

HYPOTHESIS

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## A Proposed Study on How Far Anger Contributes to Initiating Essential Hypertension in Canadian Caucasian Adults with A Family History of Hypertension

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**Abstract:** The goal of the present correlational study is to test the hypothesis that anger initiates essential hypertension in Canadian Caucasian adults with a family history of hypertension. The study population will include a cohort of 100 men and women aged 25 to 45 years at enrollment recruited from the University of Ottawa General and Civic Hospitals. Participants who are normotensives will be included in the study given that they have a family history of hypertension. The Spielberger State Trait Anger Expression inventory (STAXI) scales will assess the three main dimensions of anger: State, Trait and Anger Expression. Using a semiautomated blood pressure machine, blood pressure measurements will be conducted by the attending nurse. It is hypothesized that during the three year study, participants with higher STAXI scores will more likely develop hypertension. Results obtained from the present study are expected to highlight the significant contribution of anger as a modifiable behavioral risk factor in the pathogenesis of hypertension.

**Keywords:** anger, hypertension, Spielberger State Trait Anger Expression inventory, STAXI

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## How Far Does Anger Contribute to Initiating Essential Hypertension in Canadian Caucasian Adults with a Family History of Hypertension?

Hypertension, described as a consistent elevation in BP above 140/90 mmHg, is the primary risk factor for stroke and heart diseases such as myocardial infarction, atherosclerosis, transient ischemic attacks...etc. Stroke and heart diseases are the leading cause of death in Canada [http://www.phac-aspc.gc.ca/cd-mc/cvd-mcv/hypertension\\_figures-eng.php](http://www.phac-aspc.gc.ca/cd-mc/cvd-mcv/hypertension_figures-eng.php). To date, over one-fifth of Canadian adults are diagnosed with hypertension and over 42% of Canadians are yet unaware of their increased blood pressures (BP) <http://www.heartandstroke.com/site/c.ikIQLcMWJtE/b.3484023/>.

Essential hypertension (the focus of the present proposal) affects over 90% of hypertensive patients and refers to the increased BP without a specific medical cause [http://www.phac-aspc.gc.ca/cd-mc/cvd-mcv/hypertension\\_figures-eng.php](http://www.phac-aspc.gc.ca/cd-mc/cvd-mcv/hypertension_figures-eng.php). The remaining fewer than 10% of hypertensive patients suffer from secondary hypertension—usually caused by a known medical condition such as a kidney disease, a hormonal disorder or as a result of using certain medications.

Despite the enhanced screening, early detection and treatment of hypertension, it is clear that the scientific community has not yet found a way to prevent hypertension. This observation is supported by the fact that new hypertensive cases are being identified. Moreover, it is estimated that 90% of people will inevitably develop hypertension over their lifetime [http://www.phac-aspc.gc.ca/cd-mc/cvd-mcv/hypertension\\_figures-eng.php](http://www.phac-aspc.gc.ca/cd-mc/cvd-mcv/hypertension_figures-eng.php) emphasizing the unavoidable nature of hypertension. According to the 2009 Canadian Hypertension Education Program, an emphasis has been given towards dietary modifications, exercise promotion and strict adherence to the prescribed medications by the attending physician, yet a little emphasis has been given to the impact of the modifiable psychosocial factors such as anger on the initiation of hypertension. Therefore, we chose to focus on anger as a putative psychosocial contributor to the pathogenesis of essential hypertension.

Controversial evidence on the correlation between anger and BP currently exists.<sup>1-6</sup> While some authors have found anger suppression coping style to induce

BP elevation, other authors found anger expression to heighten cardiovascular activation.<sup>7</sup> These controversies can be attributed to variations in concepts or measurements that lead to inconsistent results.<sup>8,9</sup> It is essential to note at this point the different forms of anger. In the 1980s, Spielberger defined anger using either trait anger, state anger or anger expression terms depending on the accompanying characteristics.<sup>10</sup> While trait anger is a more permanent characteristic with a wide range of emotions from simple discontentment to rage, state anger is usually dependent on circumstances or conditions that provoke anger. On the other hand, anger expression is defined by three different patterns. First, anger can be openly expressed, an expression that we refer to as anger out. Secondly, anger can be suppressed, denied or held in, a term referred to as anger in. Finally, anger can be controlled via anger reflection control.<sup>11</sup> Regardless of whether it is trait or state, anger has been proposed to increase BP via a direct sympathetic effect and repeated episodes of anger could eventually lead to a chronic state of BP elevation.<sup>11</sup> Moreover, in adolescents, trait anger is one of the psychological factors associated with BP elevation.<sup>11</sup> While BP usually drops when a healthy person falls asleep (usually 10% reduction occurs during sleep), it has been documented that anger prevents BP from dropping.<sup>8</sup>

None of the past studies focused exclusively on the impact of the combined forms of anger on initiating high BP in the Canadian Caucasian adult population. We chose to focus on the Canadian Caucasian race because the majority of Canadians are Caucasians. According to the 2006 statistics report, over 80% of Canadians are Caucasians ([www.statcan.gc.ca](http://www.statcan.gc.ca)) or lighter-skinned populations. The remaining 17% are visible minorities including Chinese, Japanese, Arabs, and Koreans...etc.

We selected Canadian adults with a family history of hypertension; because of their increased likelihood to acquire hypertension in their lifetime (hypertension has a genetic component involved in its pathogenesis). Furthermore, Canadian adults (particularly those employed) have more chance of showing different anger patterns because of enhanced work-related stresses compared to unemployed Canadians. As such, studying Canadian adults with a family history of hypertension will enable us to offer the above participants with future educational and preventative



measures to avoid anger as a putative modifiable risk factor in hypertension—should a positive correlation exist between anger and the initiation of hypertension.

We determined to study the role of anger in initiating hypertension because there is a growing body of evidence showing patients developing hypertension (prehypertensive) to be susceptible to cardiovascular risk factors and cardiovascular events compared to those who have normal BP.<sup>12</sup> Moreover, those with prehypertension are more likely to develop overt hypertension *versus* those who have normal BP.<sup>13</sup>

These facts, combined with the realization that hypertension increases morbidity and mortality, in turn, emphasize the need for investment in psychology research with a view to identifying a novel target such as anger and understanding its role in initiating hypertension. The long term goal of this study is to increase awareness of the impact of anger on cardiovascular health, and possibly to design intervention trials where anger management programs are employed to help selected hypertensive patients (with anger) achieve their target BP.

## Methodology

### Setting

This study is a prospective study that will be conducted through the University of Ottawa in collaboration with the two largest Ottawa Hospitals namely the General and the Civic Hospitals.

### Study population

Our study is designed to survey 100 participants (50 adult men and 50 adult women) aged 25 to 45 years for a period of three years. Participants' BP will be measured monthly (by the attending nurse) under the direct supervision of the collaborating clinicians, whereas the STAXI scores will be assessed by the clinical psychologist on the same day. Participants will be asked to sign consent forms given by their primary care providers, in which a lay summary of the project is given together with the potential risks and benefits of the study. Participants will be made aware of their freedom to withdraw at anytime without penalty. Participants will be asked to give informed assent. Compensation will be in the form of a CAD\$10 Tim Hortons' gift certificate to be used towards the purchase of any item at Tim Hortons. Gift certificates

will be administered to both the participants and the accompanying members at each monthly session. During the study, patients who develop high blood pressure will be treated medically by the attending physician. Following the study, participants will be debriefed on the purpose of the study, the significance of the results and the implications for the scientific community.

The following inclusion and exclusion criteria will be strictly adhered to, when choosing the study population:

### Inclusion criteria

- Males and females aged 25–45 years
- Normotensive (120–130/80–85 mmHg)
- Family history of BP

### Exclusion criteria

- Men and women with high BP >130/85 mmHg
- Men and women who are currently on antihypertensive medications
- Men and women below 25 years of age and those above 45 years of age
- Racial groups other than Caucasians
- Men and women with a previous history of cardiovascular diseases such as myocardial infarction, stroke/transient ischemic attack, or cardiovascular revascularization procedures.

### Patients' assessment criteria

- a. Normotensive participants  
Participants will be defined as normotensive if during the 3-years study duration they neither have a BP reading above 130/85 mmHg, if they have never been told by a physician that their BP is high and if they have never been prescribed a BP medication.
- b. Development of hypertension  
Participants will be defined as developing hypertension if their respective BP measured during a minimum of 3 visits is above 130/85 mmHg, if they have been prescribed an antihypertensive, or if the attending physician has described their BP as being high.
- c. Anger assessment  
We will adopt the same anger assessment scales described by Bongard and co-authors in 2005<sup>13</sup> and originated from Spielberger State Trait Anger



Expression inventory (STAXI).<sup>10,14</sup> The above questionnaires assess state anger, trait anger (whether it is angry temperament and angry reaction) as well as the three dimensions of anger expression namely: anger-in, anger-out, and anger-control. While each of the state and trait anger scales is composed of 10-items, each of the three dimensions of anger expression subscales is composed of 8 items—see additional information on the University of Southern Queensland, Australia website (<http://www.usq.edu.au/users/senior/69301/STAXI.htm>).

Each item is essentially a statement people use to describe their emotions when they feel angry. Each item is assessed by a four point scale (1 = no anger; 4 = maximum anger). Internal consistency reliability for STAXI has a value of  $\alpha$  ranging from 0.73 to 0.95 for the total scale and from 0.73 to 0.93 for the subscales (<http://www.usq.edu.au/users/senior/69301/STAXI.htm>).

d. Blood pressure measurements

Blood pressure will be assessed using the semiautomated blood pressure device, baso-type medicus (Bosch + Sohn, Jungingen). The above device provides a highly accurate reading of blood pressure that can reach  $\pm 3$  mmHg according to the manual. Usually the cuff inflates to above the systolic blood pressure and then gradually deflates. Measurements will be repeated three times and the mean will be taken for the three readings.

e. Design and statistical analysis

This study is a correlational study. The two variables of interest in the present study are the STAXI anger scores (combined scores of state, trait, and anger expression) and the initiation of hypertension. Pearson's correlation coefficient ( $r$ ) will be calculated between the above two variables. If a statistically significant correlation exists between the above two variables, predictions will be made using regression analysis.

## Predicted results

We anticipate a direct positive correlation between overall STAXI scores (combined state, trait, and anger expression scores) and the initiation of hypertension.

## Discussion

Strengths of the study include its prospective design which will allow us to monitor participants who are

free of hypertension during multiple visits and follow-up interviews over 3-years duration. The cohort of 100 men and women will increase the power of the study and might potentially offer generalizability of the findings to patient populations of different ages and races.

One of the limitations of the present correlational study is the fact that it cannot prove that anger causes hypertension. It can only suggest that a relationship does exist between anger and hypertension, which might be positive or negative depending on the results.

Despite the fact that adolescents have been shown to be affected by anger as well,<sup>15</sup> we have chosen to limit our study population to Canadian adults only. Although a weaker design, by doing so we have accounted for the fact that human statistics have shown cardiovascular disease to be the single leading cause of death in adults, killing 252,760 in 2002 <http://www.americanheart.org/downloadable/heart/1105390918119HDSSStats2005Update.pdf>. Moreover, our present proposal excluded senior population despite the fact that 46% of women and 38% of men aged 60 or over is on drug therapy to treat hypertension [http://www.phac-aspc.gc.ca/cd-mc/cvd-mcv/hypertension\\_figures-eng.php](http://www.phac-aspc.gc.ca/cd-mc/cvd-mcv/hypertension_figures-eng.php). The reason behind our selection is the preventative nature of the present study. We expect that this proposal will possibly shed some light on the significance of anger as a modifiable risk factor for hypertension. Our study population of normotensive adult participants will gain awareness of the potential risk of anger on cardiovascular health, and will potentially adopt new lifestyles in which anger is minimized or avoided when possible. However, we are certainly open to include other populations in future studies.

To our knowledge this will be the first comprehensive evaluation of the relationship between state, trait and anger expression scores and the initiation of BP in Canadian Caucasian adults. It will also be the first study following up participants for 3 years, with multiple measurements in order to provide a pattern of BP. Should a positive correlation exist between combined anger forms and the initiation of hypertension, data from the present proposal will certainly enhance awareness of the harmful effects of anger on cardiovascular health and might potentially be included in the 2012 Canadian Guidelines for the Management of Hypertension.



## Disclosure

This manuscript has been read and approved by the author. This paper is unique and is not under consideration by any other publication and has not been published elsewhere. The author reports no conflicts of interest.

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