THE PENNSYLVANIA STATE UNIVERSITY

SCHREYER HONORS COLLEGE

DEPARTMENT OF BIOBEHAVIORAL HEALTH

FAMILY HISTORY OF HYPERTENSION EFFECTS ON BLOOD PRESSURE AND PERSONALITY MEASURES

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Spring 2012

A thesis
submitted in partial fulfillment
of the requirements
for a baccalaureate degree
in Biobehavioral Health
with honors in Biobehavioral Health

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Abstract

Objective: To assess the influence of parental history of hypertension on rumination, social support, loneliness, anxiety, and blood pressure during the stress response.

Design: One hundred and eighty five undergraduates underwent an emotional recall task. Personality was assessed at baseline, and blood pressure was assessed during baseline, reactivity, recall, and recovery.

Methods: Family history groups were assessed with t-tests on our BP and personality measures. A univariate ANOVA was used to measure the effects of a gender and family history interaction.

Results: No differences between groups were found on anxiety, loneliness, social support, and blood pressure measures. A small effect was found between rumination and family history groups.

Conclusion: Rumination may play a role in the longer recovery typically seen in individuals with a family history of hypertension.

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ACKNOWLEDGEMENTS

Thank you to Dr. William Gerin, soon to be Dr. Matthew Zawadski, and Dr. David Vandenbergh for their extreme patience with helping me put my thesis together. It was my best learning experience at Penn State. Thank you, to my wonderful and always helpful lab partners Lili Xu, Ama Adusei, Chiemeke (Emi) Nwabuele, Colleen Pisciotta, Elicia Abella, and especially Everett Bacon, and Nicole Milano for computing, compiling, and assessing the data.

Thank you all it was a pleasure, and believe me, I am not just saying that.

INTRODUCTION

Genetics, gender, personality, and environment have all been implicated in the development of hypertension (1). About 23,965 Americans died from high blood pressure in 2007, and millions more suffer complications directly resulting from hypertension (HTN) including cardiovascular diseases and cerebrovascular diseases(2). Even with the substantial health risks HTN poses to our society, adequate and widely replicated predictors, which include many aspects of genetics, personality, and gender have not been found (1). We aim to add to the literature by examining the relationships of family history of hypertension(FH+) groups, and gender groups, on BP during the stress response. Personality factors including anxiety, rumination (brooding over past events), loneliness, and, degree of social support, will also be measured during baseline, in the hopes that these associations will develop a clearer framework of a susceptible hypertensive.

A greater incidence of hypertension is seen in individuals with a positive family history(76). FH+ seems to increase the occurrence of HTN because of a possible genetic relationship that causes an excessive stress response(76). The stress response (baseline, reactivity, and recovery) have all been explored in relation to FH. Beginning with baseline, FH+ and FH- groups show no differences in BP. During reactivity the blood pressure response on the other hand becomes confounded by the issue of gender. Gender moderates this relationship such that only significant BP reactivity differences are seen in FH+/FH-females groups (26, 27), and not FH+/FH- male groups (6, 7), this supports Jorgensen and Houston data

(8) in which they examined family history and gender throughout the stress response and found that only FH+ females had a higher systolic blood pressure during reactivity. Lastly, during recovery FH participants exhibited a greater BP(9, 10), independent of gender. These two significant differences between reactivity, and recovery blood pressure will be explained in relation to personality.

How an individual reacts, appraises, and copes with stressful events can have effects on future cardiac health. Obrist and Light proposed that frequent stressful events and the resulting BP elevations may affect the development of hypertension in susceptible individuals (11-14, 15-17). However the authors of these papers do not provide a clear explanation of what constitutes a "susceptible individual," especially in regards to rumination, social support, loneliness, and anxiety. A major goal of this paper is to clarify one group of susceptible individuals, namely those with a positive family history of HTN, and these four constructs. This could allow us to achieve better predictions of hypertension and therefore may inform improved interventions, leading to more effective and aggressive treatment. We will now review these 4 personality factors and the interaction with gender and family history of hypertension.

Personality traits are vital in the stress-BP response and therefore could have a significant health effect as specified by Obrist and Light (11-13, 18). Gender influences some personality traits and must be mentioned briefly. In a large meta-analysis stable across ages and countries, dealing with personality differences between genders, women had higher levels extraversion, anxiety, trust, and tender-mindedness (19). These findings lend support that extraversion will influence our

social scale used, and that anxiety is experienced more in women (19). In regards to loneliness and rumination, no differences are seen, except when loneliness is mentioned in the study, women report higher levels of loneliness (20, 21). Gender differences are significant in rumination because of a mediating relationship with ruminative response styles(22). Explained by Nolen-Hoeksema (23) women tend to ruminate more, when stressed or depressed and men ruminate less because they are possibly able to distract themselves. This distraction hypothesis has however not been widely replicated, but differences in rumination are nevertheless observed (24).

These four personality dimensions were selected because of their importance to the Type A (25-27) & D(28) hypertension personality models.

Type D- defined as a distressing personality has two stable traits, negative affectivity and high social inhibition, also noticeable is a type D person having significantly more anxious and depressive thoughts (28). Rumination has been associated with negative affectivity (29) and social inhibition with social support and loneliness (28). Type D personality has become the newest and seemingly best predictor of negative health outcomes in regards to cardiovascular diseases and hypertension (28). CVD patients diagnosed with a type D personality are 2-5 times more likely to have risk of adverse prognosis, impaired quality of life and symptoms of anxiety and depression independent of traditional biomedical risk factors, including disease severity (28).

Type A once considered a reliable predictor of HTN has now fallen out of a favor as a psychophysiological factor in the stress response (**30**). Although three

personality traits from Type A have been correlated with excessive SNS activity, anticipation to a stressor (31), cynical hostility(32) and most interestingly denial(33). This Type A denial dimension(33, 34) seems to be similar to the Jorgensen and Houston(1) paper that found only denial to be the only significant dimension between FH+ and FH- groups when measured in regards to BP reactivity. Denial in both papers (1,35) involves individuals cognitively working at suppressing there negative or anxious feelings which was also found to be correlated to an increase in pulse rate(35).

Anxiety

Anxiety is the most widely examined dimension in previous papers about family history of HTN. The role of anxious tendencies significantly altering fluctuations in BP is disputed with, Franz(25) and Räikkönen, Matthews. et al.(36) showing an effect, and Jorgensen, Houston paper (1) showing no effect. However more widely replicated is the interaction between a personality dimension of anxiety and the psychodynamic effects of someone, having a FH+, leading to significant differences in BP. This is theorized to occur because of individual's conflicting emotions: they can not freely accept the passive dependent attitude shown in a denial family history relationship (1,35) which affects their ability to freely express their more frequent and anxious or neurotic impulses(25, 36). These conflicting psychological constructs of denial and anxiety might be a possible mechanism to greater rumination, and therefore the differences in recovery seen between family history groups.

Rumination

Although anger and hostility have both been highly associated with BP(42-44), rumination however, shows an important mediating effect on anger and the stress response (45). Of particular importance is a study examining the ability to remove ruminative effects through distraction, and the faster recovery to baseline (41). Higher rumination seems to encourage a longer and higher BP recovery, and family history groups have separately been found to have a higher recovery (9). The ruminative response scale however at this time has not been tested between FH+ and FH- groups for a possible correlation. A relationship seems plausible considering the inner emotional conflict, between a denial dimension (1, 35), and increased anxious thoughts (25,36).

Loneliness and Social Support

In much of the same way anxiety and depressive tendencies does not consistently predict BP. Social support and loneliness self-report measures might be more effectively utilized if a genetic component (family history) was added to the measurement, because like anxiety and depression the effects of social support and loneliness have been inconsistently correlated with cardiovascular reactivity(42-47). Loneliness and social support are strongly correlated(48-52) and lack of social support and loneliness may lead to cardiovascular health problems and HTN(53-56).

The present study will examine family history group differences on personality traits, and BP throughout the stress response. The stress response includes the resting blood pressure (baseline), blood pressure change in response to a writing task (reactivity), and the time it takes for the blood pressure to return to

the pre-stress level (recovery). Therefore, participants' BP will be measured at each of these points. Analyzing the entire stress sequence with changing mood is useful to understanding the health implications of these dimensions because baseline, reactivity, and recovery have all been implicated in cardiovascular diseases and hypertension (57).

In all, four sets of measurements were collected 1. Personality differences at baseline 2. BP at baseline 3. BP reactivity 4. BP recovery

We then divided these 4 measurements into our FH groups and gender, to examine the main effect of FH differences-(hypothesis1), main effect of sex differences-(hypothesis2), and the interaction of FH and sex differences (hypothesis3). The possible directional relationship of each hypothesis follows below.

Hypothesis1- Main effect of Family History of Hypertension

FH+ might report low anxiety, and social support with significantly higher rumination, and loneliness. This may be associated with the non-complaining life attitude model (58), and a denial personality pattern (1). BP differences in FH groups are mixed, a review of 150 papers by Muldoon et al. (58) revealed that only one-third of experiments showed a greater BP response during baseline and reactivity. In regards to blood pressure we except to see significant group differences during recovery.

Hypothesis2- Main Effect of Gender No significant differences between males and females have been reported on the BP measurements (9,10). Females may have higher levels of social support and anxiety, according to a stable meta analyses(19).

Hypothesis3- Interaction Effect of Gender x FH

Widely replicated in the literature is the effect of male participants in family hypertensive groups reporting few differences between normotensive counterparts (6, 7). On the contrary, there were significant interaction effects between female FH- and FH+ groups (26, 27). This leads us to hypothesize that FH males will show lower systolic and diastolic blood pressure measures throughout the stress response as compared to FH+ females. The interaction effects of personality traits can only be speculated. However the literature suggests that female FH+/+ and FH+/- will have will have the greatest rumination, and possibly the highest loneliness, and anxiety among all other family history and gender groups(1, 58, 60).

The rationale for the present study is to add to the literature by examining possible relationships between a genetic factor - positive family history of hypertension - and rumination, anxiety, social support, loneliness, and blood pressure.

METHODS

Sample, Recruitment, Exclusion

From 2 larger studies, 143 women and 42 men (Table1&2) were recruited from introductory psychology classes at Penn State University in exchange for extra credit. Subjects signed up through an online subject pool for a "blood pressure and emotions study," for one self-selected time. Participants were excluded if they exercised strenuously that day and taken caffeine, and/or nicotine 2 hours before participation in the study. Participants signed a consent form before beginning. During this time they were notified of the right to refuse to participate at any time, and to not answer any questions they felt uncomfortable with.

Table1. Breakdown of Sample by Ethnicity and Race Anger Recall Study and Touch Study (n=61)

	Women	Men	Total
Ethnic Category	-	-	-
Hispanic or Latino	1	1	2
Racial Category	-	-	-
Asian/Pacific Islander American	3	2	5
Black or African American	4	0	4
White	22	25	47
Other	2	1	3
Declined	0	0	0

Table 2 Touch Study Sample Breakdown of Ethnicity and Race n=124

	Women	Men	Total
Ethnic Category	-	-	-
Hispanic or Latino	4	3	7
Racial Category	-	-	-
Asian/Pacific Islander American	7	1	8
Black or African American	14	0	14
White	82	8	90
Other	2	2	4
Declined	1	0	1

Overview of Procedure

All subjects began with a set of survey of questions, to ascertain their gender, race, and basic mood score (See Table 1). After this, participants began with a 10 minute baseline period, this time is necessary to provide great reliability(61), and calibration (62)for Finapres2300 followed by an 8 minute writing recall task, randomly chosen for one of three conditions (happy, neutral, or anger inducing event). Participants then had a 10 minute post task recovery period. The touch study task differed from the anger recall study only during verbal recall of the emotional event. Experimenters were randomly assigned to provide one of three touch responses (no touch, back touch, or hand touch).

Materials (Questionnaires) and Measurements

Family History Data

Participants self-reported if a biological parent had a history of hypertension. From the total number of participants, ## had two parents with HTN (FH+/+), and 18 had just one parent with HTN (FH+/-), 43 had no family history of HTN (FH-/-). We had to eliminate the category of two parents having a history of hypertension because we did not have a enough subjects. Results have (Full sample FH is reported in Table2.) We only included self-report measures because previous studies have found that subjects reports are 89-93% accurate, when the parents are then asked themselves (63,64).

Table2. Breakdown of Gender by Family History of Hypertension Anger Recall Study (n=61)

	Women	Men	Total
FH+	11	7	18
FH-	22	21	43
Total	33	28	61

Table3. Breakdown of Gender and Family History of Hypertension Anger Recall Study(n=123)

	Women	Men	Total
FH+	41	3	44
FH-	69	10	79
Total	110	13	123

Physiological measurements

Pulse Rate, BP, Heart Rate, and sinus rhythm were recorded with the Finapres 2300 blood pressure monitor. The machine utilizes a finger cuff attached to the ring finger of the participant's non-dominant hand, and partially inflates to monitor pulse rate, systolic and diastolic BP (SBP, and DBP) continuously (65, 66). Heart rate and sinus rhythm are measured from 3 electrodes attached to the chest and lower abdomen.

The Finapres 2300 has been found to be extremely reliable in tracking sudden changes in blood pressure, making it useful for stress inducing experiments. (67) Studies have also shown its reliability (61) and effectiveness at consistent measurements even after hand movement (68).

Loneliness

The UCLA Loneliness Scale (ULS; 20 items) measures the frequency and intensity of aspects of the lonely experience (69).

Rumination

A subscale of the Response Styles Questionaire, the Ruminative Response Scale (RRS: 22 items) was utilized (70). This scale measures ruminative coping responses to negative mood.

Social Support

To measure social support, The Interpersonal Support Evaluation List (ISEL; 48-items) was used. This test captures the perceived amount and quality of social support (71).

Anxiety

The Spielberger Trait Anxiety Scale (STAS; 20-items) measures how often a respondent generally feel symptoms of anxiety (72).

Recall Essay and Verbal Recall

One out of three conditions was randomly assigned to the participant, either happy, neutral, or angry. It has been found that recall of an emotional stressor can raise and sustain an elevated BP (73). Participants were given directions that asked them to think about a time or event that made them feel one of these three emotions. They were told to clearly visualize this situation, and reminded that feelings and thoughts can be carried around for weeks, months, or even years. Participants then wrote for 8 minutes about a particular experience that made them feel their assigned condition.

Procedure

Subjects answered exclusion criteria with the experimenter reading these questions aloud. A consent form was signed, and the experimenter left the room so the participant could answer baseline demographic, personality, and mood measures. The subject signaled for the experimenter to return through a web cam, once this extensive list of questions was answered.

The Nexfin monitoring device and electrodes, were placed on the participant's chest and abdomen. A finger cuff was fitted to the participant's ring finger of the non-dominant hand. This equipment was calibrated with the subject's weight, height, age and gender. The participant was now again sitting in their chair facing the computer. Once the machine had achieved adequate time to find pulse, BP, and sinus rhythm. They were then told to be as "still and comfortable as possible, while the machine got a sense of the

body's natural signals." This baseline lasted 10 minutes, digital markers placed at the beginning and after baseline allowed collection, and were used at the start and end of each part of the stress response (baseline, reactivity, recovery).

After baseline participants answered a short set of mood questions. The experimenter then gave writing task instructions, which were strictly given for every participant. The subject was allowed to write with pen and paper for 8 minutes at which time the lab assistant would return. The study subject would then answer another set of mood questions, and the experimenter collected the writing prompt.

Next, the subject was prompted once again that we would measure his or her body's natural signals while not engaged in a task. This lasted for 10 minutes. Afterwards, another series of mood questions were answered. Participants were then free to go.

Statistical Analysis

T-tests were used to see independent group difference of gender or family history groups on four personality questionnaires, and blood pressure during baseline, reactivity, and recovery. To examine possible interaction effects of gender and family history of HTN a univariate linear model was utilized whereby gender and family history became two co-independent variables. Men had to be excluded from blood pressure data relating to the touch study because not enough FH+ males completed the experiment

RESULTS

Touch Study Results

There were no significant effects for gender, on rumination, F(1,121)=0.872, p>0.352 loneliness F(1, 121)=0.007, p>0.932 and anxiety F(1, 121)=0.890, p>0.347

There were no significant effects for family history, on rumination, F(1,121)=2.117, p>.148 loneliness F(1, 121)=0.481, p>0.489 and anxiety F(1, 121)=3.359, p>0.069

Table1: Independent T Test Results Comparing Personality Factors by Gender and FH

Variable	**Means ± SD**			
	Male	**Female**	**FH+**	**FH-**
Rumination Total	1.839 ± 0.44	1.684 ± 0.37	1.884 ± 0.34	1.727 ± 0.36
Loneliness	1.869 ± 0.36	1.784 ± 0.39	1.911 ± 0.43	1.598 ± 0.34
Trait Anxiety	1.934 ± 0.46	1.759 ± 0.40	1.849 ± 0.46	1.738 ± 0.37

There were no significant effects for gender on blood pressure (sys/dia).Sys Baseline F(1,83)=0.144, p>.706 Sys Essay F(1,84)=0.058, p>0.810 Sys Recall F(1,83)=0.291, p>0.591 Sys Recovery F(1,84)=0.575, p>0.451 Dia Baseline F(1,84)=0.016, p>0.898 Dia Essay F(1,84)=0.728, p>.396 Dia Cyber F(1,83)=0.320, p>0.573 Dia Recovery F(1,84)=0.037, p>0.847

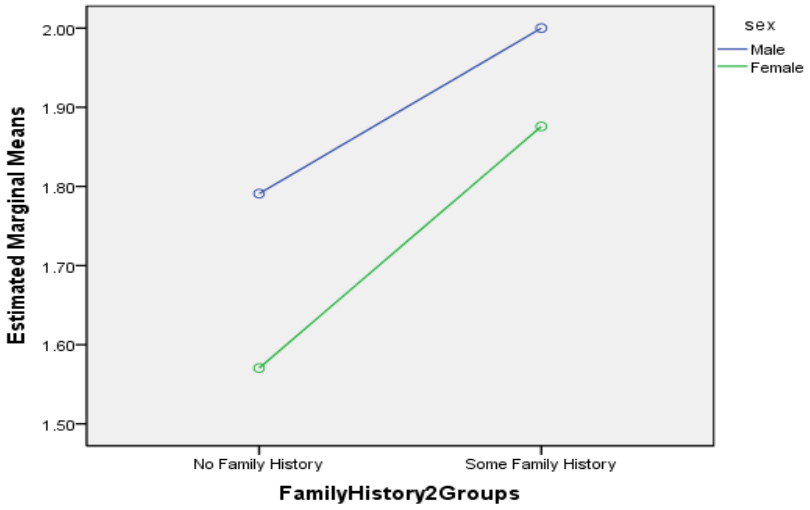
There were no significant effects for family history on blood pressure (sys/dia).Sys Baseline **F(1,82)=8.184 p>0.627 Sys Essay F(1,83)=8.395, p>0.950**Sys Cyber F(1,82)=2.889, p>0.972 **Sys Recovery F(1,83)=.5.192, p>0.736 Dia Baseline F(1,83)=6.335, p>0.738 Dia Essay F(1,83)=4.827, p>0.999** Dia Cyber F(1,82)=2.790, p>0.784 Dia Recovery F(1,83) =1.866, p> 0.731

Table2: Independent T Test Results Comparing Blood Pressure by Gender and Family History

Variable	Means ± SD			
	Male	Female	FH+	FH-
SysBaseline	109.46 ± 18.5	119.23 ± 21.0	116.92 ± 11.1	119.38 ± 24.0
SysEssay	116.46 ± 21.4	125.81 ± 21.5	125.13 ± 11.5	125.46 ± 24 .6
SysCyber	112.75 ± 18.1	123.48 ± 21.8	123.06 ± 15.4	122.88 ± 24.1
SysRecovery	110.45 ± 16.3	125.50 ± 22.3	125.97 ± 14.5	124.18 ± 24.8
DiaBaseline	71.708 ± 10.5	75.239 ± 12.7	74.302 ± 8.1	75.32 ± 14.2
DiaEssay	77.198 ± 15.1	80.791 ± 12.0	80.622 ± 7.8	80.617 ±13.7
DiaCyber	74.769 ±13.5	79.545 ± 11.5	78.743 ± 8.7	79.507 ± 12.9
DiaRecovery	74.112 ± 11.3	79.708 ± 13.7	80.203 ± 10.9	79.079 ± 14.6

The main effect of family history on rumination was significant ($F(1,119) = 3.992$, $p < .048$, $\eta_p^2 = 0.032$), but the main effect of gender, and the interaction effect of gender*FH on rumination were not significant such that Gender ($F(1,119) = 1.791$, $p > .183$, $\eta_p^2 = .015$) and Gender*FH ($F_s(1,119) = 1.791$, $p_s > .709$, $\eta_p^2 = .001$)

Figure1: Effects of FH and Gender on Rumination Measures



No significance was found between subjects (FH&Gender) effects on loneliness and anxiety.
Loneliness $F_s(1,119) = 1.334$, $p_s > .250$ $\eta_p^2 = .011$
Anxiety $F_s(1,119) = .014$, $p_s > .906$, $\eta_p^2 = .000$

Only three males had a positive family history, and therefore we exclused male participants to run a univariate ANOVA. The following blood pressure data is a univariate analysis on just females.
SysBaseline $F(1,77) = .436$, $p > .511$ $n = .006$
SysEssay $F(1,53) = .$, $p > .601$ $n = .005$

SysCyber F(1,78)=.018, p>.900 n=.000
SysRecovery F(1,78)=.016, p>.900 n=.000
DiaBaseline F(1,53)=.205, p>.652 n=.004
DiaEssay F(1,53)=.039, p>.845 n=.001
DiaRecall F(1,53)=.730, p>.397 n=.014
DiaRecovery F(1,82)=0.47 p>.828 n=.001

Anger Recall Study Results

There were no significant effects for gender, on rumination, F(1,59)=.391, p>.53 social support F(1,59)=.258, p>.61 loneliness F(1, 59)=2.15, p>.148 and social support F(1, 59)=.005, p>.94.

There were no significant effects for family history, on rumination, F(1,59)=3.845, p>.055 social support F(1,59)=1.152 p>.287 loneliness F(1, 59)=.668 and social support F(1, 59)=.668 p>.417

Table 3: Independent T Test Results Comparing Personality Factors by Gender and Family History

Variable	**Means ± SD**			
	Male	**Female**	**FH+**	**FH-**
Rumination Total	1.846 ± 0.59	1.824 ± 0.50	1.866 ± 0.39	1.820 ± 0.59
Social Support	1.220 ± 0.16	1.221 ± 0.18	1.240 ± 0.20	1.213 ± 0.16
Loneliness	1.832 ± 0.57	1.888 ± 0.42	1.908 ± 0.43	1.843 ± 0.51
Trait Anxiety	1.904 ± 0.57	1.926 ± 0.53	1.991 ± 0.42	1.884 ± 0.59

There were no significant effects for family history on blood pressure (sys/dia). Sys Baseline F(1,55)=1.692, p>.199 Sys Essay F(1,55)=1.741, p>.193 Sys Recall F(1,55)=1.257, p>.267 Sys Recovery F(1,55)=2.280, p>.137 Dia Baseline F(1,55)=.470, p>.496 Dia Essay F(1,55)=.390, p>.535 Dia Recall F(1,55)=.411, p>.524 Dia RecoveryF(1,55)=1.294, p>.260

There were no significant effects for gender on blood pressure (sys/dia).
Sys Baseline F(1,55)=.001, p>.978 Sys Essay F(1,55)=.353, p>.555 Sys Recall F(1,55)=.146, p>.704 Sys Recovery F(1,55)=.220, p>.641 Dia Baseline F(1,55)=.062, p>.804 Dia Essay F(1,55)=.390, p>.535 Dia Recall F(1,55)=.146, p>.704 Dia Recovery F(1,55)=.002, p>.969

Table10: Independent T Test Results Comparing Blood Pressure by Gender and FH

Variable	Means ± SD			
	Male	Female	FH+	FH-
SysBaseline	113.18 ± 26.6	113.69 ± 25.1	113.69 ± 14.9	113.33 ± 29.2
SysEssay	125.44 ± 28.3	125.33 ± 36.7	124.36 ± 15.0	125.82 ± 37.8
SysRecall	134.03 ±30.9	126.38 ± 23.4	132.00 ± 18.7	129.35 ± 30.5
SysRecovery	121.43 ± 38.3	123.97 ± 30.6	126.29 ± 17.2	121.20 ± 39.4
DiaBaseline	72.00 ± 17.1	78.54 ± 18.9	75.41 ± 12.5	75.29 ± 20.3
DiaEssay	80.23 ± 18.6	87.62 ± 23.9	82.94 ± 13.4	84.44 ± 24.4
DiaRecall	86.50 ± 20.8	87.72 ± 16.5	88.47 ± 14.5	86.54 ± 20.2
DiaRecovery	77.56 ± 26.1	87.14 ± 25.8	82.35 ± 13.8	82.47 ± 30.1

The main effect of family history on rumination was not significant ($F(1,57) = 0.072$, $p > 0.789$ $\eta_p^2 = .905$), and main effect of gender, and the interaction effect of gender*FH on rumination were not significant such that gender ($F(1,57) = 0.005$, $p > 0.947$, $\eta_p^2 = 0.00$) and Gender*FH ($F_s(1,57) = 0.005$, $p_s > 0.821$, $\eta_p^2 = 0.001$).

The reason why rumination was reported in a table is because it was found to be significant in the touch study. The non-significant data social support, loneliness, anxiety, and BP between-subject effects are reported next.

Social Support- $F(1,57) = .003$, $p > .957$ $n = .000$
Loneliness $F(1,57) = 1.318$, $p > .256$ $n = .023$
Anxiety $F(1,57) = .653$, $p > .422$ $n = .011$
SysBaseline $F(1,53) = .130$, $p > .720$ $n = .002$
SysEssay $F(1,53) = .278$, $p > .601$ $n = .005$
SysRecall $F(1,53) = .018$, $p > .895$ $n = .000$
SysRecovery $F(1,53) = .395$, $p > .532$ $n = .007$
DiaBaseline $F(1,53) = .205$, $p > .652$ $n = .004$
DiaEssay $F(1,53) = .039$, $p > .845$ $n = .001$
DiaRecall $F(1,53) = .730$, $p > .397$ $n = .014$
DiaRecovery $F(1,53) = 0.00$ $p > .995$ $n = 0.00$

DISCUSSION

The purpose of this paper was to assess the relationship of family history of hypertension on personality factors and the BP stress response. These data may give a clearer picture of a higher risk hypertensive, and lead to more effective treatment outcomes. We hypothesized that significant FH group differences would be noticed in levels of rumination, social support, loneliness, and anxiety. We also hypothesized that BP reactivity would be significantly higher in FH+ females only, while BP recovery would be greater, independent of gender.

To summarize the results**,** our anger recall study showed no differences in t-tests between any personality factors or BP measures. In the larger touch study no significant differences were noted in family history groups on BP, or loneliness, and anxiety. Rumination was found to be significant, but in actuality though the effect size was quite small $\eta p2=.032$. In all some family history of hypertension does not have a large effect on the outcomes measured.

Limitations/Potential Alternative Explanations

There are a few limitations that must be addressed. First, both of these studies had different purposes. Even though the procedures were quite similar there are differences in sample sizes that possibly made effect size noticeable on the touch study (n=124) versus the anger recall study (n=61). The specific procedural differences of having a cyber game involving a stimulation of two computer players leaving the human participant out of the ball tossing game and randomly assigning back touch, hand touch, or no touch conditions during recovery seems likely to affect the reliability and validity of findings. The uncertainty of self-reporting family

history of HTN may also affect the reliability of the data even though in the past self-report measures are 89-93% accurate (63, 64).This data must be interpreted with caution.

Implications

Examining the rumination and FH+ relationships had not occurred at the time of this paper, and the significant finding in the touch study does not allow us to assess the pathogenic importance. Rumination as a mechanism for a prolonged recovery to baseline cannot be assessed with our experimental design, this seems like an avenue for future experiments considering the fact that FH+ individuals have higher recovery (57).

In regards to the blood pressure data, the reactivity and recovery BP do not concur with the literature (9, 10). It seems likely that the experimental design of having an emotional recall task, might not stress a participant as much as a serial subtraction task (9, 10). Considering how widely replicated the BP data referenced, it seems likely that our experimental design could have possibly influenced BP outcomes.

Future Directions

Future studies would benefit, to assess if rumination is the mechanism causing more pronounced recovery in FH+ individuals**.** To assess this rumination recovery mechanism, we propose a study with less of an emotionally involving task. Glynn, Christenfeld and Gerin(75) found that emotional tasks such as mental arithmetic with harassment, and shock avoidance produce rumination effects during recovery (75). In contrast, emotionless stress inducing tasks (physical

exercise and cold pressor) seemed to produce no rumination (75). We propose, an experiment to analyze whether family history groups still have prolonged recovery during emotionless tasks. Our future experiment would have two conditions an emotionless task, and emotional task. If BP recovery is significant in the emotionless task we can assume that rumination plays no role in the higher recovery seen in FH+ individuals. However, if recovery is found to be insignificant in the emotionless condition but significant in the emotional stressor this would then lead us to conclude that rumination is part of the mechanism that influences FH+ individuals prolonged recovery.

Conclusions

At the present time there seems to be an association between rumination and a positive family history of hypertension, whether this plays a role in the higher recovery levels seen in FH+ groups will need future assessment.

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APPENDIX

IRB letter of approval

To: wxg17@psu.edu
Subject: Approval IBC #38263 Emotion in the Lab and the Field
Date: Tuesday October 25, 2011 3:52:34 PM

The application for the above-referenced protocol has been approved by the Institutional Biosafety Committee (IBC).

Please note: **If this protocol involves the use of human tissues/samples, you may not begin any research until a determination has been made by the IRB/ORP. If this protocol involves the use of animals, you may not begin any research until approval has been granted by the IACUC.**
THIS IS THE ONLY APPROVAL NOTIFICATION YOU WILL RECEIVE.
Please print out these documents in order to have copies for your records.
If a funding source requires a signature on the approval letter, please do not hesitate to contact me.
Thank you.

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Academic Vita

EDUCATION: **The Pennsylvania State University**
Bachelor of Science in Biobehavioral Health 2012
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RESEARCH EXPERIENCE:

Research Assistant Cardiovascular Psychophysiology Laboratory University Park, Pa. August2011-Present

-Performed experimental protocols on human research subjects.
-Designed and ran my own experiment
-Wrote my future honors thesis from experimental data collected

Research Assistant for Stress and Alcohol Study University Park, Pa. Dec2010-June2011

-Administered and designed lab procedures for mouse models.
-Recorded, collected, and analyzed experimental lab data.

Awards:
Dean's List 2008-2012
Selected exhibitor Clinton Global Initiative University 2012
Uganda Village Health Intern 2012