Knowledge and Perception of Health and its Correlation to Actual Health

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ABSTRACT

Obesity is a significant health issue that affects Douglas County in Wisconsin and St. Louis County in Minnesota. A discrepancy between perceived health and actual health may exacerbate the obesity endemic in the Northland. This study used a survey to determine perceived health, and used Body Mass Index (BMI), blood pressure, expiratory reserve volume (ERV), and resting heart rate to assess actual health. Survey questions and health measurements were categorized and point values were assigned to survey answers. Correlations were made between various survey question categories and health measurements, including BMI, systolic and diastolic blood pressure, ERV, and resting heart rate. Correlations of BMI to both health perception and resting heart rate were statistically significant. BMI was negatively correlated with health perception ($r=-0.41$, $p\leq0.05$) and positively correlated with resting heart rate ($r=0.50$, $p\leq0.05$). Many non-significant trends were observed as well. Results suggest that participants in the Northland have an accurate perception of their health and are relatively knowledgeable about what diet and exercise habits are healthy. Knowledge of which habits and activities are healthy does not consistently yield participation in those habits and activities. When reporting, participants may overestimate health habits, especially those pertaining to physical activity.

Introduction

Quality of health and obesity are significant issues on the national, state, and local levels. As of 2008, approximately 72.5 million adults in the United States were obese (Centers for Disease Control and Prevention, CDC; 2010). By the year 2030, 86.3 percent of American adults could be overweight or obese and 51.1 percent could be obese if current trends continue (Wang et al., 2008). Moreover, by the year 2048 all American adults are projected to be overweight or obese (Wang et al., 2008). Data from 2005 shows that only 32.6 percent of adults consume the recommended number of servings of fruit daily, and only 27.2 percent consume the recommended number of servings of vegetables daily (CDC, 2007). Between 1971 and 2000, women in the United States have increased their daily calorie consumption by 22 percent (from 1542 calories to 1877 calories) and men have increased their daily calorie consumption by seven percent (from 2450 calories to 2618 calories; CDC, 2004). Health habits are proving to be detrimental to the overall health of the country's citizens.

Good health is considered to mean a diet with a low intake of fats and oils (no more than six teaspoon equivalents for women and seven teaspoon equivalents for men daily); a high intake of fruits (two cups for men and women daily), vegetables (2.5 cups for women and three cups for men daily), whole grains (six ounces for women and eight ounces for men daily), and lean protein (5.5 ounces for women and 6.5 ounces for men daily); and physical activity consistent with recommended guidelines (USDA, 2011). Adults 18 to 64 years old should get at least 2.5 hours each week of aerobic physical activity at a moderate level *or* 1.25 hours of aerobic physical activity each week at a vigorous level (USDA, 2011). Activity should be done for at least ten minutes at a time, and doing physical activity for more than five hours per week adds additional health benefits (USDA, 2011). Strengthening activities such as pushups, sit-ups, and weight lifting are recommended for at least two days of the week (USDA, 2011). Good health is also defined as no smoking and limited drinking. Alcohol and tobacco are among the top causes of preventable deaths in the United States (National Institute on Alcohol Abuse and Alcoholism, 2007). Numerous studies have been performed in order to determine what society's health and wellness strengths and weaknesses are on all of the aforementioned levels. Individuals often report their nutrition and activity habits to be healthier than they actually are. Studies support that when individuals do report their nutrition and activity habits accurately, there are few individuals who reach

recommended levels. One possible way people may misrepresent their health is by underreporting caloric intake. In a study by Lichtman et al. (1992), participants were asked to estimate the overall portion sizes of various foods and the results were expressed as a percentage of total weight or volume; participants were also asked to record and report their energy intake for a 14-day period of time. Participants underreported their food intake by an average of 47±16 percent and over reported their physical activity by 51±75 percent (Lichtman et al., 1992). In a separate study, women who overestimated exertion had poor mental health and poor dietary control (Chandler-Laney et al., 2010). Estimated physiological exertion was inversely associated with vitality, mental health, and dietary control (Lichtman et al., 1992). Vitality or mental health, and cognitive dietary restraint, were independently associated with accuracy of estimated exertion, independent of age, ethnicity, and participation in exercise during weight loss (Lichtman et al., 1992). These data suggest that those with poor dietary control overestimate exertion. Both poor dietary control and overestimation of exertion go against the definition of good health. In a study by Emaus et al. (2010), participants were asked to report their physical activity during work and leisure, and physical activity was ranked on a scale from 1 to 4. Objective measurements of daily physical activity were tracked by an accelerometer, and physical activity and physical fitness using VO_2 maximum were measured, where VO_2 maximum was the highest oxygen uptake reached during a monitored exhaustive exercise. Findings demonstrate that many individuals of both sexes over-reported physical activity (Emaus et al., 2010). Reported leisure physical activity was positively correlated with VO_2 maximum and moderate to vigorous activity as registered by the accelerometer (Emaus et al., 2010). This suggests that individuals, although few, who report high levels of physical activity are accurate in their reporting and demonstrate health during exercise by reaching high levels of oxygen uptake. In the same study, there was an inverse relationship between reported leisure activity and resting heart rate for both men and women as well. Only 27 percent of women and 22 percent of men met the international recommendations of 10,000 step counts per day, and only 30 percent of women and 22 percent of men met the recommendation for at least 30 minutes per day of moderate-to-vigorous exercise (Emaus et al., 2010). Overestimation of diet and physical activity habits has a profound impact on what individuals actually consume and how often individuals are active; misperceptions can lead people to believe they are already living a healthy, active lifestyle based on their current habits. Another study designed to determine reported versus actual health found a positive correlation between individuals' reported habits and their actual habits. In people who reported high levels of physical fitness, amount of physical activity and cardiorespiratory fitness was highest (Kawakami & Miyachi, 2010). Daily step counts, the amount of activity at three METS (metabolic equivalents or rate of energy expended) or more, and the VO_2 peak were significantly greater in participants who answered "yes" to each question than in those who answered "no" (Kawakami & Miyachi, 2010). This suggests that there is no discrepancy between reported health and actual health. Clearly further studies are needed to resolve the issue of whether or not individuals' reporting can be considered accurate.

Significant weight and health misconceptions exist in the population. In one study, 23 percent of overweight women and 48 percent of overweight men perceived themselves as having the right weight (Yaemsiri et al., 2010). In the study, 74 percent of overweight individuals and 29 percent of obese individuals were never diagnosed as overweight or obese by their physicians (Yaemsiri et al., 2010). If people are not aware of their actual health status, they may not make healthy decisions or change the unhealthy decisions they are currently making. Although 74 percent of women and 60 percent of men pursued at least one weight management strategy, only 39 percent of women and 32 percent of men pursued both dietary change and physical activity, which was considered to be healthier than only pursuing one weight management strategy (Yaemsiri et al., 2010). When compared to those who did not know their overweight or obese status, individuals who were previously informed of their overweight or obese status were more likely to diet (74 percent versus 52 percent), exercise (44 percent versus 34 percent), or to do both (41 percent versus 30 percent; Yaemsiri et al., 2010). These data suggest that health misconceptions impact diet and physical activity choices.

There is a relationship between knowledge of beneficial health habits and actual behavior. When nutritional knowledge was assessed, individuals received between three percent and 38 percent incorrect

answers (Dickson-Spillman & Siegrist, 2010). Those individuals who answered more questions correctly also consumed more vegetables (Dickson-Spillman & Siegrist, 2010). Higher knowledge was associated with the female gender, younger age, higher education, nutrition-related qualifications, and not being on a diet (Dickson-Spillman & Siegrist, 2010). These data suggest that knowledge of which foods are healthy versus unhealthy leads to healthy food consumption.

Factors preventing wellness are abundant. When lifestyle, economic, and other environmental factors, including the effects of peers and education, are not controlled for, a 27 percent to 42 percent difference in prevalence of overweight and obese individuals may occur, as did between citizens of Spain and Italy (Font et al., 2010). Differences in eating habits and education were the main predictors of those gaps; however, when social environment was controlled for, between 76 percent and 92 percent of the obesity and overweight gap and the effect of eating habits were eliminated (Font et al., 2010). This suggests that when environmental factors affect habits pertaining to nutrition, physical activity, and overall health, the result may be less than optimal.

There is a relationship between Body Mass Index (BMI), waist to hip ratio (WHR), and quality of life and health. A study by Silventoinen et al. (2003) considered health over a period of time, specifically incidence of coronary heart disease (CHD). Initially, high BMI was the best predictor of elevated systolic and diastolic blood pressure values, among other CHD risk factors, whereas during a follow-up, high WHR was the best predictor of CHD incidence (Silventoinen et al., 2003). BMI was a significant predictor of heart disease in those men who had a diastolic blood pressure lower than the mean (Silventoinen et al., 2003). For women, WHR was the best predictor for CHD, indicating that abdominal obesity has a greater effect than does overall obesity (i.e. BMI; Silventoinen et al., 2003). This suggests that because high BMI and WHR measurements are positively related to CHD incidence that they may also be related to poor health and/or incidence of other diseases or conditions.

Heart rate recovery is the amount of time taken to return to resting heart rate after exercise. By considering the number of beats declined per minute, heart rate recovery can aid in predicting overall health problems. High BMI and high WHR are correlated with poor heart rate recovery. According to a study by Dimpka and Oji (2010), the best predictor of heart rate recovery in males is BMI, and the best predictor of heart rate recovery in females is WHR. Poor heart rate recovery is correlated to morbidity or early death. The increase in heart rate during exercise is due in part to a decrease in vagal tone, and a general decrease in tone of the vagus nerve is known to be a risk factor for death. Delayed return to resting heart rate can thereby be correlated to heart rate recovery. In one particular study of individuals between the ages of 43 and 73 years, 639 patients (26 percent) had abnormal values for heart rate recovery, a recovery of less than 12 beats per minute (Cole et al., 1999). A low value for heart rate recovery was strongly predictive of death within six years of the study; during this time there were 213 deaths from all causes (nine percent of all participants; Cole et al., 1999). Most significant is that even after adjustments were made for age, sex, use of medications, standard cardiac risk factors, resting heart rate, change in heart rate during exercise, and workload achieved, a low value for heart rate recovery was still predictive of death (Cole et al., 1999). Because decrease in vagal nerve tone can accompany various health conditions, care was taken to select individuals without heart problems while incidences of other factors, for example high blood pressure, were also taken into account. These data suggest that a delayed decrease in heart rate recovery is a strong indicator of decreased vagal tone and therefore death.

The purpose for the present study was to analyze the overall health of individuals at least 18 years of age living in St. Louis County and Douglas County and to use various indices to compare reported health to actual health. We hypothesized that adults' reporting of health is inconsistent with actual health. A survey was used to determine reported health, and measurements including height, weight, blood pressure, expiratory reserve volume (ERV), waist to hip ratio (WHR), BMI, and target heart rate, along with a cardiovascular activity, were used to determine actual health. Identifying misconceptions and mismatches between reported and actual health in St. Louis County and Douglas County lays a foundation for implementing changes in our community to build a healthier environment.

Methods

Documents used and distributed for the study were submitted to the Institutional Review Board for further review. Following review and acceptance of the documents, flyers were distributed in order to recruit community members for participation. Flyers were distributed at each SuperOne grocery store, Red Mug Coffee House, the YMCA, Superior Public Library, in most University of Wisconsin-Superior buildings, and various other locations in Superior, Wisconsin. Flyers were also distributed at three different SuperOne grocery stores in Duluth, Minnesota. Care was taken to avoid locations that have the potential of producing biased or overly similar participants. Information on the study was also included in the Student Digest at University of Wisconsin-Superior between the months of April 2011 and May 2011.

Following the advertisement process, a room in the Marcovich Wellness Center at University of Wisconsin-Superior was finalized as the location for conducting the study. The following materials were then acquired for the study: Weight Watchers Glass Memory Electronic Scale by Conair (model number WW43D), aerobic step, stopwatch, measuring tapes, Riester spirotest (number 5620) and mouthpieces, Omron Deluxe wrist blood pressure monitor (model number HEM-650), GO2 Achieve Fingertip Pulse Oximeter, calculator, pens, and alcohol wipes.

A template was constructed so that each participant would be told the same things during the study and the setup would remain consistent. A sheet containing blank spaces for pre-exercise measurements and post-exercise measurements was also constructed for each participant.

After setting up the layout of the study, appointments were filled. The goal set for the number of participants was thirty. Each appointment conducted was confidential and noted to last approximately forty-five minutes. During data collection, the same process was followed each time. Reading of the script was present throughout.

Data Collection

An informed consent sheet was presented to the participant immediately and the participant signed before progressing. Participants were told to ask any questions as needed and informed that dropping out of the study at any time was permitted.

Following permission from the participant, a previously generated survey containing health and wellness questions was distributed (Appendix). A previous internet search had produced The Los Angeles Public Health Department's *Los Angeles County Health Survey: Adult Screener*, distributed in 2007, the basis for the study used here. Questions were taken from the aforementioned survey, while others were self-generated.

After completion of the survey, the following values were taken for each participant: blood pressure, resting heart rate, weight, height, waist to hip ratio, ERV, BMI, and target heart rate.

Blood pressure was taken immediately after the survey while the participant was sitting. Blood pressure was taken from the left wrist, using a blood pressure cuff that required the participant to cross their arm over their chest diagonally so that the cuff was at heart level. For accuracy, each participant was instructed not to talk or have their legs crossed during the reading.

Resting heart rate was taken using a pulse oximeter, which was placed on the participant's left index finger. Cell phones were previously removed from the area, as interference was noted in the accompanying manual. Due to the pulse oximeter changing values rapidly at times, the values recorded were those that the participant centered around or stayed at for significant periods of time.

Each participant was then asked to remove their shoes so that their weight and height could be taken. Weight in pounds was taken using the Weight Watchers scale, and height in inches was taken using a measuring tape secured to the back of a door.

Waist to hip ratio was recorded using a measuring tape. Waist was defined as the part of the abdomen superior to the hips and inferior to the rib cage. The hip measurement was taken at the widest part of the hips, including the buttocks. These measurements were taken as a ratio of inches.

ERV was taken using a spirotest. The spirotest was sanitized, a new mouth piece was put on, and the instrument was reset. The participant was instructed to take a normal breath in, then a normal breath out, and finally to blow out as much air as possible after the normal breath out into the spirotest. This constituted ERV, which was measured in milliliters (mL) of air.

Calculations followed. BMI was calculated using the following formula: [weight in pounds/(height in inches)^2] times 703 (CDC, 2011). Target heart rate was calculated using the following formula: (220-age) times 0.65 (Mayo Clinic, 2010). Age was asked of the participant for the target heart rate calculation. Each participant was informed that target heart rate is between 65 percent and 85 percent of the heart's total capacity and that for this study, 65 percent was used to determine target heart rate (Mayo Clinic, 2010).

A cardiovascular exercise was then performed. The participant was informed an aerobic step would be used during the exercise, and they were informed to keep their back straight, maintain good form, and to discontinue moving if they felt pain. A demonstration was performed, and the step was adjusted per each individual's needs. A pulse oximeter was placed on the participant's left index finger until a reading showed. Then the participant was instructed to begin using the step until they reached their individual target heart rate. Upon reaching the target heart rate set, they were to continue exercising at a moderate to hard pace for three minutes.

Upon completion of the cardiovascular exercise, the timer was immediately restarted, the participant's heart rate was taken, and the participant was asked to sit down with the pulse oximeter still on their finger. The participant was told that heart rate recovery would be measured. Heart rate recovery was explained as being the amount of time it takes to get back down to one's resting heart rate after exercise. Heart rate recovery was noted in minutes.

Following determination of heart rate recovery, the participant was told about confidentiality and was given the option of entering a drawing for prizes and/or receiving the results of the study after compilation and analysis had been completed. Name and contact information were collected for each participant who was interested in being contacted. All study sheets, including the informed consent sheet, survey, and evaluation sheet, were placed in a safe location.

Data Analysis

When considering how to analyze data from the survey, point values were first assigned to the answers on the survey. Answers of choices A through E were assigned points on a scale of one to five, with five being the best answer. Yes and no questions were assigned on a two-point scale, with two being the best answer. For some questions, points were assigned for percentage of correct answers. Each participant's answers to the survey were entered into Excel spreadsheets and assigned the corresponding points (Table 1). Each survey question to be assigned point values was placed into one of the following categories: health reporting (questions 3,4), health perception (questions 1,2,14,27,43), food reporting (questions 5-9), food reporting-consciousness (questions 10-12), food knowledge (question 13), substance use (questions 29-40), physical activity-reporting (questions 18-20 and 22-24), or obesity awareness (questions 41,42). The following categories did not receive point values as they were informational: health barriers (questions 15, 28), physical activity-knowledge (questions 21, 25, 26), and physical activity-consciousness (questions 44, 45). Each participant received a point total based on their survey responses, and information-type answers were noted (Table 2). Although questions 29 and 30 were considered in the point totals per each individual, substance use questions as a category were not analyzed in the present study; they may be analyzed in the future for further knowledge.

Demographic information from the survey was broken down into percent composition per each category. Sex, age, race, highest level of education, current residence, and presence of a health condition were evaluated for the 30 participants as a whole (Table 3).

When analyzing data from the values taken pre- and post-exercise, each index was analyzed uniquely. Blood pressure values for each individual were categorized as normal (systolic value less than 120 mmHg *and* diastolic value less than 80 mmHg), pre-hypertensive (systolic value 120-139 mmHg *or*

diastolic value 80-89 mmHg), stage I hypertensive (systolic value 140-159 mmHg *or* diastolic value 90-99 mmHg), or stage II hypertensive (systolic value ≥ 160 mmHg *or* diastolic value ≥ 100 mmHg; National Institutes of Health, 2011). Resting heart rate was categorized as normal (61-100 beats/minute) or well-conditioned (40-60 beats/minute; WebMD, 2011). Height and weight were used only to calculate BMI. BMI for each participant was categorized into underweight (BMI ≤ 18.5), healthy/normal (BMI between 18.5 and 24.9), overweight (BMI between 25 and 29.9), or obese (BMI ≥ 30; CDC, 2011). ERV was categorized into below normal values (<700 milliliters), normal values (700-1200 milliliters), and above normal values (>1200 milliliters; Marieb, 2008). WHR was analyzed based on gender. Good values were considered to be ≤ 0.80 for females and ≤ 0.95 for males, poor values were considered to be 0.81 to 0.85 for females and 0.96 to 1.0 for males, and unhealthy values were considered to be ≥ 0.85 for females and ≥ 1.0 for males (BMI calculator, 2011). Target heart rate is a function of age, not health, so it was not analyzed.

Statistical analyses were performed in order to make comparisons and determine significance between various data sets. All values for BMI, systolic blood pressure, diastolic blood pressure, ERV, resting heart rate, health perception, food reporting, food reporting-consciousness, food knowledge, and physical activity reporting were entered into Excel spreadsheets to organize the data by category. Pearson correlation coefficients were determined using Excel functions, and statistical significance of those relationships was calculated by a statistical calculator (DanielSoper, 2011). A two-tailed test was used in the analysis. Health perception, food reporting, food reporting-consciousness, food knowledge, and physical activity-reporting were each compared to BMI, systolic blood pressure, and diastolic blood pressure individually. ERV was compared to health perception, physical activity reporting, and BMI. Resting heart rate was compared to BMI and health perception. Graphs were then constructed to display the relationships found.

Results

Health measurements were assessed independently and mean values for each subcategory were calculated (Table 4). When considering blood pressure, 15 participants had normal blood pressure, with a mean value of 104/64 mmHg, and 13 participants had prehypertension, with a mean value of 122/82 mmHg. Stage I hypertension and stage II hypertension each had one value. When considering BMI, underweight BMI had one value. There were 14 participants with a normal BMI and a mean value of 22.2; nine participants with an overweight BMI and a mean value of 27.6; and six participants with an obese BMI and a mean value of 35.5. When considering WHR, 23 participants had a good WHR, with a mean of 0.75 for women and 0.85 for men; three participants had a poor WHR, with a mean of 0.84 for women; one man had a poor WHR; and four participants had an unhealthy WHR, with a mean of 0.91 for women and 1.08 for men. When considering resting heart rate, 22 participants had a normal RHR, with a mean of 76.73 beats per minute, and eight participants were well-conditioned, with a mean of 53.75 beats per minute. When considering ERV, three participants had a below normal ERV, with a mean of 375 mL; 15 participants had normal ERV values, with a mean of 888.33 mL; and 12 participants had an above normal ERV, with a mean of 1531.25 mL.

Health perception was negatively correlated with BMI ($r=-0.41$, $p\leq0.05$, Figure 1). As health perception values increased, BMI decreased. No statistically significant relationships were found when BMI was compared to food reporting, food reporting consciousness, food knowledge, and physical activity reporting; however, non-significant trends were observed. Trends suggest a negative relationship between food reporting and BMI (Figure 3), a positive relationship between food reporting consciousness and BMI (Figure 4), a positive relationship between food knowledge and BMI (Figure 5), and a negative relationship between physical activity reporting and BMI (Figure 6). This suggests that BMI decreased as food reporting and physical activity reporting increased and that BMI increased as food consciousness and food knowledge increased.

BMI was positively correlated with RHR ($r=0.50$, $p\leq0.05$, Figure 2). As BMI increased, RHR increased. Non-significant trends suggest a negative relationship between health perception and RHR (Figure 15). This suggests that RHR decreased as health perception values increased.

No statistically significant relationships were found when blood pressure was compared to health perception, food reporting, food reporting consciousness, food knowledge, and physical activity reporting; however, non-significant trends were observed. Trends suggest a positive relationship between health perception and systolic blood pressure (Figure 7), a negative relationship between health perception and diastolic blood pressure (Figure 7), a negative relationship between food reporting and both systolic and diastolic blood pressure (Figure 8), a positive relationship between food reporting consciousness and both systolic and diastolic blood pressure (Figure 9), a positive relationship between food knowledge and both systolic and diastolic blood pressure (Figure 10), and a positive relationship between physical activity reporting and both systolic and diastolic blood pressure (Figure 11). This suggests that systolic blood pressure increased as health perception, food reporting consciousness, food knowledge, and physical activity reporting increased and that systolic blood pressure decreased as food reporting increased. This also suggests that diastolic blood pressure increased as food reporting consciousness, food knowledge, and physical activity reporting increased and that diastolic blood pressure decreased as health perception and food reporting increased.

No statistically significant relationships were found in our comparisons to ERV; however, non-significant trends were observed. Trends suggest a positive relationship between health perception and ERV (Figure 12), a positive relationship between physical activity reporting and ERV (Figure 13), and a negative relationship between BMI and ERV (Figure 14). This suggests that ERV increased as health perception and physical activity reporting increased and that ERV decreased as BMI increased.

Discussion

The Superior Telegram (2011) reported that more than half of Northland residents are overweight or obese. In the "Bridge to Health" telephone survey taken by Generations Health Care Initiatives, Inc. of 4,500 adults between November 2010 and February 2011 in eight Northeastern Minnesota counties plus Douglas County in Wisconsin, only 16.2 percent of respondents said they eat fruits or vegetables five times or more per day; according to the Superior Telegram, that figure is below state and national averages (2011). In the same survey, 75 percent of Northlanders report moderate exercise three or more days per week, which is down from 83.9 percent reported in 2005 (Superior Telegram, 2011). Participants in the telephone survey listed the following reasons for not exercising: not enough time (37.1 percent) and disinterest in exercise (32 percent).

Poor health and obesity have indeed become not just national issues but also local issues. The aim of the present study was to determine if the health of residents of Douglas County in Wisconsin and St. Louis County in Minnesota is in fact poor, based on their knowledge and perception of health and based on health measurements. We expected to find that poor health and wellness is prevalent in Douglas County and St. Louis County and that participants' knowledge and perception of health and wellness would directly affect their actual health, leading them to believe that they are healthier than they actually are.

When considering the health measurements independent from survey answers, 50 percent of participants had normal blood pressure at the time of the study, 47 percent had a normal BMI, 77 percent had good WHR values, 27 percent had a RHR that was well-conditioned and the remainder had normal RHR values, and 90 percent of participants had a normal or above normal ERV. When looking at the data in this way, a majority of participants have normal or above normal health as measured by the various indices. Comparing the measurement data to the health and wellness categories within the survey, and sometimes other measurement data, gave us insight into how they affect each other and how perception of health and wellness can be incorporated as well.

Within the context of our analyses, several correlations and numerous non-significant trends were consistent with our hypothesis. Lower values of health perception were associated with a higher BMI.

Because this relationship is statistically significant, we know that the data is a true representation of the relationship between perceived and actual health, when actual health is determined on the basis of BMI. No statistical relationship was found between BMI and food reporting or between BMI and physical activity reporting. Non-significant trends suggest that if the sample size were increased, participants reporting less healthy food intake would have a higher BMI. This would suggest that unhealthy food consumption has an effect on raising BMI, and therefore, healthy food consumption has an effect on lowering BMI. Trends of physical activity reporting when compared to BMI yield expected results as well. The findings suggest that less physical activity results in a high BMI and therefore, more physical activity results in a lower BMI. No statistical relationship was found between blood pressure and food reporting. When considering all comparisons to blood pressure, non-significant trends suggest that the relationship between food reporting and blood pressure is the only comparison that yielded expected results. Non-significant trends suggest, therefore, that unhealthy food consumption has an effect on raising blood pressure and so healthier food consumption has an effect on lowering blood pressure. Although no comparisons to ERV were statistically significant, non-significant trends suggest all relationships involving ERV yielded expected results. This suggests that lower values of health perception signified lower ERV and therefore, higher perceived health signified higher ERV. Non-significant trends suggest then that low physical activity reporting values signified a low ERV and therefore, higher physical activity values signified a higher ERV. Following the same trends, a high BMI indicated low ERV, suggesting that decreased health, when measured by BMI, negatively affects participants' respiratory volumes. Also, both relationships involving RHR yielded expected results. Although no statistical relationship was found between health perception and RHR, non-significant trends suggest that lower values of health perception signified a higher RHR, when RHR is an index to measure overall health. Higher values of health perception then suggested a lower RHR. Finally, a higher BMI suggested lower ERV and, therefore, a lower BMI suggested higher ERV. This suggests that poor health, when measured by BMI, negatively respiratory volumes. The correlation between ERV and BMI may be depended upon as a true representation of trends in the Northland as the relationship was statistically significant.

Other trends did not yield results consistent with our hypothesis. Although no unexpected findings were statistically significant, non-significant trends can be considered with the understanding that an increase in sample size may make these non-significant trends significant. We would expect BMI values to decrease as food reporting consciousness increases; however, trends showed a slight positive relationship between BMI and food reporting consciousness, in which BMI increased as food reporting consciousness increased. Participants may be conscious of their diet while still eating poorly, and this could explain the slight positive relationship. We would expect BMI to decrease as food knowledge values increase, provided that participants incorporate that knowledge into their eating habits. There was a positive relationship between food knowledge and BMI; however, it is a very small positive relationship and is therefore negligible. It is possible that participants may not strongly incorporate food knowledge into their lifestyles or may know foods are unhealthy and continue to eat them regardless. We would expect blood pressure to decrease as health perception increases, considering that poor health and perception of health can exacerbate or chronically raise blood pressure. Trends suggested that diastolic blood pressure did follow the expected trend; however, the relationship is very small and therefore negligible. Trends suggest that systolic blood pressure increased with increased health perception. When considering blood pressure as a marker for health, inconsistencies may explain unexpected data. For example, some participants' blood pressure readings may have been elevated temporarily due to diet, movement, or stress in the context of the study. We would expect blood pressure to decrease with increased food reporting consciousness values; however, trends suggest that both systolic blood pressure and diastolic blood pressure were slightly positively related to increased food reporting consciousness values. Again, participants may be conscious of food intake and monitoring yet still not eat healthy. Participants' underreporting of caloric intake, and thus disregard of calories that may be paired with high levels of sodium, provides a possible explanation. We would expect blood pressure to decrease as food knowledge values increased, provided that participants use this knowledge to eat healthy. However,

trends suggest that blood pressure increased as food knowledge values increased. This may be due to the participants not eating healthy despite their knowledge of what is actually healthy. We would expect blood pressure to decrease as physical activity reporting values increased; well-conditioned individuals have a lower blood pressure. In fact, trends suggest that as physical activity reporting increased, blood pressure increased. Diastolic blood pressure was not as strongly positively related with physical activity reporting as systolic blood pressure was. There is a possibility that participants inaccurately reported their physical activity levels, in which case participants may not be as conditioned as expected, and the blood pressure values reflect that.

Again, it must be noted that only the statistically significant relationships are reliable. However, increasing the sample size in the study may yield correlations between the non-significant trends discussed, which may be consistent with our findings.

Despite the limited sample size, one strength of this study is that the participants are relatively varied. Not only are the participants varied demographically, but they are also varied in knowledge and perception of health; a wide range of values within the context of the survey and health measurements suggests this.

Overall, participants realized that obesity is a problem in Douglas County and St. Louis County. Although not always associated with action, participants' perception of their health and wellness status was considerably accurate and demonstrated awareness. Participants with poor eating habits and little exercise were shown to have higher blood pressure, to have a higher BMI, lower ERV, and a higher RHR. Based on inconsistencies with health reporting consciousness values, participants may not be fully aware of their daily total caloric intake and may overestimate or underestimate these values. Outside of any distractions or temporary effectors, this may have affected blood pressure values as well. In addition, knowledge about what foods are healthy and what exercises are beneficial does not mean that participants will participate in or follow those behaviors. Based on the data, health reporting, knowledge, and perception of overall health suggest that participants are accurate. Findings involving blood pressure lead us to believe that physical activity levels may have been inaccurately, and possibly over, reported.

Although a majority of our correlations are not statistically significant, due in part to our limited sample size, we can still apply what we found overall to the general health and wellness of Douglas County and St. Louis County residents and to the relationship between reported health and actual health. Although knowledge does not necessitate action, measures taken to increase or promote levels of physical activity would be beneficial. As shown in this study, many individuals do not list physical activity, or even nutrition, in their top three priorities. Because no participants reported consumption of the recommended five fruits and vegetables per day, residents should also be prompted and educated about the benefits of increasing fruit and vegetable intake. Fortunately, perception and knowledge of health do not seem to be issues standing in the way of overall health. The true problem lies in the implementation of that knowledge.

Limitations

Most of our findings were not statistically significant due in large part to our limited sample size of 30. In addition, the participants in this study were primarily young adults from Wisconsin; therefore, the results do not largely represent populations of greater age or residents of St. Louis County in Minnesota. Furthermore, our advertising was not extensive due to restrictions set by businesses in the community.

Recommendations

We recognize that several aspects of this study were not as strong as they could have been; therefore, changes could make this study more reliable. First of all, having a larger sample size would increase the likelihood of significance and accurate representation. Early and extensive advertising in

both Douglas County and St. Louis County may help to obtain a larger and more evenly distributed sample size. Second of all, data collection should be carried out in a less public area so that distractions do not affect the readings or performance of each participant. Third of all, heart rate recovery should be measured in number of beats decreased per minute rather than by total recovery time. We found no data to determine positive or negative values for heart rate recovery by total recovery time; therefore, we did not analyze our collected values. Fourth of all, spacing of questions should be sufficient; one question in particular was missed often by participants. In addition, it may be beneficial to reword certain ambiguous survey questions. For example, instead of instructing participants to choose all that apply, we may have instructed participants to classify each into specified categories. In addition, several survey questions had answers available that may suggest a negative situation for one participant but suggest a positive situation for another. Finally, we assigned point values in close proximity to each other when in fact a logarithmic scale may have made differences between participants' values and answers seem more apparent. Additional analyses and comparisons can be performed as well in order to consider relationships not considered. The aforementioned suggestions would enrich this study greatly if it is revisited in the future.

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Appendix

Health and Wellness Survey

Note: If at any time you prefer not to answer a question, please leave it blank. If you have any questions during the survey you may ask them at any time.

Demographics—Please fill in or circle your answer

Sex:

Male

Female

Age:

18-24

25-29

30-39

40-44

45-49

50-59

60-64

65 or older

Race:

Highest level of education:

Current residence (City/town, state):

Please list any medications you are currently taking and what each medication treats:

Please list any known health condition you currently have (e.g. diabetes, heart condition, high blood pressure, high cholesterol, etc.):

For each condition listed above, please state how long you have had the condition:

Overall Health—Please circle or write your answer

1) Would you say that in general your physical health is:
   A. excellent
   B. very good
   C. good
   D. fair
   E. poor

2) In comparison to other individuals of your age and gender would you say you are physically:

   A. much healthier
   B. somewhat healthier
   C. about the same
   D. somewhat less healthy
   E. much less healthy

3) Thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good?

4) During the past 30 days, for about how many days did poor physical health keep you from doing your usual activities, such as self-care, work or recreation?

Nutrition—Please circle or write your answer

5) How many total servings of fruits and vegetables did you eat yesterday? A serving would equal one medium apple, a handful of broccoli, or a cup of cut carrots.

6) Please indicate how many servings of each food you eat in a typical week:

A.	Fats and Oils	15 or more	8-14	3-7	less than 3
B.	Sweets	15 or more	8-14	3-7	less than 3
C.	Milk, Yogurt, and Cheese/Other Dairy	15 or more	8-14	3-7	less than 3
D.	Red Meat	15 or more	8-14	3-7	less than 3
E.	Poultry	15 or more	8-14	3-7	less than 3
F.	Fish	15 or more	8-14	3-7	less than 3
G.	Dry Beans, Eggs, and Nuts	15 or more	8-14	3-7	less than 3
H.	Vegetables	15 or more	8-14	3-7	less than 3
I.	Fruit	15 or more	8-14	3-7	less than 3
J.	White Bread, Cereal, Rice, and Pasta	15 or more	8-14	3-7	less than 3
K.	Whole Grain Bread, Cereal, Rice, and Pasta	15 or more	8-14	3-7	less than 3

7) Please indicate how many servings of each beverage you drink in a typical week:

A.	Soda pop	15 or more	8-14	3-7	less than 3
B.	juice	15 or more	8-14	3-7	less than 3
C.	coffee	15 or more	8-14	3-7	less than 3
D.	tea	15 or more	8-14	3-7	less than 3
E.	water	15 or more	8-14	3-7	less than 3
F.	milk	15 or more	8-14	3-7	less than 3
G.	energy drink	15 or more	8-14	3-7	less than 3
H.	other: _____	15 or more	8-14	3-7	less than 3

8) How often do you eat any food, including meals and snacks, from a fast-food restaurant, such as McDonald's, Taco Bell, Kentucky Fried Chicken or another similar type of place:

A. 4 or more times per week
B. 1-3 times per week
C. less than once a week but more than once a month
D. less than once a month
E. never

9) Please indicate how often you eat this way in a typical week:

A. Fast food
   4 or more times 1-3times less than 1 time

B. Other restaurant
   4 or more times 1-3times less than 1 time

C. Prepare food at home (use fresh fruits and vegetables, and cooking from scratch)

   4 or more times 1-3times less than 1 time

D. Prepare food at home (using pre-packaged food like macaroni and cheese, Hamburger Helper, frozen pizza, chicken nuggets, etc.)

   4 or more times 1-3times less than 1 time

E. Vending machines

   4 or more times 1-3times less than 1 time

10) Do you pay attention to the number of calories you eat?

11) How many calories do you think you typically consume in one day:

A. Under 1500
B. 1500-2000
C. 2000-2500
D. 2500-3000
E. 3000-3500
F. 3500-4000
G. over 4000

12) Do you think your diet causes you to:

A. Gain weight
B. Maintain weight
C. Lose weight

13) Indicate whether you think the following foods are part of a healthy diet:

Salmon

Organic cookies

White Bread

Strawberry

Low-fat yogurt

Soda pop

Cheetos

Big Mac

Whole grain pasta

Almonds

Carrots

Poptarts

Ice Cream

Olive oil

Vegetable oil

14) Compared to other individuals of your age and gender does your diet consist of foods that are:

A. Much more healthy
B. Slightly more healthy
C. Just as healthy
D. Slightly less healthy
E. Much less healthy

15) If you would like to eat more healthy foods, please choose from the following the **3** main things that prevent you from doing so:

A. Cost of healthy foods
B. Distaste of healthy foods (you)
C. Distaste of healthy foods (other people in household)
D. Availability of healthy foods
E. Uncertainty as to what foods are actually healthy
F. Other: _____

Substance Abuse—Please write your answer

16) In the past five years, have you received treatment or counseling for substance abuse or addiction, excluding tobacco? This could include alcohol, prescription medications, marijuana, cocaine or some other controlled substance.

Yes No

17) If you answered "yes" to question 16, for what substance or substances have you been treated?

Physical Activity—Please circle or write your answer

18) In a usual week, do you do vigorous exercise or activities for at least 10 minutes at a time without stopping? Vigorous activities are those that require hard physical effort and cause sweating and increases in breathing and heart rate. This can include vigorous activity you do while at work.

Yes No

19) If you answered yes to question 18, how many days per week do you do such vigorous exercise or activities for at least 10 minutes without stopping?

20) On an average day when you do these vigorous activities for at least 10 minutes at a time, how much *total* time do you spend doing these activities? Please answer in minutes.

21) Please list some of the activities that you consider to be vigorous:

22) In a usual week, do you walk or do moderate exercise or activities for at least 10 minutes at a time without stopping? Moderate exercises cause light sweating and slight increases in breathing and heart rate. This can include moderate activity at work or home, for recreation or exercise.

Yes No

23) If you answered yes to question 22, how many days per week do you walk or do moderate exercise or physical activities for at least 10 minutes without stopping?

24) On an average day when you do moderate exercise or physical activities for at least 10 minutes without stopping, how much *total* time do you spend doing these activities? Please answer in minutes.

25) Please list some of the activities you do that you consider to be moderate:

26) Please select those of the following that you consider to a physical activity:

Working out in a gym
Shopping
Climbing stairs
Mowing the lawn
Swimming
Dancing
Running
Walking through the parking lot to reach your vehicle
Doing errands
Playing with children
Light cleaning
Playing frisbee with a pet

27) Compared to others of your age and gender do you participate in physical activity:

A. Much more often
B. Slightly more often
C. Just as often
D. Slightly less often
E. Much less often

Combined Nutrition and Exercise—Please circle or write your answer

28) From the following list please select the 3 things you consider to be most important to you. Please rate them 1, 2, and 3 (number one being the most important):

Household chores _____

Running errands _____

Career _____

Education _____

Physical Fitness _____

Nutrition _____

Providing for a dependent or other individual _____

Hobbies _____

Other: _____ _____

Other: _____ _____

Cigarette Use—Please circle or write your answer

29) Have you smoked at least 100 cigarettes in your entire life?

Yes No

30) Do you now smoke cigarettes:

A. every day
B. some days
C. not at all (go directly to question 37)

31) If you answered "every day" to question 30, on the average, about how many cigarettes do you now smoke each day? (ONE PACK USUALLY EQUALS 20 CIGARETTES. IF CONVERTING PACKS TO CIGARETTES, ALWAYS VERIFY CALCULATION WITH RESPONDENT):

32) What is the total number of years you have smoked every day? Do not include any time you stayed off cigarettes for 6 months or longer.

33) If you answered "some days" to question 30, on how many of the past thirty days have you smoked a cigarette?

34) During the past thirty days, on the days that you smoked, about how many cigarettes did you smoke per day? (1 pack=20 cigarettes)

35) Have you ever smoked every day for at least 6 months?

Yes No

36) About how long has it been since you last smoked cigarettes every day?

Alcohol Consumption—Please circle or write your answer

37) If a drink is considered one can or bottle of beer, one glass of wine or cocktail or a shot of liquor, then during the past month, have you had at least one drink of any alcoholic beverage such as beer, wine, wine coolers, or liquor?

Yes No

38) If you answered yes to question 37, during the past 30 days, on how many days have you had at least one drink of any alcoholic beverages? Please give your best estimate.

39) On the days that you drank alcohol during the past month, how many drinks did you have on average?

40) Considering all types of alcohol, how many times during the past month did you have (IF MALE: 5) (IF FEMALE: 4) or more drinks on the same occasion?

Thoughts on Obesity—Please circle or write your answer

41) In your opinion, how serious is the problem of overweight adults in the Northland?

A. Very Serious
B. Somewhat serious
C. Neither serious nor not serious
D. Not very serious
E. Not at all serious

42) What do you think is the biggest contributing factor to obesity?

A. Poor diet
B. Lack of exercise
C. Financial status
D. Lack of knowledge about obesity
E. Smoking and alcohol habits
F. Genetic makeup
G. Other: _____

43) According to national standards, do you think that you are:

A. Underweight
B. About the right weight
C. Overweight
D. Obese

44) How frequently do you monitor your weight or body mass?

A. More than once a week
B. About once a week
C. About once a month
D. Less than once a month
E. Almost never

45) How do you monitor your weight or body mass?

A. I don't monitor my weight or body mass
B. Scale
C. How you look in the mirror
D. How your clothes fit
E. How other people tell me I look
F. Other: _____

Comments—Please write any additional thoughts or concerns you may have:

See the following tables for more information:

Table 1 – Survey Point Totals Per Individual

Table 2 – Informational Survey Answers

Table 3 - Demographic Information

Table 4 - Health Measurement Values and Means

Table 5 - *P* and *R* values for All Comparisons Performed

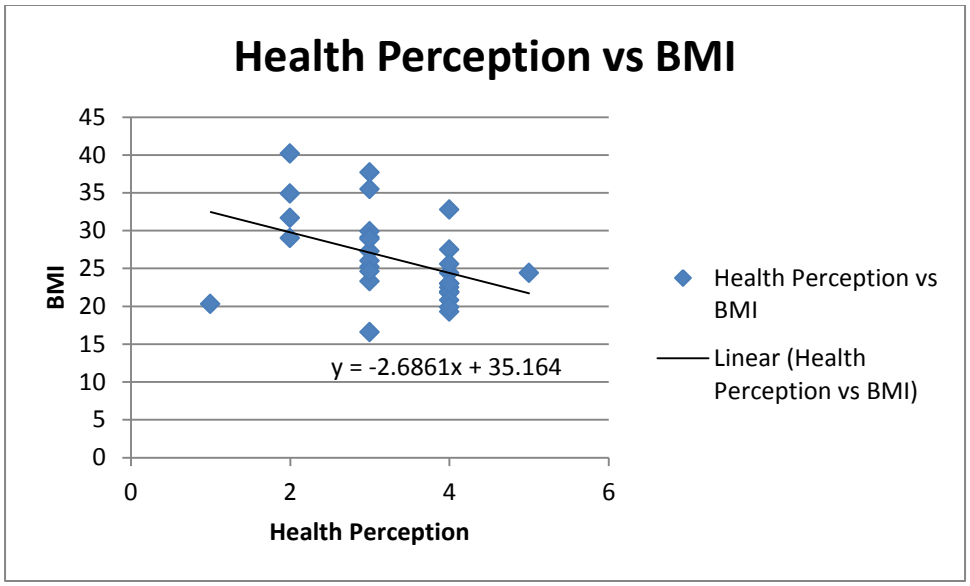

Figure 1: Health perception and BMI are negatively correlated (r=-0.41, p≤0.05). As perception of health increased, BMI decreased.

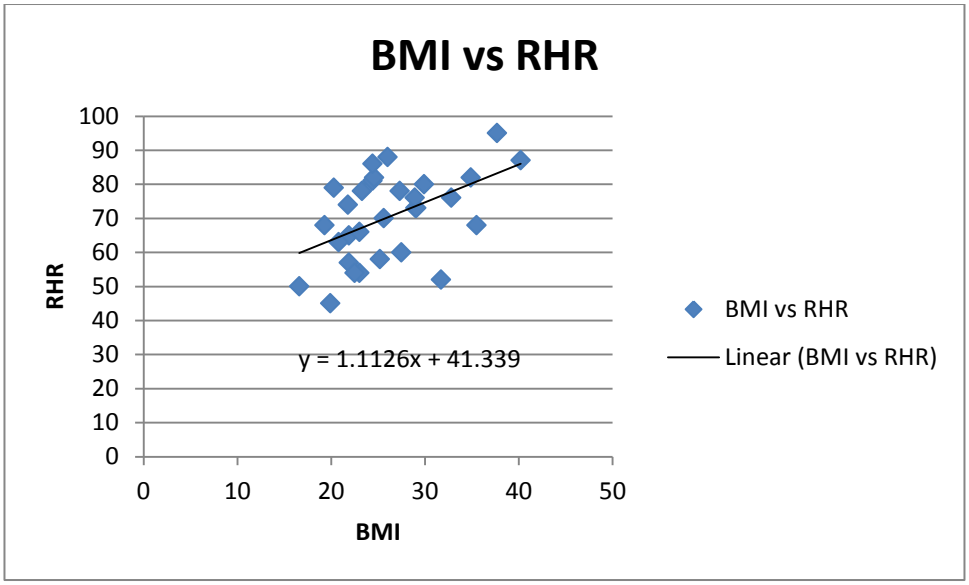

Figure 2: BMI and resting heart rate are positively correlated (r=0.50, p≤0.05). As BMI increased, resting heart rate increased.

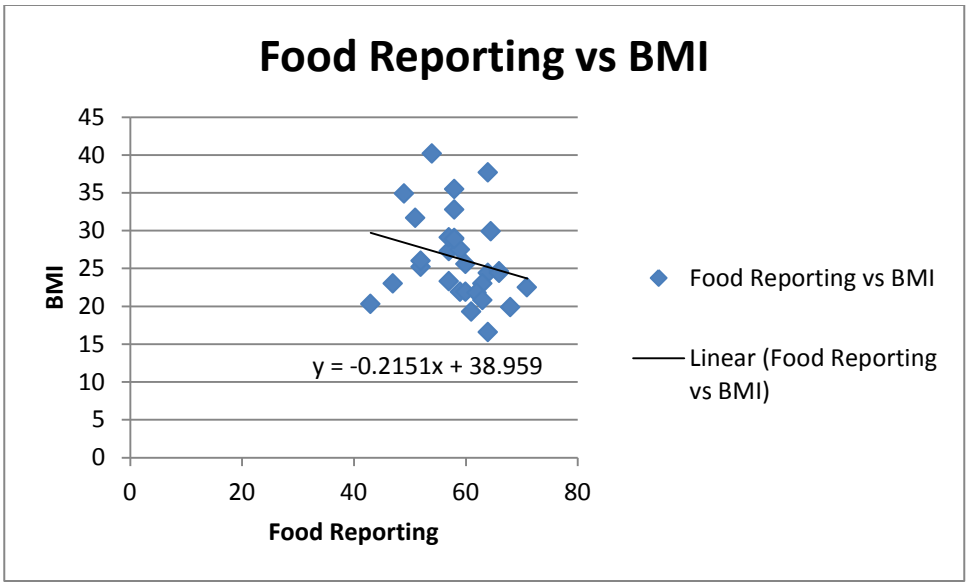

Figure 3: No correlation was found between food reporting and BMI. A non-significant trend suggests a negative relationship between food reporting and BMI. This suggests that as food reporting scores increased, BMI decreased.

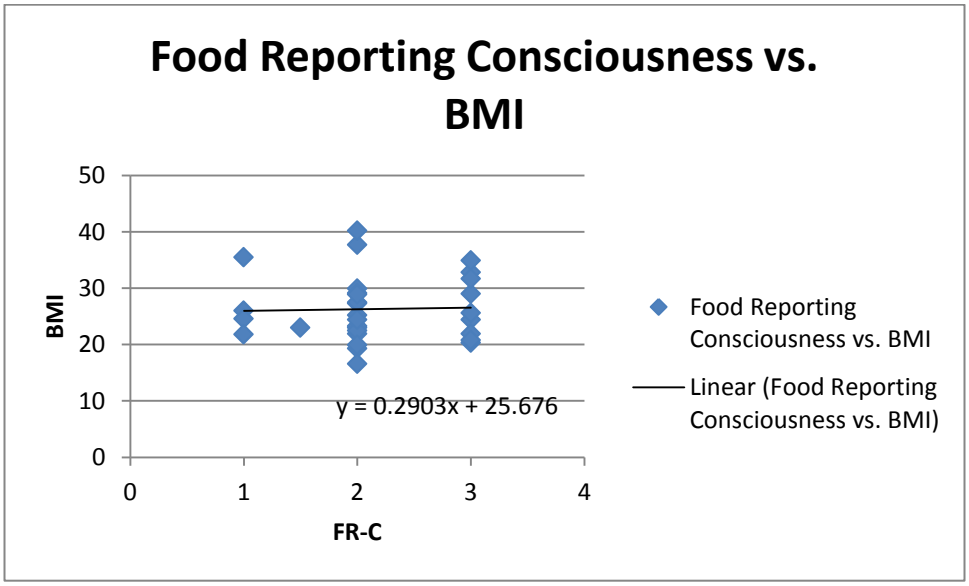

Figure 4: No correlation was found between food reporting consciousness and BMI. A non-significant trend suggests a positive relationship between food reporting consciousness and BMI. This suggests that as food reporting consciousness scores increased, BMI increased.

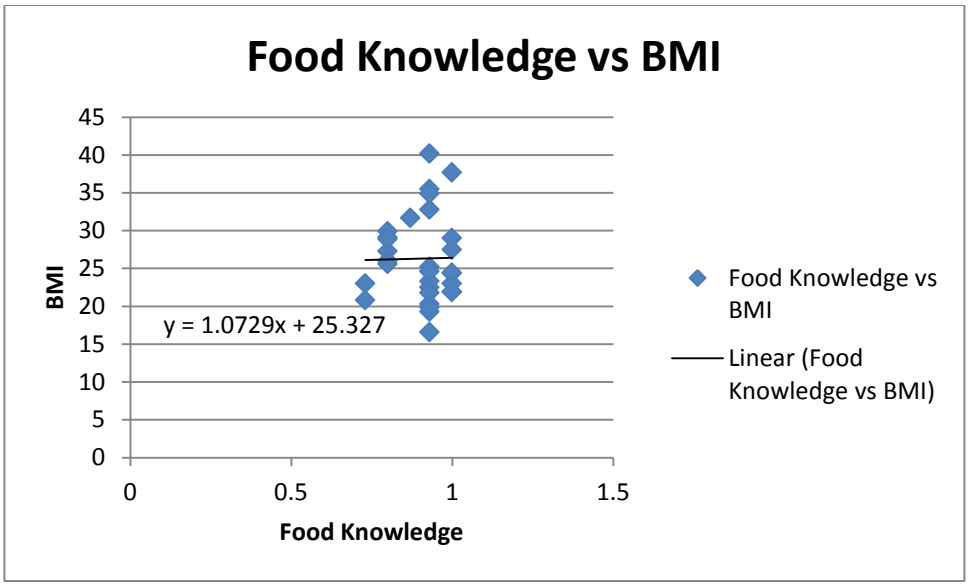

Figure 5: No correlation was found between food knowledge and BMI. A non-significant trend suggests a positive relationship between food knowledge and BMI. This suggests that as food knowledge increased, BMI increased.

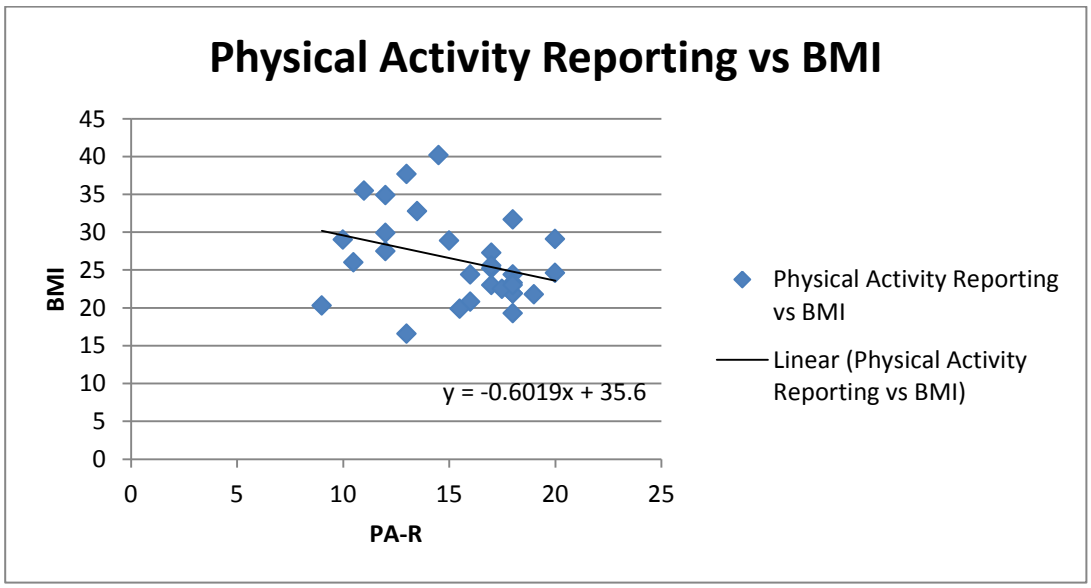

Figure 6: No correlation was found between physical activity reporting and BMI. A non-significant trend suggests a negative relationship between physical activity reporting and BMI. This suggests that as physical activity reporting increased, BMI decreased.

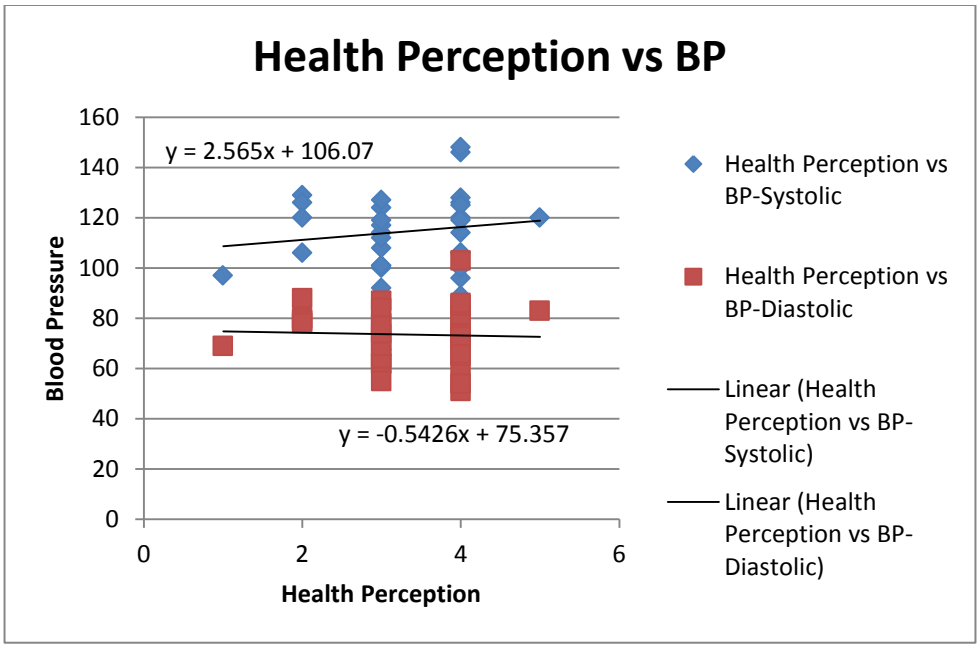

Figure 7: No correlation was found between health perception and systolic or diastolic blood pressure. A non-significant trend suggests a positive relationship between health perception and systolic blood pressure and a negative relationship between health perception and diastolic blood pressure. This suggests that as health perception increased, systolic blood pressure increased and diastolic blood pressure decreased

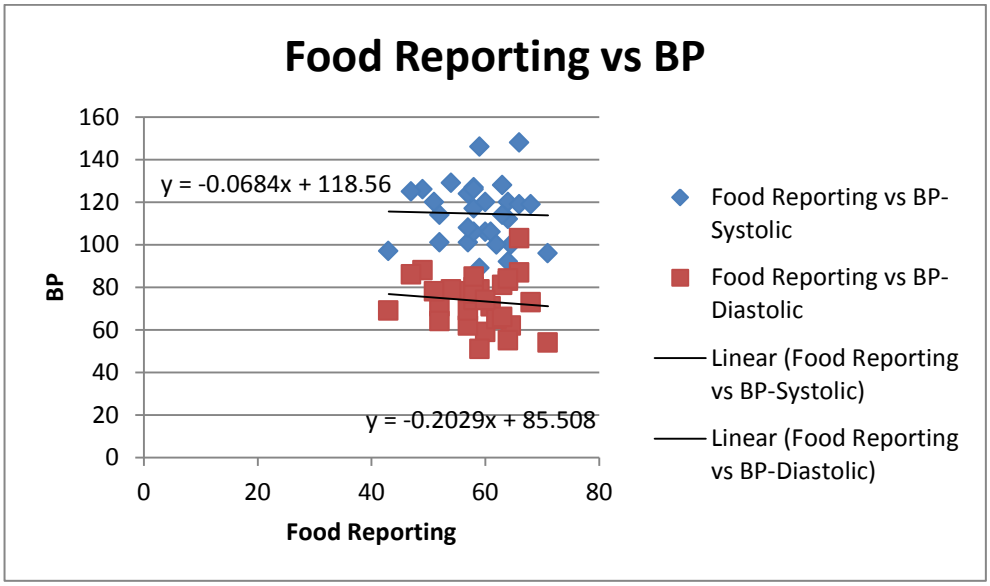

Figure 8: No correlation was found between food reporting and systolic or diastolic blood pressure. A non-significant trend suggests a negative relationship between food reporting and blood pressure. This suggests that as food reporting scores increased, blood pressure decreased.

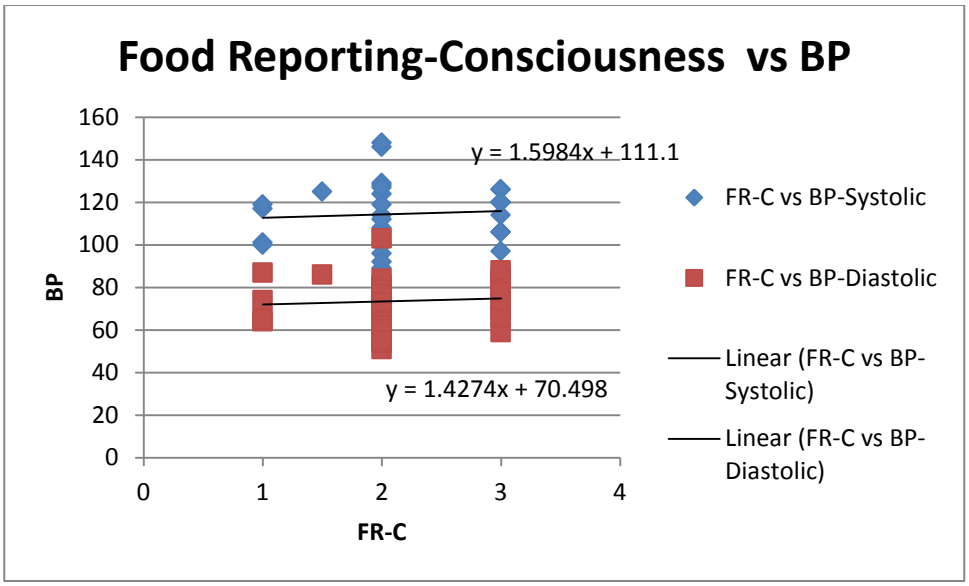

Figure 9: No correlation was found between food reporting consciousness and systolic or diastolic blood pressure. A non-significant trend suggests a positive relationship between food reporting consciousness and blood pressure. This suggests that as food reporting consciousness scores increased, blood pressure increased.

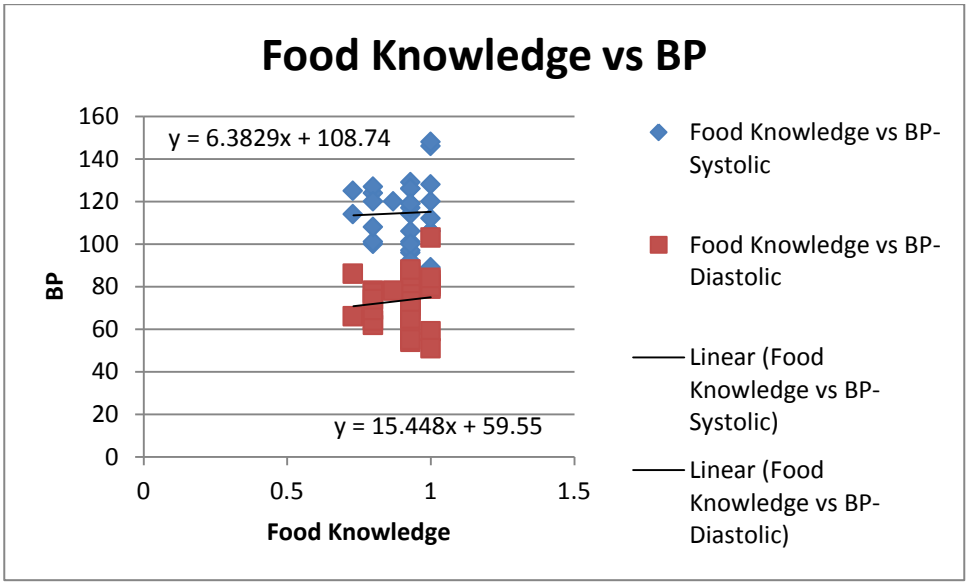

Figure 10: No correlation was found between food knowledge and systolic or diastolic blood pressure. A non-significant trend suggests a positive relationship between food knowledge and blood pressure. This suggests that as food knowledge increased, blood pressure increased.

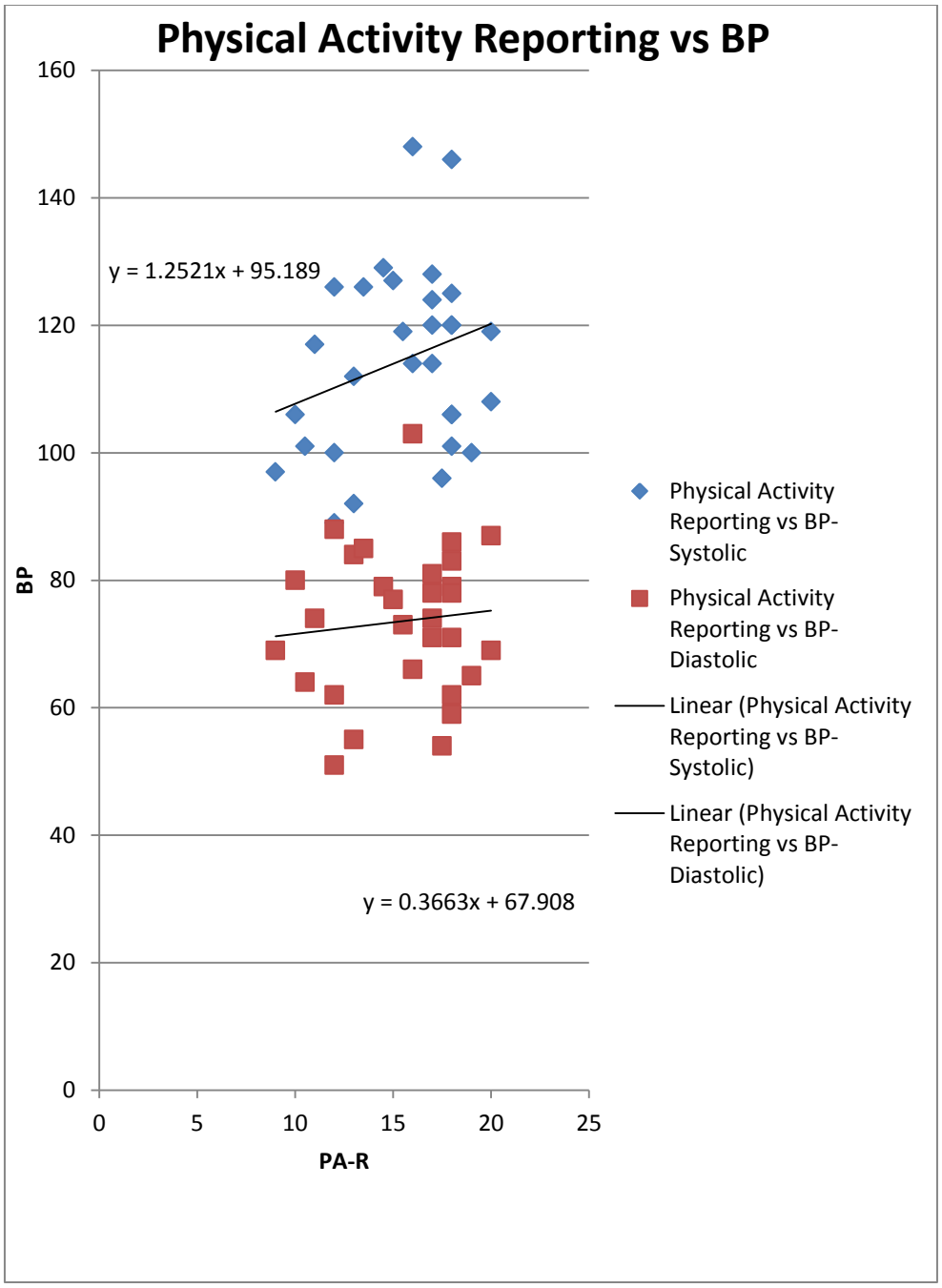

Figure 11: No correlation was found between physical activity reporting and systolic or diastolic blood pressure. A non-significant trend suggests a positive relationship between physical activity reporting and blood pressure. This suggests that as physical activity reporting increased, blood pressure increased.

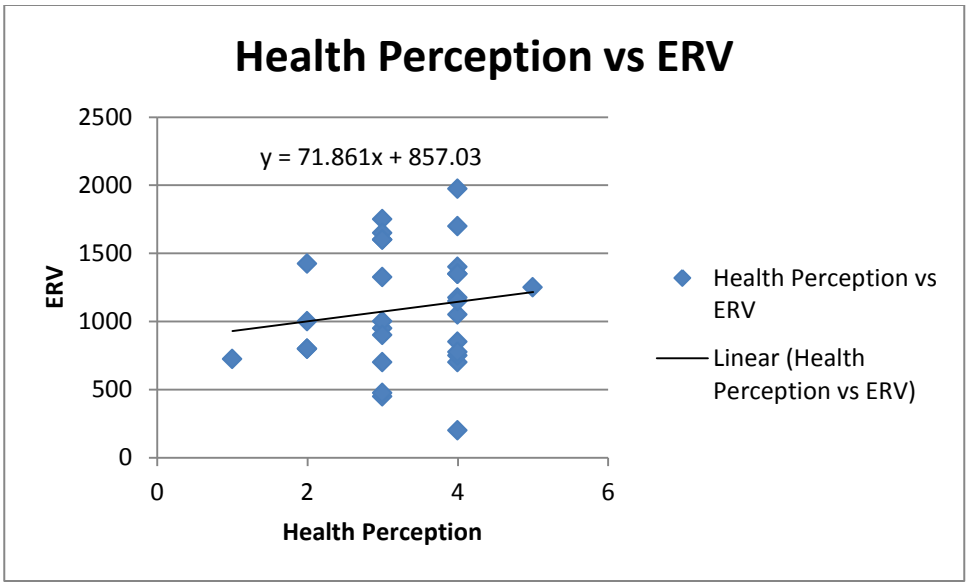

Figure 12: No correlation was found between health perception and ERV. A non-significant trend suggests a positive relationship between health perception and ERV. This suggests that as health perception increased, ERV increased.

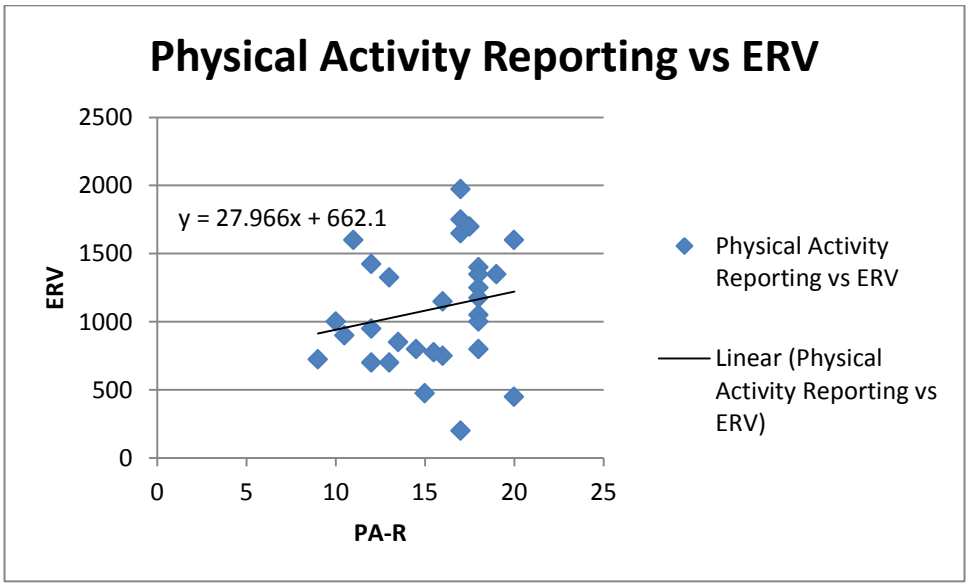

Figure 13: No correlation was found between physical activity reporting and ERV. A non-significant trend suggests a positive relationship between physical activity reporting and ERV. This suggests that as physical activity reporting increased, ERV increased.

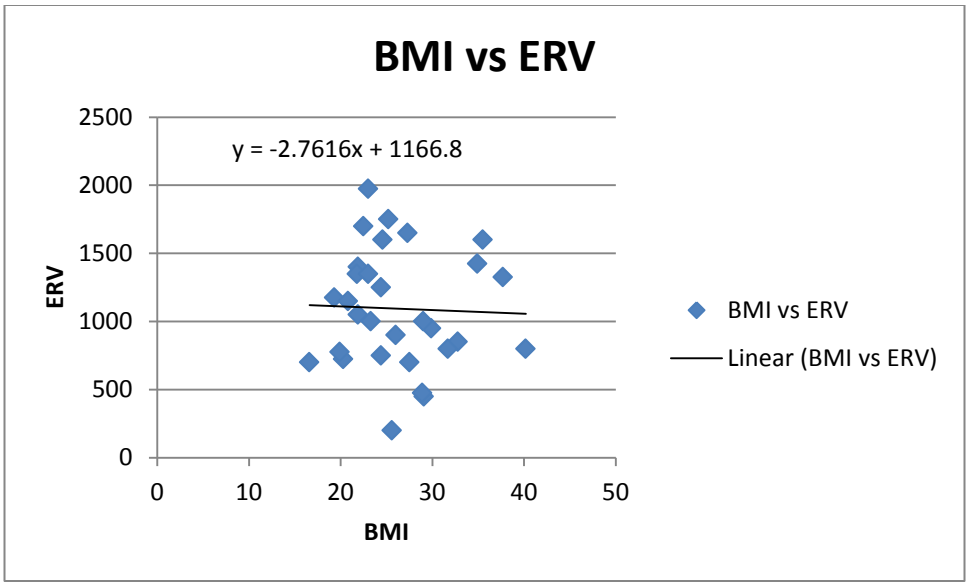

Figure 14: No correlation was found between BMI and ERV. A non-significant trend suggests a negative relationship between BMI and ERV. This suggests that as BMI increased, ERV decreased.

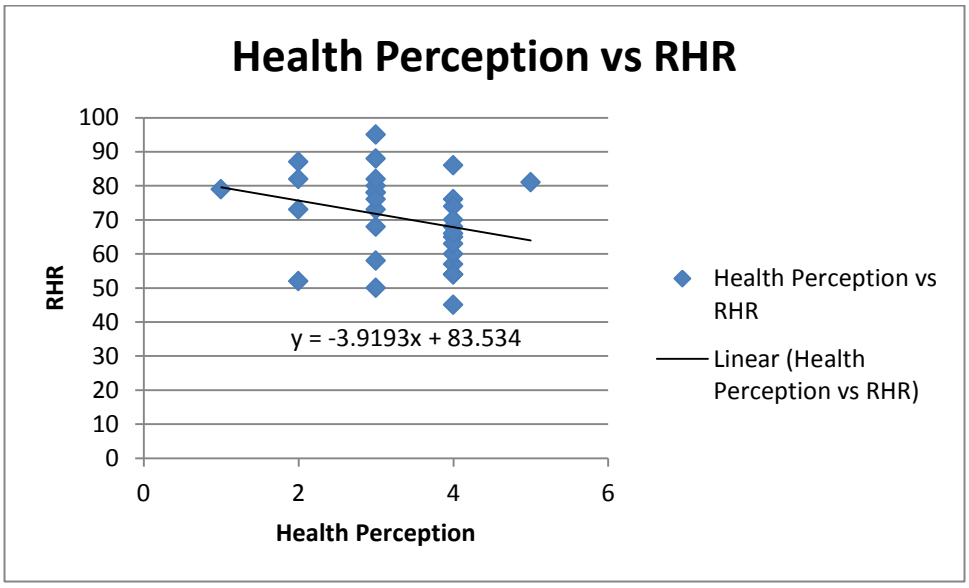

Figure 15: No correlation was found between health perception and resting heart rate. A non-significant trend suggests a negative relationship between health perception and resting heart rate. This suggests that as health perception increased, resting heart rate decreased.

**For more information or additional figures, including data collected, please email agondik@uwsuper.edu.