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Role of Age in the Ability to Accurately Identify the Function of a Song

By Angelina Feng

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ABSTRACT

Are older ages more or less accurate at identifying the function of a song?

The “Natural History of Song” database features participants’ analyses of the functions of songs from around the world. Participants were randomly assigned 36 out of 118 possible songs to complete this task. The participants were asked to analyze a song with different functions: soothing a baby, dancing, healing, or expressing love. It is hypothesized that older adults would be less accurate in their identification of the function of a song, because they typically have more difficulties in hearing and have significantly reduced automatic auditory processing compared to younger adults. In reality, the older participants were significantly more accurate in identifying the functions for dance and love songs, showing that even though their automatic auditory processing is less acute as they age, they have more experience listening to songs and are able to accurately think through this task.

Keywords: *Function, younger adults, older adults, soothe a baby, dance, heal, love, auditory processing*

INTRODUCTION

As populations around the world are shifting towards longer lifespans, there has been an influx of research targeted towards older age groups. These include how humans interpret music, particularly the function of a song. Today, the age structure around the world has changed significantly. Life expectancy has increased to about 73.5 years, while fertility rates have been decreasing almost everywhere (United Nations Population Fund, 2025). As a result, population growth has been slowing, and more people are living longer. According to the United Nations Population Fund (2025), more than 10% of the global population is now 65 and older, and this percentage is expected to double by 2050. The median global age has increased from 24 years in 1970 to 30.9 years in 2025, and it is continuously rising by about 0.19 years per year (Worldometers, 2025).

This shift is especially clear in high-income countries, which have extremely low fertility rates and high life expectancies. A big contributing factor to higher life expectancies is lower mortality rates for children under five. Today, there is about 35.5 per 1,000 live births and higher survival rates for all age groups (Worldometers, 2025). According to the World Health Organization, 2020 was the first time that there were more people who were 60 and older than children under 5 (2023). This marked a huge milestone in the progression of human lifespan and the age structure of society.

MUSIC AND SOCIETY

In every society in the world, music remains one of the most vital aspects of the culture. It is not only used as a form of art, but also for social purposes. The “function” of a song is its emotional and social use, including soothing infants, expressing love, or healing. Scholars say that songs are often used for emotional communication, improved memory, and social bonding (Pushat, 2024). Music also has uses in education, religious rituals, and during the care of others. In societies that rely on oral traditions, songs are used to tell stories, pass down knowledge and tradition. According to Turpin (2010), you can see the social functions of a song through the structure of a song. For example, songs that are simple melodies that repeat and are soothing to the listeners are usually lullabies.

Recent research supports the idea that functions of songs can be recognized across cultures. This is true even if the listeners have never listened to any music from that culture, or if they do not speak the language. Mehr et al. (2023) found participants from around the world and saw that they were able to accurately identify the purpose of songs, used to soothe a baby, dance, heal, and express love, from unfamiliar cultures solely based on the melody. Songs used to dance were typically faster, louder, and more rhythmic, while lullabies were slower, melodic, and more soothing. These features are recognizable across cultures, supporting the idea that the connection between melody and function is similar throughout the world.

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MUSIC AND THE AGEING BRAIN

As the brain ages, there are many structural and functional changes that happen which impact how the person processes music. According to the National Institute on Aging (2024), aging is associated with some brain regions shrinking, less neural connections, and less blood flow which can all affect how the brain processes its inputs. Auditory processing requires more effort, especially when there is background noise. Older adults can also experience hearing loss which is a common side effect of aging (WHO, 2023).

One of the biggest effects of aging is slower processing speed. This means it takes older adults longer to analyze auditory input and respond to it. In regular day-to-day life, this affects how older adults participate in conversations. Reduction in working memory and attention, impacts how the older adults process and interpret music. However, studies have shown that older adults can perform just as well on new musical tasks when given enough time to master them (NIA, 2024). It has also been shown that music can have positive effects on listeners' mood, arousal, and cognitive function. Additionally, a study by Liu et al. (2022) found that listening to upbeat music improved working memory and the emotions of older adults.

EXISTING RESEARCH

Studies on music in different cultures and age groups show that humans can detect different structures in music. It shows that even infants are sensitive to different features in music before this sensitivity seems to play any important functions. Trainor and colleagues (2001) found that infants could distinguish small changes in pitch and preferred slow, expressive, and high-pitched maternal singing over spoken recordings. This shows how music preference is present early on and could play a role in the development of children.

Studies across different cultures showed that the function of music can be recognized even if the listener has no prior exposure to the culture of origin. Mehr et al. (2023) showed that participants could distinguish songs originating from unfamiliar cultures with accuracy that was higher than that of pure chance, based on musical features such as tempo. This shows that even with a language and cultural barrier, music in different cultures has similar features that allow listeners to hear the function of the song.

Music processing is not limited to auditory input alone; in fact, it can also be influenced by visual input. Su (2016) ran an experiment where participants listened to music while either watching a dancer dance vigorously or relaxing/with no visuals. Participants rated music as having a faster tempo when they were watching the dancer dance more vigorously than relaxed/no visuals. Similar research on songbirds has also shown that regions in the brain, beyond the traditional areas, are also involved in the processing of songs. Damage to these areas hinders the bird's ability to recognize or repeat their song. This research supports the idea that music processing is not limited to a single brain region, most likely applying to humans as well.

According to Kwak et. al (2021), people have slower processing speeds as age increases. A slower processing speed could be the determining factor in the accuracy of older versus younger people when

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identifying the function of songs. According to WHO (2024), biological aging is the accumulation of cellular and molecular damage, which eventually leads to reduced physical and mental capacity, including hearing loss. This could result in older people not being able to identify everything in the song, voiding any advantage their increased experience in listening to songs gives them.

When younger and older people are both given the same task, younger people are better at performing them in a shorter amount of time, but if older people are given the same amount of time to learn the task, they are able to perform just as well. So even if parts of the brain shrink or neuron communication is not as effective as you age, there are other pathways that the brain can take to have the same outcome.

METHODS

This study analyzes participant input collected in the “Natural History of Song” database. The 750 participants had a mean age of 31.9 years with a standard deviation of 8.83 years, ranging from 18-65 years. Of the participants, 34% were female and the other 66% were male. The participants were recruited through MTurk, with a majority of participants from the US and India, and the rest were from countries not including the US or India or any of the 28 Western nations with high HDI scores. The participants were excluded if they did not pass the compliance and attention checks or if they self-reported any problems with hearing the audio. The songs they showed participants were from “Natural History of Song”, a set of 118 audio recordings from 86 different societies.

Each participant was required to wear headphones and pass compliance and attention checks. For example, they were asked for the function of the “Happy Birthday” song, and if they chose the wrong function more than 4 times, then they would be excluded from the study. Each participant was offered a reward between \$1-\$3 for completing the survey. They were pseudo-randomly given 36 songs each to identify the function of. The first question was if they were experiencing any issues with their audio. Then, they listened to the song and rated it on a scale from 1-6 (1=definitely not, 6=definitely) for being a song used for dance, soothing a baby, healing, and expressing love. Then there were two foil questions (how well you think this song tells a story and how well this song mourns the dead) to make the participants answer more appropriately. Here is a shortened version of the experiment given to the participants: https://yalesurvey.ca1.qualtrics.com/jfe/form/SV_e8M5XpwzWS7A0Nn. All participants gave informed consent before participating in the experiment. The study was also conducted with protocols that were approved by the Harvard University Committee on the Use of Human Subjects. The study ensured that each participant would remain anonymous. It used only song recordings from publicly available sources with permission, and for indigenous and other small societies, the recordings were only used if it was allowed. All data collected is available on the Open Science Framework: <https://osf.io/m9rxv/files/osfstorage>.

Research Question: *Are older ages more or less accurate at identifying the function of a song?*

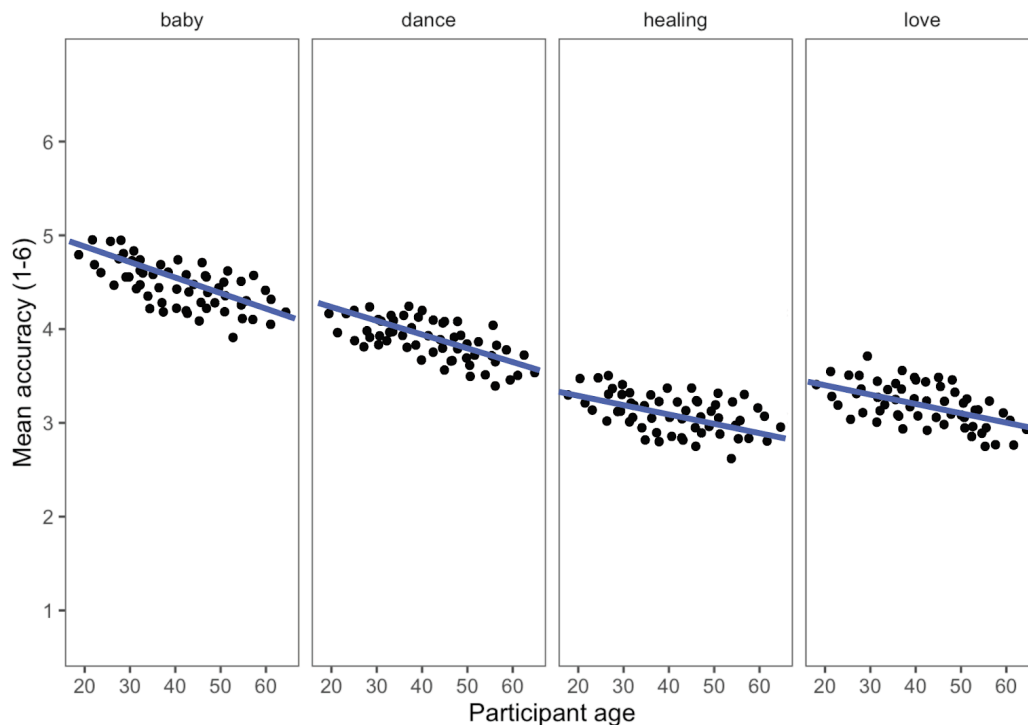
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It is predicted for older adults to be less accurate in identifying the function of a song because when measuring ERAN, younger adults had a larger amplitude for out-of-tune notes when compared to older adults. ERAN amplitude decreased with age, showing that older adults are worse at automatic auditory processing than younger adults.

Alternatively, older people could be more accurate at identifying the function of a song because they typically have more years of experience listening to music as compared to younger adults. Since the music used in Experiment 1 of the “Form and Function of a Song” was intended to be unfamiliar to all the participants, having superior automatic auditory processing would not be beneficial. It was shown that older adults used different neural strategies that processed more deliberately than automatically, showing that they spent more time applying the music they listened to in the past to the music they listened to now. Since the music is unfamiliar to the participants, this neural pathway could make the older participants more accurate in identifying the function of the song.

Another possibility is for there to be no difference in how accurate the younger and older adults are in detecting the function of the song because the experience of older participants and the automatic processing ability of younger participants will balance each other out, leading to no difference in the accuracy of certain age groups.

HYPOTHETICAL OUTCOME PLOTS



In my hypothetical outcome plots, there would be a negative r value, because as age increases, the accuracy of identifying the function of music would decrease. For songs used to soothe a baby, there would be an average accuracy of 4.5, the highest of all the functions, because it is a very popular song type. For songs used for dancing, there would be an average accuracy of 3.4, the second-highest accuracy rating among all song types, because the tempo in this type of song is most distinct from the other types. For songs used to heal, there would be an average accuracy of 3 because it is a song function that is very different than anything most participants have ever listened to, so it will be difficult for them to identify it. For songs used to express love, there would be an average accuracy of 3 as well because songs used to express love can be fast or slow, so the things that will typically differentiate the song will not be present to aid the participant.

RESULTS

To measure the correlation between age and participant accuracy, we graphed the age of the participant with their ranking of the correct function for that song. Then, we analyzed the p -value to see if there was a significant difference between the accuracy of song identification as people age. There was a positive r -value for all of the types of songs, meaning the accuracy was higher for older participants. There is also a p -value of 0.016, and since it is less than 0.05, the older participants were significantly more accurate in identifying the function of a song than the younger participants. This result means a rejection of the null hypothesis, therefore finding that older ages are significantly more accurate at identifying the function of dance songs and love songs.

Songs used to soothe a baby had a positive r value of 0.03 and a p value of 0.394, which is more than 0.05 meaning that as age increases, there is an increase in the accuracy of identifying the songs, but this increase is not considered significant. There was a mean accuracy value of about 3.65. expected lullabies to be more accurate overall because the majority of infants and adults with children listen to lullabies. However, this accuracy rating might have been low because people might have mixed up lullabies with songs used to heal or express love. All three of these songs could have a slow melody.

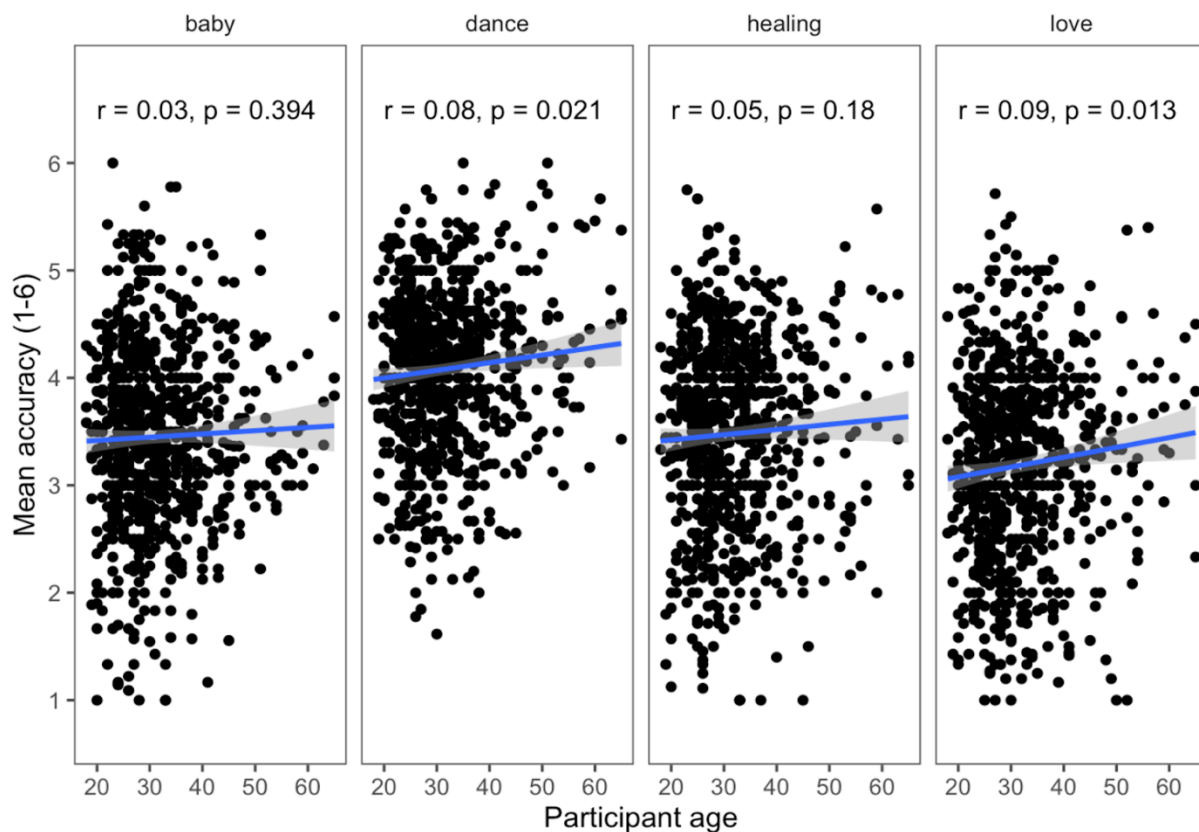
Songs used for dance had a positive r value of 0.08 and a p value of 0.021, which is less than 0.05, meaning that as age increases, there is a significant increase in the accuracy of identifying the songs. There was a mean accuracy value of about 4.15, making dance the most accurately identified song function. Dance songs were likely the most accurately identified songs because they were the most musically different from the other functions. One factor is due to a fast upbeat tempo, which distinguishes them from the other types of songs identified/included in the study.

Songs used to heal had a positive r value of 0.05 and a p value of 0.18, which is more than 0.05, meaning that as age increases, there is an increase in the accuracy of identifying the songs, but the increase is not significant. There was a mean accuracy value of about 3.65.

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Songs used to convey love had a positive r value of 0.09 and a p value of 0.013, which is less than 0.05, meaning that as age increases, there is a significant increase in the accuracy of identifying the songs. There was a mean accuracy value of about 3.25, making songs used to express love the least accurately identified song overall. Songs used to convey love most likely had the lowest accuracy rating because love songs can be so different in tempo, rhythm, and beat. They could be upbeat or slow songs, potentially causing the listeners confusion because tempo is a widely relied on feature of music when identifying the function of songs.

OUTCOME PLOTS



DISCUSSION

The results support the idea that older people are more accurate at identifying the function of unfamiliar songs compared to younger people when they are used to convey dance and love. This implies that the neural pathway that older people use to process unfamiliar songs functions better than that of younger people. The Lagrois et al. paper (2018) showed older people had reduced responses to tonal violations compared to younger people (through measuring ERAN amplitude and P600 responses). It showed that when songs have a tonal violation (ie, a note out of the key), younger people's brains had a more dramatic and automatic reaction

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to it. But when using unfamiliar songs, the older person's brain, which uses a different neural pathway, is able to think of past experiences that could help them to come up with the right answer, suggesting they are better at deeply thinking through a task than automatically solving it.

In this sample, older adults were less numerous than younger adults being tested. This disparity in population by age could weaken the findings. Later studies should consider having equal populations of each age throughout this range. Additionally, increasing the age range to a maximum age of 75 to see if there is a higher upward trend that continues, or if there is a plateau or drop as age increases. Since these songs only have one function each, future research could consider whether the participants' answers would change if they had a ranking system for all the functions. Future research could also experiment with more functions of songs to see if there is a common trend throughout all the functions that are more accurately identified by older people.

CONCLUSION

As adults age, they rely less on automatic auditory processing pathways, rather relying on their prior experience in listening to music. This research supports the claim that older adults can more accurately identify the function of a song from an unfamiliar origin compared to younger adults, specifically songs used for dance and expressing love. In a rapidly aging population, this finding will help researchers to develop better ways to support the elderly.

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