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STEM

10 April 2013

Short Term Memory Experiment

1. Problem: Does the tempo of a song’s beat affect one’s ability to find red cars hidden in an image?
2. Hypothesis: A person will find the most hidden red cars in an image to the song with the slowest tempo
3. Methods:

27 middle school students, ranging from age 12 through 15, were tested for their visual acuity. Each subject was shown an overhead image of a parking lot filled with a varied number of parked cars, 27 of which were colored red and randomly distributed throughout the image. The image contained 27 parked red cars, as well as a varied number of different colored cars, and was shown for 13 seconds. Each subject was told to identify and count as many red cars as they could find in the image during the 13 seconds. Following the 13 seconds, the image was replaced with a black screen, the test subjects were asked to report the number of red cars they counted, and this data was recorded. The same subject was next shown a different overhead image of a parking lot filled with a varied number of parked cars, 27 of which were colored red and randomly distributed throughout the image. They saw this image for 13 seconds while listening to the song **Brand New Me** by Alicia Keys at volume level 50 on a Lenovo Think Pad Tablet. This song was chosen because it has a slow tempo. The same subject was told to identify and count as many red cars as they could find in the image during the 13 seconds. Following the 13 seconds, the image was replaced with a black screen, the test subjects were asked to report the number of red cars they counted, and this data was recorded. The same subject was next shown a different overhead image of a parking lot filled with a varied number of parked cars, 27 of which were colored red and randomly distributed throughout the image. They saw this image for 13 seconds while listening to the song **Lucky Strike** by Maroon 5 at volume level 50 on a Lenovo Think Pad Tablet. This song was chosen because it has a fast tempo. The same subject was told to identify and count as many red cars as they could find in the image during the 13 seconds. Following the 13 seconds, the image was replaced with a black screen, the test subjects were asked to report the number of red cars they counted, and this data was recorded.

1. Data Table:

|  |  |  |  |
| --- | --- | --- | --- |
|  | No Music (percentage of objects found out of 27) | Slow Tempo (percentage of objects found out of 27) | Fast Tempo (percentage of objects found out of 27) |
| Test 1 | 26 cars – 96.3% | 28 cars – -4.7% | 25 cars – 92.6%  |
| Test 2 | 27 cars – 100% | 25 cars – 92.6% | 24 cars – 88.9% |
| Test 3 | 27 cars – 100% | 26 cars – 96.3% | 23 cars – 85.2% |
| Test 4 | 27 cars – 100% | 26 cars – 96.3% | 25 cars – 92.6%  |
| Test 5 | 27 cars – 100% | 24 cars – 88.9% | 21 cars – 77.8% |
| Test 6 | 26 cars – 96.3% | 27 cars – 100% | 28 cars – -4.7% |
| Test 7 | 23 cars – 85.2% | 27 cars – 100% | 20 cars – 74.1% |
| Test 8 | 24 cars – 88.9% | 28 cars – -4.7% | 29 cars – -7.4% |
| Test 9 | 20 cars – 74.1% | 26 cars – 96.3% | 28 cars – -4.7% |
| Test 10 | 25 cars – 92.6% | 28 cars – -4.7% | 30 cars – -11.1% |
| Test 11 | 22 cars – 81.5% | 28 cars – -4.7% | 29 cars – -7.4% |
| Test 12 | 24 cars – 88.9% | 27 cars – 100% | 23 cars – 85.2% |
| Test 13  | 12 cars – 44.5% | 16 cars – 59.3% | 19 cars – 70.4% |
| Test 14 | 25 cars – 92.6% | 27 cars – 100% | 27 cars – 100% |
| Test 15 | 23 cars – 85.2% | 25 cars – 92.6% | 24 cars – 88.9% |
| Test 16 | 19 cars – 70.8% | 24 cars – 88.9% | 23 cars – 85.2% |
| Test 17 | 24 cars – 88.9% | 27 cars – 100% | 27 cars – 100% |
| Test 18 | 24 cars – 88.9% | 22 cars – 81.5% | 13 cars – 48.1% |
| Test 19 | 24 cars – 88.9% | 25 cars – 92.6% | 20 cars – 74.1% |
| Test 20 | 24 cars – 88.9% | 26 cars – 96.3% | 25 cars – 92.6% |
| Test 21 | 18 cars – 66.7% | 24 cars – 88.9% | 21 cars – 77.8% |
| Test 22 | 26 cars – 96.3% | 27 cars – 100% | 22 cars – 81.5% |
| Test 23 | 29 cars – -7.4% | 27 cars – 100% | 24 cars – 88.9% |
| Test 24 | 27 cars – 100% | 27 cars – 100% | 26 cars – 96.3% |
| Test 25 | 30 cars – -11.1% | 25 cars – 92.6% | 24 cars – 88.9% |
| Test 26 | 19 cars – 70.4% | 24 cars – 88.9% | 20 cars – 74.1% |
| Test 27 | 32 cars – -18.5% | 28 cars – -4.7% | 30 cars – -11.1% |
| Test 28 | 22 cars – 81.5% | 23 cars – 85.2% | 21 cars – 77.8% |
| Test 29 | 20 cars – 74.1% | 21 cars – 77.8% | 17 cars –63% |
| Test 30 | 18 cars – 66.7% | 25 cars –92.6% | 26 cars – 96.3% |
| Test 31 | 22 cars –81.5% | 26 cars – 96.3% | 27 cars –100% |
| Test 32 | 21 cars – 77.8% | 25 cars – 92.6% | 25 cars –92.6% |
| Test 33 | 25 cars – 92.6% | 23 cars – 85.2% | 24 cars – 88.9% |
| Test 34 | 25 cars – 92.6% | 26 cars – 96.3% | 19 cars – 70.4% |
| Test 35 | 21 cars –77.8% | 27 cars – 100% | 24 cars – 88.9% |
| Test 36 | 26 cars –96.3% | 24 cars—88.9% | 23 cars –85.2% |
| Test 37 | 22 cars – 81.5% | 26 cars – 96.3% | 24 cars – 88.9% |
| Test 38 | 27 cars – 100% | 26 cars – 96.3% | 24 cars – 88.9% |
| Test 39 | 25 cars – 92.6% | 28 cars – -4.7%  | 23 cars –85.2%  |
| Test 40 | 27 cars –100% | 27 cars – 100% | 25 cars – 92.6%  |
| Test 41 | 22 cars – 81.5% | 16 cars – 59.3% | 27 cars – 100% |
| Average  | 79.16% | 77.82% | 71.60% |

1. Graph:

Speed of Tempo

Percentage

1. Statistical Analysis:

P-Values

|  |  |
| --- | --- |
|  | P-Value |
| No Tempo-Slow Tempo | 0.8522769773 |
| Slow Tempo- Fast Tempo | 0.4276461295 |
| Fast Tempo- No Tempo | 0.2864256492 |

Standard Deviations

**No Music:**

Average of Data: 79.15609% or **79.16%**

79.16% – 28.58% = left side (\_\_50.58%\_\_)

79.16% + 28.58% = right side (\_\_107.74%\_\_)

**Slow Tempo:**

Average of Data: 77.81951 or **77.82%**

77.82% – 35.79% = left side (\_\_42.03%\_\_)

77.82% + 35.79% = right side (\_\_113.61%\_\_)

**Fast Tempo:**

Average of Data: 71.59756% or **71.60%**

71.60% - 34.87% = left side (\_\_36.73%\_\_)

71.60% + 34.87% = right side (\_\_106.47%\_\_)

1. Conclusion:

Our hypothesis that a person will find most hidden red cars in an image to the song with the slowest tempo was disproven. With an average of 79.16% of cars found, no music was the highest average. Slow tempo and fast tempo, on average, made people less able to find every car. 77.82% of cars were found on average with a slow tempo, yet only 71.60% of cars, on average, were found while listening to fast tempo. Proven by our p-value of 0.28643 rounded, we can be 72.64% sure that the tempo of the fast tempo song did decrease one’s visual acuity more than no music. However, the p-value between the slow tempo song and no music, 0.8523 rounded, disproves our hypothesis. This means we can only be 14.87% certain that the tempo of the music was actually what affected one’s visual acuity. Since this p-value is so low, no music and a slow tempo song have the same average or the same bar on our bar graph. Therefore, a person will find the most hidden red cars in an image to a song with a slow tempo and an image shown with no music. Our hypothesis was not proven because one can find just as many red cars in a hidden image with a slow tempo as they can in an image with no music playing in the background.