



Homeostasis through Blood Pressure

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Hypothesis: the body would make changes in blood pressure based on a simulated stressful situation through various videos

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Introduction

The human body has many natural mechanisms for maintaining homeostasis. Homeostasis is the tendency toward a relatively stable equilibrium between interdependent elements, especially as maintained by physiological processes. One way the body can maintain homeostasis is through blood pressure and the body can do this through many different ways. The amount of blood pumped by the heart, the amount of resistance in the veins, and the volume of blood all affect blood pressure. If the heart speeds up and pumps more blood, there is a higher cardiac output and blood pressure increases. The arterioles can expand and narrow to change arteriolar resistance. Expanded arterioles create less resistance, so this lowers blood pressure. The kidneys can change the volume of blood by increasing or decreasing the amount of urine produced. Since urine is mainly waste from the blood, more urine being created decreases the volume of blood, which decreases blood pressure. In the adrenal glands, norepinephrine is released which is a hormone that makes your heart rate and blood pressure increase, during a "fight or flight" situation. Angiotensin II triggers the release of anti-diuretic from the hypothalamus which decreases the blood pressure level. In this experiment, we choose to measure blood pressure in response to a few types of videos. Previous studies from Medicine and Science in Sports and Exercise have shown that an increase in TV viewing over a period of time correlates to an increase in blood pressure over a period of time. We want to examine the short term effects of homeostasis more closely to find the relationship. In our experiment we will be showing people short videos that are calming, scary, or appealing. We think that this will raise people's blood pressure over a short period of time, especially in the scary video. If people are scared, stressed, or aroused their blood pressure may raise due to increased heart beat. We think videos will have an affect on blood pressure.

Abstract

The human body must regulate every system within itself. If even one of these processes fall out of balance, the whole body could fail. Blood pressure is one acute detail that affects almost every system in the human body. We conducted a study to find a correlation between blood pressure and watching different types of videos. Our hypothesis is that the body would make changes in blood pressure based on a simulated stressful situation through various short videos. After the stimulation is removed, homeostasis should bring the blood pressure back to normal. We found that different types of videos did have differing effects on blood pressure, but the effects were not as significant as we thought they would be. The longest it took a person to return to a relatively normal blood pressure was only 3 minutes, while the videos were all under 2 minutes long.

Materials/Methods

We conducted an experiment with 3 test subjects. They were all sophomores from San Marin in other groups in our STEM class. We tested one girl and two boys so we would have both genders represented. They were from other groups because everyone in our group had already seen the videos and we needed people who had never seen the videos so they wouldn't know what they were about when watching the videos. We tested three subjects so we would have different data to compare and we could make more accurate predictions as compared to only comparing two people. We made them all watch the same 3 videos: one scary, one happy, and one appealing. Each video was two minutes long. The scary video had jump scares about every 15 seconds from characters in Five Nights at Freddy's. The happy video was an extra gum commercial that showed a couple's relationship progressing over the years. It was very happy and had calming music. The appealing video was a Fifth Harmony music video that had appealing graphics and music. A sphygmomanometer was used to measure blood pressure and we showed them the videos from a laptop. We first took a baseline blood pressure for each subject before starting the videos. Then we started the videos and took the blood pressure at 1 minute intervals from the start of the video. We waited until blood pressure returned to normal. We repeated this process for all 3 videos for all 3 people. The only variable we changed during the experiment was the person being tested. All other variables remained constant to insure the quality of our experiment.

Results

Over all three tests, the videos affected the blood pressure of the subjects. With each video, there wasn't much difference between the results of each subject. This means that each person reacted the same way as the other people. The first video caused their blood pressures to rise rapidly but return to normal shortly after. On average, at minute one, all the subject's blood pressure rose by around 14 mmHg. The second video caused their blood pressure to fall at about 2 mmHg, but test subject 1's fell 19 mmHg because he is more chronically aroused. After it fell, it rose back up to normal at minute 2. The third video caused their blood pressure to rise and then fall but not as drastically as the first video. Test subject 2 and test subject 3's blood pressure rose 2 mmHg and test subject 1 rose 3 mmHg. Subject 1 and subject 3's blood pressure lowered at the second minute, but surprisingly subject 2's rose by 11 mmHg.

Conclusion

In the first video, we briefly scared them so this would cause blood pressure to rise, but the video was only scary for the first time, because they knew what was coming after that. It was not the most effective video to scare someone, because of the predictability, but we can still see a clear correlation between being scared and raising blood pressure. The second video was relaxing and calming so it probably releases tension in the body. This would correlate to decreasing blood pressure and it wouldn't be very hard for the blood pressure to rise back up to normal shortly after. The third video also led to a rise in blood pressure. Since it was appealing, it probably excited our test subjects, which would also correlate to increasing blood pressure. We could have made this experiment more accurate by testing a larger sample size; however our results all lead to the same conclusions. This experiment has brought up many new questions for us. Firstly, Is heart rate also affected in the same way by these videos? Secondly, would variants of the videos used yield different results? Overall, we see that stressful or exciting situations increase blood pressure and calming or relaxing situations decrease blood pressure. Our hypothesis was correct; watching different videos does affect blood pressure in different ways.

