Political Affiliation as a Predictor of Physiological Response to Political Statements

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Abstract

The purpose of this study is to measure the physiological response when presented with aversive statements compared to agreeable statements while using politics as a vehicle. Using anonymous students from the Spring 2016 Physiology 435 course at the University of Wisconsin - Madison, a political label was assigned to each participant using a pre-experiment survey that allowed us to predict which statements each individual would react aversely to. Each participant was read five liberal, five conservative, one positive control, and one negative control statements while their heart rate, respiration rate, and sweat response were measured. We hypothesized that subjects would experience an increase in heart rate, respiration rate, and sweat response when presented with political statements that support the oppositely affiliated label. While a significant increase in heart rate was observed, the electrodermal activity and respiratory rate results were insignificant; therefore, our hypothesis was not supported. Further research exposing participants to more provocative statements could provide more insight into the role of the fight-or-flight response to disagreement.

Introduction

The physiological effects of stress are instrumental to the evolution and survival of humans (Neese and Young, 2007). In anticipation of conflict or in the presence of an aversive stimulus, the body reacts in a variety of ways, including what is commonly known as the fight-or-flight response. In the fight-or-flight response, the sympathetic nervous system triggers a cascade of hormones that increase perspiration, respiration rate, and heart rate in order to prepare the body for escaping or engaging in conflict (Neese and Young, 2007).

The physiological reactions correlated with this response are also elicited in situations where the subject expresses anger or disgust. Studies have shown that experiences inducing anger, disgust, and fear result in a variety of physiological responses, such as increased heart rate, skin conductance, and respiratory rate (Kreibig et al, 2010). Vranda et al (1993) tested subjects' heart rate as they imagined situations eliciting disgust, anger, pleasure, and joy. Heart rate accelerated more when subjects experienced disgust and anger than when they experienced pleasant emotions.

While the physiological responses to stress, anger, and disgust have been researched under many conditions, there is a lack of research regarding these responses due to verbal disagreements. Since disagreement is a more complicated feeling than disgust or anger alone, testing the physiological responses of disagreement requires a model with which researchers can adequately determine the interests and values of their subjects, and subsequently present them with the opposite. Politics is a strong vehicle with which to test physiological changes due to disagreement given the divisive nature of politics in American society. Furthermore, it has been shown that an association exists between political attitudes and physiological responses to threat (Oxley, Smith, et al, 2008).

The University of Nebraska's Political Physiology Lab has performed numerous studies researching personality traits and physiological differences between conservatives and liberals. One researcher measured skin conductance while subjects were presented with images that typically elicit strong emotional responses and increased perspiration after assessing each subject's political involvement. Results showed the greater the subject's sweat increase in reaction to the pictures, the more likely the subject was to actively participate in politics – with

those whose perspiration increased the most around twice as likely to participate in political action as those who perspired the least. This study positively correlates political participation and sweat response, which we will utilize in testing the physiological response to disagreeable political beliefs (Gruszcynski et al, 2012).

The focus of this experiment is to measure the difference in the physiological response when presented with aversive statements compared to agreeable statements. In this study, political statements were used to induce physiological responses. We hypothesized that subjects would experience an increase in heart rate, respiration rate, and sweat response when presented with political statements that support the oppositely affiliated label.

Methods & Materials

Participants and Preparation

Individuals participating in this study were chosen from the Spring 2016 Physiology 435 course at the University of Wisconsin - Madison. A total of twenty subjects participated in this study: eight males and twelve females. Each student was asked to complete a consent form agreeing to participate in an experiment investigating physiological responses to various verbal statements. After signing the consent form, each participant was assigned an identification number followed by male or female depending on the participant's sex in order to keep the results anonymous.

Participants were asked to fill out a survey with a total of sixteen political statements, which included equal numbers of liberal and conservative statements. Using the political survey website ISideWith.com, survey questions designed to give the quiz-taker a political label based on their results were gathered and modified so each was clearly and intentionally presented as

either an absolutely conservative or an absolutely liberal statement. For example, the question, "Should employers be required to pay men and women the same salary for the same job?" (ISideWith.com) was modified to read, "Employers should be required to pay men and women who perform the same work the same salary." Participants were asked to judge each survey statement on a five point scale from 'completely disagree' to 'completely agree.'

A score of one was assigned to the most conservative response, and a score of five was assigned to the most liberal response. Each of the sixteen statements were organized into four political categories - social, economic, environmental, and policy - and scores were summed for each category. This accounted for participants who may be liberal in regards to one topic but conservative in regards to another. Scores over 48 were to be assigned liberal, and scores below 48 were to be assigned conservative. The generated scores were used in the later analysis of the data to help identify which experimental statements each participant was expected to find the most aversive. After completion of the consent form and the survey, test subjects were led into a quiet room, a controlled environment, and seated for preparation.

The ten political statements used in the experiment were different from those generated for the survey. However, these experimental statements followed the same guidelines; each statement was presented from an absolute viewpoint, with half being conservative and half being liberal. Additionally, the statements covered the range of social, economic, environmental, and policy-based political categories. The ten statements were arranged in a random order, and this order was conserved throughout the experiment from subject to subject. Additionally, positive and negative controls were added to the conserved statement list. Non-political statements were chosen for the controls in order to elicit specific responses without influencing the political

nature of this study. The negative control, "The walls are white," was chosen because of its non-stimulating nature. The positive control, "Do you think I'm attractive?" was chosen for the largely excitatory response it would provoke whether or not the subject wanted to answer yes or no, as has been shown in a previous study (Beguin et al, 2014). These two statements were also added to fixed positions on the experimental statements list and maintained from test subject to test subject (Figure 1).

All equipment required for the appropriate physiological readings was connected to the participant. Heart rate, respiration rate, and electrodermal activity were assessed with the goal of evaluating the stress response that each statement induced in the individual. The Nonin (Plymouth, MN) Pulse Oximeter (model 9843) used to read the subject's heart rate was placed on the left index finger. The BIOPAC Systems, Inc. (Goleta, CA) Respiratory Belt (model SS5LB) was tightly secured around the subject's chest, directly under the armpits, and above the nipple line to measure the subject's respiration rate. This sensor was plugged into channel 1 of the BIOPAC Data Acquisition Unit which was connected to the computer for recording. The BIOPAC Systems, Inc. EDA unit (model SS3LA) was attached to the subject's right index and middle fingers in order to measure sweat response. The BIOPAC Isotonic Recording Gel was applied to each of the biofeedback sensors which were wrapped around the subject's fingers. The EDA unit was connected to channel 2 of the BIOPAC Data Acquisition Unit.

Experimental Segment

Physiological recordings were taken in 15 second intervals; a statement was read out loud to the subject, they were asked to silently think about what their response would be for 15 seconds, followed by a relaxation period where they were asked to stop thinking about the

statement for 15 seconds in order to return to a baseline reading (Figure 2). Time required to return to baseline was established after the first three trials; the initial trials included 30 second relaxation periods in order to return to baseline; however, researchers noticed that a sufficient amount of time needed to return to baseline levels was closer to 10 seconds. Following this realization, all subsequent trials were revised to include 15 second relaxation periods to allow the subject to return to baseline. An experimenter read each statement out loud to the participant in an unbiased, steady tone, and recording of heart rate, EDA, and respiration was initiated immediately after the reading of the statement was finished. The physiological response was measured for 15 seconds until the participant was instructed to stop thinking about the statement, and recording continued for another 15 seconds to allow the participant to return to baseline. The next statement was read, and this procedure was followed for each of the twelve statements. Control statements were also read out loud to each participant during the experiment.

Analysis

Independent samples t-tests were conducted on mean electrodermal activity, respiration cycles per minute, and max heart rate to test for statistically significant differences between conservative and liberal statements. For each physiological variable, two ANOVAs with three groups per ANOVA were performed. The groups were liberal statements, conservative statements, and either the positive or negative control. This tested for a statistical difference between the statements and the positive control, as well as the statements and the negative control.

Results

Electrodermal Activity Response

The average electrodermal activity from hearing conservative and liberal statements is summarized in Table 1 and Figure 3, along with the positive and negative controls for each participant. Data was missing for four participants. There was a statistically insignificant difference in the electrodermal activity between conservative and liberal statements of p=0.954. The difference between conservative statements, liberal statements, and the positive control had a statistically significant p-value of 0.0006. There was a statistically insignificant p-value of 0.143 for the differences between conservative and liberal statements when compared to the negative control.

Respiration Rate

The average respiration rate from conservative, liberal, positive, and negative control statements for each participant is summarized in Table 2 and Figure 4, but data was missing for five participants. There was a statistically insignificant difference between conservative and liberal statements with p=0.0651. The difference between the statements and the positive control had a statistically significant p-value of 0.009. There was a statistically insignificant p-value of 0.765 for the differences between the statements when compared to the negative control.

Heart Rate

Table 3 and Figure 5 show the average max heart rate from hearing conservative, liberal, and the control statements. There was a statistically significant difference in hearing conservative and liberal statements of p=0.0258. The statistically significant difference between statements

and the positive control had a p-value of 0.001. There was a statistically insignificant p-value of 0.452 for the differences between the statements when compared to the negative control.

Discussion

The positive control had statistically significant differences from the statements across all of the physiological variables. On the other hand, the negative control was not statistically different across any physiological variable, which is expected because the negative control should not be eliciting significant physiological responses.

When looking at electrodermal activity, there was no statistically significant deviation in skin conductance between conservative and liberal statements, providing evidence against our hypothesis. The same was true when comparing differences in respiration rate, in cycles per minute, between conservative and liberal statements, but with a p-value of 0.0651, it was very close. To the contrary, max heart rate did have significant differences between liberal and conservative statements, which supported our hypothesis. Due to these mixed results, we are not able to confirm our hypothesis that a participant who disagreed with a political statement would display a larger increase in perspiration, heart rate, and respiratory rate than when presented with a statement that they agreed with.

Several errors also occurred during the setup of this experiment. For four of the participants, the electrodermal activity unit was not plugged into the BIOPAC system correctly, so we were unable to collect data for these individuals. In addition, the respiration belt may not have been tightly fastened on each participant. Each subject fastened the belt on themselves, and some fastened it more securely than others. A loose belt will produce inaccurate data showing little to no respiration cycles. Had the belt been tightly secured on each participant or

standardized by having an experimenter fasten the belt on each participant, the data may have shown more prominent respiration cycles which could have provided statistical evidence in the form of a change in respiration rate.

In order to better standardize reading the statements so that no emotional affiliation or bias is present in the tone, a computer simulated voice could be used. In this experiment, a researcher read each of the twelve statements out loud while actively avoiding any bias or emotion in their tone; however, this is hard to control, and any hint of bias coming from the researcher could have affected the participant's response to the statement. Additionally, utilizing a computer simulated voice could help avoid any participant reaction to the researchers themselves that is unrelated to the reading of the statements.

Hot topic statements surrounding today's politics were used in order to stimulate a physiological response, but using provocative stimuli to even a larger degree may have created a statistically significant response. Further research could investigate the physiological response to political statements or images designed to invoke an even larger threat-like response to trigger the fight-or-flight reaction. When the fight-or-flight response cascade is triggered, a change from resting heart rate, respiration rate, and sweat conductance would be observed as the body is preparing to react to the perceived threat. By testing political statements or images that have been confirmed to produce a fight-or-flight response, the results from this type of experiment would more accurately conclude whether it is statistically significant to suggest individuals exhibit a physiological increase in heart rate, respiration rate, and sweat conductance when faced with aversive stimuli. Furthermore, a vehicle other than politics that stimulates a fight-or-flight-like

response could be used to determine whether individuals have a greater physiological response to disagreement than agreement.

Further research of this design could also take into account political participation of the test subjects. As shown in Figure 6, all participants in this study had survey scores classifying them as liberal. This study was limited in its capacity because no participants scored in the conservative range, so there was no way to test any differences in physiological response between political parties. In future studies, a significant amount of subjects from each political party should be used, and scores could be further categorized as very conservative, conservative, moderate, liberal, and very liberal to get the most detailed results. In addition, how politically aware or interested the subjects were in our experiment could have affected their response to the statements read out loud. One who is not interested in politics may not elicit a physiological response to the oppositely survey-assigned political label simply because they are do not perceive this type of situation as life-threatening. The fight-or-flight response is a relatively extreme reaction by the body, therefore it generally requires an extreme stimulus; in order for a political statement to be considered 'extreme' enough to induce this response, the participant must have fairly strong feelings regarding the subject. A screening survey could be used to select individuals who respond as being politically active or interested and obtain an equal number of each political affiliation. These screened subjects could be used to test the physiological change induced by aversive political statements in order to gather potentially statistically significant evidence to this study design.

Since studies have been performed to observe differences in political regards between males and females, this experimental design could be taken into account for future studies to

observe the differences in physiological responses to aversive political beliefs between sexes. In addition, the age of this study's participants was limited to college aged students. Further experimentation could include older participants in order to test physiological differences to aversive statements between age groups. This type of experimental design could also shed light onto how political involvement and affiliation changes with age.

Nonetheless, when a threat is perceived, the sympathetic nervous system triggers a cascade of responses known as the fight-or-flight response. This response is necessary for survival in order to overcome stimuli that put the body in a state of stress. More research must be conducted in order to conclude how the fight-or-flight response is associated with responding to disagreeable statements.

Tables

Table 1: Participant Electrodermal Activity (microSiemens)

	EDA (sweat)			
Participant	Positive Control	Negative Control	Avg. from conservative statements	Avg. from liberal statements
1	0.5095	0.2161	0.38414	0.35736
2	11.971	NA	8.81026	8.9126
3	14.73476	13.53921	15.027154	15.08014
4	14.69777	7.604	8.6456	8.52472
5	11.02	10.716	10.7766	10.6354
6	9.492	6.042	5.5521	5.9586
7	8.706	9.071	9.90485	10.0149
8	9.5985	8.346	9.2316	9.7331
9	15.973	13.721	13.615	13.0511
10	13.3515	8.78	8.7366	8.6119
11	NA	NA	NA	NA
12	NA	NA	NA	NA
13	NA	NA	NA	NA
14	NA	NA	NA	NA
15	4.383	2.864	3.2686	3.1906
16	1.962	2.018	2.227	2.1466
17	7.002	5.755	5.9682	5.924
18	4.874	4.409	4.6896	4.6856
19	5.475	4.091	3.874	3.9062
20	10.79	9.647	8.7724	8.7074

Table 2: Participant Respiration Rate (cycles/min)

	Respiration Rate (cycles/min)			
Participant	Positive Control	Negative Control	Avg. from conservative statements	Avg. from liberal statements
1	75.535	21.702	33.5226	31.972
2	NA	NA	NA	NA
3	9.071	12.596	11.7408	10.2528
4	21.671	17.301	19.2526	19.31
5	18.321	17.928	17.7376	17.8196
6	47.468	10.616	11.8682	10.0124
7	43.881	12.739	13.3008	11.7488
8	28.002	15.096	10.4698	10.9834
9	NA	NA	NA	NA
10	41.705	18.842	18.827	22.5224
11	NA	NA	NA	NA
12	NA	NA	NA	NA
13	NA	NA	NA	NA
14	16.468	18	19.569	17.1718
15	27.663	16.5	17.6496	18.3552
16	18.441	16.796	19.0474	17.409
17	22.939	13.612	13.0534	11.3728
18	34.836	21.871	12.5846	14.1506
19	39.982	21.464	22.4614	20.7974
20	15.289	12.19	13.3554	10.888

	Max Heart Rate (beats/minute)			
Participant	Positive Control	Negative Control	Avg. from conservative statements	Avg. from liberal statements
1	90	113	92.6	95.2
2	80	75	77.4	76.8
3	74	69	76	73
4	85	83	78.6	78.8
5	77	68	72.8	73.2
6	78	82	81.6	80.2
7	93	82	82.6	82.4
8	75	68	68.8	70.6
9	82	81	80.6	77.6
10	91	87	88.4	85.6
11	79	75	73.2	71.8
12	72	70	65.4	65.6
13	104	93	97.4	95.6
14	61	52	56.4	56.6
15	93	93	96.4	88.4
16	69	68	70.2	70.6
17	93	83	85.6	83
18	85	59	64.6	59.2
19	94	88	90.2	88.8
20	101	94	95	94.6

Table 3: Participant Maximum Heart Rate (beats/min)

Figures

Figure 1: Order of Experimental Statements

1. Muslim immigrants should be banned from entering the country until the government improves its ability to screen out potential terrorists.
2. The military should allow women to serve in combat roles.
3. Every person purchasing a gun should be required to pass a criminal and public safety background check.
4. Marriage should be defined as between a man and a woman.
5. Abortion should be legal.
6. The walls are white.
7. The government should allow the death penalty.
8. The U.S. should accept refugees from Syria.
9. The government should increase military spending.
10. The government should make cuts on public spending to reduce national debt.
11. Taxes on the rich should be increased in order to reduce interest rates for student loans.
12. Do you think I'm attractive?

Figure 1. Order of Experimental Statements. The statements presented by the experimenter to each test subject, and the order in which they were presented. Conservative statements are outlined in red, liberal statements in blue, and the control statements in black.

Figure 2: Timeline of Events Carried Out by Each Participant

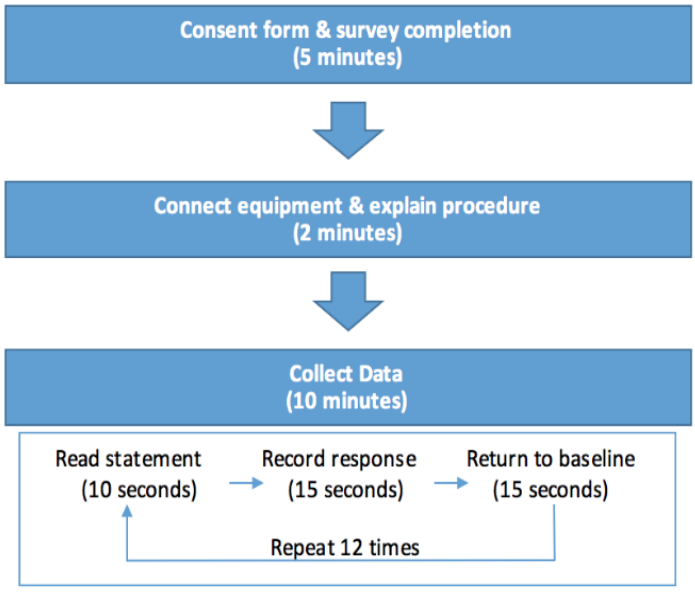

Figure 2. Timeline of Events Carried Out by Each Participant. The sequence of events carried out by each participant during this study.

Figure 3: Average Electrodermal Activity Responses after Statements are Given

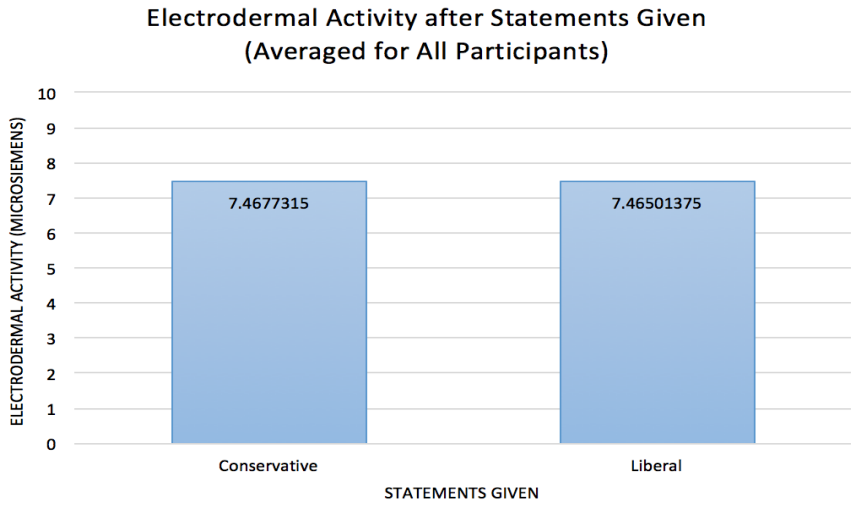

Figure 3. Average Electrodermal Activity Responses after Statements are Given. The electrodermal activity responses after each statement was given averaged for each participant.

Figure 4: Average Respiratory Rates after Statements are Given

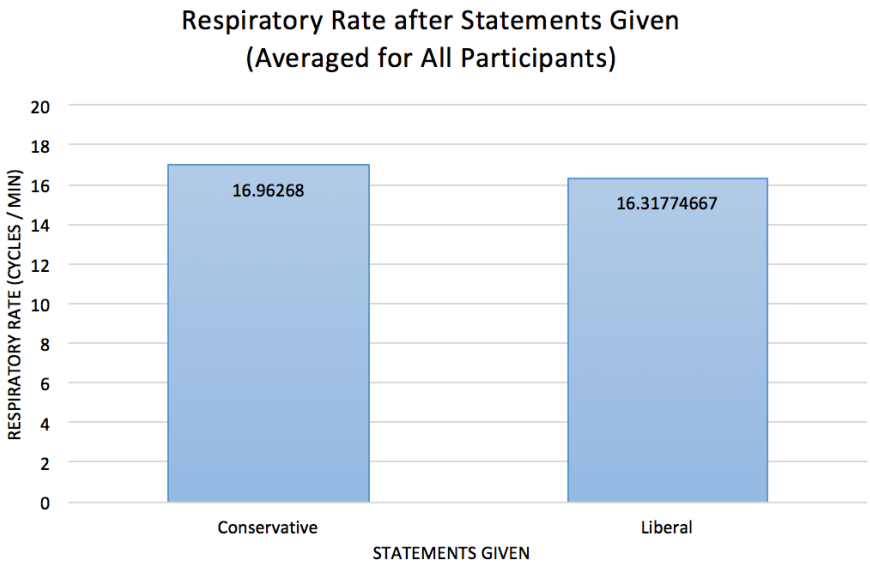

Figure 4. Average Respiratory Rates after Statements are Given. The respiration rates (cycles/min) after each statement was given were averaged for all participants.

Figure 5: Average Maximum Heart Rates after Statements are Given.

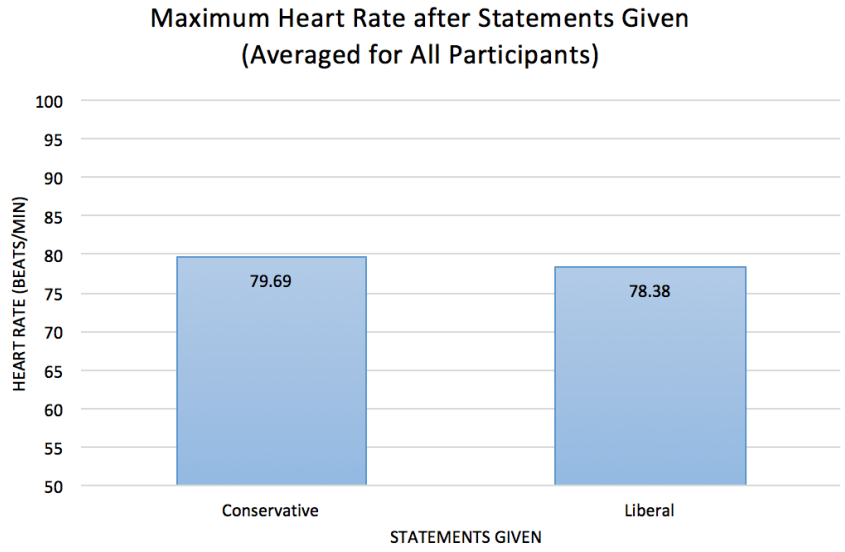

Figure 5. Average Maximum Heart Rates after Statements are Given. The maximum heart rate after each statement was given averaged for each participant.

Figure 6: Political Affiliation of Study Participants

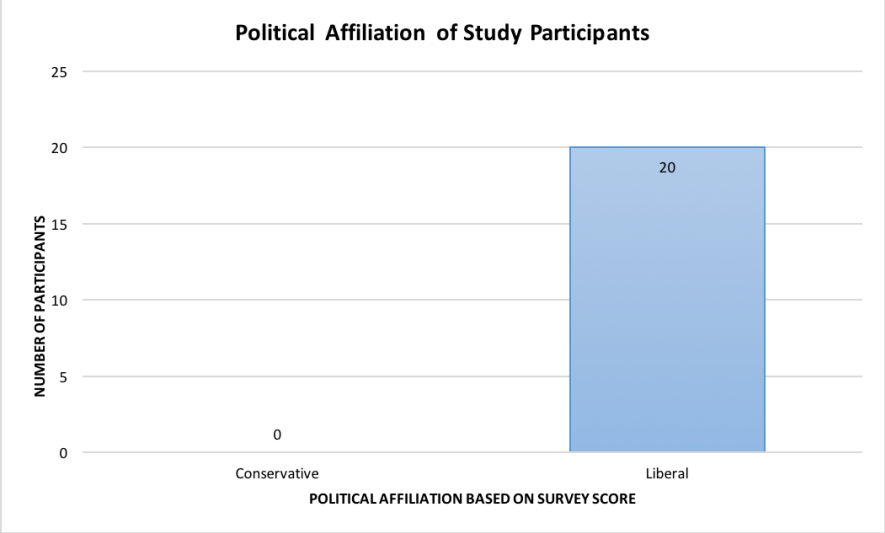

Figure 6. All 20 participants in the study had scores over 48, designating all of them as liberal. No study participants identified as conservative.

References

Beguin, C, *et al.* Correlation between Physical Activity and Stress Response in Polygraph Tests. *Journal of Advanced Student Science*. Spring 2014.

Gruszczynski, M, *et al*. The Physiology of Political Participation. *Political Behavior*, 35 (1), 135-152.

"How Republican vs Democrat Are You?" *ISideWith*. ISideWith, n.d. Web. 11 Feb. 2016.

Kreibig, S. Autonomic nervous system activity in emotion: A Review. *Biological Psychology*, 84 (3), 394-421.

Neese, Randolph M., and Elizabeth A. Young. "Evolutionary Origins and Functions of the Stress Response." *Encyclopedia of Stress* 1 (2007): 965-70. Elsevier Inc. Web. 3 Apr. 2016.

Oxley, Douglas R., Kevin B. Smith, *et al*. "Political Attitudes Vary with Physiological Traits." *Science* 321.5896 (2008): 1667-670. *AAAS*. American Association for the Advancement of Science, 19 Sept. 2008. Web. 4 Apr. 2016.

Vrana, S. (n.d.). The psychophysiology of disgust: Differentiating negative emotional contexts with facial EMG. *Psychophysiology, 30*(3), 279-286.