Hostility, Negative Emotional Valence, Sadness, Rumination to Sadness
and Cardiovascular Reactivity

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ABSTRACT

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The study's first goal investigated what type of thoughts and underlying emotions

are exactly experienced by high versus low hostile participants following an anger

provoking interpersonal stressor. Results revealed that high compared to low hostile

participants experienced overall significantly more inferred thoughts of negative

emotional valence; emotions that they did not express in a direct manner. It was

suggested, that high hostiles might be high on the trait of Negative Affectivity. When

specific emotion categories were analyzed, results revealed that high compared to low

hostile individuals experienced overall more sad-inferred thoughts; sad thoughts that they

did not express in a direct manner. Furthermore, the study found that high compared to

low hostile participants ruminate more to sadness. The combined results of more sad-

inferred thoughts and significantly more rumination to sadness, lends support to the

interpretation, that high hostile individuals may be vulnerable for the development of

sustained depressed mood and perhaps even depression. These results are important given

that depression, even milder depressive symptoms have been found to be independent

risk factors for cardiovascular disease in general and coronary heart disease in particular.

This study did not find associations between cardiovascular reactivity and

hostility or rumination to sadness. The absence of an association between hostility and

cardiovascular reactivity is, however, consistent with the specific emotion category

results found in this study. Research suggests that it is the high hostile's propensity to

experience more frequent and more intense emotions in the anger category that is directly linked to heightened cardiovascular reactivity. This study did not find that anger-thoughts and anger intensities were significantly higher for high compared to low hostile participants following the anger provoking interpersonal stressor. It was suggested that the lack of heightened cardiovascular reactivity to interpersonal stress is due to the finding that the high hostile participants in this study did not experience more frequent and intense anger.

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Cardiovascular Reactivity.

Coronary heart disease (CHD), rheumatic heart disease, hypertension and stroke

are examples of major cardiovascular disease. Cardiovascular disease (CVD) remains the

number one killer in the United States, Canada and most industrialized societies. In

Canada, in 1997, almost 37% of all deaths were associated with cardiovascular disease

(Statistics Canada, 1999). And, in the United States, in 1998, almost 41% of all deaths

were due to CVD (American Heart Association, 2001). Heart disease, including coronary

heart disease (CHD), accounts for about three-fourth of all cardiovascular disease

(American Heart Association, 2001).

The Search for Psychological Factors

While the etiology of cardiovascular disease in general and coronary heart

disease (CHD) in particular is complex and multifaceted, several risk factors, such as

cigarette smoking, hypertension, elevated cholesterol and diabetes mellitus have been

researched and held responsible for its onset and manifestation. Because these risk factors

only explained about half of the variance in the etiology of CHD, researchers began to

look for additional, more psychological, explanations (Dembroski & Costa, 1987).

It was in the 1950's that Friedman and Rosenman, using research and clinical

observations, started to investigate a behavior pattern they believed was associated with

coronary heart disease and thus "coronary prone" (Friedman & Rosenman, 1959;

Friedman, Rosenman, & Caroll, 1958). This behavior pattern became widely knows as

the Type A Behavior Pattern (TABP) and was originally defined as a global "behavior pattern of any person who is involved in an aggressive and incessant struggle to achieve more and more in less and less time" (Friedman & Rosenman, 1974; Rosenman & Friedman, 1974). In general, researchers agreed that the major elements of the TABP include: Competitive achievement striving, a sense of time urgency, impatience, and aggressive behaviour and easily aroused hostility (Friedman & Rosenman, 1974).

Early research found that global Type A Behavior Pattern (TABP) was an independent risk factor for coronary heart disease (CHD). The TABP's effect on CHD incidence was comparable in magnitude to the traditional risk factors, such as, habitual cigarette smoking, elevated serum cholesterol and blood pressure. (Blumenthal, Williams, Kong, Schanberg, & Thompson, 1978; Brand, 1978; Cooper, Detre, & Weiss, 1981; Frank, Heller, Kornfeld, Sporn, & Weiss, 1978; Friedman, Rosenman, Strauss, Wurm, & Kositchek, 1968; Matthews & Haynes, 1986; Rosenman et al. 1975; Williams et al., 1980). Soon after, however, other studies either failed to replicate the association between TABP and CHD (Dembroski, MacDougall, Williams, Haney, & Blumenthal, 1985; Shekelle et al., 1985) or found the association too weak to be clinically significant (Williams et al., 1986).

Subsequently, the hypothesis that global TABP could predict CHD was questioned. Definitional and methodological confounds were forwarded to explain the inconsistent results (Dembroski & MacDougall, 1983; Matthews & Haynes, 1986). It followed that research started to make a finer distinction between the concept of Type A Behavior Pattern and coronary prone behavior by recognizing that not all components of the TABP may be associated with cardiovascular disease. In particular it was suggested

that the hostility component of the Type A Behavior Pattern may be specifically

predictive of coronary heart disease (Dembroski et al. 1985; Williams, Barefoot, &

Shekelle, 1985). Thus, research began to investigate the mechanisms linking hostility and

cardiovascular disease in general and coronary heart disease (CHD) in particular.

Hostility and Cardiovascular Disease

The consensus among researchers was that only certain components of the Type

A Behavior Pattern (TABP) such as the hostility component may be "toxic" and

therefore coronary-prone (Williams et al. 1985). In general, hostility was defined as a

"tendency to want to inflict harm on others and/or the proclivity to feel angry towards

others" (Chaplin, 1985; Smith, 1992)

Evidence linking hostility with cardiovascular disease comes from both cross-

sectional and prospective studies. A significant relationship between hostility, as

measured by the Cook-Medely Hostility Scale (HO) and extent of coronary artery disease

severity, was found in a cross-sectional study of about 400 cardiac patients (Williams et

al. 1980). Other researchers, also using the HO Scale, also found a significant

relationship between hostility and peripheral artery disease (Joesoef, Wetterhal,

DeStefano, Stroup, & Fronek (1989). Furthermore, MacDougall, Dembroski, Dimsdale,

& Hackett (1985) using the Potential for Hostility rating system, found that hostility and

anger were associated with increased coronary artery disease severity. The evidence

linking hostility with cardiovascular disease, however, has also been inconsistent in

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cross-sectional studies. For example, Helmer, Ragland & Syme (1991) and Friedman & Booth-Kewley (1987) have failed to find a statistically significant association between hostility and cardiovascular disease. Furthermore, while other researchers have found that analyzing average hostility scores (HO) did not result in a significant association between hostility and coronary heart disease, when they compared high with low hostile individuals, however, they found a significant relationship (Fontana et al. 1989).

A significant relationship between hostility and cardiovascular disease has also been supported by prospective studies. For example, when data from the Western Collaborative Group Study (WCGS) was reanalyzed, researchers found that hostility, anger directed outward, frequent experience of anger and irritation best differentiated between individuals who developed coronary heart disease (CHD) during follow-up with those who did not (Matthews, Glass, Rosenman, & Bortner, 1977). In another prospective study using the Hostility Facet Scoring System (HFSS), Total Potential for Hostility (an overall hostility score) and the subcomponent of hostile interpersonal style were significant predictors of coronary heart disease when comparing individuals who had developed CHD with those that did not. There were additional prospective studies that found significant associations between increased risk of cardiovascular disease process and hostility (Almada et al., 1991; Chesney, Hecker, & Black, 1989; Barefoot, Dahlstrom, & Williams, 1983; Shekelle, Gale, Ostfeld, & Paul, 1983). Other prospective researchers, however, failed to find a significant association between hostility and cardiovascular disease. For example, hostility as measured by the Cook-Medley Hostility (HO) Scale, did not predict coronary heart disease morbidity or mortality in a 33-year follow-up study of 1399 male university students (Hearn, Murray, & Luepker, 1989).

In summary, while there exist many studies supporting a link between hostility and cardiovascular disease there are also numerous studies that fail to find this association. Thus, the evidence linking hostility with cardiovascular disease remains inconsistent.

Hostility and Cardiovascular Reactivity

It has been suggested, that hostility is associated with cardiovascular disease process mainly via its psychophysiological effect. Williams et al. (1985) proposed that hostile individuals experience anger more frequently and intensively. Hostile individuals furthermore also engage more frequently in vigilant observations of their social environment because they expect mistreatment and antagonistic behavior from others. Both anger and increased vigilance are associated with heightened cardiovascular and neuroendocrine responses (Engebretson & Matthews, 1992; Hardy & Smith, 1988). In turn, heightened psychophysiological reactivity to stress is hypothesized to contribute to the development of coronary heart disease (Friedman, 1992).

The results of studies that have investigated associations between hostility and physiological reactivity have also not always been consistent (Williams et al. 1985; Diamond et al. 1984; Glass, Lake, Contrada, Kehoe, & Erlanger, 1983). In general, studies that used non-social stressors, such as solvable anagrams and mental arithmetic tasks, have not found an association between hostility as measured by the Hostility (HO) Scale (Cook & Medley, 1954) or the Buss-Durkee Hostility Inventory (BDHI) (Buss & Durkee, 1957) and physiological reactivity (Kamarck, Manuck, & Jennings, 1990; Sallis,

Johnson, Trevorrow, Kaplan, & Melbourne, 1987; Smith & Houston, 1987). Studies that have used anger provoking interpersonal stressors, on the other hand, have often found a positive relationship between hostility and cardiovascular reactivity. For example, Suarez and Williams (1989) found that compared to the effects of performing an anagram task alone, the effects of the anagram plus anger provoking interpersonal stress led to increased cardiovascular reactivity especially for high compared to low hostile participants. Other researchers also found that high hostile participants exhibited greater diastolic blood pressure reactivity during an anger provoking interpersonal stressor when compared to low hostile participants (Hardy & Smith, 1988). Other researchers, however, failed to find an association between hostility and increased cardiovascular reactivity even when an anger provoking interpersonal stressor was used (e.g. Biaggio, Supplee, & Curtis, 1981).

In summary, the evidence linking hostility with cardiovascular reactivity, a potential precursor in the disease process of cardiovascular disease also remains inconsistent

Possible Explanations for Inconsistent Results

In an attempt to clarify matters in regards to inconsistent results, meta-analyses and reviews investigating the link between hostility and cardiovascular disease more thoroughly, were conducted. While some reviews concluded that hostility plays an important risk factor in the pathogenesis of cardiovascular disease (Smith, 1992), others

found that only half of the studies assessing hostility and cardiovascular disease reported significant associations between these variables (Miller, Smith, Turner, Guijarro, & Hallet, 1996; Hemingway & Marmot, 1999).

Different explanations for the inconsistent results have been suggested. One explanation includes the Health Behavior Model. This model proposes that hostile individuals may be more prone to coronary disease processes via their poor life-style habits (Smith & Christensen, 1992). Research has demonstrated that high hostility is positively associated with reports of alcohol consumption, cigarette smoking, increased prevalence and amount of marijuana use, total caloric intake, excessive salt-intake and negatively associated with physical exercise and self care (e.g. adequate sleep, dental hygiene) (Leiker & Hailey, 1988; Raikkonen & Keltikanagas-Jarvinen, 1991; Scherwitz & Rugulies, 1992). If these poor life-style habits are the mechanism by which hostility contributes to illness, as has been proposed by the Health-Behavior Model, then controlling for these habits in studies, may diminish or eliminate effects between hostility and cardiovascular disease (Krantz & McCeney, 2002). This may be one reason why some studies found an association between hostility and cardiovascular disease and others did not.

Other researchers propose that perhaps not all high hostile populations are at higher risk for cardiovascular illness. For example, some researchers suggest that the association between hostility and cardiovascular disease process is found more frequently in younger compared to older adults (Dembroski, MacDougall, Costa, & Grandits, 1989; Lichtenstein, Pederson, Plomin, de Faire, & McClearn, 1989; Miller et al. 1996). Thus some inconsistent results may be due to the testing of different age groups across studies.

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Alternately, an association between hostility and cardiovascular disease for a given age group may have been diluted due to the testing of a wide range of age groups within one study.

The above explanations may certainly explain some of the inconsistent results linking hostility with cardiovascular disease. Most researchers, however, also agree that inconsistent findings may result from the following related issues: a) the use of different measures and definitions of the hostility-anger construct (e.g. McCranie, Watkins, Brandsma, & Sisson, 1986); b) the assumption that hostility is a multidimensional construct comprised of emotional, cognitive and behavioral components that are not entirely well understood (Siegman, Dembroski, & Ringel, 1987, Suls & Wan, 1993); and c) that as with research investigating the Type A Behavior Pattern (TABP) and cardiovascular disease, not all components of hostility may be "toxic" and thus associated with cardiovascular disease (Smith, 1994, 1992).

Definition and Conceptualization of Hostility

There exists no unanimous definition of hostility. In fact, research investigating hostility and disease has been plagued by the use of numerous definitions and instruments to assess the concept. To complicate matters even further, the constructs of anger, aggression and hostility are often used interchangeably (Smith, 1992). To help distinguish between these multidimensional constructs, it has been useful to separate them into three parts: cognitive, affective and behavioral.

Anger is usually the response to a perceived provocation (threat) or mistreatment. Anger has been conceptualized as both, an emotional state and an enduring trait

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(Johnson, 1990). Aggression, on the other hand, refers to overt behavior. Aggression is usually defined as attacking, destructive or hurtful actions (Barefoot, 1991). In regards to hostility, the distinctions between cognitions, affect and behavior have not been clear or have not been made. For example, hostility has been defined as the "tendency to wish to inflict harm on others or the tendency to feel anger towards others" (Chaplin, 1985; Smith, 1992); or more generally "as a set of negative beliefs, appraisals and attitudes towards others" (Barefoot, 1991). Dembroski and Costa (1987) describe hostility or the potential for hostility as a stable tendency to "experience varying degrees and combinations of anger, irritability, resentment, and related negative effects in response to everyday events that are likely to arouse them in individuals who are prone to react in such ways, and/or to react with expressions of antagonism, disagreeableness, rudeness, surliness, criticalness, and uncooperativeness".

When researchers separate hostility into the three components of cognition, affect and behavior, hostility is conceptualized as follows: The cognitive component of hostility is comprised of negative beliefs about others, such as mistrust and cynicism (also referred to as cynical hostility). These negative beliefs in turn can produce biases in the attributions that may make it more likely that the behavior and action of others will be interpreted as antagonistic, hostile or threatening (Smith & Christensen, 1992). Such beliefs can also justify a hostile person's own antagonistic behavior towards others. The affective component of hostility includes several related emotional states predominantly in the anger domain, such as irritation, annoyance, anger, resentment, contempt and disgust (Smith & Christensen, 1992). The affective component can be assessed with regard to frequency and intensity (Johnson, 1990). The behavioral component is

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comprised of an action intending to harm others, either verbally or physically. Thus aggression, verbally or physically, or other forms of antagonistic behavior are aspects of the behavior component of hostility (Barefoot, 1991; Smith & Christensen, 1992). Even though some definitions or conceptualizations of hostility, try to make distinctions between the cognitive, affective and behavioral components of hostility, all three components covary. Separating them on an operational level is difficult (Matthews, 1988). In addition, it has been suggested that it is not essential for all of the three components to always occur together (Barefoot, 1991). Again, as with anger, hostility has been conceptualized as both a state and an enduring trait. In the domain of health psychology, where research tries to find a link between psychological variables and health outcome, hostility is in general conceptualized as a trait (Suls & Wan, 1993).

The use of different definitions or conceptualizations of hostility remains a problem in the research investigating hostility and cardiovascular disease. A related methodological issue pertaining to this research has been the use of varying instruments assessing the concept of hostility. There are at least 26 instruments measuring hostility (Matthews, Jamison, & Cottington, 1985). With such a large number of instruments, it is possible that some may be tapping into different or related aspects of hostility or even measuring different constructs altogether. For example, hostility as assessed via the Cook-Medley (Ho) scale has been positively correlated with measures such as Type A, anxiety, depression, anger and a mistrustful/cynical outlook (Smith & Frohm, 1985; Smith, Sanders, & Alexander, 1990; Swan, Carmelli, & Rosenman, 1989). Other measures, such as the Buss-Durkee Hostility Inventory (BDHI, Buss & Durkee, 1957) have been associated with constructs of hostility-anger, such as suspicion, anger,

resentment (an affective component), and a tendency to express hostility through aggressive behavior (Bushman, Cooper, & Lemke, 1991; Buss & Durkee, 1957).

In addition, there is also evidence across hostility measures, that hostility correlates with depressive symptoms or depression and that hostile and angry emotions and depressive emotions may not be independent of each other (Biaggio et al. 1981; Felsten, 1995). Furthermore, in a study examining the reliability and validity of several measures of hostility, anger and depression, Moreno, Fuhriman, & Selby (1993) found that these measures were "limited in their ability to discriminate between anger/hostility and depression".

In summary, the conceptualizations, definitions and measures of hostility vary from study to study (Smith, 1994). This variation may be one main reason why there have been inconsistent findings linking hostility with cardiovascular disease in general and with coronary heart disease (CHD) in particular. More attention needs to be given to the problems and controversies surrounding the definition and measurement of hostility. While this is widely acknowledged, the quest for the "toxic", hostility-anger component of hostility continues without addressing or testing this issue in an adequate manner.

Perhaps, the common denominator in all definitions and conceptualizations is that individual differences in hostility are generally seen as involving specific ways of thinking about and also behaving toward others (Smith & Christensen, 1992). That is, it is generally hypothesized that hostile individuals view others as untrustworthy and sources of provocation. In this regard, it has been suggested, that hostile individuals may perceive social interactions in a negative light and thus may view and think about others as "hostile". Such cognitive style in turn is more likely to elicit hostile and angry

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emotions in the hostile individual (Allred & Smith, 1991; Smith & Christensen, 1992). There is indeed evidence of such a hostile cognitive style. For example, high hostile individuals have been found to report greater frequency of angry and suspicious thoughts during daily activities. Furthermore, the behavior of others, was interpreted by hostile individuals as deliberately provocative (Pope, Smith, & Rhodewalt, 1990; Smith et al. 1990).

Thus, there is evidence that hostile individuals experience cognitions and emotions in the hostility-anger domain. Yet, as mentioned above, global measures of hostility have also been associated with constructs and emotions outside the hostility-anger domain. Thus, it is quite possible that hostility instruments tap into negative emotions other than those in the hostility-anger domain. Alternately, hostile individuals may not only experience anger but also negative emotions outside the hostility-anger category. Yet, what type of thoughts and emotions are exactly experienced by high versus low hostile individuals has rarely been assessed in a direct manner. That is, association between hostility and emotions have mainly been assessed using self-report measures such as the State-Trait Anger Scale (Spielberger et al.1991), Likert Scales asking subjects to indicate the extent to which they experienced a specified emotion (e.g. angry, hostile, sad) (e.g. Feldman et al. 1999), or list of adjectives (e.g. Allred & Smith, 1991) that may inadvertently bias research outcome. Assessing whether high compared to low hostile individuals' thoughts or ruminations are indeed mainly associated with emotions in the anger-hostility domain or whether hostile individuals also experience other negative emotions such as, for example, sadness, is also of importance given the more recent

studies that have linked depressive symptoms and depression with cardiovascular disease

(Barefoot & Schroll, 1996; Frasure-Smith, Lespérance, & Talajic, 1993).

<u>Cardiovascular Disease, Depressive Symptoms and Depression</u>

The search for psychological risk factors in the etiology of cardiovascular disease

in general and coronary heart disease (CHD) in particular led researchers also to

investigate negative emotions other than those in the anger-hostility domain. In 1987,

Booth-Kewley and Friedman concluded in their meta-analysis that depression and

anxiety were independent predictors of CHD. They furthermore suggested that the

"coronary-prone" personality may be one that describes a person "with one or more

negative emotions". Other researchers, however, soon criticized their results on

methodological grounds (Matthews, 1988). That is, because Booth-Kewley and

Friedman's (1987) research was based on less verifiable CHD endpoints, such as chest

pain, it is quite possible that their results were due to symptom reporting often associated

with depression, anxiety or neuroticism (also called negative affectivity), and not actually

a true reflection of CHD (Smith & Ruiz, 2002; Watson & Clark, 1984)).

More recent methodologically sound studies, however, provide convincing

evidence that symptoms of depression, anxiety and individual differences in the

propensity to experience negative emotion are predictors of coronary heart disease

(Feldman et al. 1999). Most of these studies have focused on depressive symptoms or a

diagnosis of depression in a) patients already afflicted with cardiovascular disease and b)

initially healthy individuals. For example, in one prospective study, patients had already

experienced their first myocardial infarction (MI) (Frasure-Smith, Lespérance, & Talajic,

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1995). These patients were given a structured psychiatric evaluation within a two-week delay following their MI. They were then followed for 18 months. The researchers found that independent of other risk factors, such as initial health status, depression was associated with a 3.5 fold mortality risk (Frasure-Smith et al. 1995).

Other studies also found that depression contributed to cardiovascular disease process and mortality (Ahern et al. 1990; Barefoot et al. 1996; Carney, Rich, Freedland, & Saini, 1988). In regards to prospective studies investigating initially healthy individuals, depression, hopelessness and anxiety have also been found to predict future coronary illness independent of other health-behavior risk factors, such as smoking and hypertension (Barefoot & Schroll, 1996; Eaker, Pinsky, & Catelli, 1992; Everson et al. 1996; Ford et al. 1998).

Most importantly, it has been suggested that depressive affect may be sufficient to increase risk for cardiovascular disease and mortality (Anda et al. 1993; Pratt et al. 1996). For example, data from 2832 initially healthy adults who participated in the National Health Examination Follow-Up Study, was analyzed to assess the relationship between depressed affect, hopelessness and coronary heart disease over a mean follow-up period of about 12 years. After controlling for traditional risk factors such as, smoking, alcohol consumption, physical inactivity, cholesterol, systolic blood pressure, age, sex , body mass index, and race, Anda et al. (1993) found that depressed affect was an independent risk factor of fatal and nonfatal ischemic heart disease. Furthermore, moderate and severe hopelessness (depressive symptoms), were also found to be independent risk factors. Interestingly, there was an increase in fatal risk consistent with increases in depressive affect (Anda et al. 1993; Everson et al. 1996).

Similar results were obtained by Pratt et al. (1996). These researchers examined prospectively the association between a history of a major depressive episode and dysphoria and the risk of myocardial infarction (MI). The study followed individuals who had taken part in the Epidemiologic Catchment Area Study in Baltimore in 1981, a survey of psychiatric illness in the general population. Both, a history of dysphoria, defined as two weeks of depressed, sad mood; and a history of a major depressive episode, were associated with self-reported non-fatal myocardial infarction at follow-up 13 years later. Specifically, compared to individuals with no history of dysphoria, the odds ratio for myocardial infarction associated with a history of dysphoria was 2.07. Furthermore, a history of a major depressive episode increased the risk of myocardial infarction over four times compared to those individuals with no history of a major depressive episode and no history of dysphoria. The increased risks were independent of traditional coronary risk factors such as smoking and hypertension.

Taken together, a history of depressive symptoms, including depressed, sad affect, appears to be sufficient to incur risk for coronary heart disease. Furthermore, risk for heart disease appears to increase in a linear fashion with increase in depressive symptomatology or severity (Anda et al. 1993; Pratt et al. 1996).

Rumination to Sadness

Rumination to sadness is one process and trait that has been associated with a person's tendency to become depressed and to stay depressed for an extended period of time (Nolen-Hoeksema, 1991). Nolen-Hoeksema's Response Styles Theory of depression (1991) suggests that how people typically respond to their sadness and depressed mood

may influence the course of this mood. She proposed that individuals who engage in a ruminative style when feeling sad are more likely to exacerbate this mood and are more likely to become depressed, worsen their symptoms or prolong their depression compared to individuals who use distraction when feeing sad or depressed.

Rumination as conceptualized by Nolen-Hoeksema (1991) is the tendency to engage in self-focused thoughts and behaviors that center on an individual's "symptoms of distress and on all the possible causes and consequences of these symptoms". This ruminative style differs from other theories of self-focused attention in depression (Greenberg & Pyszczynski, 1986; Pyszczynski, Holt & Greenberg, 1987; Pyszczynski, & Greenberg), in that rumination is seen as a particular type of self-focus involving focusing on the existing sad, depressed mood and not on and about failures and stressful events (Nolen-Hoeksema, Parker, & Larson, 1994). Examples of rumination include: Focusing on one's depressed mood to better understand the reason for this mood; thinking about how sad one is feeling and isolating oneself to think about the feeling.

Controlled laboratory studies indeed have demonstrated that a ruminative style is associated with increased or maintained sad, depressed mood (Lyubomirsky & Nolen-Hoeksema, 1993; Morrow & Nolen-Hoeksema, 1990, Nolen-Hoeksema & Morrow, 1993)). Numerous field studies also have demonstrated, that individuals who tend to engage in such a ruminative style, when feeling distressed are more likely to experience prolonged symptoms of depression and major depressive episodes, compared to those who do not ruminate when feeling distressed (Nolen-Hoeksema & Morrow, 1991; Nolen-Hoeksema, Morrow, & Fredrickson; 1993; Nolen-Hoeksema et al. 1994). For example, one longitudinal study examined associations between rumination, pessimism, and

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depression in 253 bereaved individuals. The individuals were assessed at one month and at six months following the loss of a loved one. To assess rumination on sadness, they were given Nolen-Hoeksema's and Morrow's (1991) Ruminative Responses Scale (RSCALE). The researchers found that individuals who engaged in a ruminative style at one month following their loss were more pessimistic about the future and exhibited higher levels of depressed mood six months after their loss when compared to those individuals with a less ruminative style. Individuals with a ruminative style were also more likely to be depressed at 6 months, even when initially depressed mood and symptoms were controlled for (Nolen-Hoeksema et al. 1994).

In regards to risk for cardiovascular disease in general and heart disease in particular, it is possible that the tendency to ruminate when feeling sad may not only confer risk for depression but may also be an independent risk factor for the development of cardiovascular disease, given the research linking a history of sad, depressed affect with heart disease (Anda et al. 1993; Pratt et al. 1996).

Thus, it seems of interest to investigate whether high compared to low hostile individuals ruminate significantly more to sadness.

In summary, initial studies investigating the relationship between hostility and cardiovascular disease in general and coronary heart disease in particular found positive associations between these variables (MacDougall, Dembroski, Dimsdale, & Hackett, 1985; Williams et al. 1980). Soon after, however, there were a growing number of studies that failed to find an association between hostility and cardiovascular disease (Biaggio et al. 1981; Hearn et al. 1989). Methodological and definitional confounds were in part held responsible for the inconsistent results between hostility and cardiovascular disease

(Matthews et al.1985). Some researchers furthermore hypothesized that hostility is a multidimensional construct and not entirely well understood (Siegman et al. 1987; Suls & Wan, 1993). The "toxic and coronary prone" component(s) of hostility remain elusive and a matter of debate (Smith, 1992, 1994).

Many researchers initially found that high hostile individuals experience anger more frequently and intensively (Williams et al. 1985). Such reaction in turn is associated with heightened cardiovascular and neuroendocrine responses, proposed precursors in the disease process of cardiovascular disease (Engebretson & Matthews, 1992; Hardy & Smith, 1988). Other researchers, however, found that hostility is not only associated with anger but also with depression and anxiety (Booth-Kewley & Friedman, 1987; Feldman et al. 1999). It was thus suggested that the "coronary-prone personality" describes an individual "with one or more negative emotions"(Booth-Kewley & Friedman, 1987). Thus, it is of importance, to find out what type of cognitions and underlying emotions are exactly experienced by hostile individuals. Furthermore, more recent studies have provided methodologically convincing evidence that a diagnosis of depression contributes to cardiovascular disease process and mortality, independent of other traditional risk factors, such as smoking (Frasure-Smith et al. 1995). Most importantly, some researchers found that depressed, sad affect is sufficient to increase the risk for cardiovascular disease and mortality (Anda et al. 1993; Pratt et al. 1996).

One process that has been associated with a person's tendency to become depressed and to stay depressed is rumination to sadness. This Response Styles Theory of Depression suggests that people who engage in a ruminative style when feeling sad are more likely to become or stay depressed (Lyubormirsky & Nolen-Hoeksema, 1993;

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Morrow & Nolen-Hoeksema, 1990; Noelen Hoeksema, 1991, 1995). If hostility is associated with negative emotions such as sadness or depressed affect, then rumination to sadness may be an initial predisposition to prolong such feelings or even lead to depression. Thus it is of interest to investigate whether high hostile individuals have a tendency to ruminate more to sadness than their low hostile counterparts.

Goals and Hypotheses

The present study had the following three goals:

First, it assessed the emotional content of thoughts experienced by high versus low hostile participants following an anger provoking interpersonal stressor in a healthy population of young men. In order to do so, participants were pre-selected on whether they obtained high or low scores on the Buss-Durkee Hostility Inventory (Buss & Durkee, 1957).

To evaluate the emotional content of thoughts, participants were asked to write down all the thoughts that they were having over the last few minutes 1) prior to and 2) following an anger provoking interpersonal stressor. This type of measurement was chosen because it provides in-depth information in regards to a number of cognitions, such as those related to anger, worry and depressive ruminations (Clark 2001). To classify the content of a participant's thoughts, the emotions list of Shaver, Schwartz, Kirson & O'Connor (1987) was used. Based on a prototype approach to emotion knowledge, Shaver et al. (1987) found that all emotion words can be classified into the

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following six basic emotion categories: anger, sadness, fear, joy, love, surprise. Furthermore, they suggested that words pertaining to a specific emotion category may differ in intensity (e.g. sadness vs grief; irritation vs anger). Thus, the emotional content and the intensity of the participants' written thoughts were coded accordingly.

To measure more precisely the emotional content of all participants' thoughts, all emotions were also classified into those that were directly expressed (e.g. "I feel anger") and those that could be inferred. Emotions were coded as inferred if the coder could infer the underlying emotion (e.g. "I am beginning not to care" = sadness). Again, Shaver et al.'s (1987) research on emotion knowledge was used as a guideline. More precisely, their categories of emotion features: behaviors depicting specific emotions, were used as a guideline (e.g. "loud voice, yelling screaming = anger; giving up = sadness; nervous talk = fear). Furthermore, emotions were categorized into the broader categories of positive (love + joy + surprise) and negative (anger + sadness + fear) expressed and inferred valences.

Because research has linked hostility with a tendency to experience various negative emotions, such as anger, depression and anxiety (Biaggio et al. 1981; Feldman et al. 1999; Smith & Frohm, 1985), it was hypothesized that:

1) High compared to low hostile participants will experience significantly more thoughts and underlying emotions of negative valence (expressed and inferred) following an anger-provoking interpersonal stressor.

2) High compared to low hostile individuals will experience significantly more intensity for negative valence cognitions and underlying emotions (expressed and inferred) following an anger-provoking interpersonal stressor.

The predominant opinion in hostility research is that hostile individuals experience emotions primarily in the anger-hostility category. Abundant research in this area indeed suggests that hostile individuals experience predominantly such emotions; especially following an anger provoking interpersonal stressor (Engebretson & Matthews, 1992; Hardy & Smith, 1988; Williams et al. 1985). Furthermore, it has been suggested that it is the high hostile's propensity to experience more frequent and intense anger that has been associated with increased cardiovascular reactivity. And heightened, frequent cardiovascular reactivity may lead to cardiovascular disease (Engebretson & Matthews, 1992). Thus, it was hypothesized that:

3) High compared to low hostile participants will experience significantly more emotions falling in the anger category (expressed and inferred) especially following an anger provoking interpersonal stressor.

4) High compared to low hostile participants will experience significantly greater intensity for emotions falling in the anger category (expressed and inferred) especially following an anger-provoking interpersonal stressor.

The second goal of this study was to assess whether high hostile participants are also more prone to ruminate to sadness (as assessed via the RSCALE; Nolen-Hoeksema & Morrow, 1991). Assessing rumination to sadness, a trait that may predispose individuals to experience heightened depressed mood or may lead to or prolong depression (Nolen-Hoeksema, 1991, 1995), is of especial importance given the more recent findings that have linked depressive affect and sadness with risk for coronary heart disease (CHD) (Anda et al. 1993; Barefoot & Schroll, 1996; Pratt et al. 1996). There is also research evidence that has found that hostility correlates with sadness and depression (Biaggio et al. 1981; Felsten, 1996; Smith & Frohm, 1985). Thus, emotions in the anger-hostile domain and emotions related to depression, such as sadness may co-exist in a hostile individual (Biaggio et al. 1981; Felsten, 1995). Therefore it was hypothesized that:

5) High compared to low hostile participants will ruminate significantly more to sadness as assessed via the Ruminative Response Scale (RSCALE, Nolen-Hoeksema & Morrow, 1991).

The third goal of this study was to investigate the effects and interactions of hostility, an anger-provoking interpersonal stressor (harassment) and rumination to sadness (as assessed via the RSCALE, Nolen-Hoeksema & Morrow, 1991) on cardiovascular reactivity. Prior research has linked hostility with increased cardiovascular reactivity following an anger provoking interpersonal stressor (Hardy & Smith, 1988; Suarez & Williams, 1989). Furthermore, other research has suggested that a history of

depressed affect and sadness leads to increased risk for coronary heart disease (Anda et al. 1993; Pratt et al. 1996). For example, an increased sympathetic nervous system mediated cardiovascular response has been suggested to be involved in the pathogenesis of cardiovascular disease in depressed individuals (Dimsdale, 1988; Sinha, Lovolla, & Parsons, 1992; Williams & Williams, 2001). It was thus hypothesized that:

6) High compared to low hostile participants will experience significantly greater cardiovascular reactivity following the anger provoking interpersonal stressor.

7) High compared to low ruminators to sadness (as assessed via RSCALE, Nolen-Hoeksema & Morrow, 1991) will experience significantly more cardiovascular reactivity following the anger-provoking interpersonal stressor.

This is the first laboratory study investigating and exploring the emotional content of thoughts in high versus how hostile young men prior to and following an anger provoking interpersonal stressor. Given the exploratory nature of this study, results should be viewed and evaluated within this context.

Method

<u>Participants</u>

A total of 100 healthy, normotensive male students between 18 and 30 years of age were recruited from the student population of Concordia University and McGill University in the following way: Each potential participant had to complete two screening questionnaires: 1) a Health Questionnaire (see Appendix A) and 2) the Buss-Durkee Hostility Inventory (BDHI; Buss & Durkee, 1957; see Appendix B). Based on self-reported information given in the Health Questionnaire, participants were excluded from participating in the research, if they had any serious physical or psychological health problems, including high blood pressure, using medication on a regular basis that could influence blood pressure, a diagnosis of depression or using anti-depressive-medication.

Participants were chosen based on their scores on the Buss-Durkee Hostility Inventory (BDHI). Participants who obtained a high total score of 36 and above, were classified as high hostiles (HIGH HO; N = 49); and those who scored a total score of 26 or below, were classified as low hostiles (LOW HO; N = 51). Two participants were excluded from the final analyses (Total N = 98) due to equipment failure.

All participants had to complete the Ruminative Response Scale (RSCALE, see Appendix C) of the Response Styles Questionnaire (RSQ, Nolen-Hoeksema & Morrow, 1991). Based on a median score, those participants who scored 44 or higher, were defined as High Ruminators (HIGH RUM; N = 49) and those who scored below 44, were defined as Low Ruminators (LOW RUM; N = 49). The mean rumination score for the high rumination (HIGH RUM) group was 53.92 (Standard Error (Std. E.) = 1.09), with a

median value of 53 and scores ranging from 44 to 77. The mean rumination score for the

low rumination (LOW HO) group was 35.31 (Std. E. = 0.72), with a median value of 37

and scores ranging from 26 to 43.

High and low hostile participants were randomly assigned to either a harassed

(anger-provoking interpersonal stressor) (HAR; N = 44) or non-harassed (no anger-

provoking interpersonal stressor) (NON-HAR; N = 54) condition. The varying subject

total values (N) for the analyses are either due to specific equipment failure or missing

data. Participants did not differ significantly in age, weight and height as a function of

hostility group, harassment and rumination to sadness condition (see Appendix D). All

participants were paid $ 50.00 for participating in the study. Women were not included in

the present study because of potential gender differences in cardiovascular reactivity

(Stoney, Davis, & Matthews, 1987) and the potential confounding variable of menstrual

cycle on cardiovascular reactivity and mood (Hastrup & Light, 1984; Collins, Eneroth, &

Landgren, 1985).

Physiological Measures and Apparatus

Measures of cardiovascular reactivity in this study consisted of systolic and

diastolic blood pressure, heart rate, cardiac output, stroke volume, and total peripheral

resistance. These measures are frequent reported measures of cardiovascular reactivity

(Sherwood & Turner, 1992).

Measurements of systolic (SBP) and diastolic blood pressure (DBP) (in mm Hg)

were obtained at one minute intervals using an IBS Automated Blood Pressure and Pulse

Rate Monitor SD-700 A (Waltham, Mass., USA). The blood pressure cuff was placed on

the participant's left thigh. Blood pressure values were corrected for the distance between the cuff and the heart level according to the manufacturer's recommendations. Heart rate (HR: in bpm), cardiac output (CO: in l/min), stroke volume (SV: in ml) and total peripheral resistance (TPR: in dyne-sec.cm-5) values were obtained non-invasively using the Minnesota Impedance Cardiograph (Model 304 B, Instrumentation for Medicine, Greenwich, Conn, USA), the Cardiac Output Program (C.O.P., Bio-Impedance Technology, Chapel Hill, North Carolina, USA) and an IBM compatible 486 computer. Cardiac output (CO) and total peripheral resistance (TPR) values were automatically calculated using the C.O.P program created by BIO-Impedance Technology. (For further information regarding impedance methodology and the Minnesota Impedance Cardiograph, see Sherwood et al. 1990). A tetrapolar band-electrode configuration was employed. The inner two recording electrode bands were placed around the base of the participant's neck and around the thorax over the tip of the xiphoid process. The outer two electrode-bands were placed around the neck and thorax at least 3 cm apart from each of the inner electrode bands.

The EKG signal was recorded independently using 3 spot electrodes. Two electrodes were placed on opposite sides of the rib cage at approximately the level of the seventh rib. The ground electrode was placed on the right hipbone. The EKG signal was filtered through a Coulbourne Instrument bypass biofilter (Lehigh Valley, Penn., USA) and then transferred to the Minnesota Impedance Cardiography. Recordings of cardiac measures were obtained during the first 55 seconds of each minute. The values for HR, CO, SV and TPR were obtained from these recordings by the C.O.P. program and averaged across 1-minute periods.

Psychological Measures

Buss-Durkee-Hostility Inventory (BDHI)

To assess trait-hostility each participant completed the Buss-Durkee Hostility

Inventory (BDHI, Buss & Durkee, 1957). The BDHI consists of 75 true-false items and

yields information on the individual's self-reported level of general hostility. Sample

items include: "I am irritated a great deal more than people are aware of", "When I look

back on what's happened to me, I can't help feeling mildly resentful"; "I can't help being

a little rude to people I don't like"; "I would rather concede a point than get into an

argument over it". The authors reported a test-retest reliability of 0.82 for the total score..

The Ruminative Responses Scale (RSCALE)

To assess rumination on sadness, each participant completed the 21-item

Ruminative Responses scale (RSCALE) of the Response Styles Questionnaire (RSQ;

Nolen-Hoeksema & Morrow, 1991). The RSCALE includes items that describe

responses to depressed mood focusing on oneself" (e.g. "I think why do I react this way),

focus on symptoms (e.g. "I think about how hard it is to concentrate") or focus on the

possible consequences and causes of one's mood (e.g. "I go away by myself and think

about why I feel this way"). The researchers reported an internal consistency of

Cronbach's alpha .89 for the RSCALE. Furthermore, the authors reported that their

subjects' responses to the RSCALE correlated significantly (r = .62) with their use of

ruminative responses to depressed mood in a 30-day diary study (Nolen-Hoeksema &

Morrow, 1991).

The Mathematical Subtraction Task Stressor

The mathematical subtraction task stressor (math-task) consisted of the Computerised Subtraction Version 1.21 computer program. This program consists of a series of mathematical subtraction equations with either correct or incorrect solutions (Turner et al. 1986) and is a widely employed stressor in studies investigating cardiovascular reactivity (Suarez & Williams, 1989).

During each three-minute trial, 180 three-second presentations of equations are presented on the computer monitor. The participant responds by pressing the right computer mouse button if he thinks the answer on the screen is correct, or by pressing down the left button if he thinks the answer on the screen is incorrect. If the participant's answer is correct, the computer emits a high pitched tone indicating that the participant has responded accurately. If the participant's answer is incorrect, the computer emits a low-pitched tone indicating that the participant has responded inaccurately. If the participant does not respond within the three seconds, no tone is emitted. The math-task is designed in such a way that each participant will attain a 50 to 60 percent correct response rate. Equations become more difficult or easier depending on the performance of each participant.

Procedure

Participants were asked to refrain from drinking coffee and from cigarette smoking for four hours prior to the experimental session.

At the beginning of the session, participants were told that they would engage in a computerised mathematical subtraction-task consisting of 3-three minute trials, then

ingest a potato-leek soup and then again engage in the mathematical task. They were told, that the purpose of this study was to investigate the influence of a nutritious meal and the ingestion of amino acids, on their math-task performance and their physiological responses. All participants were kept blind as to the real purpose of the study.

The participants were attached to the cardiovascular recording apparatus, by Researcher A (female). The participants then rested for 13 minutes. During the last three minutes of the rest period, baseline cardiovascular values were recorded. To assess the emotional content of thoughts, participants then were given Rumination-Cognition Task 1 which consisted of a sheet of blank paper with the following instruction: "Please write down all the thoughts that you are having over the last few minutes regardless of what they are about. Don't worry about spelling, punctuation, or grammar". These instructions were given verbally as well and participants were assured that their written thoughts would be kept strictly confidential and anonymous. To further enhance the participants' trust in confidentiality and to minimize any response bias, Researcher A showed each participant an envelope and told him that the written thoughts would be placed immediately in this envelope. Any questions in regards to the rumination-cognition task, such as, "what should I write down" were answered by simply rephrasing the instruction: "Just write down all the thoughts you were having, everything that came to your mind during the last few minutes. Don't worry about spelling and grammar". To obtain a truly naturalistic representation of thoughts and rumination, participants were not given a uniform time-limit, but were asked to inform Researcher A once the task was completed. Researcher A then left the room.

Following baseline recordings, participants were randomly assigned to either the anger provoking interpersonal stressor (harassment -HAR) or the non-harassment (NON-HAR – no anger provoking interpersonal stressor) condition. Subsequently, the math-task was explained. For participants in the harassment condition, a modification of the Suarez and Williams' (1989) anger provoking interpersonal stressor procedure was employed. That is, while Researcher A explained the math-task to the participant, a tape-recorded phone ring was played in the adjoining room. Researcher B (male) then entered the testing room to inform Researcher A that she had received a phone call. Researcher A replied to Researcher B: "Just a minute", completed the math-task instructions, excused herself and entered the adjoining room. In a voice loud enough for participants to overhear, Researcher A pretended to engage in a telephone conversation in which she was being called away from the experiment. Researcher A then asked Researcher B if he could take over the testing of the participant. Researcher B became angry with Researcher A and only grudgingly agreed to continue the testing for her. Researcher A then entered the testing room, explained to the participant that Researcher B would continue the testing and then left the room. Researcher B pretended to be angry while entering the testing room. In the non-harassment condition, Researcher B courteously agreed to take over for Researcher A and such entered the testing room (for a description of the complete harassment and non-harassment preparation scenarios, please see Appendix E). Participants then completed the nine-minute math-task consisting of three trials of three minutes each.

In the harassment condition the following procedure was used during the math-task: Researcher B delivered the following six anger-provoking statements at

predetermined times: "Did you understand the instructions?!"; "The right button is correct, the left button is incorrect!"; "Could you try harder this time?!"; "Can't you do better than this?!"; "It isn't that hard you know!"; "I can do better than that" (see Appendix F). All remarks by the participants were ignored unless the participant asked to end the experiment. In the non-harassment condition, researcher B was courteous throughout the math-task but also did not respond to any remarks given by the participant. Researchers were kept blind as to the participant's hostility score.

Following the math-task, participants completed the Rumination-Cognition Task 2 and were debriefed.

<u>Data Preparation and Analyses</u>

<u>Rumination-Cognition Task Coding</u>

The coding of the rumination-cognition tasks was based on research undertaken by J. L. Ducharme (1997). First, each rumination-cognition task was divided into thought units. A thought unit is in general comprised of a meaningful idea that can stand on its own. It typically consists of a subject-verb-object combination and is either a sentence or sentence fragment. (for the complete coding, see Rumination Task Coding Manual in Appendix G). Thought units served as the basis of analysis to determine the 1) total frequency and 2) percentage ratio intensity values for a) valence values (positive or negative emotion valence) and specific b) emotion categories (anger, sadness, fear, joy, love, surprise). Furthermore, a) valence values and b) emotion categories were also coded as to whether they were I) directly expressed or could be II) inferred. A frequency value was defined as the total amount of a given variable (i.e. valence positive expressed, anger

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inferred) for each rumination-cognition task (rumination-cognition task 1, rumination-cognition task 2). Because the content for each specific emotion or valence can vary as a function of intensity (i.e. anger category: irritation vs anger) (Shaver et al. 1987), it was also given an intensity rating from 1 (low) to 6 (high). A total intensity value was calculated for each of the valence and emotion categories. For statistical analyses, intensity was defined as the percentage ratio between the total intensity value of a given variable (i.e. valence negative expressed) for a given rumination-cognition task (i.e. rumination-cognition task 1) and the number of total thoughts units for that given rumination-cognition task (rumination-cognition task 1) multiplied by 100 (i.e. total intensity of valence negative expressed thought units for rumination-cognition task 1 / total frequency of thought units for rumination–cognition task 1 * 100)

Because of insufficient data for the variables of love and surprise, these variables were not included in the final analyses for the specific emotion categories but were included into all analyses pertaining to valence.

To establish interrater reliability, one hundred percent of the thought units and valence measures were coded by two independent coders. The interrater reliability for the thought units and valence measures was good (range from 61.3 % to 99.5 %). The specific emotion categories were coded one hundred percent by the primary coder, seventy-five percent of these measures were also coded by an independent coder. The interrater reliability for the emotion categories was also good (range from 79.6% to 100%) (see Appendix H).

Cardiovascular Measures and Choice of Analyses

The cardiovascular reactivity responses for all measures (systolic and diastolic blood pressure, heart rate, cardiac output, stroke volume, and total peripheral resistance) recorded during the experimental session were reduced in the following way: The values obtained during baseline were averaged to obtain a mean baseline value. Similarly, all values acquired during the math-task stressor were averaged to obtain a stressor value.

Multivariate Analyses of Variance (MANOVA) were chosen for data analyses because analyzing multivariate data with univariate tests can lead to importantly inflated error rates. MANOVA's may provide some protection against inflation of alpha (finding significant results by chance). As Stevens (1986) proposes, multivariate significance is required "before interpreting univariate F's" because "it provides an extra measure of protection against researchers interpreting effects which are likely to be spurious".

Rumination Task Coding Measures

Thought Units

To assess the main effects and interactions of hostility group and anger provoking interpersonal stress (harassment condition) on differences from thought unit 1 total values to thought unit 2 total values, a 2 (High vs Low Hostility – between) x 2 (Harassed vs Non-Harassed - between) x 2 (Time 1 vs Time 2 – within factor) repeated measures analysis (ANOVA) was conducted.

A significant within subjects main effect of time (F (1,93) = 22.74, p< .01) was found, indicating that all participants experienced a significant decrease in thought units (thoughts) from time 1 (Mean = 12.36; Std. E. = .73) to time 2 (Mean = 8.96; Std. E. = .81). Participants did not differ significantly in thought units as a function of hostility group and harassment condition.

Please refer to Appendix I for the means and standard errors of thought units from time 1 to time 2 as a function of hostility group and harassment condition. For the ANOVA summary table see Appendix J.

For all analyses, a critical level of .05 was selected as the criterion for statistical significance. Furthermore, for all pairwise comparisons, Bonferroni adjustments were made. Significant results and trends only are reported.

Valence-Frequency

To assess the main effects and interactions of hostility group and harassment condition on differences between time 1 and time 2 rumination-cognition tasks valence

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frequency values, a 2 (High vs Low Hostility – between) x 2 (Harassed vs Non-Harassed – between) x 2 (Time 1 vs Time 2 – within factor) multivariate analysis of variance (MANOVA) was conducted with the following outcome measures: Valence positive expressed (VPOEX), valence positive inferred (VPOIN), valence negative expressed (VNEEX) and valence negative inferred (VNEIN) thoughts.

An overall significant multivariate main effect for hostility (F (4,90) = 3.12, p< .05) was found. Univariate F-tests revealed a significant difference (F (1,93) = 7.76, p< .01) in negative inferred thoughts between high and low hostile participants. Specifically, high hostile participants experienced significantly more negative inferred thoughts (Mean = 1.33; Std. E. = .14) compared to low hostile subjects (Mean = .77; Std. E. = .14), irrespective of harassment and time conditions.

Please refer to Table 1 for the means and standard errors of all valence frequency values comparing time 1 and time 2 rumination-cognition tasks as a function of hostility group and harassment condition. For the Manova summary table see Appendix K

The results also indicated a significant multivariate main effect of time (F (4,90) = 10.86, p< .01) and a time by harassment interaction (F (4,90) = 4.28, p< .01). Univariate F-tests revealed a significant interaction for negative expressed thoughts (F (1,93) = 16.14, p< .01). Specifically, pairwise comparisons revealed that harassed participants experienced a significant increase in negative expressed thoughts following the anger provoking interpersonal stressor (from time 1 to time 2) (Mean difference = 1.09; Std. E. = .19; p< .01) while no such increase was found for non-harassed participants (Mean difference = .01; Std. E. = .17; p< .77).

In summary, our results did not support the hypothesis that high compared to low

hostile participants will experience significantly more emotions of negative valence

(expressed and inferred) following the anger provoking interpersonal stressor.

Interestingly, however, high compared to low hostile participants experienced

significantly more negative inferred emotions overall, irrespective of harassment and

time conditions. Furthermore, the anger provoking interpersonal stressor used in our

laboratory was successful in that it elicited a significant increase in negative expressed

emotions in all participants that were harassed, whether they were high or low hostile.

Table 1

Means and Standard Errors of Valence-Frequency Values at Time 1 compared to
Time 2 for High and Low Hostile Participants as a Function of Harassment
Condition (Harassed vs Non-Harassed).

	VPOEX1	VPOEX2	VPOIN1	VPOIN2
High Ho				
Har	.18 (.11)	.00 (.07)	.64 (.22)	.23 (.15)
Non-Har	.15 (.10)	.00 (.06)	.92 (.20)	.19 (.14)
Low				
Har	.29 (.12)	.01 (.07)	.71 (.22)	.33 (.16)
Non-Har	.14 (.10)	.14 (.06)	.75 (.19)	.50 (.14)

	VNEEX1	VNEEX2	VNEIN1	VNEIN2
High Ho				
Har	.23 (.15)	1.46 (.27)	.86 (.28)	2.05 (.28)
Non-Har	.50 (.14)	.42 (.25)	.92 (.26)	1.50 (.25)
Low				
Har	.19 (.16)	1.14 (.28)	.91 (.29)	1.05 (.28)
Non-Har	.36 (.14)	.54 (.24)	.36 (.25)	.75 (.24)

<u>Valence Intensity</u>

To assess the main effects and interactions of hostility group and harassment condition on differences between time 1 and time 2 rumination-cognition tasks valence intensity percentage-ratio values, a 2 (High vs Low Hostility – between) x 2 (Harassed vs Non-Harassed – between) x 2 (Time 1 vs Time 2 – within factor) multivariate analysis of variance (MANOVA) was conducted with the following outcome measures: Intensity valence positive expressed (IPOEX), intensity valence positive inferred (IPOIN), intensity valence negative expressed (INEEX) and intensity valence negative inferred (INEIN) thoughts.

Please refer to Table 2 for the means and standard errors of all valence intensity percentage-ratio values comparing time 1 to time 2 rumination-cognition tasks as a function of hostility group and harassment condition. For the MANOVA summary table see Appendix L.

Overall significant multivariate results included a main effect of harassment condition (F (4,90) = 2.53, p< .05), a main effect of time (F (4,90) = 12.23, p< .01) and a time by harassment condition interaction (F (4,90) = 3.60, p< .01). Univarite F-tests revealed a significant interaction for the intensity of negative expressed thoughts (F (1,93) = 12.51, p< .01). Specifically, pairwise comparision revealed that harassed participants increased their intensity of negative expressed thoughts following the anger provoking interpersonal stressor (from time 1 to time 2) (Mean difference = 54.15; Std. E. = 9.83; p < .01), whereas no such effect was found for non-harassed participants (Mean difference = 7.55; Std. E. = 8.77; p< .39).

In summary, our results did not support the hypothesis that high compared to low

hostile participants will experience significantly more intensity for negative valence

emotions (expressed and inferred) following an anger provoking interpersonal stressor.

The anger provoking interpersonal stressor used in our laboratory, however, was

successful in that it elicited a significant increase in the intensity of negative expressed

emotions in all participants that were harassed, whether they were high or low hostile.

Table 2

Means and Standard Errors of Valence-Intensity Percentage Ratio
at Time 1 compared to Time 2 for High and Low Hostile Participants
as a Function of Harassment Condition (Harassed vs Non-Harassed).

	IPOEX1	IPOEX2	IPOIN1	IPOIN2
High Ho				
Har	2.52 (2.32)	0.83 (1.23)	12.22 (6.42)	3.53 (3.89)
Non-Har	2.58 (2.13)	0.62 (1.13)	19.81 (5.90)	3.12 (3.58)
Low				
Har	7.32 (2.38)	1.72 (1.25)	25.94 (6.57)	12.28 (3.99)
Non-Har	1.78 (2.06)	2.21 (1.09)	17.44 (5.69)	8.33 (3.45)

	INEEX1	INEEX2	INEIN1	INEIN2
High Ho				
Har	8.04 (5.33)	66.46 (14.59)	27.86 (6.12)	66.71 (14.10)
Non-Har	15.45 (4.90)	23.38 (13.42)	20.37 (5.63)	47.84 (12.97)
Low				
Har	6.44 (5.45)	56.29 (14.93)	24.42 (6.26)	53.35 (14.43)
Non-Har	7.73 (4.72)	14.90 (12.93)	12.27 (5.42)	33.79 (12.49)

Emotion-Frequency

To assess the main effects and interactions of hostility group and harassment

condition on differences between time 1 and time 2 rumination-cognition tasks emotion

frequency values, a 2 (High vs Low Hostility - between) x 2 (Harassed vs Non-Harassed

– between) x 2 (Time 1 vs Time 2 – within factor) multivariate analysis of variance

(MANOVA) was conducted with the following outcome measures: Anger expressed

(ANGEX), anger inferred (ANGIN), sad expressed (SADEX), sad inferred (SADIN), fear

expressed (FEREX), fear inferred (FERIN), joy expressed (JOYEX) and joy inferred

(JOYIN) thought units.

An overall multivariate trend for hostility (F (8,86) = 1.75, $p< .10$) was found.

Univariate F-tests revealed that high and low hostile participants differed in sad inferred

thoughts (F (1,93) = 4.67, $p< .05$). Specifically, high hostile participants experienced

more sad inferred thoughts (Mean = .36, Std. E. = .07) compared to low hostile

participants (Mean = .16, Std. E. = .07), irrespective of harassment and time conditions.

Please refer to Table 3 for of the means and standard errors of all emotion

frequency values comparing time 1 to time 2 rumination cognition tasks as a function of

hostility group and harassment condition. For the MANOVA summary table, see

Appendix M.

Furthermore, results indicated a significant multivariate main effect of time (F

(8,86) = 9.54, $p< .01$), and a significant time by harassment interaction (F (8,86) = 3.22,

$p< .01$). Univariate F-tests revealed significant interactions for anger expressed (F (1,93)

= 8.67, $p < .01$) and fear expressed (F (1,93) = 9.93, $p< .01$) thoughts and a trend for

anger inferred (F (1, 93) = 3.29, $p< .10$) and joy expressed thoughts (F (1,93) = 3.83, $p<$

.10). Pairwise comparisons revealed that for harassed participants only, anger expressed (Mean difference = .79; Std. E. = .15; $p < .01$) and fear expressed (Mean difference = .18; Std. E. = .07; $p < .05$) thoughts increased significantly following the anger provoking interpersonal stressor (from time 1 to time 2), while no such increase was found for non-harassed participants (ANGEX: Mean difference = .22; Std. E. = .13; $p < .10$; FEREX: Mean difference = -.13; Std. E. = .07; $p < .10$). Furthermore, there was a greater increase in anger inferred thoughts for harassed participants following the anger provoking interpersonal stressor (from time 1 to time 2) (Mean difference = .51; Std. E. = .14; $p < .01$) compared to non-harassed participants (Mean difference = .17; Std. E. = .12; $p < .18$), while joy expressed thoughts decreased more for harassed (Mean difference = .23; Std. E. = .08; $p < .01$) than for non-harassed participants (Mean difference = .00; Std. E. = .07; $p < .78$).

In summary, our results did not support the hypothesis that high compared to low hostile participants will experience significantly more emotions falling in the anger category (expressed and inferred) following an anger provoking interpersonal stressor. Interestingly, however, high compared to low hostile participants experienced more sad inferred thoughts overall, irrespective of harassment and time conditions. Furthermore, the anger provoking interpersonal stressor used in our laboratory was successful in that it elicited a significant increase in anger expressed and an increase (trend) in anger inferred thoughts in all participants that were harassed whether they were high or low hostile. Interestingly, the anger provoking interpersonal stressor did not only elicit emotions in the category of anger but also elicited a significant increase in fear expressed thoughts in all subjects that were harassed, whether they were high or low hostile. Furthermore the

anger provoking interpersonal stressor elicited a decrease (trend) in joy expressed

thoughts in all subjects that were harassed, whether they were high or low hostile.

<u>Emotion Intensity</u>

To assess the main effects and interactions of hostility group and harassment

condition on differences between time 1 and time 2 rumination-cognition task emotion

intensity percentage-ratio values, a 2 (High Hostility vs Low Hostility – between) x 2

(Harassed vs Non-Harassed – between) x 2 (Time 1 vs Time 2 – within factor)

multivariate analysis of variance (MANOVA) was conducted with the following outcome

measures: Intensity anger expressed (IANGEX), intensity anger inferred (IANGIN),

intensity sad expressed (ISADEX), intensity sad inferred (ISADIN), intensity fear

expressed (IFEREX), intensity fear inferred (IFERIN), intensity joy expressed (IJOYEX)

and intensity joy inferred (IJOYIN).

Overall significant multivariate results included a main effect of harassment

condition (F (8,86) = 4.10, p< .01), a main effect of time (F (8,86) = 7.97, p< .01) and a

time by harassment condition interaction (F (8,86) = 3.39, p< .01). Univarite F-tests

revealed significant interactions for the intensity of anger expressed (F (1,93) = 8.67, p<

.01), intensity of anger inferred (F (1,93) = 9.19, p< .01) and intensity of fear expressed

thoughts (F (1,93) = 10.62, p< .01).

Table 3

Means and Standard Errors of Emotion-Frequency Values at Time 1 compared to Time 2
for High and Low Hostile Participants as a Function of Harassment Condition.

	ANGEX1	ANGEX2	ANGIN1	ANGIN2
High Ho				
Har	.01 (.70)	.91 (.21)	.18 (.11)	.96 (.17)
Non-Har	.15 (.07)	.27 (.19)	.15 (.10)	.35 (.15)
Low				
Har	.00 (.07)	.81 (.21)	.33 (.11)	.57 (.17)
Non-Har	.00 (.06)	.32 (.18)	.11 (.10)	.25 (.15)

	SADEX1	SADEX2	SADIN1	SADIN2
High Ho				
Har	.00 (.06)	.14 (.08)	.14 (.10)	.59 (.15)
Non-Har	.12 (.06)	.12 (.08)	.23 (.10)	.46 (.14)
Low				
Har	.00 (.07)	.14 (.09)	.14 (.11)	.19 (.16)
Non-Har	.11 (.06)	.11 (.08)	.01 (.04)	.21 (.14)

	FEREX1	FEREX2	FERIN1	FERIN2
High Ho				
Har	.01 (.09)	.41 (.08)	.50 (.20)	.55 (.14)
Non-Har	.23 (.08)	.12 (.08)	.46 (.19)	.62 (.13)
Low				
Har	.14 (.09)	.19 (.08)	.43 (.21)	.33 (.15)
Non-Har	.25 (.08)	.11 (.07)	.14 (.18)	.29 (.13)

	JOYEX1	JOYEX2	JOYIN1	JOYIN2
High Ho				
Har	.18 (.11)	.00 (.07)	.59 (.20)	.18 (.14)
Non-Har	.12 (.10)	.00 (.06)	.73 (.19)	.19 (.13)
Low				
Har	.33 (.11)	.00 (.07)	.67 (.21)	.33 (.15)
Non-Har	.14 (.10)	.18 (.06)	.75 (.18)	.46 (.13)

Please refer to Table 4 for the means and standard errors of all emotion intensity

percentage-ratio emotion values comparing time 1 to time 2 rumination-cognition tasks

as a function of hostility group and harassment condition. For the MANOVA summary

table, see Appendix N.

Specifically, pairwise comparisons revealed that only harassed participants

increased their intensity for anger expressed (Mean.difference = 42.64; Std. E. = 8.59; $p<$

.01), anger inferred (Mean difference = 18.93; Std. E. = 3.96; $p< .01$) and fear expressed

thoughts (Mean difference = 9.13; Std. E. = 2.97; $p< .01$) following the anger provoking

interpersonal stressor (from time 1 to time 2) while no such effects were found for non-

harassed participants (ANGEX: Mean difference = 8,74; Std. E. = 7.67; $p< .26$;

ANGIN: Mean difference = 2.77; Std. E. = 3.55; $p< .44$; FEREX: Mean difference =

3.85; Std. E. = 2.65; $p< .15$).

In summary, our results did not support the hypothesis that high compared to low

hostile participants will experience significantly greater intensity for emotions falling in

the anger category (expressed and inferred) following an anger provoking interpersonal

stressor. Furthermore, the anger provoking interpersonal stressor used in our laboratory

was successful in that it elicited a significant increase in the intensity of anger expressed

and anger inferred thoughts in all participants that were harassed, whether they were high

or low hostile. Interestingly, the anger provoking interpersonal stressor did not only elicit

an increase in intensity for emotions in the anger category but also elicited a significant

increase in intensity for fear expressed thoughts in all participants that were harassed,

whether they were high or low hostile.

The Ruminative Response Scale

To assess rumination to sadness a 2 factor (High Hostility vs Low Hostility) analysis of variance (ANOVA) was conducted on the Ruminative Response Scale (RSCALE: Nolen-Hoeksema & Morrow, 1991).

Results revealed a significant difference ($F_{(1,96)} = 16.40$, $p < .01$) in rumination to sadness between high and low hostile participants. Specifically, high hostile participants ruminated significantly more to sadness (Mean = 49.11; Std. E. = 1.54) compared to low hostile subjects (Mean = 40.47; Std. E. = 1.48.

See Appendix O for ANOVA summary table.

In summary, our hypothesis that high compared to low hostile participants will ruminate significantly more to sadness as assessed via the Ruminative Response Scale (RSCALE) was supported.

Table 4

Means and Standard Errors of Emotion-Intensity Percentage Ratio at Time 1 compared to Time 2 for High and Low Hostile Participants as a Function of Harassment Condition.

	IANGEX1	IANGEX2	IANGIN1	IANGIN2
High Ho				
Har	4.96 (3.27)	47.45 (11.87)	5.32 (2.13)	31.91 (4.79)
Non-Har	5.17 (3.01)	12.67 (10.92)	2.26 (1.96)	5.33 (4.41)
Low				
Har	1.19 (3.35)	.00 (2.90)	4.24 (2.18)	15.50 (4.90)
Non-Har	43.99 (12.15)	9.97 (10.52)	1.65 (1.89)	4.13 (4.25)

	ISADEX1	ISADEX2	ISADIN1	ISADIN2
High Ho				
Har	1.24 (1.32)	4.55 (4.27)	2.34 (1.87)	15.67 (5.38)
Non-Har	2.56 (1.22)	6.01 (3.93)	2.15 (1.72)	11.44 (4.95)
Low				
Har	.00 (1.35)	3.73 (4.37)	1.47 (1.91)	3.70 (5.51)
Non-Har	1.71 (1.17)	8.33 (3.79)	2.52 (1.65)	10.81 (4.77)

	IFEREX1	IFEREX2	IFERIN1	IFERIN2
High Ho				
Har	1.84 (3.03)	16.52 (4.11)	9.73 (4.03)	18.35 (10.54)
Non-Har	7.72 (2.79)	4.70 (3.78)	8.68 (3.71)	26.76 (9.70)
Low				
Har	5.25 (3.11)	8.84 (4.21)	10.79 (4.13)	31.51 (10.79)
Non-Har	6.03 (2.69)	1.35 (3.65)	3.51 (3.57)	7.44 (9.34)

	IJOYEX1	IJOYEX2	IJOYIN1	IJOYIN2
High Ho				
Har	2.52 (2.31)	.00 (1.00)	11.65 (6.34)	3.53 (3.94)
Non-Har	2.31 (2.12)	.62 (.91)	17.32 (5.83)	3.12 (3.62)
Low				
Har	8.00 (2.36)	.53 (1.02)	25.25 (6.48)	13.23 (4.03)
Non-Har	1.78 (2.04)	1.99 (.88)	17.20 (5.62)	9.22 (3.49)

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Cardiovascular Measures

Baseline analyses

To assess the main effects and interactions of hostility group, harassment
condition and rumination to sadness group (RSCALE, median split) on cardiovascular
baseline values, a 2 (High vs Low Hostility - between) x 2 (High vs Low Ruminators
between) x 2 (Harassment vs Non-Harassment- between factor) multivariate analysis of
variance (MANOVA) was conducted with the following cardiovascular outcome
measures: Heart rate (HR), stroke volume (SV), cardiac output (CO), diastolic blood
pressure (DBP), systolic blood pressure (SBP) and total peripheral resistance (TPR). No
significant results were obtained.

Please refer to Table 5 for the means and standard errors of all cardiovascular
baseline values comparing time 1 to time 2 as a function of hostility group, harassment
condition and rumination on sadness group. For the MANOVA summary table see
Appendix P.

In summary, the participants' baseline values did not differ significantly as a
function of hostility group, rumination to sadness group and harassment condition.

Stress analyses

To assess the main effects and interactions of hostility group, harassment
condition and rumination to sadness group (RSCALE, median split) on cardiovascular
differences from baseline to mask-task stressor, a 2 (High vs Low Hostility - between) x
2 (Harassment vs Non-Harassement - between) x 2 (Low vs High Ruminators - between)
x 2 (Time 1 vs Time 2 - within factor) multivariate analysis of variance (MANOVA) was

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conducted with the following cardiovascular outcome measures: Heart rate (HR), stroke

volume (SV), cardiac output (CO), systolic blood pressure (SBP), diastolic blood

pressure (DBP) and total peripheral resistance (TPR).

An overall significant multivariate main effect of time (F (6,80) = 56.04, p< .01)

and a time by harassment interaction (F (6,80) = 3.81, p. < 01) was found. Univariate F-

tests for the interaction revealed a significant effect of heart rate (F (1,85) = 16.18, p<

.01) and systolic blood pressure (F (1,85) = 7.35, p< .01).

Please refer to Table 6 for the means and standard errors of all cardiovascular

measures comparing time 1 to time 2 as a function of hostility group, harassment

condition and rumination on sadness group. For MANOVA summary table see Appendix

Q.

Specifically, pairwise comparisons revealed a significant greater heart rate (Mean

difference = 11.26; Std. E. = .90; p< .01) and greater systolic blood pressure (Mean

difference = 15.67; Std. E. = 1.03; p< .01) for harassed participants following the anger

provoking interpersonal stressor (at time 2) compared to non-harassed participants.

In summary, the hypothesis that high compared to low hostile individuals will

experience significantly greater cardiovascular reactivity following an anger provoking

interpersonal stressor, was not supported. Also the hypothesi s that high compared to low

ruminators to sadness (as assessed via RSCALE) will experience significantly more

cardiovascular reactivity following an anger provoking interpersonal stressor, was not

supported. The anger provoking interpersonal stressor, however, elicited a higher heart

rate and systolic blood pressure in all participants that were harassed compared to those

that were not harassed, whether they were high or low hostile.

Table 5

Means and Standard Errors of Cardiovascular Baseline Values for High and Low Hostile Participants as a Function of Harassment Condition (Har vs. Non-Har) and Rumination to Sadness Group (High Rum vs. Low Rum).

		HR	CO	SV	SBP	DBP	TPR
High Ho							
Har	Low	57.57 (3.14)	7.85 (.54)	135.63 (9.12)	115.67 (2.75)	64.70 (2.62)	905.87 (95.96)
	High	66.66 (3.14)	7.46 (.57)	113.35 (9.57)	116.64 (2.75)	66.47 (2.62)	941.10 (95.96)
Non-Har	Low	58.45 (4.66)	7.55 (.80)	132.38 (13.53)	114.60 (4.60)	64.87 (3.89)	876.33 (135.71)
	High	59.51 (2.33)	6.77 (.40)	116.09 (6.76)	112.89 (2.04)	61.28 (1.95)	963.34 (67.86)
Low Ho							
Har	Low	59.98 (2.69)	7.71 (.46)	125.95 (7.81)	116.51 (2.25)	61.60 (2.25)	903.45 (78.35)
	High	57.48 (3.94)	7.02 (.68)	123.36 (11.43)	113.10 (3.45)	69.28 (3.55)	951.14 (114.70)
Non-Har	Low	64.08 (2.46)	8.02 (.44)	125.13 (7.34)	114.41 (2.15)	66.00 (2.05)	832.54 (73.60)
	High	58.93 (3.14)	7.76 (.54)	125.13 (7.34)	118.03 (2.75)	68.08 (2.62)	1019.89 (91.50)

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Table 6

Means and Standard Errors of Cardiovascular Values at Time 1 compared to Time 2, for High and Low Hostile Participants as a Function of Harassment Condition (Har vs. Non-Har) and Rumination to Sadness Group (Low Rum vs. High Rum).

		HR1	HR2	CO1	CO2	SV1	SV2
High Ho							
Har	Low Rum	57.57 (3.16)	77.04 (4.14)	7.85 (.54)	10.10 (.67)	135.63 (9.17)	128.72 (8.66)
	High Rum	66.66 (3.16)	80.24 (4.14)	7.46 (.57)	8.38 (.70)	113.35 (9.62)	106.81 (9.08)
Non-Har	Low Rum	58.45 (4.68)	62.76 (6.14)	7.55 (.81)	8.03 (1.00)	132.38 (13.61)	130.58 (12.84)
	High Rum	59.24 (2.40)	66.03 (3.15)	6.72 (.41)	7.20 (.51)	115.93 (7.00)	112.16 (6.59)
Low Ho							
Har	Low Rum	59.98 (2.70)	74.16 (3.54)	7.71 (.47)	8.74 (.58)	125.95 (7.86)	119.90 (7.41)
	High Rum	57.48 (4.00)	74.01 (5.19)	7.02 (.68)	7.86 (.84)	123.36 (11.50)	108.00 (10.85)
Non-Har	Low Rum	64.08 (2.47)	73.18 (3.24)	8.02 (.44)	8.55 (.54)	125.13 (7.38)	116.92 (7.00)
	High Rum	58.93 (3.16)	69.43 (4.14)	7.76 (.54)	8.55 (.67)	133.51 (9.17)	125.66 (8.66)

		SBP1	SBP2	DBP1	DBP2	TPR1	TPR2
High Ho							
Har	Low Rum	115.67 (2.75)	132.05 (4.07)	64.70 (2.62)	71.93 (2.61)	905.87 (96.47)	923.85 (90.42)
	High Rum	116.64 (2.75)	133.27 (4.07)	66.47 (2.62)	76.36 (2.91)	941.10 (96.47)	972.23 (90.42)
Non-Har	Low Rum	114.60 (4.08)	126.21 (6.04)	64.87 (3.89)	71.28 (3.87)	876.33 (136.43)	912.58 (127.87)
	High Rum	112.89 (2.04)	123.38 (3.02)	61.28 (1.95)	70.00 (1.94)	967.89 (70.00)	1004.15 (65.60)
Lowh Ho							
Har	Low Rum	116.51 (2.36)	135.81 (3.48)	61.60 (2.25)	72.32 (2.24)	903.45 (78.77)	953.76 (73.83)
	High Rum	113.10 (3.45)	134.42 (5.10)	69.28 (3.55)	79.91 (3.54)	951.14 (115.31)	997.21 (108.07)
Non-Har	Low Rum	114.41 (2.15)	130.18 (3.18)	66.00 (2.05)	75.67 (2.04)	832.54 (73.99)	899.97 (69.35)
	High Rum	118.03 (2.75)	130.62 (4.07)	68.08 (2.62)	75.67 (2.61)	1019.89 (91.98)	975.25 (86.21)

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Discussion

The first goal of this study consisted of analyzing the emotional content of thoughts experienced by high versus low hostile healthy young men prior to and following an anger provoking interpersonal stressor. The hypotheses that high compared to low hostile participants will experience significantly more 1) thoughts and underlying emotions of negative valence (expressed and inferred) and 2) intensity for negative valence (expressed and inferred) thoughts and underlying emotions following an anger provoking interpersonal stressor were not supported. Furthermore, in regards to specific emotions, also the hypotheses that high compared to low hostile individuals will 3) experience significantly more emotions falling in the anger category (expressed and inferred) and 4) experience significantly greater intensity for emotions of the anger category (expressed and inferred) following an anger provoking interpersonal stressor were not supported.

Hostility and Negative Emotional Valence

This study, however, provides some new and interesting data on the differential emotional content of thoughts experienced by high versus low hostile subjects. To the researcher's knowledge, this is the first study to observe in a direct manner that high hostile individuals experience significantly more inferred thoughts of negative emotional valence compared to low hostile individuals, overall, irrespective of an anger provoking interpersonal stressor or time condition. The effect was not found for expressed thoughts of negative emotional valence and appears to indicate that high hostile individuals are

prone to experience specifically more of those thoughts of negative emotional valence that they do not express in a direct manner. The obtained result in regards to valence, appears to support previous research that suggested that hostility is associated with negative emotions in general, including anger, anxiety, and depression (Smith & Frohm, 1985; Smith, Sanders, & Alexander, 1990). Yet, hostile individuals may not express all negative emotions in a direct manner.

Hostility and Inferred Sadness

In regards to specific emotion categories, further interesting new data included the obtained trend that high compared to low hostile individuals experienced more sad inferred thoughts, overall, irrespective of an anger provoking stressor or time condition. This effect was not found for sad expressed thoughts and may indicate that high hostile subjects are prone to experience specifically more of those sad thoughts that they do not express in a direct manner. The obtained result for specific emotion categories supports research that has linked hostility with depressed mood, including sadness (Biaggio et al. 1981; Felsten, 1995). Interestingly, our data did not support findings that have associated hostility with emotions primarily in the anger-hostility domain (e.g. Bushman, Cooper, & Lemke, 1991).

Hostility and Negative Affectivity

In regards to the result that high compared to low hostile participants experience more inferred thoughts of negative emotional valence, overall, one may conclude that high hostile individuals have a general tendency to experience negative emotions. In this regard the construct of Negative Affectivity appears to be of relevance (Watson & Clark, 1984; Watson & Pennebaker, 1989).

Research has demonstrated that two comprehensive emotion factors: Negative Affect and Positive Affect are the main dimensions of self-reported affect (Watson, Clark, & Tellegen, 1988). While it may appear that these two factors represent opposite ends of a bipolar continuum, Negative Affect and Positive Affect are, however, two independent, orthogonal factors. (Diener & Iran-Nejad, 1986; Watson, Clark, & Carey; 1988). Meaning, that an individual who is high in Negative Affectivity does not necessarily lack in traits of Positive Affectivity such as, joy, interest, enthusiasm, alertness, energy etc. (Diener & Iran-Nejad, 1986). Both factors can be viewed as either a state or a trait. In regards to research investigating Negative Affectivity and Positive Affectivity, these factors are viewed as traits (Watson & Clark, 1984). More precisely, Negative Affectivity is a trait that describes pervasive individual differences in negative emotionality and self-concept. It is conceptualized as a unitary dimension, comprised of negative emotions and cognitions (Watson & Clark, 1984). The terms Negative Affectivity, neuroticism and emotionality are often used interchangeable to describe the same or similar constructs (Bridewell & Chang, 1997; Ravaja, Kauppinen, Keltikangas-Jarvinen, 2000; Watson & Clark, 1984). In general, Negative Affectivity describes a

factor of subjective distress, including a broad range of negative affective states such as, hostility, anger, scorn, anxiety, tension, nervousness, worry, depression, sadness, loneliness, disgust and self-dissatisfaction (Watson & Clark, 1984; Watson, Clark, & Carey, 1988). Negative Affectivity is furthermore a disposition that occurs even in the absence of overt stress. Meaning, that even though fluctuations of mood are expected to occur especially in response to situational demands and stressors, individuals high in Negative Affectivity are more likely to experience a high level of negative emotions and distress even in relaxed settings (Watson & Clark, 1984). This is in agreement with the result obtained in this study, namely, that high compared to low hostile individuals experienced more inferred thoughts of negative emotional valence overall, irrespective of an anger provoking interpersonal stressor and time condition. Thus, according to our study, a high hostile individual may describe a person high on the trait of Negative Affectivity.

Interestingly, there appear to be some conceptual similarities between hostility and Negative Affectivity. For example, research of Negative Affectivity demonstrated that individuals high on this trait tend to embrace a "negative world view", focus on the negative aspects of themselves, others, and are less satisfied with themselves and others (Watson & Clark, 1984). Hostility has also been associated with specific ways of thinking about other people. It has been suggested that high hostile individuals appear to maintain a "hostile other" or "cynical world view". Specifically, high hostile individuals tend to view others in a negative manner, as likely sources of provocation, as being untrustworthy and unworthy (Allred & Smith, 1991; Smith & Christensen, 1992). This "hostile other" or "cynical world view" suggested for high hostiles, is similar to the

negative focus on others and the "negative world view", as has been suggested for individuals high in Negative Affectivity (Watson & Clark, 1984; Watson, Clark, & Carey, 1988). In regards to hostility, Smith and Christensen (1992) furthermore suggest that because hostile individuals perceive others in a negative manner and view them as likely sources of provocations, high hostiles also tend to behave in a more disagreeable and possibly antagonistic manner toward others. Such behaviour may then in turn elicit disagreeable even hostile responses from others, which in turn may confirm a hostile individual's negative view of others and the world in general. This then may contribute to a hostile individual's tendency to experience negative thoughts and emotions overall, as found in this study. While the hostile participants in our study experienced overall more inferred thoughts of negative emotional valence compared to their low hostile counterparts, one cannot infer from this study that high hostile individuals experience specifically a more "negative other" or "negative self" view. Future studies may want to research in more detail whether high hostile individuals experience a general tendency to experience negative thoughts overall or whether the negative thoughts they are experiencing are specifically directed towards the self or others.

In summary, our obtained result in regards to valence supports the notion that a hostile individual may indeed describe someone with a wide range of negative emotions including anger, fear and sadness, as has previously been suggested by research investigating, hostility and cardiovascular disease in general and hostility and coronary heart disease in particular (Barefoot & Schroll, 1996; Feldman et al. 1999). Furthermore, given our result on valence, one may conclude that high compared to low hostile individuals experience more Negative Affectivity, a factor that predisposes individuals to

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experience a broad range of negative emotions, including, hostility, anger, anxiety, worry, sadness and depression, even in the absence of stress. The disposition to experience Negative Affectivity may also predispose high hostile individuals to view and interact with others in a negative manner which in turn may elicit disagreeable responses form others thus contributing to a hostile individual's negative view of him or herself, others, and the world, and thus maintain a hostile's tendency to experience negative thoughts and emotions.

Interestingly, what needs to be kept in mind is our result that the negative thoughts and emotions that were experienced significantly more by high versus low hostile individuals are those that they did not express in a direct manner.

The results described above provide some suggestions and possible explanations in regards to the overall valence of thoughts and associated emotions experienced by high versus low hostile individuals.

The First Hostility Depression Link: Sad Inferred Thoughts

In regards to specific emotion categories, the obtained result consisted of the trend that high compared to low hostile participants experienced more sad inferred thoughts overall, even in the absence of an anger provoking interpersonal stressor. This result appears to support previously found associations between hostility, depressed mood and depression (Moreno, Selby, Fuhriman, & Laver, 1994).

For example, in a study undertaken by Brown & Zeichner (1989), 166 subjects

completed the Cook-Medley Hostility (HO) Scale (Cook & Medley, 1954) and the Beck

Depression Inventory (BDI, Beck, 1967). For analyses, the subjects were divided into the

following 4 hostility groups depending on the score obtained on the Cook-Medley HO

Scale: Hostility group (HO) 1 = 0-14, none to mild; HO 2 = 15-22, low; HO 3 = 23-39,

medium, HO 4 = 39-50, high. Interestingly, the researchers found a linear relationship

between hostility groups and depression scores. As hostility increased so did depressive

symptoms (HO 1 = 4.13 BDI; HO 2 = 6.49; HO 3 = 9.90; HO 4 = 12.18). The

researchers concluded that depression and hostility appear to coexist in an individual.

Brown & Zeichner (1989) furthermore suggested that hostility and depressive symptoms

may only be noticed once they have become clinically noticeable, yet may confer risk for

the development of cardiovascular and other disease at earlier stages. Thus, it may be

possible that hostile individuals, as found in our study, are at special risk for the future

development of sustained depressed mood and perhaps even depression given our result

that they experienced more sad inferred thoughts. Because sad inferred thoughts are not

expressed in a direct manner they may even remain unnoticed in research and clinical

settings.

Further evidence linking hostility and depression comes from a study undertaken

by Moreno et al. (1993). When studying the relationship between hostility and depression

in 69 depressed and non-depressed subjects, they also found significant correlations

between hostility and depression scores. The researchers concluded that hostility is linked

to depression. They furthermore suggested that hostility may in fact mask underlying

depressive symptoms or depression. Again, this suggestion is interesting in light of our

result that high hostile individuals experience specifically more sad inferred thoughts.

One could hypothesize that high hostile individuals filter their sad thoughts. For example,

high hostiles may not want to acknowledge or show others and the world how sad they

truly are. For example, it may be possible that high hostile individuals are high on the

trait of social desirability, a need for social approval. Social desirability has been defined

as "the tendency to answer according to cultural norms" or the "tendency of individuals

to project favourable images of themselves during social interaction" (Tousignant,

Brosseau, & Tremblay, 1987). Future studies may want to assess whether high hostile

individuals indeed score high on this trait, which can be measured by the Crowne-

Marlowe Scale (Crowne & Marlowe, 1964).

The existence of a relationship between hostility and depression has been

longstanding. For example, in his psychodynamic explanation of depression, Freud

(1917,1955 as cited by Bemporad, 1985,1995) proposed that melancholy originates from

the loss of a loved person/object early in life. In an attempt to make up for that loss, the

young individual internalizes the lost object but also feels angry. Freud (1917,1955 as

cited by Bemporad, 1985,1995) proposed that the individual, from this time onward,

reacts to further real or imaginary loss, with a reactivation of the anger that accompanied

the original loss. However, because the lost object has since become internalized, the

anger is directed inward toward the introjected object rather than outward toward the real

object (source of anger), resulting in depression. Thus, this theory explained depression

as misdirection of anger turned inward. Subsequent psychodynamic ego theories

(Bemporad, 1985,1995) furthermore proposed that hostility may also serve a defensive

function in that it masks underlying depression as Moreno et al. (1993) proposed in their study when they found that hostility and depression are positively associated. Given the results in our study that high compared to low hostile participants experienced significantly more sad inferred thoughts but did not experience significantly more thoughts in the anger category, it is possible that high hostile individuals indeed mask underlying sadness and depression.

It has to be kept in mind that sad inferred thoughts are not equal to depression. However, they may nevertheless represent an initial vulnerability for the development of depressive symptoms and depression.

The Second Hostility Depression Link: Rumination to Sadness

Further evidence that hostile individuals may indeed be prone to experience depression comes from the result obtained in the second goal of this study. The (5) hypothesis that high compared to low hostile participants will ruminate significantly more to sadness was supported. That is, high compared to low hostile participants in our study, ruminated more to sadness as assessed via the Ruminative Response Scale (Nolen-Hoeksema & Morrow, 1991). Rumination to sadness is a trait that is associated with a person's tendency to become depressed and/or stay depressed over an extended period of time (Nolen-Hoeksema, 1991, 1995). Thus, our result suggests that high hostile individuals may be prone to develop depression because they ruminate more when sad.

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Given that the high hostile participants in our study also experienced more sad inferred thoughts, overall, compared to low hostile individuals, they may indeed be vulnerable to develop depression. The tendency to ruminate to sadness found in this study for high hostile participants was not due to pre-existing depression because such participants were not included in this study.

The result that high hostile individuals ruminate more to sadness is also of importance for research investigating hostility and cardiovascular disease, given the more recent research findings that have identified not only depression, but milder depressive symptoms as independent risk factors for coronary heart disease (Anda et al. 1993; Barefoot et al. 1996; Frasure-Smith et al. 1995).

Inferred Negative Emotional Valence and Inferred Sadness

Of special interest is our finding that high compared to low hostile individuals experienced specifically significantly more inferred thoughts of negative emotional valence and more sad inferred thoughts. The results were not obtained for expressed thoughts of negative emotional valence and sad expressed thoughts. What this may mean is a matter of speculation. In the area of health psychology, distinctions between emotions that are directly expressed and those that are not directly expressed have frequently been made. For example, in research investigating hostility and cardiovascular disease, hostility is sometimes classified into, a) The experience of hostility (covert) and b) Expressive hostility (overt) (Siegman, 1989). The experience of hostility refers to the

subjective experience of anger and related anger emotions such as resentment and contempt. Covert hostility also comprises the cognitive processes typically associated with a hostile person, including negative thoughts about themselves and others. The expression of hostility, on the other hand, refers to aggressive behaviour following anger arousal (Siegman, 1989). Interestingly, research has shown that the tendency to experience hostility is strongly associated with indices of neuroticism or Negative Affectivity, while the expression of hostility has much lower correlations with neuroticism (Siegman, Dembroski, & Ringel, 1987).

A similar distinction between an emotion that is directly expressed and one that is not, is the one made between anger-in and anger out (Spielberger, 1991). For example, Spielberger (1991) suggests that anger is comprised of internalized anger (anger-in) and externalized anger (anger-out). While anger-in refers to the tendency to suppress emotions and cognitions associated with anger, anger-out, in contrast, refers to the tendency to express angry behaviour.

The expression of anger and the experience of anger, as well as the related constructs of anger-in and anger-out are also differentially related to cardiovascular reactivity. In general it is the expression (or anger-out), but not the experience (or anger-in) of hostility-anger, that correlates positively with cardiovascular reactivity in individuals that have been subjected to anger provoking interpersonal stressors (Siegman, Anderson, Herbst, Boyle, & Wilkinson, 1992; Suarez & Williams, 1990).

The classifications of expressed and inferred anger in this study may resemble those between the experience of hostility (covert) and expressive hostility (overt) or those between anger-in and anger-out. They are, however, not quite identical. That is, the anger

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expressed category, in our research includes the subjective experience of anger and cognitions typically associated with the experience of hostility/anger, but also includes the verbal aggressive part of expressive hostility/anger (verbal insults).

Distinctions between emotions that are directly expressed and those that are not are useful and can potentially provide interesting differential results. The high hostile participants in this study experienced overall more inferred thoughts of negative emotional valence and also specifically more sad inferred thoughts. This appears to indicate that high hostile individuals experience more negative emotions but tend not express them in a more direct manner as assessed by our research. It also appears to indicate that high hostile individuals experience specifically more of those sad thoughts that they tend not to express in an overt manner. Firstly, this may suggests that high hostile individuals experience difficulties expressing all types of negative emotions in a direct manner. And secondly, high hostile individuals appear to experience difficulties expressing sad thoughts. One could hypothesize that high hostile individuals try to "mask" or "filter" negative emotions in general and sad ones in particular. Perhaps out of an attempt to garner social approval. This, however, needs to be tested in future studies.

Hostility, Rumination to Sadness and Cardiovascular Reactivity

Hostility and Cardiovascular Reactivity

The third goal of this study was to investigate the effects and interactions of hostility, rumination to sadness (as assessed via the RSCALE, Nolen-Hoeksema &

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Morrow, 1991) and harassment on cardiovascular reactivity. The (6) hypothesis, that high compared to low hostile participants, will experience significantly greater cardiovascular reactivity following an anger provoking interpersonal stressor was not supported. Thus, contrary to other studies that have found increased cardiovascular reactivity in high hostile participants following an anger-provoking stressor (Hardy & Smith, 1988; Suarez & Williams, 1989), high hostile participants in this study did not experience heightened cardiovascular reactivity. The result found in this study, however, is consistent with those studies that have failed to find an association between hostility and cardiovascular reactivity (Biaggio et al. 1981).

The Anger Provoking Interpersonal Stressor and Measures of Emotion.

The absence of cardiovascular reactivity in high versus low hostile participants in our study cannot be attributed to an unsuccessful anger provoking interpersonal stressor. That is, the anger-provoking stressor in our study was successful in that it elicited a significant increase in anger expressed and an increase (trend) in anger inferred thoughts and intensities in all participants that were exposed to the anger-provoking interpersonal stressor, whether the participants were high or low on hostility. The anger-provoking interpersonal stressor, however, did not elicit a greater anger response in high compared to low hostile participants, as has been suggested by previous researchers (Hardy & Smith, 1988; Suarez & Williams, 1989). Why high compared to low hostile participants in our study did not experience more frequent and more intense emotions in the emotion category of anger, remains a matter of debate. One possible explanation is the fact, that

the majority of studies investigating hostility and cardiovascular disease, use likert-type

scales or list of adjectives in order to assess to what degree a participant feels a specific

emotions (e.g. angry, irritated, annoyed, sad, depressed, fearful etc.) (e.g. Allred & Smith,

1991; Feldman et al. 1999). Using such measurements, participants are forced to

provide answers on predetermined emotion words, which may bias research outcome

and/or interpretation. Furthermore, such measures often blur the distinction between

frequency and intensity. For example, likert-type scales assess more accurately intensity

and do not provide sufficient information regarding frequency.

We believe, that the assessment of thoughts and underlying emotions in our study

was more naturalistic in that it asked participants to "write down all the thoughts that they

were having over the last few minutes". This type of assessment was proposed by Clark

(2001), who suggested that this more specific measurement provides researchers with a

greater depth and understanding of thoughts and rumination, such as those related to

anger, worry and depression at a given moment in time. Thus, it may be argued that the

Rumination-Cognition Task used in our study is a more accurate indicator of a

participant's thoughts and underlying emotions at a given time.

Of further interest are also our results that the anger provoking interpersonal

stressor used in this study, did not only elicited specific negative emotions in the category

of anger but also elicited a significant increase in fear expressed thoughts and intensity in

all participants that were harassed, whether they were high or low hostile. This suggests

that researchers may want to keep in mind that an anger provoking interpersonal stressor,

often also referred to as harassment, may not only or necessarily elicit more frequent

and/or intense emotions in the category of anger but also elicit other negative emotions, such as fear, as found in this study.

Interestingly, our result that high compared to low hostile participants did not experience heightened cardiovascular reactivity to the anger provoking interpersonal stressor is consistent with the emotion-category results found in this study. That is, it has been suggested that it is the high hostile person's propensity to experience more frequent and more intense emotions in the anger-hostility category that is directly linked to heightened cardiovascular reactivity, especially following an anger provoking interpersonal stressor (Friedman, 1992; Siegel, 1992). This study did not find that anger-thoughts (expressed and inferred) and anger intensities (expressed and inferred) were significantly higher for high compared to low hostile participants following the anger provoking interpersonal stressor. Thus, it may be hypothesized that the lack of heightened cardiovascular reactivity to interpersonal stress, often believed to be a major risk factor in cardiovascular disease development in hostile individuals, may be due to the fact that the high hostile participants in our study did not experience more frequent and heightened intensity in the emotion category of anger following the anger provoking interpersonal stressor.

Rumination to Sadness and Cardiovascular Reactivity

The (7) hypothesis, that high compared to low ruminators to sadness (as assessed via the RSCALE, Nolen-Hoeksema & Morrow, 1991), will experience significantly more cardiovascular reactivity following an anger provoking interpersonal stressor was also not

supported. Studies have found that the association between depression and cardiovascular reactivity, such as heightened systolic and diastolic blood pressure, is less strong when individuals experience depressive symptoms. The relationship is stronger when depression is studied (Dimsdale, 1988; Friedman & Bennett; 1977; Monk, 1980). Thus, while rumination to sadness has been found to be a risk factor for depression (Nolen-Hoeksema, 1991) it is not a diagnosis of depression. Thus, the lack of an association between rumination to sadness and cardiovascular reactivity in this study may be due to the fact that rumination to sadness may present an initial vulnerability for depression but is not depression per se.

Summary

The first goal of this study was to find out what type of thoughts and underlying emotions are exactly experienced by high versus low hostile participants following an anger provoking interpersonal stressor. We found, that high compared to low hostile individuals experienced more inferred thoughts of negative emotional valence, overall, irrespective of the anger provoking interpersonal stressor. Meaning, that high hostile individuals experienced more of those negative thoughts that they do not express in a direct manner. Given this result, it was suggested that high hostile individuals may be high on the trait of Negative Affectivity. Negative Affectivity, also referred to as emotionality or neuroticism (Bridewall & Chang, 1997; Ravaja, Kauppinen, Keltikangas-Jarvinen, 2000) is a trait comprised of negative emotions and cognitions, such as, hostility, anger, scorn, anxiety, tension, worry, nervousness, sadness, depression and self-

dissatisfaction (Watson & Clark, 1984; Watson et al. 1988). It is a disposition that occurs even in the absence of overt stressful events.

When emotion categories were analyzed it was found that high compared to low hostile individuals experienced overall more sad inferred thoughts. Thus, it appears that high hostile individuals experience especially more of those sad thoughts that they do not express in a direct manner. This result supports research that has found a positive association between hostility and depressed mood, including sadness (Biaggio et al. 1981; Felsten, 1995). It was suggested that high hostile individuals may be especially vulnerable to develop sustained depressed mood and even depression given our result that they experienced more inferred sad thoughts compared to low hostile participants. Furthermore, because sad inferred thoughts are not expressed in a direct manner, they may remain unnoticed in clinical and research settings.

Further evidence that high hostile individuals may be at risk to develop depression comes from the result obtained in the second goal of this study. It was found that high compared to low hostile individuals ruminate more to sadness (as assessed via the RSCALE; Nolen-Hoeksema & Morrow, 1991). The combined results of more sad-inferred thoughts and heightened rumination to sadness found in only high hostile individuals lends support to the interpretation that high hostile individuals tend to be more sad and tend to ruminate more to sadness. This may potentially increase a high hostile individual's risk for depression. Furthermore, depression, even milder depressive symptoms, have been found to be independent risk factors for cardiovascular disease in general and coronary heart disease in particular (Anda et al. 1993; Pratt et al. 1996).

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According to our results, it appears that a high hostile individual describes an individual who experiences many negative emotions but especially sad ones. It also appears that a high hostile individual describes someone who experiences difficulties expressing negative emotions in general and in particular sadness in a direct open manner. Perhaps, in an attempt to appear in a socially favourable light, high hostiles try to "mask" or "filter" negative emotions in general and sadness in particular. This, however, needs to be verified in future studies.

Limitations and Implications for Future Research

One limitation of this study consisted of an insufficient total sample size, at least for one of the more demanding analyses. That is, while the cell sizes for all the emotion analyses were relatively equal and adequate (cell sizes ranging from 21 to 28), the cell sizes for the cardiovascular reactivity analyses were more problematic. In particular, cell sizes for the latter analyses ranged from 5 to 19 subjects, making them unequal and small. Thus, the interpretation of our statistical results for these analyses, need to be taken with caution. In this regard, it is important to recall the exploratory nature of the study. This was indeed the first laboratory study that investigated and explored the emotional content of thoughts in a direct manner. Replications to solidify our findings are important and needed. Future studies need to augment the total subject number (N) size so that adequate cell sizes for all analyses can be obtained. This will provide researchers with more powerful and confident results and interpretations (Stevens, 1986).

Another shortcoming of this study was the lack of a recovery measure. Because this study was part of a bigger project, a recovery rate could unfortunately not be

obtained. The use of analyzing recovery rates in studies investigating cardiovascular

reactivity to stressors has always been important to many researchers (Faber & Burns,

1996; Lai & Linden, 1992). Of particular interest to researchers investigating emotion,

rumination, and cardiovascular reactivity, are some recent studies that suggest that

especially the recovery rate may provide the researcher with some unique results that

may not be obtained by data investigating baseline to stressor changes alone (Schwartz et

al., 2003). For example, Glynn, Christenfeld and Gerin (2002) found that cardiovascular

responses, such as heart rate and blood pressure, returned slower to pre-stress levels in

those participants that had to re-evoke emotional compared to non-emotional stressors.

They suggested that rumination about emotional stressful events not only influences

recovery immediately following a stressor but that rumination could also reactivate

cardiovascular reactivity at a later time. Others also found that individuals who ruminate

more following an anger-provoking situation exhibited poorer recovery compared to

those individuals who ruminated less (Schwartz et al., 2000). Given these findings it is of

importance that future studies include an adequate, prolonged cardiovascular recovery

measure.

In regards to rumination, Schwartz et al. (2003) suggest that an individual who is

susceptibility to ruminate about the causes and consequences of his or her distress may be

more prone to experience enhanced cardiovascular reactivity. Thus, assessing whether an

individual ruminates to sadness or other negative emotions such as anger seems to be an

important variable and merits to be included in studies investigating hostility, emotion

and cardiovascular reactivity.

In that regard, it is also of importance to note that man and woman may differ in their propensity to ruminate when faced with a stressful event. For example, previous studies have shown that women may ruminate more when faced with sad or anxiety provoking events (Butler & Nolen-Hoeksema, 1991; Thayer, Newman, & McClain, 1994). In regards to anger provoking events, Rusting & Nolen-Hoeksema (1998), however found that women tended to distract themselves from induced anger instead of focusing and ruminating about it. While men, on the other hand, equally engaged in rumination and distraction coping strategies when faced with induced anger. Thus, more studies investigating hostility, rumination, emotion and cardiovascular reactivity in women are needed. In regards to our study, it would be particularly interesting to find out whether high compared to low hostile women experience the same pattern of significantly more inferred thoughts of negative emotional valence in general. And, in particular if women also experience more inferred sadness as found for the high hostile male participants in this study.

In addition, it may be important to extent the laboratory findings of this study to a naturalistic environment. For example, future studies may want to investigate thoughts and emotions in hostile individuals during their daily activities. High and low hostile participants could be asked to write down all the thoughts that they are having at predetermined times. Furthermore, in order to investigate a potential link between emotions and risk for cardiovascular disease, participants could be provided with ambulatory blood pressure instruments to obtain measures of cardiovascular reactivity.

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Appendix A

Health Questionnaire

Health Questionnaire

Name:_____

Telephone:_____

Please answer the following questions carefully.

Have you had any medical or surgical problems during the last year?
Yes_____   No_____
Please specify_____
Do you suffer from any chronic illnesses?
Yes_____   No_____
Please specify_____
Have you ever had heart trouble of any kind?
Yes_____   No_____
Please specify_____
Do you now, or have ever had high blood pressure?
Yes_____   No_____
Please specify_____

Do you have diabetes?   Yes_____   No_____
Have you ever had kidney trouble of any kind?
Yes_____   No_____
Please specify_____
Do you suffer from epilepsy?   Yes_____   No_____
Have you ever had liver trouble of any kind?
Yes_____   No_____
Please specify_____
Do you have asthma?   Yes_____   No_____
Do you suffer from bronchitis or do you suffer from chronic bronchitis?
Yes_____   No_____
Have you ever had a fainting spell?   Yes_____   No_____
If yes, please explain_____
Are you presently, or have you ever been treated for psychological or psychiatric
reasons?   Yes_____   No_____
If yes, please explain briefly_____

_____

Please list any medication that you are presently taking and the reason for taking it_____

_____

Please give the date (or approximate date) of your last medical check-up_____

_____

Appendix B

The Buss-Durkee Hostility

Inventory (BDHI)

The Buss-Durkee Hostility Inventory

Read the questions carefully and circle your answer.

1. I seldom strike back, even if someone hits me first.   T   F

2. I sometimes spread gossip about people I don't like.   T   F

3. Unless somebody asks me in a nice way, I won't do what they want.   T   F

4. I lose my temper easily but get over it quickly.   T   F

5. I don't seem to get what's coming to me.   T   F

6. I know that people tend to talk about me behind my back.   T   F

7. When I disapprove of my friends' behavior, I let them know it.   T   F

8. The few times I have cheated, I have suffered unbearable feelings of remorse.   T   F

9. Once in a while I cannot control my urge to harm others.   T   F

10. I never get mad enough to throw things.   T   F

11. Sometimes people bother me just by being around.   T   F

12. When someone makes a rule I don't like I am tempted to break it.   T   F

13. Other people always seem to get the breaks.   T   F

14. I tend to be on my guard with people who are somewhat more friendly than I am expected.   T   F

15. I often find myself disagreeing with people.   T   F

16. I sometimes have thoughts which make me feel ashamed of myself.   T   F

17. I can think of no good reason for ever hitting anyone.   T   F

18. When I am angry , I sometimes sulk.   T   F

19. When someone is bossy, I do the opposite of what he/she asks.   T   F

20. I am irritated a great deal more than people are aware of.   T   F

21. I don't know any people that I downright hate.   T   F

22. There are a umber of people who seem to dislike me very much.   T   F

23. I can't help getting into arguments when people disagree with me.   T   F

24. People who shirk on the job must feel very guilty.   T   F

25. If somebody hits me first I let him have it.   T   F

26. When I am mad I sometimes slam doors.   T   F

27. I am always patient with others.   T   F

28. Occasionally when I am mad at someone I will give him/her the "silent treatment."   T   F

29. When I look back on what's happened to me, I can't help feeling mildly resentful.   T   F

30. There are a number of people who seem to be jealous of me.   T   F

31. I demand that people respect my rights.   T   F

32. It depresses me that I do not do more for my parents.   T   F

33. Whoever insults me or my family is asking for a fight.   T   F

34. I never play practical jokes.   T   F

35. I makes my blood boil to have somebody make fun of me.   T   F

36. When people are bossy I take my time just to show them.   T   F

37. Almost every week I see someone I dislike.   T   F

38. I sometimes have the feeling that others are laughing at me.   T   F

39. Even when my anger is aroused, I don't use "strong language."   T   F

40. I am concerned about being forgiven for my sins.   T   F

41. People who continually pester you are asking for a punch in the nose.   T   F

42. I sometimes pout when I don't get my own way.   T   F

43. When someone annoys me, I am apt to tell him/her what I think of him/her. T F

44. I offer feel like a powder keg ready to explode. T F

45. Although I don't show it, I am sometimes eaten up with jealousy. T F

46. My motto is "Never trust strangers." T F

47. When people yell at me, I yell back. T F

48. I do many things that make me feel remorseful.afterward. T F

49. When I really lose my temper, I am capable of slapping someone. T F

50. Since the age of ten, I have never had a temper tantrum. T F

51. When I get mad, I say nasty things. T F

52. I sometimes carry a chip on my shoulder. T F

53. If I let people see the way I feel, I'd be considered a hard person to get along with. T F

54. I commonly wonder what hidden reason another person may have for doing something nice for me. T F

55. I could not put someone in his/her place, even if he/she needed it. T F

56. Failure gives me a feeling of remorse. T F

57. I get into fights about as often as other people do. T F

58. I can remember being so angry that I picked up the nearest thing and broke it. T F

59. I often make threats I don't really mean to carry out. T F

60. I can't help being a little rude to people I don't like. T F

61. At times I feel I get a raw deal out of life. T F

62. I used to think that most people tell the truth but now I know otherwise. T F

63. I generally cover up my poor opinion of others. T F

64. When I do wrong, my conscience punishes me severely. T F

65. If I have to resort to physical violence to defend my rights I will. T F

66. If someone doesn't treat me right, I don't let it annoy me. T F

67. I have no enemies who really wish to harm me. T F

68. When arguing, I tend raise my voice. T F

69. I often feel that I have not lived the right kind of life. T F

70. I have known people who push me so far that we have come to blows. T F

71. I don't let a lot of unimportant things irritate me. T F

72. I seldom feel that people are trying to anger or insult me. T F

73. Lately, I have been kind of grouchy. T F

74. I would rather concede a point than get into an argument over it. T F

75. I sometimes show my anger by banging on the table. T F

Appendix C

The Ruminative Response Scale

(RSCALE)

R-SCALE

People think and do many different things when they feel sad or depressed. Each of the items below describes something people may do or think about when they feel sad or depressed. Please read each of the items below and indicate the degree to which you think or do the things described when you feel down, sad, or depressed by circling the appropriate number on the scale. Please indicate what you generally do, not what you think you should do.

WHEN I AM SAD, DOWN, OR DEPRESSED.............

1. I think about how alone I feel.

| 1 | 2 | 3 | 4 |
| ALMOST NEVER | SOMETIMES | OFTEN | ALMOST ALWAYS |

2. I think "I won't be able to do my job or work because I feel so badly".

| 1 | 2 | 3 | 4 |
| ALMOST NEVER | SOMETIMES | OFTEN | ALMOST ALWAYS |

3. I think about my feelings of fatigue and achiness.

| 1 | 2 | 3 | 4 |
| ALMOST NEVER | SOMETIMES | OFTEN | ALMOST ALWAYS |

4. I think about how hard it is to concentrate.

| 1 | 2 | 3 | 4 |
| ALMOST NEVER | SOMETIMES | OFTEN | ALMOST ALWAYS |

5. I think about how passive and unmotivated I feel.

| 1 | 2 | 3 | 4 |
| ALMOST NEVER | SOMETIMES | OFTEN | ALMOST ALWAYS |

6. I analyze recent events to try to understand why I am sad or depressed.

| 1 | 2 | 3 | 4 |
| ALMOST NEVER | SOMETIMES | OFTEN | ALMOST ALWAYS |

7. I think about how I don't seem to feel anything any more.

1	2	3	4
ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS

8. I think "Why can't I get going?"

1	2	3	4
ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS

9. I think "Why do I always react this way?"

1	2	3	4
ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS

10. I go away be myself and think about why I feel this way.

1	2	3	4
ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS

11. I write down what I am thinking about and analyze it.

1	2	3	4
ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS

12. I think about a recent situation, wishing it had gone better.

1	2	3	4
ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS

13. I think about how sad I feel.

1	2	3	4
ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS

14. I think about all my shortcomings, failings, faults, mistakes.

1	2	3	4
ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS

15. I think about how I don't feel up to doing anything.

1	2	3	4
ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS

16. I analyze my personality to try to understand why I am depressed.

1	2	3	4
ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS

17. I go someplace alone to think about my feelings.

1	2	3	4
ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS

18. I think about how angry I am with myself.

1	2	3	4
ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS

19. I listen to sad music.

1	2	3	4
ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS

20. I isolate myself and think about the reasons why I feel sad

1	2	3	4
ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS

21. I try to understand myself by focusing on my depressed feelings.

1	2	3	4
ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS

Appendix D

<u>Table: Means and Standard Errors of Age, Weight and Height,</u>

<u>by Hostility Group, Harassment Condition</u>

<u>and Rumination to Sadness Group</u>

Table: Age, Weight and Height

Means and Standard Errors of Age, Weight and Height, by Hostility Group, Harassment
Condition and Rumination to Sadness Group (Low Rum vs High Rum).

		Age (years)	Weight (kg)	Height (in.)
High Ho				
Har	Low	22.55 (.76)	73.89 (2.84)	69.70 (.83)
	High	23.27 (.76)	74.26.(2.84)	69.27 (.79)
Non-Har	Low	21.60 (1.13)	73.90 (4.21)	70.00 (1.17)
	High	23.10 (.57)	70.14 (2.10)	70.15 (.59)
Low Ho				
Har	Low	22.07 (.65)	74.82 (2.43)	70.57 (.70)
	High	21.86 (1.00)	69.09 (3.56)	68.71 (.99)
Non-Har	Low	22.94 (.60)	73.01 (2.22)	71.06 (.62)
	High	23.46 (.76)	75.15 (2.84)	71.33 (.88)

Appendix E

Harassment and Non-Harassment Preparation Scenario

Harassment Preparation Scenario

While researcher A (female) is explaining the math-task to the subject, the phone rings. Researcher B (male) comes into the testing room and tells researcher B: " Dr.Miller is on the phone". Researcher A: "Just a minute" and continues to explain the math-task to the subject. Once explained she excuses herself and enters the adjoining room. In a voice loud enough so that the subject can overhear. researcher A (female) says: "Hello Dr.Miller. Right now? Oh, but I'm running a subject right now. Oh, okay – I'll ask if Researcher B can take over for me. Ok – Thanks –Bye Bye."

Researcher B pretends to be angry with Researcher A: "Now what?"

Researcher A: "He wants to see me right now"

B: "Now?! But you have a subject in there!<

A: "I know – but it sounds really important – would you mind taking over for me?!"

B: "Look – I won't be responsible if your results screw up!"

A: "Don't worry – nothing will go wrong – everything is set up in there – just follow the instructions"

B: "I don't normally deal with the subjects that's your job you know!"

A: "You know I would not ask you if I didn't have to. Everything will be fine! (pause(okay?! Thanks, I'll be back as soon as I can"

Researcher A goes into the testing room and tells the subject that she has to leave and that another researcher will take over for her.

A: "I'm sorry I have to leave right now. I'll try to make it back before you'r done. If I don't get to see you before your's done, I want to say thanks for coming in ...."

Non Harassment Preparation Scenario

While researcher A (female) is explaining the math-task to the subject, the phone rings.

Researcher B (male) comes into the testing room and tells researcher A: " Dr.Miller

wants to see you".

Researcher A: "Just a minute" and continues to explain the math-task to the subject. Once

explained, she tells the subject that another researcher will take over for her, excuses

herself and leaves the testing room. Researcher B is friendly towards the subjects

throughout the math-tasks.

Appendix F

<u>Anger-Provoking Statements</u>

Anger-Provoking Statements

The nine minute mathematical subtraction task stressor was divided into three trials of three minutes each. At the beginning of each task and halfway through each three minute period the following treatments were delivered to the subject:

Trial 1:

1. Did you understand the instructions?!

2. The right button is correct, the left button is incorrect!

Trial 2:

3. Could you try harder this time?!

4. Can't you do better than this?!

Trial 3:

5. It isn't that hard you know!

6. I can do better than that.

Appendix G

<u>The Rumination Task Coding Manual</u>

RUMINATION TASK CODING MANUAL

1. TOTAL NUMBER OF THOUGHT UNITS FOR EACH RUMINIATION STATEMENT

- determine the total number of thought units for each rumination task separately (e.g. total Rumination Task 1)
- similar and/or repetitive thought units should each be coded and counted as separate thought units
- a thought unit is in general comprised of a <u>subject-verb-object</u> combination; however, a pronoun subject may be implicit and can be filled in by the coder
- by definition, an intransitive verb does not need an object
- incomplete sentences (forgotten words, incorrect grammar) are corrected by the coder (Example: This hard = this is hard)
- single words, or sentence fragments are counted as a thought unit only if a subject enumerates words/fragments throughout a rumination task. Only then can each word/fragment be conceived as a distinct thought unit.

<u>Example:</u>
- fireworks
- girls
- school

- verbs are important clues to separate thought units. Clue: approach task by finding the verb(s) first and go from there.
- multiple objects <u>with</u> explicit repetitions of verbs count as separate thought units
- multiple objects <u>without</u> repetition of verb is counted as a single thought unit

<u>Example:</u>
I feel angry and I feel upset = 2 thought units

I feel angry and upset = 1 thought unit

I am angry and want to go get out of here (I before want is implied) = 2 thought units

I thought/about going to call my brother = 2 thought units because 2 verbs.

2. VALENCE FOR EACH THOUGHT UNIT

- determine whether a thought unit contains positive or negative emotion or whether emotion content is absent.
- each positive and negative valence thought unit is then also coded as either an expressed valence or an inferred valence.
- a valence thought unit is coded as expressed, when <u>a.</u> An actual emotion is directly expressed. <u>Example:</u> I am happy. I am sad. I hope. This makes me angry (Shaver, Schwartz, Kirson & O'Connor, 1987); <u>b.</u> when the word <u>feel</u> is used. <u>Example:</u> I feel good. I feel crappy (White & Younger, 1988); <u>c.</u> when insults are expressed. <u>Example:</u> He is a jerk.
- emotion thought units are coded. as inferred when an underlying emotion/affect can be inferred The coder should ask herself/himself, whether

the subject is feeling a specific emotion/affect that underlies the thought unit.

Example:

> I am comfortable. I did very well (positive valence, joy)
>
> I was very bad. It is hard to keep encouraged. I am beginning not to care (negative valence inferred, sad)
>
> I lost all concentration. I am confused. I am having stressful thoughts. (negative valence inferred, fear)
>
> I try not to let him bother me. This is unfair. He is wearing yucky cologne (negative valence inferred, anger)

- thought units that do not contain positive-expressed, positive-inferred, negative-expressed, negative-inferred valences are not coded.
- count valence positive expressed, valence positive inferred, valence negative expressed and valence negative inferred thought units for each rumination task.

3. EMOTION CODING

- each thought unit that has been coded as positive or negative valence is also coded for a specific emotion category. The categories are based on research conducted by Shaver, Schwartz, Kirson & O'Connor (1987) and are comprised of the following emotion categories and prototypes: Love, joy, surprise (positive valence) and anger, sadness, fear (negative valence).
- emotion words that are included in the list that is provided by Shaver, Schwartz, Kirson & O'Conner (1987) for each emotion category, are coded as emotion-expressed (e.g. anger-expressed, joy-expressed). In addition, thought units that express "I feel" are also coded as emotion-expressed (White & Younger, 1988). Also, insults and threats are coded as emotion-expressed.

Example:

> I am annoyed. I hate. I feel like I am going to hit somebody. (Anger-expressed)
>
> I am melancholic; I feel down and depressed. (Sadness-expressed)
>
> I am anxious. I feel scarred. (Fear-expressed)

- thought units are coded as emotion-inferred if the coder can infer the underlying emotion (see also Valence Coding)

Example:

> This is pleasant. This was fun. I am doing extremely well (Joy-inferred)
>
> I imagined I was fighting. This is really bothering me. (Anger-inferred)
>
> I am beginning not to care. I am not good (Sad-inferred)
>
> I am having stressful thoughts. This made me very uneasy. (Fear-inferred)

- count all anger expressed, anger inferred, sad expressed, sad inferred, fear expressed, fear inferred, joy expressed, joy inferred, love expressed, love inferred, surprise expressed, surprise inferred thought units for each rumination task.

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4. INTENSITY

- each emotion thought unit, whether coded as emotion-expressed or emotion-inferred is given an intensity value. Intensity values rank from 1(low) to 6 (high).
- intensity ratings are based on the emotion word employed and the use of qualifiers.
- If a given thought unit contains two or more emotion words, then the intensity values for all emotion words are added up but can not exceed the highest intensity level of 6.

Example:

Joy

I feel okay = 1; I feel good = 2; I feel very good = 3; I am happy = 4; I am very happy = 5; I feel extremely happy = 6.

Anger

I am slightly irritated = 1; I am annoyed = 2; I am angry = 3; I feel very angry = 4; I am extremely angry = 5; I feel like I am going to hit somebody = 6.

Sadness

I feel bored = 1; I am not good = 2; I always was bad =3; I did very poorly = 3; I felt stupid = 4; I felt humiliated = 5; I feel depressed = 6.

Fear

I am less relaxed = 1; I feel uneasy = 2; I felt a bit worried = 2; I was worried = 3; I feel tense = 3; I was stressed = 4; There was the fear of claustrophobia = 5; I felt extremely stressed, anxious and worried = 6.

- count the total of each intensity anger expressed, anger inferred, sad expressed, sad inferred, fear expressed, fear inferred, joy expressed, joy inferred, love expressed, love inferred, surprise expressed, surprise inferred for each rumination task.

The coding manual is in part based on research undertaken by Jennifer Lynn Ducharme (1997). Especially the part on how to code thought units is taken directly from her research. Some minor aspects on how to code thought units have been changed to make it fit the type of this research project. The remaining coding guide sections are based on her research with some parts also taken directly from her manual. All adaptations are the sole responsibility of this researcher.

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Appendix H

Inter-Rater Correlations

Table: Interrater Reliability for Rumination Task Variables

Variable	Pearson Correlation	
	Task 1	Task 2
Thought Units	.991	.995
VPOEX	.887	.613
VPOIN	.888	.926
VNEEX	.990	.885
VNEIN	.957	.923
ANGEX	1.000	.970
ANGIN	.944	.902
SADEX	.940	.965
SADIN	.955	.796
FEREX	1.000	.913
FERIN	.964	.851
JOYEX	1.000	1.000
JOYIN	.983	1.000

Note:
V = valence, PO = positive, NE = negative, EX = expressed, IN = inferred,
ANG = anger, SAD = sad, FER = fear, JOY = joy.

Appendix I

<u>Means and Standard Errors of Thought Units from Time 1 to Time 2 as a</u>

<u>Function of Hostility Group and Harassment Condition</u>

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Table: I

Mean and Standard Errors of Thought Unit Values from Time 1 to Time 2 as a Function
of Hostility Group (High Ho vs. Low Ho) and Harassment Condition (Har vs. Non-Har)

	Thought Unit 1	Thought Unit 2
High Ho		
Har	11.86 (1.53)	9.36 (1.69)
Non-Har	12.81 (1.14)	7.23 (1.55)
Low Ho		
Har	9.67 (1.57)	7.62 (1.73)
Non-Har	15.11 (1.36)	11.61 (1.50)

Appendix J

Anova Summary Table for Thought Units

Table J

Analysis of Variance for Total Functional Play, Study 2a

Source	df	F
Between subjects		
Hostility Group (HO)	1	0.25
Harassment Condition (HAR)	1	2.26
HO x HAR	1	3.76
Error	93	(89.65)
Within Subjects		
Thought Unit (T)	1	22.74**
T x HO	1	0.78
T x HAR	1	2.51
T x HO x HAR	1	0.32
Error	93	(24.41)

Note. Values enclosed in parentheses represent mean square errors.

*p <.05. **p < .001.

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Appendix K

<u>Multivariate Analysis of Variance Summary Table</u>

<u>for Valence Frequency Values</u>

Table K

Multivariate Analysis of Variance Summary for Valence Frequency Values

Source of Variance	Wilks'Lambda	Hypoth df	error df	Multivariate F
Hostility	0.88	4.00	90.00	3.12*
Harassment	0.93	4.00	90.00	1.72
Time	0.68	4.00	90.00	10.85***
Hostility by Harassment	1.00	4.00	90.00	0.12
Hostility by Time	1.00	4.00	90.00	1.05
Harassment by Time	0.84	4.00	90.00	4.28**
Hostility by Harassment by Time	0.96	4.00	90.00	0.96

*p<.05; **p<.01; ***p<.001

Appendix L

Multivariate Analysis of Variance Summary Table

for Valence Intensity Percentage-Ratio Values

Table L

Multivariate Analysis of Variance Summary for Valence Intensity

Percentage-Ratio Values

Source of Variance	Wilks'Lambda	Hypoth df	error df	Multivariate F
Hostility	0.94	4.00	90.00	1.46
Harassment	0.90	4.00	90.00	2.53*
Time	0.65	4.00	90.00	12.23***
Hostility by Harassment	0.97	4.00	90.00	0.64
Hostility by Time	0.99	4.00	90.00	0.15
Harassment by Time	0.86	4.00	90.00	3.60**
Hostility by Harassment by Time	0.97	4.00	90.00	0.81

*$p<.05$; **$p<.01$; ***$p<.001$

Appendix M

Multivariate Analysis of Variance Summary Table

for Emotion Frequency Values

Table M

Multivariate Analysis of Variance Summary for Emotion Frequency Values

Source of Variance	Wilks' Lambda	Hypoth df	error df	Multivariate F
Hostility	0.86	8.00	86.00	1.75 (trend)
Harassment	0.85	8.00	86.00	1.90 (trend)
Time	0.53	8.00	86.00	9.54***
Hostility by Harassment	0.98	8.00	86.00	0.18
Hostility by Time	0.91	8.00	86.00	1.07
Harassment by Time	0.77	8.00	86.00	3.22**
Hostility by Harassment by Time	0.94	8.00	86.00	0.66

*p<.05; **p<.01; ***p<.001

Appendix N

Multivariate Analysis of Variance Summary Table

for Emotion Intensity Percentage-Ratio Values

Table N

Multivariate Analysis of Variance Summary for Emotion Intensity

Percentage-Ratio Values

Source of Variance	Wilks'Lambda	Hypoth df	error df	Multivariate F
Hostility	0.89	8.00	86.00	1.24
Harassment	0.72	8.00	86.00	4.10***
Time	0.57	8.00	86.00	7.97***
Hostility by Harassment	0.92	8.00	86.00	0.94
Hostility by Time	0.93	8.00	86.00	0.84
Harassment by Time	0.76	8.00	86.00	3.39**
Hostility by Harassment by Time	0.92	8.00	86.00	0.90

*p<.05; **p<.01; ***p<.001

Appendix O

<u>ANOVA Summary Table for Rumination to Sadness</u>

<u>(RSCALE) Scores as a Function of Hostility Group</u>

Table O

Analysis of Variance Summary for RSCALE Scores

Source	df	F
Between subjects		
Hgroup	1	16.40**
Error	96	(111.24)

Note. Values enclosed in parentheses represent mean square errors.

*$p < .05$. **$p < .001$.

Appendix P

Multivariate Analysis of Variance Summary Table

for Cardiovascular Baseline Values as a Function

of Hostility Group, Harassment Condition and

Rumination to Sadness Group (RSCALE)

Table P

Multivariate Analysis of Variance Summary for Cardiovascular Baseline Values

as a Function of Hostility Group, Harassment Condition and Rumination to Sadness

Group (RSCALE)

Source of Variance	Wilks' Lambda	Hypoth df	error df	Multivariate F
Hostility	0.96	6.00	81.00	0.50
Harassment	0.97	6.00	81.00	0.36
Rumination	0.96	6.00	81.00	0.58
Hostility by Harassment	0.94	6.00	81.00	0.93
Hostility by Rumination	0.91	6.00	81.00	1.37
Harassment by Rumination	0.94	6.00	81.00	0.89
Hostility by Harassment by Rumination	0.97	6.00	81.00	0.44

*$p<.05$; **$p<.01$; ***$p<.001$

Appendix Q

Multivariate Analysis of Variance Summary Table

for Cardiovascular Stress Values as a Function of

Hostility Group, Harassment Condition, Time and

Rumination to Sadness Group (RSCALE)

Table Q

Multivariate Analysis of Variance Summary for Cardiovascular Stress Values as a Function of Hostility Group, Harassment Condition, Time and Rumination to Sadness Group (RSCALE)

Source of Variance	Wilks'Lambda	Hypoth df	error df	Multivariate F
Hostility	0.95	6.00	80.00	0.76
Harassment	0.94	6.00	80.00	0.91
Rumination	0.95	6.00	80.00	0.70
Time	0.19	6.00	80.00	56.04***
Hostility by Harassment	0.91	6.00	80.00	1.38
Hostility by Rumination	0.93	6.00	80.00	1.01
Harassment by Rumination	0.91	6.00	80.00	1.36
Hostility by Time	0.93	6.00	80.00	1.07
Harassment by Time	0.78	6.00	80.00	3.81**
Rumination by Time	0.95	6.00	80.00	0.68

*p<.05; **p<.01; ***p<.001

Table Q (continued)

Multivariate Analysis of Variance Summary for Cardiovascular Stress Values

Source of Variance	Wilks'Lambda	Hypoth df	error df	Multivariate F
Hostility by Harassment by Rumination	0.97	6.00	80.00	0.36
Hostility by Harassment by Time	0.96	6.00	80.00	0.61
Hostility by Rumination by Time	0.94	6.00	80.00	0.82
Harassment by Rumination by Time	0.95	6.00	80.00	0.65
Hostility by Harassment by Rumination by Time	0.97	6.00	80.00	0.41

*p<.05; **p<.01; ***p<.001