

# THE EFFECT OF SOUND ON HUMAN EMOTION

## ABSTRACT

Which has a bigger impact on the emotions that we experience when we listen to a sound: the feelings and memories that we associate with the sound based on our past experiences, or the musical qualities of the chord that is formed by the tones that we are hearing? The answer to this classic “nature vs. nurture” question could be important in marketing, medicine, music, or any area where it might be useful to use sound to manipulate people's emotions. In this experiment I asked 20 subjects to record their emotions as they listened to 8 different sounds that are embedded in the experiment's website. The resulting data reinforced to some extent the idea that the inherent properties of major chords cause positive emotions while minor chords cause negative emotions, but the correlation was not as strong as expected. The police siren, the only sound with no chord qualities, produced the strongest reaction of all, suggesting that the association of specific sounds with life events may have an even larger effect on emotion than chord quality. Certain chords are known to reliably produce a predictable emotional response, and my hypothesis was that this chordal quality would play the largest role in determining emotions. My hypothesis was not supported, however, since listener familiarity and pre-determined opinions about the sounds seemed to have a greater effect on emotions than the chordal quality of the sound.

## QUESTION

Question: Do we feel emotions from sound primarily due to the chordal quality of the sound, or are our emotions brought on by what we associate the sound with?

## HYPOTHESIS

I expect that the chordal quality of each sound will have a greater effect on emotional response than what the sound is associated with by the subject. Sounds centered around a major chord will generally produce positive emotions (happiness, surprise), and sounds centered around a minor or diminished chord will consistently produce negative emotions (sadness, fear, anger, disgust). Of the two effects, I predict that the chordal quality of the sound will have the greater impact on emotional response.

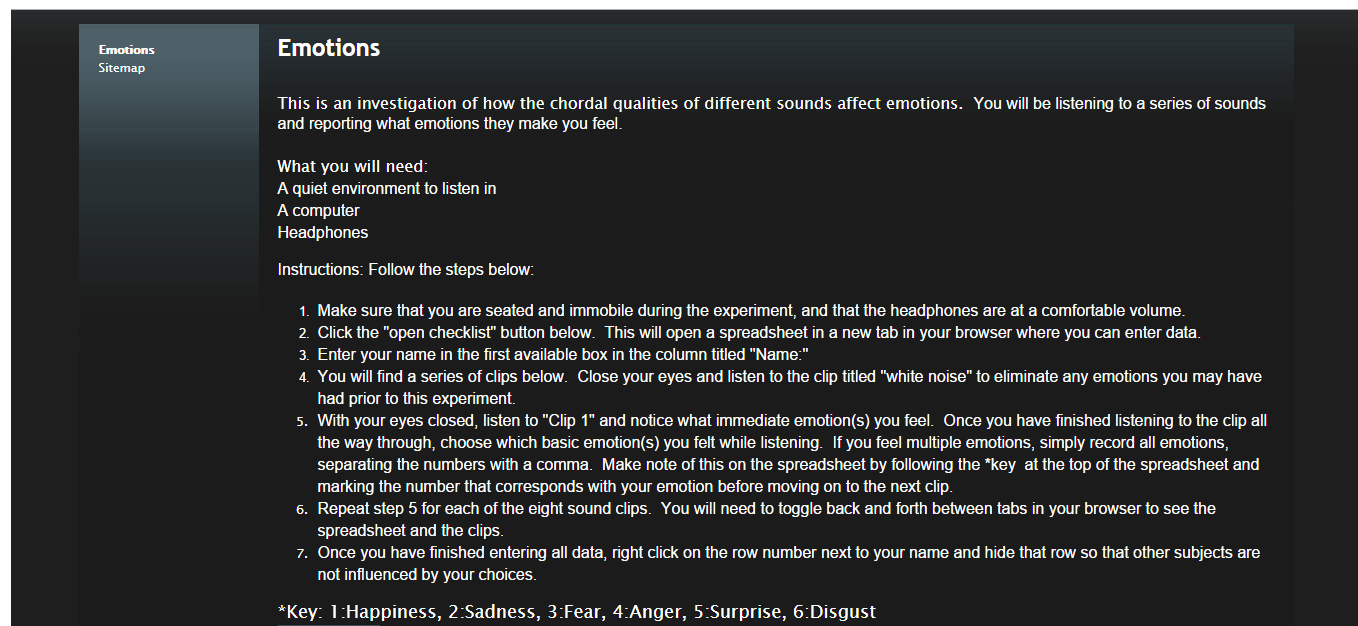
## BACKGROUND

Research has long shown that sound rooted in major chords tends to produce positive emotions, and sounds rooted in minor chords produce negative emotions. On the other hand, sounds that we hear in everyday life often come to represent something to the listener, which affects the emotional response. In the modern age, people are constantly surrounded by various advertisements, alerts, and notifications, and most of these sounds have been intentionally designed with chordal qualities that are intended to produce a desired emotional response. Hundreds of uniform sounds that we hear every day have a specific meaning or purpose, and it is important that each conveys the correct message to the listener. This project is designed to determine whether subjects' emotional response to sounds is primarily determined by the chordal quality of the sounds (as was originally intended by the sounds' designers), or whether the association of these sounds with life events overrides the chordal qualities of the sounds. Humans may be wired to experience certain chords positively and

others negatively, but hearing a song multiple times will change its effect, and a familiar sound has a different emotional impact than an unfamiliar one.

## PROCEDURE

1. Select a group of brief sounds for the subjects to listen to. One of these sounds should have no chordal center, and another should be identifiable as a musical passage that is based exclusively on either major or minor chords. The other selected sounds should be simple, familiar sounds that we hear in everyday life, and each of these sounds should be based on either a major chord or a minor chord.
2. Choose a group of positive emotions and a group of negative emotions that the listeners may experience while hearing the sounds.
3. Create an online spreadsheet for subjects to record their emotional responses to each sound.
4. Create a website with the various sounds embedded and complete instructions for the subjects to complete the test. Include a link to the spreadsheet where the subjects will record their emotional responses to each sound.
5. The website should instruct the subject to remain seated in a quiet environment with a computer and headphones at a comfortable volume during the experiment.
6. Next, the subject is instructed to relax with closed eyes and listen to a sample of white noise (provided on the website).
7. The subject is then instructed to listen to each clip with closed eyes and record an emotional response to each clip.
8. Once the subject has finished entering emotional responses for each clip onto the spreadsheet, they are instructed to right click on the row number next to the subject's name and hide that row so that other subjects are not influenced by the results



The screenshot shows a website interface for an experiment titled "Emotions". On the left is a dark sidebar with a "Emotions Sitemap" link. The main content area has a title "Emotions" and an introductory paragraph: "This is an investigation of how the chordal qualities of different sounds affect emotions. You will be listening to a series of sounds and reporting what emotions they make you feel." Below this, a section "What you will need:" lists "A quiet environment to listen in", "A computer", and "Headphones". An "Instructions: Follow the steps below:" section contains a numbered list of 7 steps: 1. Make sure that you are seated and immobile during the experiment, and that the headphones are at a comfortable volume. 2. Click the "open checklist" button below. This will open a spreadsheet in a new tab in your browser where you can enter data. 3. Enter your name in the first available box in the column titled "Name:". 4. You will find a series of clips below. Close your eyes and listen to the clip titled "white noise" to eliminate any emotions you may have had prior to this experiment. 5. With your eyes closed, listen to "Clip 1" and notice what immediate emotion(s) you feel. Once you have finished listening to the clip all the way through, choose which basic emotion(s) you felt while listening. If you feel multiple emotions, simply record all emotions, separating the numbers with a comma. Make note of this on the spreadsheet by following the "key" at the top of the spreadsheet and marking the number that corresponds with your emotion before moving on to the next clip. 6. Repeat step 5 for each of the eight sound clips. You will need to toggle back and forth between tabs in your browser to see the spreadsheet and the clips. 7. Once you have finished entering all data, right click on the row number next to your name and hide that row so that other subjects are not influenced by your choices. At the bottom, a "\*Key: 1:Happiness, 2:Sadness, 3:Fear, 4:Anger, 5:Surprise, 6:Disgust" is provided.

Screenshot of the website created for this experiment  
(<https://sites.google.com/site/sciencefairchecklist/>)



Sound clips embedded on the website created for this experiment  
[\(https://sites.google.com/site/sciencefairchecklist/\)](https://sites.google.com/site/sciencefairchecklist/)

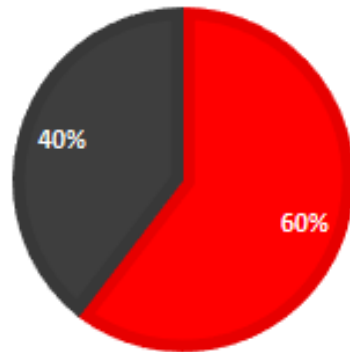
Checklist ☆											sheq4@student.k12albemarle.org
File Edit View Insert Format Data Tools Add-ons Help Last edit was 7 hours ago											Comments Share
fx   Key: 1:Happiness, 2:Sadness, 3:Fear, 4:Anger, 5:Surprise, 6:Disgust											
	A	B	C	D	E	F	G	H	I	J	K
1	Key: 1:Happiness, 2:Sadness, 3:Fear, 4:Anger, 5:Surprise, 6:Disgust	Sound 1	Sound 2	Sound 3	Sound 4	Sound 5	Sound 6	Sound 7	Sound 8		
2	Name:										
3	Maggie Byers	4	5	1	1	1	1	1	6		
4	Griffin Coffey	3, 1, 5	1, 5		3, 5, 6	2, 3		1	1		
5	Tyler Ealy	3, 6	1, 5	5	1	5	3	2	1		
6	Maggie Murray		3, 1, 5	5	1, 3, 5	3, 5		1	2		
7	Nancy	4, 6	5, 4	1, 5	1, 4, 6	3, 5	2, 1		1		
8	Deke Ealy		3, 1, 5	1, 5	1, 3, 5	5, 3, 4		2	1		
9	Graham Haynie	3	4	1	5	3	5	2	1		
10	Pingyi Zhu	1, 5	4	4	4	5, 4, 6		1	1		
11	Braxton Sesler	6	4	1	4, 4, 5		3	1	6		
12	Drew Giacalone	1	5	3	5	3	3	1	1		
13	Corinne Beverly	5	1	1	1	5	2	2	3		
14	Kai Millner		1, 5, 4	5	6, 5, 4		2, 1, 2		6		
15	Jack Bailey	3, 5	4, 6	5, 6	4, 6	1, 5	5	1, 2, 3			
16	Alex Jordan	6	5	6	4, 4, 6		3	1	1		
17	Rachel Birkholz	3	5	1	1	4	3	2	1		
18	Libby Friday	3	1	1	1	4, 2, 3, 5		2	1		
19	Tyler Cosgrove	4	5	1	2	5	1	3	2		
20	Sam Muhler	4	5	1	6, 3, 5	3, 5		1	1		
21	Emma Bashline	3	5	1	6	4	3	1	3		
22	Coco Stone	2	4	5	4	4	2	2	5		

Spreadsheet showing subjects' emotional response to each sound

## DATA / RESULTS

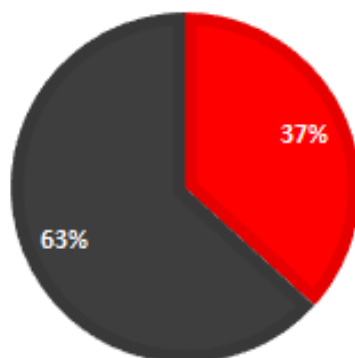
## MAJOR

■ Positive ■ Negative



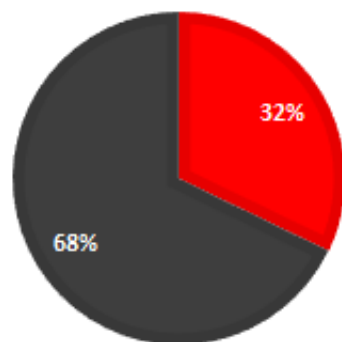
## MINOR

■ Positive ■ Negative



## POLICE SIREN

■ Positive ■ Negative



Subjects hearing Major Chords felt more positive emotions like happiness and surprise.

Subjects hearing Minor Chords felt more negative emotions like sadness, fear, anger and disgust.

Subjects hearing a police siren with no chordal properties felt the most negative emotions of all!

## BIBLIOGRAPHY

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## CONCLUSION

My hypothesis was not supported by the data. While Major and Minor chords did have a noticeable effect on the emotional reaction of the subjects, this effect was not as strong as I had anticipated. Surprisingly, pre-existing associations of specific sounds with life experiences seemed to have made a larger than predicted impact on emotional reaction. The police siren, which has no chordal center, produced the most strongly negative reactions; apparently this was due to the listeners' negative associations. The unexpectedly high frequencies of negative reactions to major chords and positive reactions to minor chords demonstrates that the chordal qualities of these sounds had only a limited impact on the emotions of the listener. Some listeners reported that their negative reactions to sounds that might normally be considered pleasant were due to negative associations with things like a morning alarm. This study differed from many studies, since it examined listener familiarity with the sounds in addition to the chordal qualities. This study provides clues as to what makes a successful advertisement, how the media affects people's emotions, and what aspects of music are the most emotional.

## FUTURE DIRECTIONS

The results of this project are applicable in advertising, media psychology, and musical composition. This research could help an advertiser decide what sound to use in order to make their audience feel happy and positive about a product. This project could be expanded testing a broader group with a broader variety of sounds. Testing more obscure sounds could also provide more accurate results, since what the listener associates with a sound had an equally strong effect on the results as its chordal qualities. Some limitations of this study include the difficulty of classifying the emotions as positive or negative, and the well-known problem of accurately identifying and recording subjects' emotional responses. In addition, this study relied on sounds that are so commonplace that it is safe to assume that each subject had previous experiences with the sounds. A future study could use less common sounds and ask the listener to report any familiarity of previous associations with a sound in order to more precisely identify what is causing the emotional reactions.