

Beatboxing and how it works in the brain



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Introduction

As I was surfing through the internet, a viral video had caught my attention. At the time, it had roughly one million views and thus sparked my interest, so I watched it. In this video, a fairly large man began to move his lips and multiple sounds came out. He starts out slowly by setting a bass foundation and eventually adds a rhythmic part to the foundation. To the rhythm and foundation, he then adds a melody. Within the first 15 seconds, I recognize that he is indeed playing Bille Jean by Michael Jackson and it caught 100 percent of my attention. This man made me wonder how a human could possibly play 3 different parts of a song and how was he able to accomplish this feat. Now what was he doing in this video exactly? This man was beatboxing. Beatboxing is the art of producing drum beats, rhythm, and musical sounds using one's mouth, lips, tongue, voice, nasal passage and throat.[i]Thus this video had caused me to further examine beatboxing and try to answer the question: how is this man able to play multiple different parts, when the only source is him? To attempt to even answer this question, this paper will first give a brief history on beatboxing to give the reader a basic understanding on the concept of beatboxing before exploring how this type of music interacts with the brain. The video clip will then be analyzed to form a conclusion based on the analysis.

The Link: <http://www.youtube.com/watch?v=ayz0j7YB7IA>

History of Beatboxing

Prehistory of Beatboxing

The root of beatboxing is vocal percussion and it has been a part of human history for hundreds of years and can be traced back to Africa. As part of

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African ritualistic music, vocal percussion patterns such as, “ hup, hup, hup, hup” and “ Ch Ka Ch Ch” were used to help performers become induced into a trance like state, in addition to using clapping and stamping to maintain rhythm. Then during the 17th Century, when African slaves were taken to plantations, African music was blended with European folk and brass band music becoming jazz and blues. These black slaves were generally poor and usually couldn't afford musical instruments and so improvised with their bodies and voices to create music.

“ Claps and clicks became the drums, and low hums because the double bass; the two back bones of blues and jazz music. One would hum, one would clap, stick and hit things as the drums, and one would sing. This would eventually evolve into imitating many sounds, such as the ‘ shhchh’ of a soft snare and the ‘ tssa’ of the hi-hat being played with brushes. Blues groups found a way to make their music with nothing but their voices...Immediately, this form of vocal percussion became a staple of urban culture, that is, culture of the street.”[ii]

Old Skool: The Beginning of Beatboxing

Beatboxing, like graffiti, seems to have begun as an urban art form. It appears with the beginning of hip-hop, which gets its start from DJs spinning records, while MCs are rapping. MCs could also be seen rapping over drum machine (also known as the beat box) beats. Since these drum machines couldn't have been purchased in the ghettos (aka poor urban cities), people began trying to imitate these drum machines with their mouths and thus became human beatboxers.

New School: Beatboxing As We Know It Now

During the 1990s, a new type of beatboxer appeared that developed new sounds and techniques. A great example of this is a beatboxer from 1999 called Rahzel, who used a method called auditory illusion to make listeners believe that he is indeed singing and beatboxing at the same time. The beatboxing song that Rahzel first revealed this new sound and technique with was 'If Your Mother Only Knew' which was reconfigured from Aaliyah's 1997 song 'If Your Girl Knew'.

How Does Beatboxing Work in The Brain?

Auditory Continuity Illusion

Audio continuity affects whether a frequency component is thought of as being continuous in time or if a frequency component contains gaps. Our brains can perceive a song as being continuous, even if it is not. Auditory continuity works by filling in these missing gaps with a different sound, which our brain then "fills in" the missing portions of the song, even if they aren't there. Our brain is thus producing a perception of a sound that is not truly there because it thinks that the two sounds are taking place at the same time. This is how Rahzel is able to make one believe that he is singing and beatboxing at the same time in the 'If Your Mother Only Knew' song. What listener does really hear is this pattern:

B[iff] your Pff[mother] B B[on] B[ly] B[knew] B[knew] B B B Pff B = Classic Kick

Pff = Classic Snare although the brain actually interprets this pattern as 2 different streams. A link to this song is:

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Grouping by Pitch Proximity & Tempo

Beatboxing also works by increasing pitch separation and tempo. Our brain sets limits on what should be physically possible for instruments such as guitar strings or the human voice box. When the sounds we hear are outside of the brain's limits, it thinks of other reasons why these sounds are outside. An example of this is: if we hear frequency changes that are way quicker than would normally be possible, the brain interprets it as coming from separate sources, even it is coming from a single source. This is because it is easier for the brain to believe that with multiple sources, the sound would reach the ear quicker. Thus beatboxing works by making the brain think that there are multiple sources creating the sound, when there is not.

Beatboxing Song from Video & Analysis

In order to collect data from this video to analyze, I converted the video into an mp3 file using <http://www.listentoyoutube.com/index.php>. Then opened it into the WaveSurfer computer program and had it create both a pitch contour and spectrogram diagrams at different time intervals. This should reveal how the beatboxer in the video is able to create sounds that seem to come from multiple sources. The top box is the pitch contour and the bottom box is a spectrogram.

Pitch Contour & Spectrogram @ 10 mm/s

Pitch Contour & Spectrogram @ 50 mm/s

Pitch Contour & Spectrogram @ 100 mm/s

Pitch Contour & Spectrogram @ 250 mm/s

As one compares the pitch contours, they are able to see that the beat boxer is actually putting into affect grouping by pitch proximity & tempo to make the brain believe that there are multiple sources. He is able to change frequencies so fast that our brain is not able to comprehend the sound as coming from one source, as seen in the last diagram where pitch contour & spectrogram are in 250 mm/s intervals.

Conclusion

Beatboxing is a perceived art; it makes us believe in something that isn't true. It is made clear that there is only one source producing all of the sounds, but the tricks of beatboxing tell our brains otherwise. By separating the different frequencies so quickly, our brain is not able to comprehend the

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sound coming from the same source and so we sense different streams. If there were indeed multiple sources, the spectrogram and pitch contours would have shown multiple frequencies overlapping one another, which clearly is not evident. Grouping by increasing pitch separation and increase tempo (speed in this case) is exactly how the beatboxer in the video is able to make me believe that there are multiple sources creating the sounds. Thus the question: how is this man able to play multiple different parts, when the only source is him, is solved.

References

[i]“ Vocal Echo.” Humanbeatbox. com. 2009. Humanbeatbox. com, Web. 2 Mar 2010. .

[ii]TyTe, , and Defenicial. “ The Real History of Beatboxing : Part 1.” Vocal Echo 2008: n. pag. Web. 2 Mar 2010. .

[iii]Al Bregman: Auditory Analysis. Web. 2 Mar 2010. .