

COULD PEOPLE LEARN 'PERFECT PITCH' BY SHORT-TERM MEMORY?

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ABSTRACT

Perfect Pitch refers to the ability to recognize and define the pitch of a tone without the use of a reference tone. This research experiment is designed for demonstrating that people cannot learn perfect pitch by their short-term memory.

1. OVERVIEW

Perfect Pitch refers to the ability to recognize and define the pitch of a tone without the use of a reference tone. This ability is often compared to absolute recognition of color without any comparison to a standard spectrum. Only 2% people are partially or totally colorblind. However, more than 99.99% people have no ability to recognize the absolute pitch. Perfect pitch contrasts with relative pitch. Nearly all persons can tell whether one tone is higher than another. Someone with a well-trained ear can tell when the frequency of a second tone deviates a little as one percent from the expected interval, although these judgments are not as accurate as they claim. Psychologists have studied perfect pitch for at least 75 years, and during that time there has been considerable discussion and some controversy concerning its origin. In particular, there is less than unanimous agreement as to whether perfect pitch is inherited, acquired, or possibly both. At least four different theories about how perfect pitch is developed. (1). Heredity theory. The faculty for developing perfect pitch is inherited, just as the ability for color identification is. The child learns pitch names in early life just as color names are learned. (2). Learning theory. The opposite point of view, that perfect pitch can be acquired by almost anyone by diligent and constant practice,

is not too widely held. (3). Unlearning theory. The ability to develop perfect pitch is nearly universal, but is simply trained out of most people at an early age. (4). Imprinting theory. Imprinting is a term used to describe rapid irreversible learning that takes place at a specific developmental stage. Proponents of this theory feel that nearly all children could be taught perfect pitch at the appropriate age of development.

2. HYPOTHESIS

Personally, I believe that people cannot learn perfect pitch by practicing and memorizing. It is as the same as the colorblind people cannot recognize the color by training or practicing. People who stand for the learning theory believe everyone can learn perfect pitch by constantly testing himself on one note until he has it memorized. An experiment is designed for proving that the learning theory is wrong.

3. LITERATURE REVIEW

People who stand for the learning theory believe (1). Learning perfect pitch means memorizing notes. (2) You can learn perfect pitch by constantly testing yourself on one note until you have it memorized. (3) You can learn perfect pitch by memorizing how your throat feels when you sing a note. On the contrary, there are some disagreements on these statements. (1) You already know how to perceive a pitch. However, having perfect pitch means you need to understand what makes one pitch different from another. Memorizing notes in isolation can allow you recognize those notes when you hear them (just like you can tell when it's your phone ringing in public) but it will not help you learn perfect pitch. (2) With the exception of pure sine

waves, any pitch that you hear is going to be accompanied by lots of extra information provided by the device or instrument that you are using to make it. Whether you carry a pitch pipe around with you or come back to the keyboard every two hours to "check your memory", your mind is not hearing a pitch but a complex waveform. It is possible that you could, with great effort, remember the entire experience of this complex waveform, but what you will have learned is just one note on one instrument, not the universal character of a pitch. (3) You will associate extra feelings with the sensation of "pitch" which are not universally attendant. Your voice changes not merely as you age, but based on how you feel on any given day. If you have the flu, your throat will not feel the same as it does as when you are healthy. When you've just woken up, your throat is more relaxed than it is after a stressful afternoon at the office. The "feeling" you are attempting to associate with pitch fluctuates unreliably.

4. EXPERIMENT DESIGN

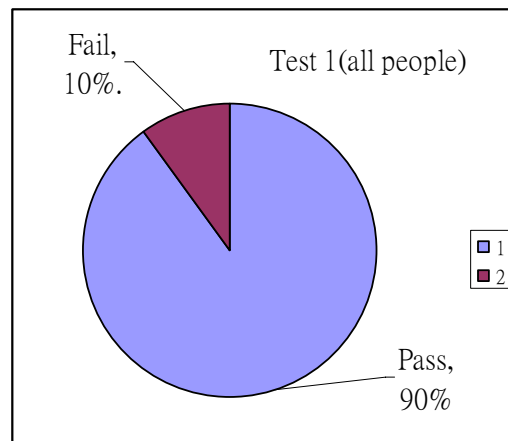
The experiment is divided into two groups of test subjects. Group A is the people who have basic knowledge and training on music but claim not to have perfect pitch. Group B is the people who claim to have no formal musical training and no perfect pitch. Both groups A and B would face a series of questions before the experiment to ensure they are in the right group. Group B needs to be carefully screened to be people without any prior musical training. People are placed in the rooms without any resonant objects. A thorough search would eliminate personal items like wristwatches, coins, whistles, jewelry or anything else that could be used as a tonal reference. I will play four pure tones: C4, D4, E4, and F4 until the subjects claim to memorize all these four notes. The seven stages of perfect pitch tests are as following. (1). ***Distinguish four pure tones in the order of C4, F4, E4, and D4.*** People are familiar with the notes sequence as C, D, E, and F. It is not good idea to test them in this way. Therefore, I put F after C. Some people will get confused with whether it is F or E. (2). ***Distinguish four guitar sounds in the order of C4, F4, D4, and E4.*** Different music instruments produce different timber on the same music notes. People may be able to distinguish four notes on pure tones, but they may be not able to do that on guitar sounds. (3). ***Distinguish four flute sounds in the order of F4, C4, E4, and D4.*** (4). ***Distinguish four piano sounds in***

the order of D4, F4, C4, and E4. (5). ***Distinguish four pure tones in the order of E4, C4, F4, and D4#.*** I would not tell subjects there is semitone in the test. If people have memorized the four pure tones, they are supposed to be aware of that D4# is not in the four notes. Such as people with perfect pitch, they can tell the frequency not in the music scale. (6). ***Distinguish four pure tones in the order of C4, D4, E4, and F4#.*** I would tell the subjects that I put one semitone in the previous test and ask them to find out which tone is semitone in this test. The four notes are played in ascendant order. (7). ***Distinguish four pure tones in the order of C4#, F4, E4, and D4.*** The order is rearranged and the semitone is changed too. I want to show that people are used to the notes sequence in ascendant order. Therefore, it is easy for people to find out which note is semitone. If I change the notes order, people may hardly distinguish the semitone. (8) ***For the person who passes previous seven tests, I will add more notes and repeat the test (1) ~ (7).***

5. RESULT AND DISCUSSION

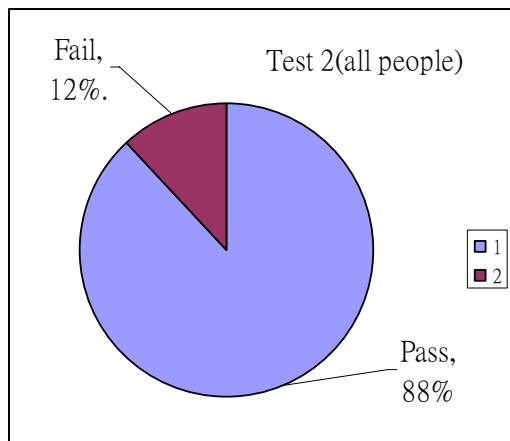
There are thirty people participated in this experiment. Half of them have music background and others do not.

5.1 Test 1- Distinguish four pure tones in the order of C4, F4, E4, and D4.



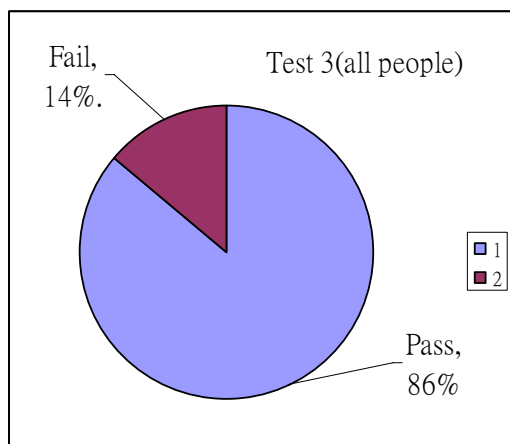
For people who pass this test, 56% of people have music background and 44% of people do not. It proves that most people could memorize these four notes well.

5.2 Distinguish four guitar sounds in the order of C4, F4, D4, and E4.



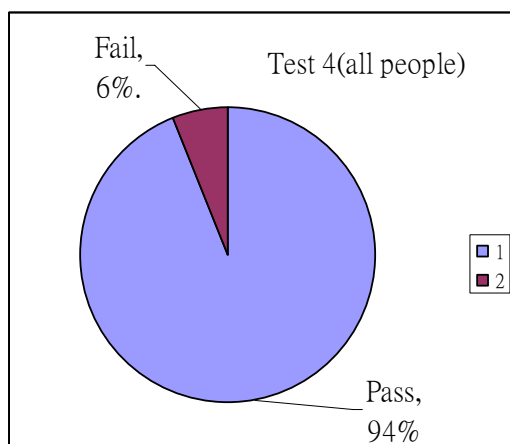
For people who pass this test, 54% of people have music background and 46% of people do not. Because the guitar sound is different from the pure tone, the failing rate becomes a little higher.

5.3 Distinguish four flute sounds in the order of F4, C4, E4, and D4.



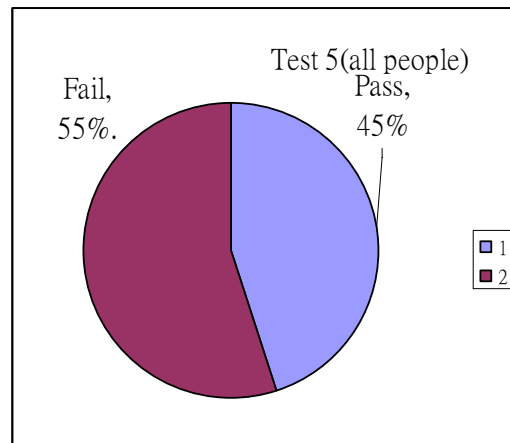
For people who pass this test, 54% of people have music background and 46% of people do not. The failing rate is higher than previous one, people are not familiar with the flute tones.

5.4 Distinguish four piano sounds in the order of D4, F4, C4, and E4.



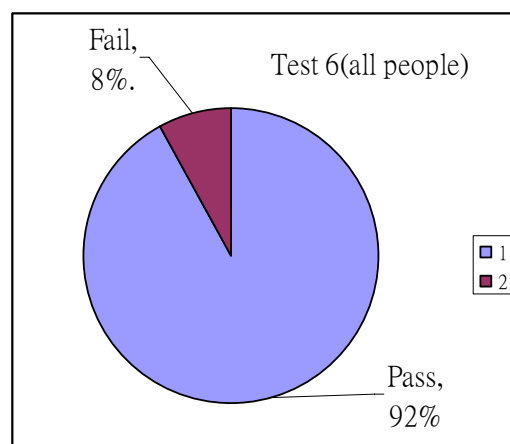
For people who pass this test, 53% of people have music background and 47% of people do not. The piano sound is most common for people. They could distinguish the notes well on piano sound. Especially, every person with music background passes it.

5.5 Distinguish four pure tones in the order of E4, C4, F4, and D4#.



For people who pass this test, 87% of people have music background and 13% of people do not. Only 45% of all people pass this test. For most people, it is not easy to distinguish the semitone. Moreover, the D4# is played after the F4, so people get confused with whether it is D4 or E4. The people with music background could feel that the semitone is quite weird. However, some people still classify it to D or E.

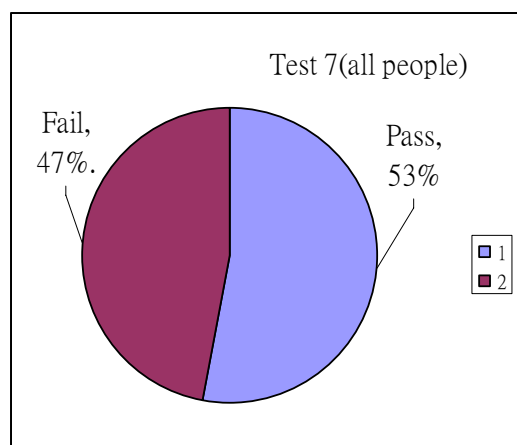
5.6 Distinguish four pure tones in the order of C4, D4, E4, and F4#.



For people who pass this test, 54% of people have music background and 46% of people do not. People are used to the notes sequence in ascendant order. Therefore, it is easy for people

to find out which note is semitone.

5.7 Distinguish four pure tones in the order of C4#, F4, E4, and D4.



For people who pass this test, 76% of people have music background and 24% of people do not. The notes order is changed, so people hardly distinguish the semitone. This test also proves that people still use the relative pitch to distinguish the notes. That is why people do well on last test but fail on this one.

6. CONCLUSION

This experiment shows that people could memorize the notes by short-term memories, but it does not mean they have perfect pitch. They could memorize four notes easily. However, if more and more notes are added, the memorizing job becomes impossible. Most of time, they still use relative pitch to distinguish the notes. It is possible that every person had the ability of perfect pitch when they were an infant, but that there was no use for it so the trait went undeveloped. Those with early musical training kept the ability because it was useful to their everyday lives. The debate of how perfect pitch is developed is not yet settled, as data on this highly specialized ability are quite scarce. It has become apparent that a critical period in early

childhood is involved in the acquisition of absolute pitch; this critical period may be related to that for acquisition of speech. However, after that period, people may not be able to learn the perfect pitch.

To prove people cannot have perfect pitch by learning or memorizing is very crucial for me. That means I will never own this remarkable ability in this life. Nevertheless, many famous musicians have no perfect pitch such as Wagner, Tchaikovsky, and Stravinsky. Their compositions are not inferior to the musicians with perfect pitch. I believe that having the ability to hear and appreciate music is already a precious gift which God gave us.

7. REFERENCE

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