question "Who is the girl on the beach with?" was answered poorly (in Survey B 63% and Survey C 45% gave the correct answer).

Figure 11: Repeated High Hats before Verse 1 Snapshot from Score

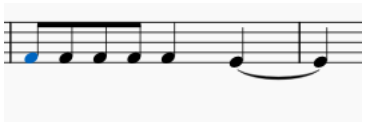


Rhythmic Changes

Another point to make regarding why some of the questions were answered poorly is because of the rhythmic changes in the lyrics. The rhythm of the lyrics stays mostly the same with few changes. However, it is noticeably different in the last two phrases of the second verse. The questions affected were:

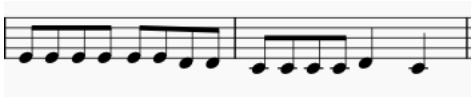
- "Where does the wind blow from", which 52% of Survey B respondents and 32% of Survey C respondents answered correctly.

  Figure 12: Lyric Rhythm Variation Snapshot from Score

- "Who does the dog play with?", which was answered correctly by 19% of Survey B respondents and 14% of Survey C respondents.

  Figure 13: Lyric Rhythm Variation Snapshot from Score

Complex Song Only

The vocal harmony and ad libs added more complex melodic and rhythmic content in the piece. The verse vocal harmony was present in the later stages of each phrase. Much like the marimba, this makes the song fuller and more interesting, but it appears to have distracted from the information, for example:

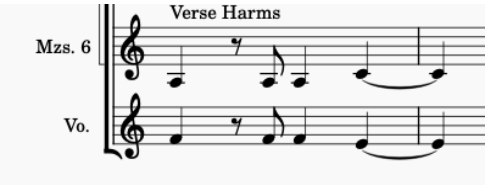
in Verse 1

- … sticks and spades
- … making it look great
- … look over there
- … high up in the air

in Verse 2

- … green and blue
- … the deep sea view
- … blowing from the West side
- … poodle is the best time.

Figure 14: Example of Verse harmony Snapshot from Score



A guitar and a three interval piano melody were included in the verse of the complex song version. These additional two layers may also have distracted listeners from processing the lyrics.

Two examples where listeners to the complex song had a particularly high proportion of wrongs answers (77% each) were: of wrongly answered reason were:

- What do the boys use for decoration? Six starfish.

Possible reason why answered poorly: ‘six’ was sung on the first beat of the bar, meaning there is more competition from the instruments (guitar, drums, piano, bass). Also the guitar is slightly out of tune on that beat, causing more distraction from the lyrics.

- Where does the owner sit down? One the dunes.

The word ‘dunes’ is sung between the fourth and the first beat of the next bar. As ‘dunes’ is syncopated in the rhythm it is possible that it made the word ‘weak’. Additionally, the word ‘dunes’ is sung in a held vibrato note, which may have made more difficult to understand.

Memorability Comparison by Subgroups

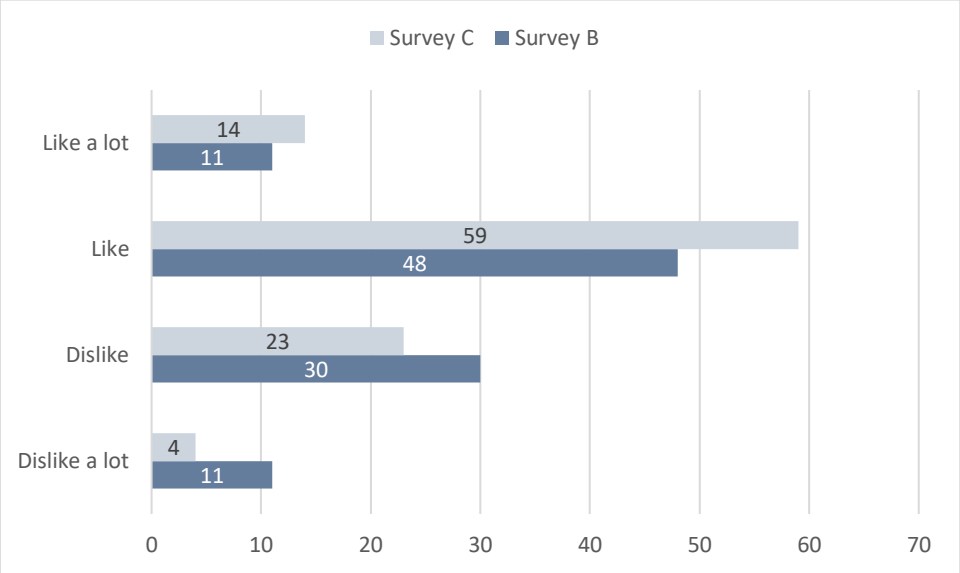
Impact of Likeability of the Song on Memorability

Bermann and Fergusen (188) suggest that likeability of a song boosts mood and subsequently memorability. This was further explored in this study.

Participants in Surveys B and C were asked whether or not they liked the song they had listened to. A larger proportion of listeners to the complex Survey C song stated, that they either liked, or liked the song a lot (73%), compared with 59% of those who listened to the simpler song (Survey B).

Considering that memorability results for the more complex song (Survey C) were considerably lower compared to the simpler version of the song (Survey B), the results of this research suggest that likeability of a song does not necessarily positively impact memorability of information.

Figure 15: Likeability of a Song (%)

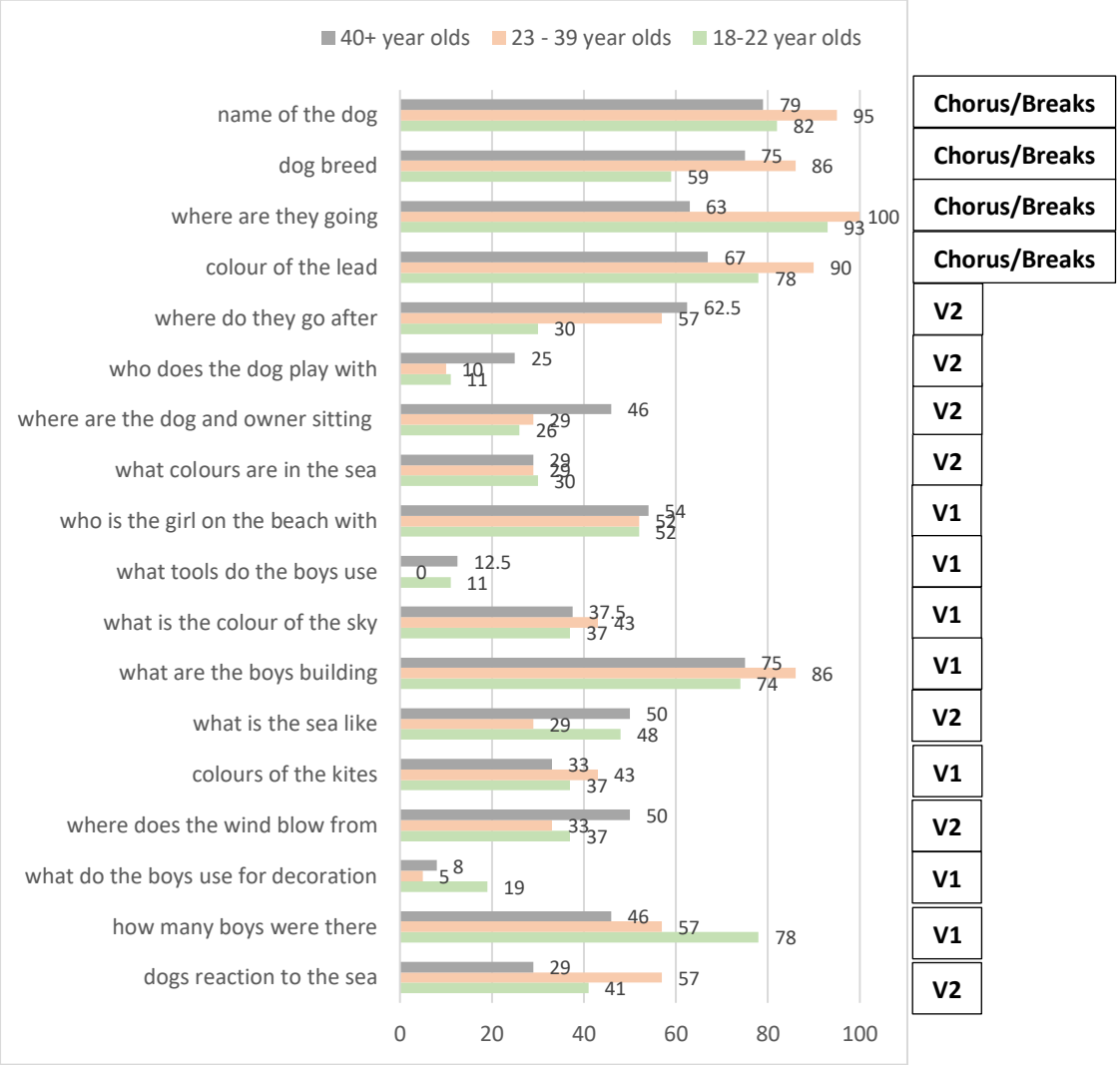


Base: Survey B (27), Survey C (22)

Impact of Age on Memorability

An analysis of the impact of age on the ability to memorise information across the three surveys has shown that overall, those aged 39 years or younger achieved a higher percentage of correct answers to the memory questions.

Figure 16: Impact of Age on Memorability (%)



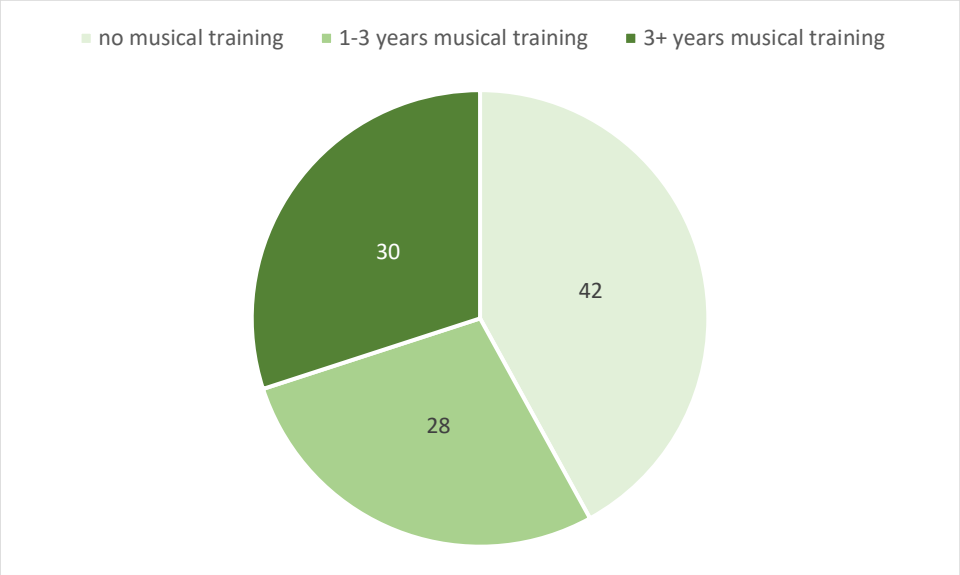
Base: 18-22 (27), 23 – 39 (21), 40+ (24)

The 23 to 39 years olds performed particularly well on the repeated Chorus and Breaks. Interestingly, 40+ year olds tended to remember Verse 2 information better than the younger age groups.

Impact of Musical Training on Memorability

The research also explored whether musical training has an impact on memory and retaining information. Across the three surveys, over half (58%) had musical training and the remainder (42%) had not.

Figure 17: Musical Training received (%)



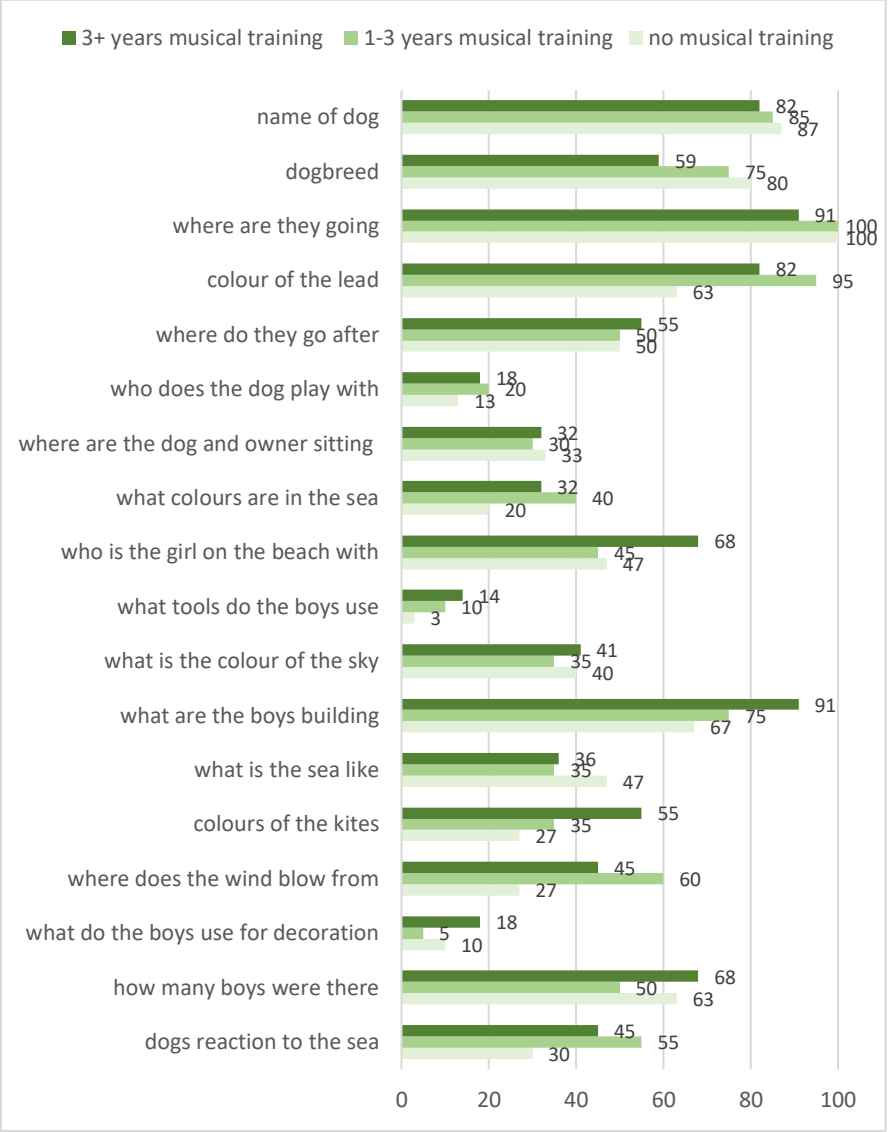
Base: All (72)

The chart below illustrated the proportion of correct answers by musical training.

For most questions, those with musical training were more likely to give the correct answer. The exception being: the name of the dog, dog breed, where to dog and owner are sitting and what the sea is like, where those without musical training achieved a higher proportion of correct answers.

The research findings do not suggest that the length of musical training affects information memorability.

Figure 18: Proportion of Correct Answers by Musical Training (%)

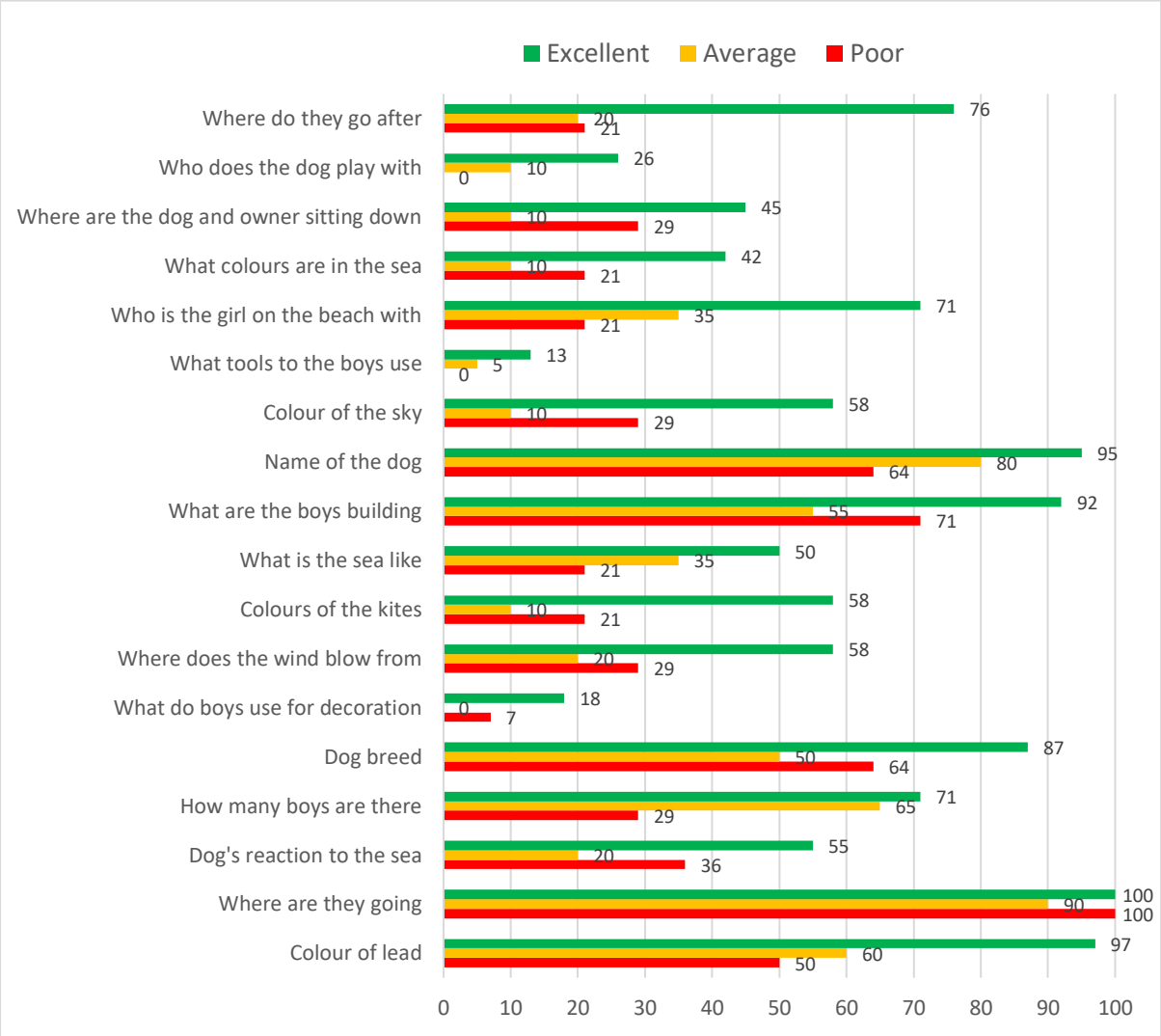


Base: No musical training (30), 1-3 years musical training (20), 3+ years musical training (22)

Impact of Memory Capacity on Memorability

Those with excellent memory capacity, far outperformed those with average or poor memory capacity, achieving a higher proportion of correct answers for all but one question. Perhaps surprisingly, those with a poor memory capacity achieved a higher proportion of correct answers for a number of questions compared with those with an average memory capacity. The research has shown that Survey C was the lowest performing in terms of information retention, suggesting that the complex song was the most difficult for listeners. Survey C also had the largest proportion of those with average memory capacity (41%), compared with Survey A (17%) and Survey B (26%). This may provide an explanation as to why in some instances those with poor memory capacity outperformed those with an average memory capacity.

Figure 19: Proportion of Correct Answers by Memory Capacity (%)



Base: Excellent (38), Average (20), Poor (14) Memory Capacity

Discussion:

Introduction:

In sum, the 'simple' song performed strongest, followed by the text with the 'complex' song coming in last in terms of the memorability of information, confirming also that a song improves the memorability of information. A number of important findings from the research are discussed below:

Musical Techniques:

The survey findings confirmed that repetition is an important aspect in remembering information. Details contained in the Chorus and Breaks, that were repeated three to four times in the text and songs, were much better remembered compared with the information in the Verses, which respondents only read/listened to once. Repetition is one of the many strategies listed by Matla *(EDMprod.com)* that aids in composing a memorable song.

Furthermore, it appears that a song holds the listeners' attention and concentration longer, in that those who read the text were more likely to remember the information contained in Verse 1, whereas listeners to the 'simple' song, were able to remember information contained in Verse 2 better and more accurately. This may have been due to the use of certain musical techniques such as repetition, rhythm, and melody content, e.g. call and response, various rhythmic motifs, and accented notes. As Dr. Dunne said:

> Melody, lyrics, chord progressions, rhythm and groove, arrangement, production quality, uniqueness, and cultural and personal connections to music, all contribute to the memorability of a song. (Appendix A.1)

In addition, Hayes described a memorable piece of music to include:

> A balance between a leap and a step within the melody and a simplistic harmony line …they do say that the Western and harmonic system is more catchy than Eastern systems. (Appendix A.2)

Thus, the simple song seems to have provided a good balance of keeping the participants sufficiently entertained to maintain their arousal level while also helping them to subconsciously retain information.

Complexity:

The survey findings suggest that a more melodically complex song seems more likely to distract or divide attention, as previously also observed by Musliu (139). One of the main melody lines that may have distracted listeners of the 'complex' song version were the electric guitar chords. Birmann and Fergusen (188) found that rock music had the most negative impact on long term memory.

Dr. Dunne suggested that:

> The difficulty of a song can vary based on factors such as the complexity of the melody, intricate rhythms, fast tempo, intricate lyrics, or challenging vocal range. (Appendix A.1)

A number of these techniques were used in the composition of the complex version of the song, the main being the use of the guitar chords and applying more challenging vocal ranges, with the use of harmony and extra layers of vocals.

Likeability:

Birmann and Fergusen (188) believed that likeability of a song can boost mood and subsequently memory and Lehmann and Seufert (8) suggested that background music could benefit learners by influencing their mood and arousal level, thus fostering the learning process. These sources suggest that usually music does not have a positive impact on retaining information but that if the music being played is liked by the listener, who is in a better frame of mind to receive information and may recall more effectively. Hayes also claims that information put to "rhythm and … pitch [it] is more likely to be remembered because we're enjoying singing it". (Appendix A.2)

The research was unable to confirm that likeability of a song leads to increased memorability. A larger proportion liked the 'complex' song, however, the 'simple' song achieved higher levels of memorability of the details.

Age:

"It is well understood that working memory declines with age", Chai (5). One of the aims of the research study was to explore the extent to which age affects the memorability of information from the text/songs. Those aged 23 to 39 were most likely to have an excellent memory capacity (62%), while a third of those aged 40 or older (33%) had a poor memory capacity.

Findings from the survey indicated that the 23 to 39 age group had superior memory recall for the chorus and breaks, i.e. those elements of the songs/text that were repeated. Perhaps surprisingly, 40+ years olds answered Verse 2 questions with greater accuracy than the younger groups. The reasons for this could be twofold: 1) older participants remember information better that they have most recently read/heard, or 2) older participants have a longer attention span[14] compared with the younger cohort.

To investigate this further memory capacity and attention span need to be understood:

Memory Capacity

Chai explains the importance of working memory in retaining information:

> The general consensus regarding working memory supports the idea that working memory is extensively involved in goal-directed behaviors in which information must be retained and manipulated to ensure successful task execution. (1)

Due to cognitive deterioration, older people are more likely to experience deficits in working memory. Neuroscience research has established that the exercise of memory involves the frontal-parietal brain region and certain sub cortical regions. Thus, Chai concluded that:

> Older participants are expected to perform poorer on a working memory task when making comparison with relatively younger task takers. In fact, it was reported that decreases in cortical surface area in the frontal lobe of the right hemisphere was associated with poorer performers (5).

[14] How long a person can concentrate on a specific activity

He found that other reasons for working memory impairment that may affect people of any age included traumatic brain injury, mental or developmental and/or neurological disorders, such as major depressive disorder and others.

Attention Span

Attention span and working memory are the two critical elements when learning new information, whereby attention enables the in-take of information which, if deemed important, is then passed to working memory. Murman clarifies:

> Changes in attention that occur with age are declines in performance on complex attentional tasks such as selective or divided attention. Selective attention is the ability to focus on specific information in an environment while at the same time ignoring irrelevant information. Divided attention is the ability to focus on multiple tasks simultaneously, such as walking an obstacle course and answering questions. (para. 9)

Apart from age, there are other factors that can affect attention span as explained by Murman:

> When comparing a cohort of subjects that were born in the 1990s to subjects born in the 1940s, the two cohorts might differ significantly in nutritional variables, childhood educational experiences, exposure to environmental toxins or social stressors, knowledge of new technology, and other unmeasured variables. These other factors may influence test performance over and above normal cognitive aging. (para. 6)

As stated previously in the literature review, Thrasher pointed out that the average song length has decreased by at least 40 seconds since 2009; and that the average length of songs distributed on Spotify has decreased.

In sum, the research focussed on the recall of information and short-term memory. Although age and memory capacity were considered factors in the research and analysis, the impact of working memory and attention span were not addressed. However, these factors may provide an explanation as to why younger participants displayed better working memory. However, older participants were better at retaining certain information in Verse 2. This may have been due to having a better attention span.

Musical Training:

Cheever (1214) found that having musical training has a positive influence on speech processing and creativity in general. Results from the study found that being musically trained has a positive impact on decoding information.
Participants with musical training answered more memory questions correctly overall. However, the number of years of musical training did not seem to affect the degree of information retained and remembered. Cheever explains that there is a crossover between language processing and playing music creatively, which he describes as 'improvisation'. Perhaps an additional question about a participant's ability to improvise on an instrument would have benefited the research.

Dr. Dunne explained that people who play an instrument gain natural benefits like pattern recognition, ear training, motor skills, musical memory, and focused learning.

> Musicians are accustomed to breaking down complex pieces into smaller, manageable sections, which aids in systematic learning. Learning to play an instrument has been linked to cognitive benefits, such as improved memory, attention, and problem-solving skills. These cognitive enhancements can indirectly contribute to faster learning of songs. (Appendix A.1)

This may explain why participants, even with only one year of musical training tended to answer a larger number of memory questions correctly in the surveys.

Memory Capacity:

Lehmann and Seufert (3) explained that people have either a high or low memory capacity and that retaining information is regulated by this capacity. It is clear from the results of the surveys, that respondents with a high memory capacity also scored high on the memorability test. There may be several reasons for this, in that people with high memory capacity may have a higher tolerance for mental distraction, better absorption of information and/or simply having a better memory.

Conclusions:

The research has indicated that a song enhances the memorability of information, provided it is a ‘simple’ song i.e., has a steady beat, repeated melodies and the vocals in the foreground of the mix. The information that is best recalled after listening to a ‘simple’ song are straightforward facts, such as ‘who is the girl on the beach with?’ or ‘where do they go after?’.

Conclusion

Summary of Findings

The results from the project support the hypothesis: “Does Music increase The Memorability Of Information?”. Out of the three versions (text, simple and complex song), the research indicated that information paired with a simple melody, is more likely to be remembered.

Survey B (‘simple’ song) achieved the highest proportion of correct answers, with participants who completed this survey, remembering more details overall. In contrast, Survey C (‘complex’ song) was the lowest performing in terms of information retention. Finally, Survey A (‘text’), had the best recall of repeated information in the chorus and break. Survey A preformed strongest in questions that required participants to remember more than one fact.

The most successful musical techniques used in the simple version was using a major key, having a consistent pulse throughout, and using simplistic and repetitive melodies that build up in the chorus, break down during the breaks and repeat the same melodies during the verses. Using different vocal melodies helped distinguish the different sections, while also building anticipation for the participant. Mixing the vocals so that they are in the foreground with plenty of space benefited the participant, so that there was still a divide between the music and sung information.

It may be concluded from the research findings, that musical training brings advantages in decoding verbal information, pattern recognition, ear training, motor skills, musical memory, and focused learning. The length of musical training did not appear to make a difference.

While desk research indicated that the likeability of a song enhances retaining and remembering information through lyrics, this was not substantiated with the present research.

Recommendations for Future Research

It was suggested by Ferreri and Verga (167) that music has a positive effect on verbal learning and memory, particularly in the long term. In the memorability survey the vast majority of participants agreed with the following statements:

- I can sing along to songs I have not heard for many years (91%)
- I find it easier to recall song lyrics than words (86%).

Hence, it would be interesting to repeat the memorability survey after a certain period of time to compare results of those who read the text and those who listened to a 'simple' and a more 'complex' song. The aim would be to gauge if information conveyed in a song achieves higher levels of memorability, after some time has passed and also to compare the longterm results with participants' instant recall of information.

It would also be of interest to analyse the memorability of information by age, musical training and memory capacity for each survey, not just overall. Due to sample size constraints this was not possible in this instance. For statistically robust conclusions, a larger scale study of at least 100 to 300 completed questionnaires for each survey, would be appropriate to undertake this additional layer of analysis - to determine the impact of text only, simple and complex song on the memorability of the information by age, musical training and memory capacity.

The research findings suggest that, in addition to memory capacity, listeners' attention span has an important impact on the memorability of information. This was outside the remit of this research, but is worth further investigation taking into account generational differences in attention spans and the shortening of attention spans over time. These findings will inform what the implications are on song composition, in order to enhance the memorability of information, taking into account: what catches the listeners' attention, what holds their attention, what commits information from attention to working memory and what enhances the memorability of information.

Bibliography

1. Birman, Anna R., and Christopher J. Ferguson. “Impact of Different Genres of Background Music on a Memory Test.” *Journal of Individual Differences*, vol. 43, no. 4, Oct. 2022, pp. 188–93. https://doi.org/10.1027/1614-0001/a000371.

2. Chai, Wen Jia, et al. “Working Memory From the Psychological and Neurosciences Perspectives: A Review.” *Frontiers in Psychology*, vol. 9, Mar. 2018, https://doi.org/10.3389/fpsyg.2018.00401.

3. Cheever, Thomas R., et al. “NIH/Kennedy Center Workshop on Music and the Brain: Finding Harmony.” *Neuron*, vol. 97, no. 6, Mar. 2018, pp. 1214–18. https://doi.org/10.1016/j.neuron.2018.02.004.

4. Das, Paromita, et al. “Measurement of Effect of Music on Human Brain and Consequent Impact on Attentiveness and Concentration During Reading.” *Procedia Computer Science*, vol. 172, Jan. 2020, pp. 1033–38. https://doi.org/10.1016/j.procs.2020.05.151.

5. Ferreri, Laura, and Laura Verga. “Music Perception.” *Benefits of Music on Verbal Learning and Memory*, vol. Vol. 34, No. 2, Dec. 2016, pp. 167–82. *JSTOR*, www.jstor.org/stable/26417442?read-now=1&seq=1#page_scan_tab_contents.

6. Icon Collective, LLC. *Tips on How to Write Better Melodies*. 30 May 2023, www.iconcollective.edu/writing-melodies-tips.

7. Jäncke, Lutz. *The Oxford Handbook of Music and the Brain: Music and Memory*. Edited by Michael H. Thaut and Donald A. Hodges, Oxford UP, 2018, academic.oup.com/edited-volume/28334?login=false.

8. Koh, Kevin Hao Kiat, et al. "Music Cognition: How Pitch of Music Affects Memory Performance." *ResearchGate*, Nov. 2014, www.researchgate.net/publication/313395383_Music_Cognition_How_Pitch_of_Music_Affects_Memory_Performance.

9. Lea, R. B., Elfenbein, A., & Rapp, D. N. (2021). Rhyme as resonance in poetry comprehension: An expert–novice study. *Memory & Cognition*, *49*(7), 1285–1299. https://doi.org/10.3758/s13421-021-01167-0

10. Lehmann, J., and Tina Seufert. "The Influence of Background Music on Learning in the Light of Different Theoretical Perspectives and the Role of Working Memory Capacity." *Frontiers in Psychology*, vol. 8, Oct. 2017, https://doi.org/10.3389/fpsyg.2017.01902.

11. Matla, Sam. "Catchy Songs: 8 Strategies for Making More Memorable Music - EDMProd." *EDMProd*, 29 May 2023, www.edmprod.com/memorable-music/#:~:text=In%20any%20case%2C%20memorable%20melodies,repeating%20rhythmic%20or%20melodic%20motif.

12. McCollum, Sean. "Your Brain on Music: The Sound System Between Your Ears." *The Kennedy Center*, edited by Lisa Resnick, 5 Sept. 2019, www.kennedy-center.org/education/resources-for-educators/classroom-resources/media-and-interactives/media/music/your-brain-on-music/your-brain-on-music/your-brain-on-music-the-sound-system-between-your-

ears/#:~:text=The%20recognition%20and%20understanding%20of,and%20prefrontal%20cortex%20contribute%2C%20too.

13. Miller, Alexandria. “The Effects of Music on Short-Term and Long-Term Memory.” *The Effects of Music on Short-Term and Long-Term Memory*, 2017, iro.uiowa.edu/esploro/outputs/undergraduate/The-Effects-of-Music-on-Short-Term/9984109909802771.

14. Murman, Daniel L. “The Impact of Age on Cognition.” *Seminars in hearing* vol. 36,3 (2015): 111-21. doi:10.1055/s-0035-1555115

15. Musliu, Arian, et al. “The Impact of Music in Memory.” *European Journal of Social Sciences Education and Research*, vol. 10, no. 2, May 2017, p. 222. https://doi.org/10.26417/ejser.v10i2.p222-227.

16. Thrasher, D. (2023, May 15). How long should a song be? [Radio, Streaming, and social!] - Improve Songwriting. *Improve Songwriting*. https://improvesongwriting.com/how-long-should-a-song-be/#:~:text=1)%20Song%20Length%20on%20Terrestrial%20Radio&text=The%20sweet%20spot%20for%20radio,the%20intro%20and%20pre%2Dchoruses.

17. Tuarez, Maria Antonia Velez, et al. “The Brain and Its Role on Learning Process.” *International Journal of Physical Sciences and Engineering*, Aug. 2019, https://doi.org/10.29332/ijpse.v3n2.326.

Appendix

Addional supporting documents can be found in the supporting martials folder.

Appendix A.1: Expert Interviews – Dr. Sarah Dunne

Interview With Dr. Sarah Dunne

1. To start with, can you tell me a bit about yourself, your background in music and what do you do for a living?

- **Bit about me: I have been working in the Creative Arts for the past twenty years. I have 2 PhDs, 1 in Music and another in Fine Art. I teach mostly post-primary age, but do some third level.**
- **Background in Music: Music is the family business! My dad and youngest brother are music teachers, and my oldest brother is a full-time percussionist with the NCO.**
- **What I do for a living: I am a Music and Art teacher in Belvedere College Dublin, a post-primary school in Dublin 1.**

2. As you know, the topic of my thesis is the memorability of songs. What do you think makes a song memorable? And why? An example possibly?

- What makes a song memorable? **Several elements contribute to making a song memorable. These elements can engage listeners emotionally, create a lasting impression, and make the song stand out. A strong and memorable melody is often the foundation of a memorable song. Melody, lyrics, chord progressions, rhythm and groove, arrangement, production quality, uniqueness, and cultural and personal connections to music, all contribute to the memorability of a song.**
- Why? **Melodies that are catchy, singable, and have a distinctive character tend to stay with listeners. Meaningful and relatable lyrics can enhance the emotional impact of a song. Memorable lyrics often tell a story, convey emotions, or capture a universal experience that resonates with listeners. Harmonic movement can greatly influence the emotional character of a song. Unique or unexpected chord progressions can make a song more memorable and distinguish it from others. An interesting rhythm and groove can make a song feel infectious and enjoyable. People tend to remember songs that make them want to move or tap their feet. The way a song is structured and arranged can impact its memorability. A well-crafted arrangement with effective dynamics and contrasting sections can keep listeners engaged. High-quality production can enhance the overall listening experience. A well-mixed and well-mastered song is more likely to leave a lasting impression. Songs that bring something new or innovative to the table are often memorable. Whether it's a unique sound, instrumentation, or genre-blending, innovation can make a song stand out. Songs that tap into cultural trends or personal experiences have a better chance of becoming memorable. They become associated with specific times, places, or memories.**
- An example: **Bohemian Rhapsody by Queen. This song is memorable for its unconventional structure, operatic elements, powerful melody, and emotional intensity. The combination of Freddie Mercury's distinctive vocals, the intricate arrangement, and the timeless appeal of the song has made it a classic that continues to resonate.**

How important are:

- Melody: **As mentioned above, melodies that are catchy and singable tend to be more memorable.**
- Pitch: **Aligning pitch and range to an anticipated audience is important if memorability is a key factor, assuming that memorability and audience recall through singing/playing as used synonymously**
- Rhythm: **can play a key role in promoting movement and kinaesthetic learning.**
- Anything else? **Lyrics with broad universal themes can be impactful when considering the memorability of a piece of music.**

All in all, what has the most impact on memorability? Why?

- **Melody, because it transcends language, and if used repetitiously enough, can affect memorability.**

3. What instruments do you think are most memorable? In terms of learning and remembering melody.

- **The piano is interesting because it transcends many genres. For students, its layout is logical and visually intuitive. The clear and crisp sound of each key can aid in the memorisation of melodies.**

- **The visual and physical patterns on the guitar fretboard can help players remember melodies and chords.**
- **The expressive and emotive quality of the violin and flute can make melodies played on them quite memorable.**
- **Some instruments, like the saxophone, can signal the sound of a decade!**
- **It is worth noting that I'm viewing this from a European context. The context in which an instrument is experienced, such as cultural or personal associations, can greatly impact its memorability.**

4. As a music teacher, how do you teach pupils songs in class, for choir or instruments?

- **Where possible, I prefer a student-centred programme, built on pieces that students already have some prior knowledge of (this could be from a school trip to the concert hall or based on their own listening)**
- **Also, it can be useful to forefront any musical learning with intent (we will be hopefully playing this for the Christmas concert etc.)**
- **The teaching approach for class, choir and instrumental is quite varied due to student investment in a subject.**
- **As Music is a choice subject in most Irish Post-primary schools, one can assume that they are broadly happy to be there. Engagement in choir and instrumental lessons, demonstrates a different level of engagement that insinuates an increased level of time, and capacity for the instrument. So the types of teaching approaches vary depending on student engagement.**
- **Broadly speaking, new song acquisition usually begins with warm-ups (reinforcement of what is known).**
- **Then continue with a demonstration (class intention or aspiration).**
- **Then sections are segmented based on song structure patterns (understanding the structural logic), and are usually build on call and response methods**
- **Then repeat and reinforce (memorability)**
- **Then make connections with prior work (building on what they know)**
- **For choir, solfege is used. We start with unison singing and then add harmonies as students become more comfortable with the main melody.**
- **For class and instrumental lessons, sheet music is used. In some instances, numbers or letters can be used to bridge the gap between reading and playing.**
- **For younger performers, movement (swaying, clapping, or tapping to the rhythm to enhance understanding and engagement) can be used**
- **For all learning, audio recordings aid in supplementing the learning process when students are practicing at home.**
    - Do you find that pupils who play an instrument learn songs faster or not? Why do you think that is?
- **Yes, I think that factors such as pattern recognition, ear training, motor skills, musical memory, and focused practice, can all contribute to this phenomenon.**
- **Pattern Recognition: Learning to play an instrument, especially one that involves reading sheet music, helps develop pattern recognition skills.**
- **Ear Training: Musicians often develop a keen sense of ear training, allowing them to identify and replicate musical notes and phrases by ear.**
- **Motor Skills: Playing a musical instrument requires the development of fine motor skills. This enhanced motor skill development can contribute to quicker learning and execution of musical pieces.**
- **Musical Memory: Musicians tend to develop strong musical memory through repetition and practice. This memory can facilitate the recall of songs, making it easier for them to learn and retain new pieces.**
- **Focused Practice: Musicians are accustomed to breaking down complex pieces into smaller, manageable sections, which aids in systematic learning. Learning to play an instrument has been linked to cognitive benefits, such as improved memory, attention, and problem-solving skills. These cognitive enhancements can indirectly contribute to faster learning of songs.**
    - Can you give examples of songs that your pupils find easy to learn/memorise? Why do you think that is?

- **Examples: nursery rhymes, folk songs, and some pop songs with simple structures and repetitive elements can be good for beginners. Songs with repetition, simple melodies, familiar tunes, clear structure, manageable range, and positive association, are usually easier to learn.**
- **Why: Because they are based on repetition, simple melodies, familiar tunes, clear structure, manageable range, and positive associations.**
    - And can you also give examples of songs your pupils find difficult to learn/memorise? Why do you think that is?
- **The difficulty of a song can vary based on factors such as the complexity of the melody, intricate rhythms, fast tempo, intricate lyrics, or challenging vocal range. Here are a few that have been more challenging to teach in a peformance capacity:**
- **"Bohemian Rhapsody" by Queen:**
  This iconic song is known for its unconventional structure, ranging from rock ballad to opera-style sections.
- **"Through the Fire and Flames" by DragonForce:**
  A fast-paced and technically demanding heavy metal song with complex guitar riffs and intense drumming.
- **"Flight of the Bumblebee" by Nikolai Rimsky-Korsakov:**
  Originally a classical piece for the opera "The Tale of Tsar Saltan," this composition is famous for its extremely fast-paced and challenging violin passages.
- **"The Way You Make Me Feel" by Michael Jackson:**
  Michael Jackson's songs often involve intricate vocal techniques, and this one is known for its dynamic range and vocal nuances.
- **"Cliffs of Dover" by Eric Johnson:**
  A guitar instrumental with intricate fingerpicking and fast-paced guitar solos, making it challenging for aspiring guitarists.
- **"Rap God" by Eminem:**
  Known for its rapid-fire lyrics and intricate rhyme schemes, this song demands a high level of precision and speed from the rapper.
- **"Piano Sonata No. 14 in C-sharp minor 'Quasi una fantasia', Op. 27, No. 2" by Ludwig van Beethoven (Moonlight Sonata):**
  The third movement, known as "Presto agitato," is particularly challenging due to its fast tempo and demanding technical passages.

5. Do you have any tips for students to memorise certain elements in music, like sayings or rhymes?

- **Acronyms or Initials: Create acronyms using the first letters of the elements you need to memorize. For example, to remember the order of sharps in key signatures (F, C, G, D, A, E, B), "Father Charles Goes Down And Ends Battle."**
- **Rhymes and Sayings: Develop rhymes or sayings that incorporate the information you want to remember. For example, to remember the lines of the treble clef (E, G, B, D, F), you can use the phrase "Every Good Boy Does Fine."**
- **Associations: Create associations between the elements and something familiar. For instance, associate each musical note with a specific colour or a memorable object. This can help trigger your memory.**
- **Storytelling: Develop a short story that includes the elements you need to memorize. This can make the information more interesting and easier to recall.**
- **Visual Aids: Use visual aids such as flashcards or diagrams. Drawing charts or diagrams can help reinforce the information visually in your mind.**
- **Chunking: Break down larger pieces of information into smaller chunks. Instead of trying to memorise a long sequence of notes or chords, focus on smaller groups and gradually combine them.**
- **Musical Mnemonics: Create melodies or rhythms that represent the information you want to memorize. Singing or playing these musical mnemonics can make the learning process more engaging.**
- **Repetition and Practice: Practice regularly, and quiz yourself on the information. The more you encounter the material, the more likely you are to remember it.**
- **Use Technology: Record yourself reciting the information or creating a musical mnemonic. Listening to these recordings can reinforce the memory.**

- **Teach Someone Else: Teaching someone else what you're trying to learn can be a powerful method. Explain the concepts to a friend or family member. Teaching requires a deep understanding, which enhances your own retention.**

§ Type of information?
§ Type of melody?
§ How useful has this proven to be?

6. Do you find that pupils are able to learn things faster when music is involved?
- **Yes, but more importantly, I feel that it aids in memory retention.**

7. Do you find that pupils retain the information better long term if music is involved?
- **Yes, should not have anticipated this question!**
8. What type of pupils are most receptive to learning information through a song?
    - Age, gender, musically trained, any other factors?
- **Age is a big factor in the receptibility of a new concept. If a song has not been used as a means of learning before, this can appear trivial to students. If a song is being introduced, it needs to be consistently used.**
- **My early experience teaching in a mixed post-primary school was that girls were more receptive to singing initially than boys. However, teaching in an all-boys school has given me less experience with the variation of gender in singing. Music is very strong in my current school and boys learn through song in Music class, choir, and liturgical music. There is a school song that all 1st years learn on their first day of school, that ends all our whole school assemblies, and that is sung by all sports teams at the end of each match.**
9. What, if any, genre of music do you think suits most people as background music when studying, why?
- **Classical music due to no lyrics**
10. Is there anything else you would like to add?
- **I hope that this was useful to your research Hannah!**

Appendix A.2: Expert Interviews – Roisin Hayes

Interview With Roisin Hayes

Everything you say is confidential there are no right or wrong answers so please just speak freely. So, you know this is going towards my major project, my thesis in my 4th year.

So, just to start off can you tell me a bit about yourself what do you do for a living? Yeah so, my name is Roisin Hayes. I am a qualified music therapist. I'm also a healthcare assistant on the side and so that's kind of my whole roles but I'm full time as a music therapist now. I studied an undergraduate in music in Trinity College and then I went and did music therapy in university of Limerick. After that I was really lucky to kind of get into a lot of work with music therapy so as part of my healthcare assistant work, I worked in Saint James's hospital, so I really wanted to explore working there. I did get in in 2020 soon as I qualified in the Saint James's setting up the service. A lot of our profession is all about setting something up and advocating for the service and things like that so I'm still there but only one day a week. The rest of my week and I'm currently 2 days in the national rehabilitation hospital in Dun Laoghaire, so that's working with children and adults with stroke brain injury, limb absence and spinal injuries. I work one day with the Irish country society so that again service development and there's a national program that I've rolled out and stuff so it's a really big piece of work. One other day in a place called “PMount” which is another rehabilitation hospital or specific unit in that hospital, and I work as a music therapist at all those different places. I’m a busy girl. But it all came from my training in Limerick.

1. Can you tell me a bit more about how you use music with your patients, if you can? Yeah absolutely, so I won't discuss any specific patients or any names or anything but I might discuss different settings that I work in. Let's start off with the adults with stroke and brain injury’s because that's a real interest of mine and that's kind of a specialty of mine. We use music in a very specific strategic way and that's what music therapy is all about and it's about using music as the tool for rehab or for change and or for supporting somebody. So, in stroke and brain injury, we can get referrals for speech and language support for example: somebody that might have had a stroke or brain injury might not be able to verbally communicate clearly but actually they can sing many of their favorite songs, they can remember many lyrics, and they can sing words really really clearly, once it's through music. We have lots of different techniques but one example of the specific techniques that we might use is “melodic intonation therapy”, which is where we will assign specific words, specific phrases to pitch. It might be you know “hello” and “how are you” to specific pitches and we get the person to sing with us with accompliment and make it all lovely and practice and practice and practice, and then we slowly take away the pitch, and what happens is when we say you know “how are you” they might say “how are you” so it's melodic in the way that they speak. We can incorporate their accent or their own language things I thought it was just wonderful and it's that speech and language rehab. There's a lot more in that that's just a little anecdote of 1 technique that we might use we also do like voice support and so someone who's hypophonic which just means they've lost their voice or their lower volume in voice. Singing and breathing and focal support can really enhance that and support there are swallow. We work really closely with speech language therapist but a lot of that work. We might work alongside the physiotherapist music is innately motivating so something with a nice strong beat can make us move or make us want to move it can also distract us and if we're in pain or fatiguing or you know we don't want to move or do our exercises we can treat it as dance with music and so we work really closely alongside physiotherapists in that regard. We might have our cognitive side of it, learning something new or even the cognitive stimulation that music can cause, “can you play the drum on this side and the drum on this side”, crossing your midline and things like all these different activities that we take for granted as people who haven't had you know something happened to them or neurologic conditions and things like that so crossing the midline. Even word finding like what color is this you know can you play the color that I say or can you play DEF the notes that are I call out or things like that or even learning something new or coming back to something that they might have had previously in their lives they might played piano or guitar or sing or something so we can we can hopefully help with that as well. That's the kind of cognitive side of it. Then of course not forgetting the emotional and the social impact that we can bring to somebody in a hospital setting or if they're home alone or if they're just finding things difficult or if they've gone through significant changes in

their lives medically or otherwise, music can bring such a sense of togetherness, community, social interaction, and enjoyment. Our goals, sometimes people have misconceptions like “ohh the music therapist is here, they're gonna cheer us all up”, you know “ohh great they're gonna be really happy when music therapist leaves”. Yes and no, we obviously want to cheer everybody up but it's therapy, you know so sometimes therapy sessions are hard, sometimes it brings up pretty difficult things. So, it in that emotional and sphere what I'm talking about now, sometimes we might use song writing or lyric analysis or listening or talking about music or playing and improvising and on a certain theme and things like that and can connect that way and then have open discussions about what the music might be evoking or memories associations. We are therapists first and foremost and obviously that leads through all of the functional work that we might work on as well the communication, the movement, the cognitive, all of those different things. This is one more thing, children, child development, that side of things. When we work with young children and our children with any sort of additional needs you know ASD diagnosis, dyspraxia, dyslexia. We can work on kind of education goals, learning, counting, the alphabet, colors all these different things, but also the child development piece. Even their bond with what their mother or their caregiver and how that works. We can also work with their social interaction, do they give us eye contact, are they confident in themselves, do they have a sense of self and others how do they regulate their emotions are they getting really overwhelmed by specific emotions are they getting overexcited and overstimulated, and they can't regulate themselves. Lots of different things like that with children and that we might work with. We also can work with end of life, which it can be really significant time someone's life and their family’s life. Some therapists work in premature babies you know we literally work from premature babies all the way to end of life. Now I don't do premature baby work but some of my colleagues do, but end of life for older people and some children I would do some of that work.

2. Is there a go to selection of songs that you might have for your clients?
   Yeah, like to be honest a lot of therapists might have their arsenal of the few songs but the key, I'm reluctant to give you specific songs, because the reason why, the real reason why, is it's all about the preference of the client. So, it's whatever the client likes, whatever they want, whatever they're gravitate towards, or in their history or whatever that's what we're going to use. So, it's all about the client leading the sessions. However, there is you know specific go to things that we might do and specific elements of music so the pitch, the rhythm, the tempo, the harmony the structure, even silence that is really impactful in certain occasions. For example when we're doing the movement piece, obviously something with a strong beat, a regular beat a you know something out of particular tempo so sometimes with movement we might be looking at some of these gate, somebody's walking and particularly somebody with Parkinson's, they might have what's known as a “Parkinson shuffle”, so they're their feet kind of “shshshsh” it's not a regular movement and they're really short steps. So, what we do is we place a really strong beat beside that walking. Physiotherapists do this all the time using a metronome, but however the metronome is not as benifial because once you put a metronome on 60 beats per minute, it's stuck on 60 beats per minute. For all of us, we are live, we can play at 60 beats per minute and if we see that the persons achieving it or more importantly not achieving it, we can slow it down. So, the person is always going to be achieving, they're not going to be feeling like they have to quicken up their pace or that they're losing the beat or that they're going to fall or you know we can slow it down and then when it's appropriate and we're getting it we can speed it up and look at our goals there. So, to answer your question something with a strong beat, an appropriate tempo which is what I'm saying with the movement. With speech and language you're looking at something that's obviously easy to sing, simple lyrics we can leave gaps to see if somebody will fill the lyrics, so “you are my sunshine”, you know somebody will fill in the gaps. For children, nursery rhymes are really impactful there is a reason why they are so well known that they're so impactful because if you actually look at each nursery rhyme they're teaching something and you know whether it's ringing ring a Rosie or five little ducks which you're counting or action songs and it's just building the relationship between caregiver and child all the time. In terms of music, if we're looking at relaxation and kind of yeah relaxation really we always look at something again with a slow tempo so actually when I say 60 beats per minute that's more appropriate for the relaxation. Our heart rate is at rest generally around 60 beats per minute, now depending on the client generally and adults heart rate is above that at rest. So, what we look at is that we will play something to that pace to are heart rate and our breathing rate attune to music when something is placed beside it hence why the Walking. When we put that with it and we attune to somebody with live improvised music we can actually start seeing heart rate decreasing and breathing rate increasing you know and oxygen

saturations increase and everything there's lots can happen when somebody's actually really relaxed and actually with the music, lots can happen.

3. All in all, do you think music enhances the rehabilitation process just in general?
   Yeah absolutely, in lots of different ways as well so not only does it impact the functional rehabilitation when somebody looks clinically at rehabilitation and says well what are our goals here is the person able to walk further, talk you know these particular sentences, is their voice better, is their cognitive skills better. Music therapy can really support that, but more but more. If you're looking at the rehabilitation process for somebody it can be very tiring, very lonely, very scary, very you know yeah just a big change for people, and to have somebody as a therapist that's not really worried about you know well what medication are you on and what you know I don't really care about you medically really, I actually care about what music you like, and do you like football and do you like you know you as a person they're not bad five on whatever ward you're actually John who loves Limerick hurling team you know and that's really significant for people that their identity is not lost during this process because I can tell you now working in a lot of different hospitals people's identities completely taken away from them, even their clothes can be taken away from them, they're you know their hair can be cut, there you know they don't have control over what dinner they have, what time they take their medication, when they go for their walk, what programs they watch, what music they listen to, or even if they get to listen to music. You know so, I do think music therapy in particular with as well as the functional stuff it can bring back that sense of human and identity and compassion and the whole person back into the the medical model.

4. What makes the song memorable the different kind of musical elements involved? If you could just expand on that would be great.
   I was really interested by your question with memorable, there's a few different ways and take this, but in terms of like what makes the song catchy or an earworm as they call it yeah, it is about simplicity #1 and there's something in the melody that is what's catchy okay, so every catchy song is different, but generally it's a balance between a leap and a step within the melody and a simplistic harmony line. But then there has to be something different in it too for it to go ohh that's that song whether it's a beat or a different sound like a different instrument sound or yeah maybe a different interval and or something but generally they do say the western and harmonic system is more catchy than you know Eastern Europe you know eastern systems. So yeah of course if I'm speaking about it a little bit more broadly in terms of why music is memorable, well why do we use music as a tool to have memory and things like that it's because it's connected to emotion. Even within the brain it's so closely linked with emotion so if you think about people with dementia and there's a reason why they remember a lot of these different songs and things because they associated with a time in their life. It's a known fact that if you went and spoke to somebody with dementia and you were not very nice to them and they didn't like you and they would say no I really really don't like you for whatever reason, the next time they meet you they want to remember who you are potentially but they'll know they don't like you, because they can associate a feeling they will remember a feeling more than they'll remember detail. So, that's the same with music, music gets connected into our brain more likely because it's connected to a feeling, so they'll remember that song because they were enjoying singing it years ago in the pub, so that's where it's connected. So, that's why music is more memorable than other things but then we can use it as a tool to help us obviously reduce agitation for someone with dementia, re-orientation, you know support and connect with them but also in learning you know for young children that's why we do our you know our five little ducks and our you know little things and our ABC's are sang, that's why they're sang because they're more likely to be remembered and they're in a rhythm and when they're in a pitch it's more like to be remembered because we're enjoying singing it now.

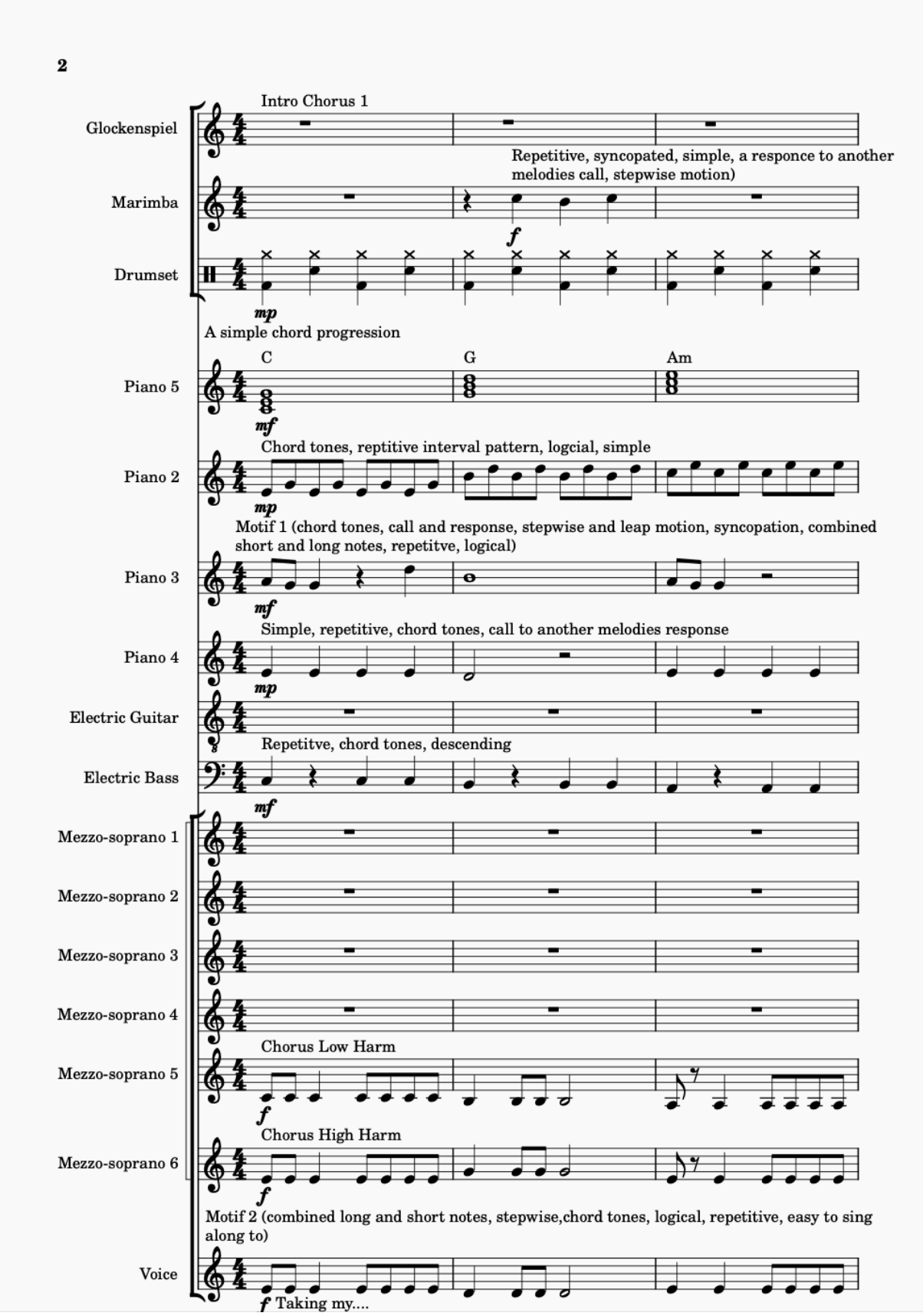
Appendix B.1: Final Compositions

Simple Version :
Simple Version Master 1.mp3

Complex Version :
Complex Version master 1.mp3

Appendix B.2: MuseScore Composition

See full score in the supporting folders.

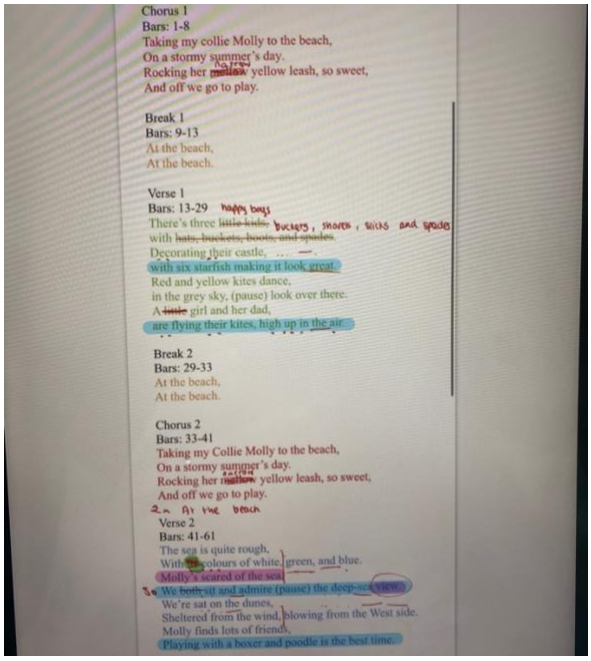


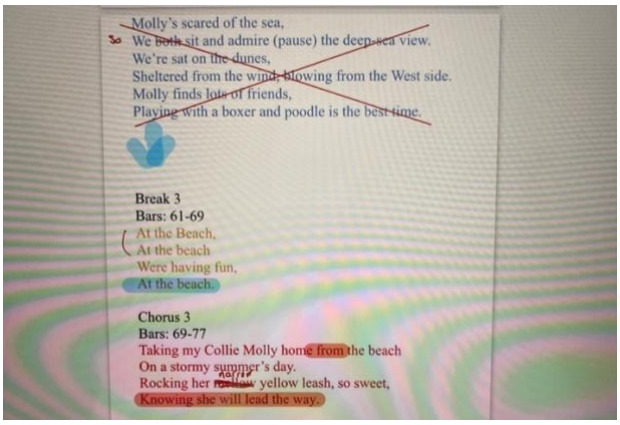
Appendix C: Lyrics

A day on the beach

Chorus 1: Bars: 1-8
Taking my collie Molly to the beach,
On a stormy summer's day.
Rocking her mellow yellow leash, so sweet,
And off we go to play.
Break 1: Bars: 9-13
At the beach,
At the beach.
Verse 1: Bars: 13-29
There's three little kids,
with hats, buckets, boots, and spades.
Decorating their castle,
with six starfish making it look great.
Red and yellow kites dance,
in the grey sky, (pause) look over there.
A little girl and her dad,
are flying their kites, high up in the air.
Break 2: Bars: 29-33
At the beach,
At the beach.
Chorus 2: Bars: 33-41
Taking my Collie Molly to the beach,
On a stormy summer's day.
Rocking her mellow yellow leash, so sweet,
And off we go to play.
Verse 2: Bars: 41-61
The sea is quite rough,
With its colours of white, green, and blue.
Molly's scared of the sea,
We both sit and admire (pause) the deep-sea view.
We're sat on the dunes,
Sheltered from the wind, blowing from the West side.
Molly finds lots of friends,
Playing with a boxer and poodle is the best time.
Break 3: Bars: 61-69
At the Beach,
At the beach
Were having fun,
At the beach.
Chorus 3: Bars: 69-77
Taking my Collie Molly home from the beach
On a stormy summer's day.
Rocking her mellow yellow leash, so sweet,
Knowing she will lead the way.

Ali’s (singers notes from recording):





Appendix D: Studio Plan Day 1 + 2

Professional Project: Does Memorable Music Increase The Memorability Of Information – Studio Plan Day 1 and 2

Studio Plan: Day 1

9:30am – Start

9:45am – Set up desk, import audio files, set up vocal microphone in live room and warm up vocals

11:00am – Practice lyrics and work out chorus melody

11:30am – Break

11:45am – Start going for takes

12:30pm – Play around with harmonies

13:00pm – Set up for electric guitar

13:30pm – Start going for takes

14:30pm – Clean up and export audio files

Studio Plan: Day 2

9:30am – Start

9:35am – Set up desk, import audio files, set up electric guitar and amp in live room and set up vocal booth/microphone for later

10:30am – Go for electric guitar takes, while Ali goes over harmony 3 and verse harmonies

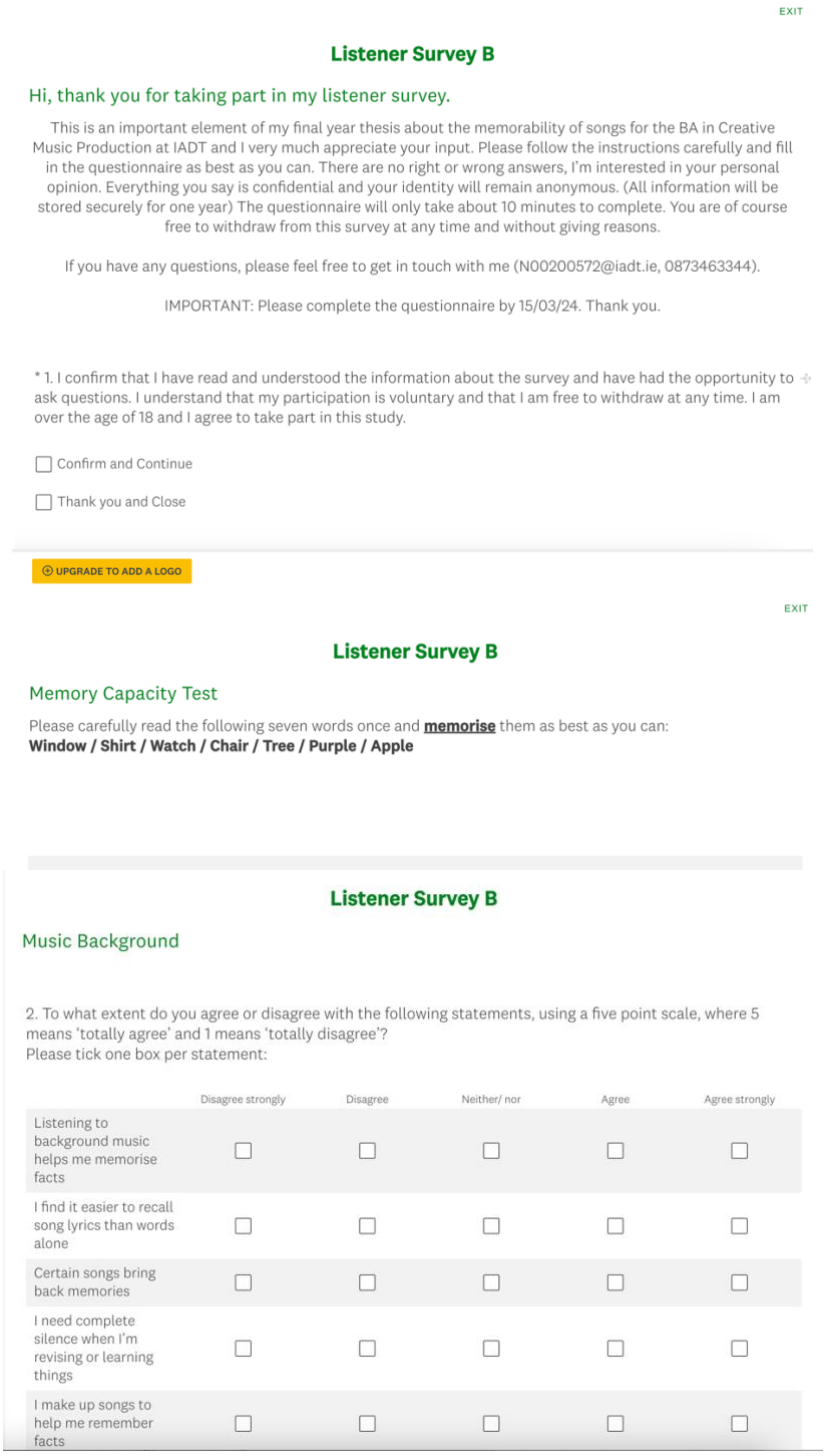
11:15am – Ali warms up

11:30am – Go for vocal takes including main vocals (bars 59-61)

12:00pm – clean up and export audio files, remember to take photos of anything new!

- Electric guitar full
- Main vox bars 59-61
- Re-record harm 3
- Add some verse harmonies.

Appendix E: Survey Design



EXIT

Listener Survey B

Hi, thank you for taking part in my listener survey.

This is an important element of my final year thesis about the memorability of songs for the BA in Creative Music Production at IADT and I very much appreciate your input. Please follow the instructions carefully and fill in the questionnaire as best as you can. There are no right or wrong answers, I'm interested in your personal opinion. Everything you say is confidential and your identity will remain anonymous. (All information will be stored securely for one year) The questionnaire will only take about 10 minutes to complete. You are of course free to withdraw from this survey at any time and without giving reasons.

If you have any questions, please feel free to get in touch with me (N00200572@iadt.ie, 0873463344).

IMPORTANT: Please complete the questionnaire by 15/03/24. Thank you.

* 1. I confirm that I have read and understood the information about the survey and have had the opportunity to ask questions. I understand that my participation is voluntary and that I am free to withdraw at any time. I am over the age of 18 and I agree to take part in this study.

- [ ] Confirm and Continue
- [ ] Thank you and Close

UPGRADE TO ADD A LOGO

EXIT

Listener Survey B

Memory Capacity Test

Please carefully read the following seven words once and **memorise** them as best as you can:
Window / Shirt / Watch / Chair / Tree / Purple / Apple

Listener Survey B

Music Background

2. To what extent do you agree or disagree with the following statements, using a five point scale, where 5 means 'totally agree' and 1 means 'totally disagree'?
Please tick one box per statement:

	Disagree strongly	Disagree	Neither/ nor	Agree	Agree strongly
Listening to background music helps me memorise facts	☐	☐	☐	☐	☐
I find it easier to recall song lyrics than words alone	☐	☐	☐	☐	☐
Certain songs bring back memories	☐	☐	☐	☐	☐
I need complete silence when I'm revising or learning things	☐	☐	☐	☐	☐
I make up songs to help me remember facts	☐	☐	☐	☐	☐

I struggle to learn poems off by heart	☐	☐	☐	☐	☐
I can sing along to songs I have not heard for many years	☐	☐	☐	☐	☐

* 3. Please write down all the words you ca… memory capacity section:

0 UPGRADE TO EDIT OPTIONS MOVE COPY LIBRARY DELETE

4. What type(s) of music do you like? Please tick up to 3:

- ☐ Pop
- ☐ Rock
- ☐ Irish Tradional
- ☐ Rap & Hip Hop
- ☐ Classical
- ☐ Jazz and Blues
- ☐ Electronic
- ☐ Alternative
- ☐ Metal
- ☐ Other (please specify)

* 5. Do you or did you play an instrument?

- ◯ Yes
- ◯ No

EXIT

Listener Survey B

Musical Training

* 6. Which instrument or instruments do you/did you play? Pease write in:

* 7. How many years of musical training have you received? Please write in: __ years

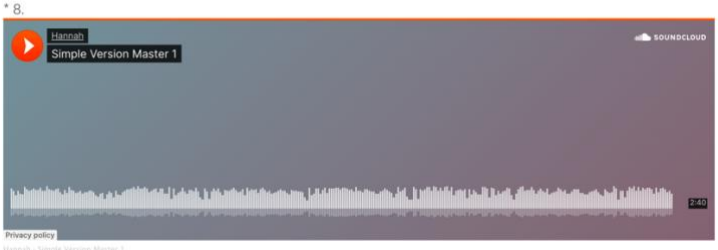
Listener Survey B

Audio Sample

Please listen to the recording **once**. Listen carefully and try to **memorise** as many details as possible.

Please play the audio provided and select "Completed" when finished.

* 8.



☐ Completed

EXIT

Listener Survey B

Music and Information

Please answer these questions: EDIT

* 9. Do you think putting information to a song or melody helps or hinders you to:

(Please tick one box each)

	Helps	Hinders	No Difference	Don't Know
Learn or memorise information	☐	☐	☐	☐
Recall or remember information	☐	☐	☐	☐

Listener Survey B

Memory Test

Please answer these next questions as best as you can from **memory**:

10. What is the colour of the lead?

11. Where is the owner taking the dog?

12. How does the dog react to the sea?

13. How many boys are there?

14. What is the dog breed?

15. What do the boys use for decoration?

16. Where does the wind blow from?

17. What colours are the kites?

18. What is the sea like?

19. What are the boys building?

20. What is the name of the dog?

21. What colour is the sky?

22. What tools do the boys use?

23. Who is the girl on the beach with?

24. What colours are in the sea?

25. Where are the dog and its owner sitting down?

26. Who does the dog play with?

27. Where do they go after?

Listener Survey B

Likability

* 28. To what extent do you like or dislike the song you have just listened to? (please tick one box)

- [ ] Like a lot
- [ ] Like a little
- [ ] Dislike a little
- [ ] Dislike a lot

* 29. Please state why you liked or disliked the song:

EXIT

Listener Survey B

Finally, for statistical purposes, could you please tell me:

* 30. How old are you?

* 31. What is your gender?

Thank you very much for completing this survey on the memorability of songs vs text!

If you have questions about this study or wish to have your data removed from the study, please contact me (N00200572@iadt.ie, 0873463344). Alternatively, you may contact my supervisors, <Peter Jones and Brian Carty, peterjones@soundtraining.com and brian@soundtraining.com>

I thank you sincerely for contributing and assure you that your data is confidential and anonymous, and if published, the data will not be in any way identifiable as yours.