CARDIOVASCULAR RESPONSE TO HARASSMENT AND THE INFLUENCE OF APOLOGY STRATEGIES ON RECOVERY PERIOD

by

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Abstract

184 participants (92 male, 92 female) performed a laboratory stress task involving mental arithmetic in a study examining the influence of apology strategies on cardiovascular recovery from anger provocation involving harassment. Participants completed the Cook-Medley Hostility Scale prior to the laboratory session, to assess their degree of cynicism. Participants were randomly assigned to one of four conditions: (1) non-harassed Control, (2) harassed/Good Apology, (3) harassed/Pseudo-apology, or (4) harassed/Delayed Apology. Measures of systolic blood pressure (SBP), diastolic blood pressure (DBP), and heart rate (HR), and samples of salivary cortisol were taken at consecutive baseline, task and return to baseline periods. Results indicate that verbal harassment resulted in increased reported anger and increased cardiovascular reactivity in participants, but did not result in slower overall recovery than was seen in Controls. Participants who received a genuine apology displayed faster decreases in self-reported anger than those who received a fake apology, termed a pseudo-apology. Participants low in cynicism displayed little if any difference in cardiovascular recovery between apology conditions, while those higher in cynicism displayed faster SBP recovery when they received a genuine apology. High-cynical individuals displayed similar SBP recovery when given a pseudo-apology compared to when given no apology. Men typically displayed slower overall SBP recovery than women and men displayed the fastest HR recovery when given a pseudo-apology. Asian participants displayed slower SBP recovery when they received no apology at the beginning of the recovery period. It is concluded that a genuine apology can accelerate recovery from anger provocation but only in certain population subgroups.
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Introduction

Within the past three decades or more, it has become increasingly clear that stress, something which is perhaps a universal human experience, can influence disease processes in animals and humans. Stress can be defined as a transaction between the individual and the environment, in which the person assesses both the threatening stimuli (stressor) and also available coping resources (i.e., the ability of that individual to deal with the threat), and the psychological and physiological reactions to the perceived threat (Lazarus, & Folkman, 1984). Research examining the relationship between stress and cardiovascular disease has focused on how individual personality characteristics interact with stressors such that some people develop illness while others do not. The current study goes a step further, by examining a uniquely human social process, i.e., the influence of apologies on cardiovascular functioning following interpersonal conflict. In so doing, this research illuminates the effect of remedial strategies following acute emotional stress, the kind thought by some to be particularly salient for the development of disease processes (Linden, Earle, Gerin, & Christenfeld, 1997). For it may not be the experience of stress per se which results in illness, but rather the manner in which individuals are able to cope with that experience.

Stress and Illness

The physiological response associated with stress has traditionally been viewed within the context of the “fight or flight” model proposed by Cannon (1929), expanded later by Selye (1936) to include three phases: (1) activation, (2) resistance and (3) exhaustion. Within Selye’s model, whenever an organism encounters a perceived threatening stimulus, physiological changes occur within that organism (activation) in order to better its ability to fight or flee from the threat (resistance). Activation and resistance to threat maintained beyond the organism’s available resources results in exhaustion. It has been proposed that physiological activation beyond the resistance phase contributes to disease processes (Linden et al., 1997).
The physiological response to stress is partly the result of increased activity of the sympathetic nervous system (SNS). SNS activity stimulates the heart, resulting in increases in blood pressure and heart rate, dilates the pupils, inhibits digestion, stimulates the liver, resulting in increases in blood glucose levels, constricts blood vessels in the skin and dilates blood vessels in skeletal muscles, and also stimulates the adrenal medulla, resulting in production of epinephrine and norepinephrine. Norepinephrine also serves as a neurotransmitter in the SNS. Increased levels of these hormones in the blood have a similar effect of SNS activity in that they result in increased blood pressure, heart rate, respiration, perspiration, and muscle strength. This has been termed the sympathoadreno-medullary (SAM) axis (McCabe, & Schneiderman, 1985).

Further, the physiological response to stress also acts via the hypothalamic-pituitary-adrenocortical (HPA) axis. In this system, central nervous system (CNS) activity stimulates the hypothalamus, resulting in secretion of corticotropin-releasing factor (CRF), that acts on the pituitary gland to produce adrenocorticotropic hormone (ACTH). ACTH then activates the adrenal cortex which then produces corticosteroids, which regulate blood glucose and blood electrolytes, and suppress inflammation and immune system activity. Because HPA axis activity is regulated by hormonal pathways more so than SAM axis activity, HPA activity tends to be slower-acting and longer-lasting than SAM activity. It has been suggested that HPA axis activity is associated with experience of chronic strain and negative affect and that HPA activation is more closely linked to disease processes, as it represents slower return to an organism’s homeostatic functioning (Dienstbier, 1989; Taylor, 1991).

**Cardiovascular Disease, Reactivity Studies, and Hostility**

In the past three decades, there has been growing interest in the psychological and behavioural aspects relating to cardiovascular disease (CVD). The Type A behaviour pattern emerged in the late 1970’s as a cluster of traits and behaviours thought to contribute to CVD. These include competitiveness, sense of time urgency, achievement striving and hostility (Glass,
Numerous studies have suggested that Type A individuals are at increased risk for CVD (Drummond, 1982; Schmidt, 1983), and that Type A's show greater severity of CVD, even after controlling for other known risk factors (Frank, 1978).

However, many studies failed to show a significant relationship between Type A behaviour pattern and increased risk of CVD (MacDougall, Dembroski, Dimsdale, & Hackett, 1985). Surprisingly, other studies showed that, following one's first heart attack, Type A's were less likely than Type B's to die from a second heart attack (de Leo, Caracciolo, Berto, Mauro, et al., 1986; Ragland & Brand, 1988). Findings such as these led researchers to question the validity of the Type A construct and led some authors to call for a closer examination of specific components of the Type A behaviour pattern (Costa, et al., 1987; Linden, 1987). These authors suggested that the hostility component in the Type A behaviour pattern in particular plays the vital role in contributing to CVD.

Hostility has itself been the topic of CVD research for a long time. In one study, it was found that CVD patients with angina pectoris tended to show compulsiveness, repressed hostility and an inability to verbalize their anger (Wolff, 1969). A separate study found that expressed hostility was related to severity of angina and duration of CVD (Tennant and Langeluddecke, 1985). Given results such as these, researchers were left to propose a mechanism by which hostility exerts an influence on the development of CVD.

Within the cardiovascular literature, there have been numerous studies suggesting that hyperreactivity of the SNS, resulting in exaggerated increases in heart rate (HR) and blood pressure (BP), is predictive of development of hypertension. Much of this research has been done comparing the cardiovascular reactivity of those with and without a family history of hypertension. Several studies have found that normotensive individuals with a positive family history of hypertension show greater reactivity to laboratory stressors (Ernst, Francis, & Enwonwu, 1990; Fredrikson, Tuomisto, & Bergman-Losman, 1991; Johnson, 1982; Jorgensen,
Gelling, & Kliner, 1992; Jorgensen, & Houston, 1986; Jorgensen, & Houston, 1988; Marrero, al’Absi, Pincomb, & Lovallo, 1997; Sausen, Lovallo, & Wilson, 1991; Semenchuk, & Larkin, 1993; Stoney, & Matthews, 1988; Voegele, Jarvis, & Cheeseman, 1997). Other studies have shown that diagnosed hypertensives also show greater cardiovascular reactivity to laboratory stressors than normotensives (Drummond, 1983; Fredrikson, 1992; Tuomisto, 1997). Evidence from studies such as these led Fredrikson and Matthews (1990) in their meta-analytic review article to conclude that chronic cardiovascular hyperreactivity is a factor leading to essential hypertension.

However, other studies have failed to replicate such a relationship. Some researchers found that while hypertensives showed higher mean systolic blood pressure (SBP) and diastolic blood pressure (DBP), the magnitude of change during the stressor from baseline did not differ reliably from that of normotensives (Lazaro, Valdes, Marcos, & Guarch, 1993; Koehler, Scherbaum, & Ritz, 1995; Koehler, 1996). Prior to these studies, one meta-analytic study and a literature review had suggested that effect sizes for observed differences in reactivity are small (Rosenman, & Ward, 1988; Pickering, & Gerin, 1990). These authors argue there is little support for the reactivity hypothesis of hypertension. This is echoed by Rosenman and Hjemdahl (1991) and Rosenman (1991) who point out that cardiovascular changes such as those observed in the laboratory occur constantly in an individual’s waking state and that anxiety disorders, conditions characterized by cardiovascular hyperreactivity, correlate poorly with CVD. They argue the need for stronger evidence before assigning a causal role to reactivity for the development of hypertension. Criticism such as this, as well as the above-mentioned findings regarding hostility and CVD, led to a new wave of research relating hostility to reactivity.

At least as early as 1977, A. H. Mann had found that hypertensive individuals tended to show more hostility than normotensives. Another early study had found that hostility accounted
for greater increases in SBP, HR, and neuroendocrine levels in Type A’s than Type B’s during a competitive task (Glass et al., 1980). It was noted in another review article that coronary-prone individuals seemed to be more aggressive (Diamond, 1982).

In another study, it was found that only those scoring high in hostility showed elevated SBP reactivity as a function of the Type A behaviour pattern (Diamond et al., 1984). The finding that hostile individuals show greater reactivity than non-hostiles, was replicated in some studies (McCann, & Matthews, 1988); however, others failed to show a convincing relationship (Sallis et al., 1987; Smith, & Houston, 1987). In spite of this, researchers continued to find that hostility was related to CVD, even though many studies failed to show a relationship to reactivity, the proposed mechanism by which hostility exerts its influence on the development of CVD. Few studies found that overall hostility scores were related to CVD (Bernardo, et al., 1987), however, many authors remained adamant that hostility needed to be studied more closely in relation to reactivity and CVD (Costa et al., 1987; Dembroski, & Costa, 1988; Krantz, Contrada, Hill, & Friedler, 1988; Linden, 1987; Mann, 1986). These authors pointed to a multidimensional nature of hostility.

Beginning at this time, studies were published demonstrating that hostility was differentially related to CVD if it was classed as “neurotic” vs. “non-neurotic” (Siegman, Dembroski, & Ringel, 1987), “overt” vs. “covert” (Jorgensen, & Houston, 1988), or “neurotic” vs. “antagonistic” (Suarez, & Williams, 1990). Mode of anger expression as well as hostility, may also be related to reactivity and CVD (Krantz, Contrada, Hill, & Friedler, 1988). Reviews at this time similarly called for further sophisticated examinations of specific hostility components (Schneiderman, Chesney, & Krantz, 1989).

Following this, numerous studies have emerged which demonstrate the relationship between specific types of hostility and cardiovascular reactivity. Some research found that ratings of cynical hostility were related to greater reactivity (Christensen, & Smith, 1993; Powch,
This and other findings demonstrating that expressive hostility is associated with greater reactivity during harassment suggests that more researchers would find such a relationship between hostility and reactivity if they took into account the different components of hostility (Felsten, & Leitten, 1993). Lawler, Harralson, Armstead, and Schmied (1993) also compared reactivity of those with high and low neurotic and expressed hostility. They found a pattern of results in which degree of reactivity was related to interactions between type of hostility, gender and type of lab task. Another study found that high hostility scores were associated with greater heart rate reactivity in low-defensive men and that low hostility scores were associated with greater DBP reactivity in low-defensive women (Shapiro, Goldstein, & Jamner, 1995). These studies suggest a complex relationship between reactivity and hostility.

Around this time, Johan Denollet began reinvestigating the coronary-prone behaviour pattern. In a study of cardiac patients, it was found that those displaying high negative affectivity had more physical complaints, overreacted to physical problems and produced higher hostility scores than did those with a repressive coping style (Denollet, 1991). Denollet (1993) later produced a theoretical model in which distressed individuals—those who are hostile and stressed—and who are also socially inhibited, in that they do not express their anger, are prone to CVD. This conceptualization is supported by the results of studies finding that individuals characterized by hostility, avoidance coping and low expressed anger showed exaggerated reactivity to an emotional task (Vitaliano et al., 1993). It has also been found that hostility and self-deception are associated with elevated ambulatory BP means (Linden, Chambers, Maurice, & Lenz, 1993). Another study found that for a task designed to provoke hostility, only those who suppressed their anger showed cardiovascular hyperreactivity (Davidson, 1993). Holding anger in coupled with hostile attitudes has been associated with increased reactivity (Lawler et al., 1998) and with arterial plaque build-up (Matthews et al., 1998). Negative affectivity has itself recently been shown to produce hyperreactivity in low hostile
individuals (Raeikkonen, Matthews, Flory, & Owen, 1999). These findings are consistent with the concept of the Type D behaviour pattern (Denollet, 1997). Denollet presents Type D as a behaviour pattern of those at risk for CVD and is meant as an improvement on the Type A pattern. Type D's are described as showing high levels of depressive affect, low self-esteem, little life satisfaction, low positive affect, high negative affect such as anger, and at the same time being socially inhibited. The same author has proposed a 24-item questionnaire, as well as a 16-item screening form, used to classify individuals as Type D (Denollet, 1998).

In addition to the work relating components of hostility to cardiovascular reactivity, some recent research has turned towards examination of rate of recovery to baseline following a laboratory stressor. It has been theorized that negative emotions such as anger induce greater physiological arousal within an organism than do positive emotions and that once aroused, organisms minimize that arousal via homeostatic mechanisms (Taylor, 1991). Further, it has been suggested by the same author that effective coping with stress is characterized by quick recovery from such stress-related arousal. Many authors have found slower recovery rates among high hostile individuals (Ganster, Schaubroeck, Sime, & Mayes, 1991), Type A's versus Type B's (Palmero, Codina, & Rosel, 1993), those high in anxiety and social avoidance (Vitaliano, Russo, Paulsen, & Bailey, 1995), as well as hypertensives (Koehler, Fricke, Ritz, & Scherbaum, 1997; Seibt, Boucsein, & Scheuch, 1998; O'Brien, Haynes, & Mumby, 1998). In a meta-analytic review, Hocking-Schuler, and O'Brien (1997) conclude that individuals at high risk for hypertension show delayed recovery from laboratory stressors.

Remorse and Apologies

Remorse and apologetic behaviour are features of social interaction which are familiar to most people. Nearly everyone can think of a situation in which they either received an apology or gave an apology for some error or offense they committed. And one need not look far to encounter public apologies in daily life. The news media regularly portray public figures
apologizing for their behaviour, be it a politician apologizing for a sex scandal, a sports figure apologizing for his drunk driving, or a criminal apologizing for his crime. Yet despite the importance and frequent display of expressions of remorse, the psychological literature is surprisingly lacking on this topic. A search of available psychological abstracts by this author revealed fewer than 30 articles published from 1967 to the present relating to apologies and a review of the sociological and sociolinguistic literature is only slightly more promising. Further, no studies within the apology literature included physiological measures. To the author’s knowledge, the current study is an original contribution in that there has been no published psychophysiology study specifically examining the effects of apologies.

Perhaps psychology researchers neglect the study of remorse and apologies because remorse is a difficult concept to define. The working definition I have used in previous studies is, “Feeling sorry for something you have done, or not done, to another person.” While this is a simple and easily understood definition for study participants, it is not one that invites disciplined inquiry from psychologists. Landman (1993) in a comparison of remorse with regret, defines remorse as, “gnawing distress arising from a sense of guilt for past wrongs (as injuries done to others),” (pp. 51). Landman’s definition seems more adequate, and she goes on to argue that remorse is a narrow, more-focused cousin of regret. In particular, remorse applies to one’s own past, voluntary, overt, and morally or legally wrong acts, or failures to act.

When individuals commit some offense or error for which they feel remorse, a common strategy is to offer an apology. In a study comparing an apology following destructive criticism of participants by a confederate with other interventions, such as the opportunity to offer retaliatory criticism or statements by the criticizer that they did not intend to cause harm, it was found that often an apology was the most effective remedial strategy (Baron, 1990). In a study involving children, it was found that after witnessing a transgression by an actor, children rated
the actor most favorably if he had a good reputation, gave an apology and appeared remorseful (Darby, & Schlenker, 1989).

Similar results have been found with university undergraduates. One study had students read a vignette depicting a man who incurred a motor vehicle accident while drunk (Taylor, & Kleinke, 1992). These authors found that those students who read the vignette in which the man expressed remorse for his actions rated the man as being more responsible and more sensitive. This is echoed by studies in which participants were asked to rate criminal confessors to sexual assault (Kleinke, Wallis, & Stalder, 1992) and vehicular manslaughter (Robinson, Smith-Lovin, & Tsoudis, 1994). In these studies it was found that participants rated confessors more favorably if they expressed remorse. It should be noted that in these studies, although perceptions of the offender changed, sentencing recommendations did not.

It is clear from these studies that the apology is an effective way of impression management following one’s offense. It suggests that an apology may be an effective way of reducing anger in victims of an offence, although in the above studies, victims were not those rating the offenders. An earlier study specifically compared victim responses following harm when they received an apology to when no apology was given (Ohbuchi, Agarie, & Kameda, 1989). They found that those who received an apology experienced reduced aggression and improved impression of the offender. Further, they suggest that more severe offenses require more elaborate apologies.

Within the literature examining apologies, there is no standard by which apologies are judged. Various authors have proposed specific components of apologies (Holmes, 1990) however, there is little consistency across studies as to what constitutes a genuine apology. The system I have used in previous research (Anderson & Prkachin, 1998) includes six verbal components, the first being an explicit expression of remorse (e.g., “I’m sorry.”). The second is a statement of why one feels remorse and this requires specificity (e.g., “I’m sorry for stepping
on your toe," as opposed to, "I'm sorry for... you know.") and being sorry for the right thing (e.g., "I'm sorry I called you a liar," as opposed to, "I'm sorry you feel that way."). Next, one must accept responsibility his or her actions (e.g., "It's my fault."). A genuine apology also includes an explanation for the offensive behaviour. It is important to provide an explanation without trying to excuse the offence and shirk responsibility (e.g., "I'm sorry. I wasn't looking where I was going," vs. "I'm sorry I bumped into you but I had to answer my cell phone quickly."). The fifth component is a promise of forbearance. This is a statement stating that the offensive behaviour is not reflective of the offender's true character, therefore the victim can trust the behaviour will not recur in the future (e.g., "I'll be more careful in the future."). Finally, a genuine apology is accompanied by a offer of restitution (e.g., "I'll pay to have it cleaned.").

Obviously, these components are not the only factors making up a genuine apology. Aside from what is actually said, non-verbal factors such as facial expression, body posture and tone of voice speak to the sincerity of the apologizer. Indeed, previous research conducted by this author suggests that non-verbal factors are essential in perception of apology sincerity (Anderson & Prkachin, 1998). In a pilot study conducted for the current research interest, nine participants read and listened to the delivery of eight different apology scripts, created by the investigator each with a different number or combination of the apology components listed above. Participants were asked to rate the perceived sincerity of each apology on a 9-point Likert scale for which 1 = "Not at all sincere" and 9 = "Extremely sincere." It was found that by varying the number and combination of components included in an apology script and the manner in which it is presented one can reliably manipulate the perceived sincerity of the apology. The apology which received the highest mean rating (\(M = 8.75, \ SD = 1.28\)) formed the Good Apology script and the apology with the lowest mean rating (\(M = 2.5, \ SD = 1.51\)) formed the Pseudo-apology script used in the following investigation. Researchers involved in the
The current study wanted to investigate the effects of different types of apologies on cardiovascular recovery.

**The Current Study**

The research study is partly a replication of Earle, Linden, and Weinberg (1999), who examined differential effects of harassment on cardiovascular and salivary cortisol reactivity and recovery in men and women. Salivary cortisol is a marker of ACTH and is indicative of HPA axis activity (Linden et al., 1997). By measuring cortisol, investigators are able to tease apart the relative contributions of SAM axis activity, associated with effective coping with stress, and HPA axis activity, the axis associated with negative affect and more relevant to disease processes.

In that study, male and female participants all performed a mental arithmetic task and those in the experimental group were verbally harassed by the experimenters in order to induce anger. The researchers then compared the patterns of reactivity and recovery of those who were harassed to those who were not, as well as comparing the patterns produced by men to those produced by women. They found that harassed participants showed greater reactivity than controls and that men show delayed recovery to baseline levels, while women tended to show overcompensation in cardiovascular recovery.

Consistent with that research, the first hypothesis of this study is that harassed participants will show greater cardiovascular reactivity to the task than will non-harassed controls. Hypothesis 2 states that harassed participants will show delayed recovery relative to non-harassed controls.

The unique feature of this study is its examination of apology strategies and their consequence for cardiovascular recovery to baseline. Indeed, the author is aware of no previous psychophysiological study involving apologies. Following the arithmetic task, harassed participants were assigned to one of three groups: those who received a good apology, those who
received a pseudo-apology and those who received no apology. Hypothesis 3 states that harassed participants will show differential recovery depending upon the apology condition to which they are assigned. Further, participants in this study were assessed for level of cynical hostility (high or low). Consistent with the above-noted research literature, Hypothesis 4 states that cynical participants will show attenuated return to baseline relative to non-cynicals.

It should be noted that Hypotheses 1 is merely a validity check. Support for Hypothesis 1 is required for investigators to conclude that the task manipulation was successful—that participants were indeed angered by the harassment—and that this anger is associated with cardiovascular hyperreactivity. Support for Hypothesis 2 is useful although not required as a validity check. It is upon these two supporting hypotheses that the central question in the current study, Hypothesis 3, rests. Given the premise based on the above apology literature, that an effectively delivered apology reduces anger in its audience, one may suggest that the influence of apology strategies on cardiovascular recovery (Hypothesis 3) results from its reducing (or not reducing) anger in participants. Hypothesis 4 is included in this study due to the previously demonstrated specific effects of cynical hostility on cardiovascular reactivity and recovery and also because cynicism might reasonably be expected to influence one's interpretation of the sincerity of an apology.

Although there were no specific hypotheses related to either gender or ethnicity, these factors were included in the data analysis. Earle, Linden, and Weinberg (1999) did in fact find significant differences in recovery related to gender, although it is unclear how those findings may relate to the current study with its examination of apologies. Previous apology research by the author (Anderson, & Prkachin, unpublished), failed to find a gender difference in response to apologies. Studies conducted in our lab have not yet discovered differences in reactivity or recovery due to ethnicity, however the relatively large resident Asian population at UBC allows for sufficient n such that one could examine ethnic factors (comparing Asian to Caucasian) with
reasonable statistical power. Further, cross-cultural research comparing apology strategies has suggested ethnic differences in both social context in which apologies are given and the specific components used in apology statements (Cupach, & Imahori, 1993; Ide, 1998).

Method

Participants

Participants in this study were psychology undergraduates from the University of British Columbia who received bonus course credit for their participation. Of the 192 participants tested, 184 (92 males, 92 females) were included in the analysis. Testing sessions for 6 participants were aborted due to incidents of mechanical failure and aborted for 2 participants due to their inability to perform arithmetic. Sample ethnicity was as follows: 48% Asian, 42% European/Caucasian, 4% Indo-Canadian, 6% various others. This ethnic proportion allowed experimenters to examine effects of ethnicity, comparing Asians to Caucasians.

Pre-session Questionnaires and Habituation

One day prior to their participation in the laboratory portion of the study, participants were asked to come to the lab to obtain a battery of pre-session questionnaires and sign a consent form. The battery included the Cook-Medley Hostility scale, a measure containing a Cynicism subscale by which participants were classified as either High or Low cynical hostility in this study, and numerous other questionnaires examined in a separate study (Habra, Linden, & Anderson, manuscript in progress). Further, participants completed a Medical Screening Questionnaire to determine the presence of any medical conditions which might alter reactivity or suggest danger to the participant of participating. During their pre-session visit, participants were given a tour of the lab and had their blood pressure taken using the same equipment used the following day. This visit was expected reduce the novelty of the lab environment and assist with habituation, such that observed changes can be attributed solely to the experimental manipulation.
Procedure

Consistent with previous studies of this sort conducted in this lab, prior to the testing session participants were informed via written instructions that they were to: (1) refrain from consuming alcohol, caffeine, refrain from smoking, and refrain from exercising vigorously for 12 hours prior to participation in the study; (2) eat a light meal at least 1 hour prior to their visit; (3) take care brushing their teeth the night prior to their visit so as not to cause their gums to bleed and to refrain from brushing on the day of their visit.

Upon arriving on the day of their visit, participants were greeted by an experimenter who collected their completed questionnaires and obtained their further verbal consent to participate in the study. Each participant was randomly assigned to one of four conditions: (1) Harassed/Good Apology, (2) Harassed/Pseudo-apology, (3) Harassed/Delayed apology, and (4) Non-harassed Control. Participants were told that the purpose of the study was to assess their physiological reaction to a challenging cognitive task, although they were not told they would be harassed.

Baseline Period

The experiment began by having the participant be seated alone in the testing room and attaching an automated digital BP and HR monitor (Dinamap 845 Vital Signs Monitor, Critikon, Inc., Tampa, FL) to the participant's non-dominant arm. Participants were asked to relax quietly. Baseline Dinamap readings were taken at Time 0, and minutes 2, 10, and 12. At the end of minute 12, participants were asked to produce a saliva sample and complete a visual analogue emotion rating scale (ERS) form.

Task Period

Following the baseline period, the experimenter entered the testing room to provide more detailed task instructions. Each participant was again told that the purpose of the study was to examine the effects of a challenging task on one's blood pressure and heart rate and that to do
this they would be performing some mental arithmetic. Consistent with previous reactivity studies (e.g., Earle, Linden & Weinberg, 1999), participants were instructed that when told to start, they were to perform serial subtractions of 7, starting at 9000 (i.e., “9000, 8993, 8986, 8979… etc.”), out loud and as fast as possible for several minutes until instructed to stop. They were informed that a lab technician (in reality a study confederate) had arrived and would be telling them when to start and stop. Further, participants were informed that a prize of $50.00 would be awarded to the individual who demonstrated the best performance, based on number of subtractions and accuracy, and therefore they should be motivated to count as quickly and accurately as possible.

At approximately minute 17 of the study protocol, participants were instructed by the confederate to begin counting backwards. Dinamap readings were taken at approximately minutes 17, 21, 24, 27, and 30, lasting a total of 13 minutes. This time frame was chosen to allow salivary cortisol levels to reach a peak prior to the recovery period. Participants in the Non-harassed/Control condition were left to count unfettered until the end of the task period. For those in the harassed groups, confederates provided scripted, harassing comments\textsuperscript{1} identical to those used in Earle, Linden, and Weinberg (1999) at approximately minutes 20, 23, and 26. This was done with the intent of producing mild feelings of anger or irritation in participants. Prior to the study, confederates were trained to deliver their scripts in a consistent and firm, but not overly harsh or abusive, manner. At the end of minute 30, participants were told to stop counting by confederates and to provide a second saliva sample and complete a second ERS form. All instructions were provided via an intercom. Confederates were gender-matched to participants such as to avoid potential confounding effects of gender dynamics between confederate and participant.
Recovery Period

The recovery period began immediately after the participant stopped counting and lasted for 20 minutes to approximately minute 50. Participants were asked over the intercom by the confederate to relax quietly until the end of the session. Dinamap readings were taken at 5-minute intervals beginning at minute 35 until minute 50. Saliva samples were taken at minutes 40 and 50. Participants were asked to complete a third ERS form at minute 40 and a fourth at minute 50.

Harassed participants in the Good Apology and Pseudo-apology conditions received a scripted apology from the confederate at approximately minute 32. Those in the Delayed Apology and Non-harassed/Control condition were left to spend the recovery period in silence.

Debriefing

The debriefing period occurred immediately following the recovery period and was conducted by the experimenter with the confederate (if applicable). In addition, all participants received a written debriefing form explaining the full hypotheses, conditions, and procedures used in the study. As well as receiving a full explanation, participants in the Harassed/Delayed Apology condition received their apology, and those in the Harassed/Pseudo-apology condition received a further genuine apology for the deception. Both the experimenter and confederate were available to answer any questions or concerns participants had.

Data Analysis Preparation

Self-report ratings were quantified by measuring the distance in centimetres between participants' tick mark on each 10 cm visual analogue scale and the far left point of that scale representing no such emotion. Blood pressure and heart rate raw values were recorded for each time point. Systolic blood pressure and diastolic blood pressure were recorded separately, as opposed to one mean value. Saliva samples were frozen and transported to another laboratory prior to being assayed for cortisol.
Results

Self-report Emotion Rating Scales

Ratings were first analyzed by performing six $4 \times 4$ (condition) ANOVAs for each subscale of the ERS form (Happiness, Anger, Fear, Sadness, Disgust & Surprise). The results, including $F$ values, degrees of freedom and $p$ values, are displayed in Table 1.

Results from the omnibus $F$-tests all show main effects for both Time and Condition. $F$-test results for three subscales (Happiness, Anger and Fear) obtained a significant interaction between Time and Condition, suggesting that participants in different experimental conditions reported differing intensity of these emotions over time. Mean emotion ratings are displayed in Figures 1-6. As can be seen from the figures, participants in the harassed conditions show greater increase (Anger and Fear) and decrease (Happiness) in emotion intensity over time, than those in the Control condition.

Post-hoc comparisons for each of the three subscales bearing an interaction were performed using Tukey’s HSD. No post-hoc comparison of Happiness ratings was significant. Of note, comparisons for the Anger subscale revealed that: (1) participants in all conditions did not differ at baseline in their reported anger, (2) participants in harassed groups reported significantly more anger than those in the Control condition following the task period ($p < .05$) but did not differ significantly between harassed groups, and (3) that participants in the Pseudo-apology condition reported significantly more anger than those in the Control and Good Apology condition at recovery ($p < .05$) but did not differ from those in the Delayed Apology condition.

Also, comparisons for the Fear subscale showed that: (1) groups did not differ in their fear ratings at baseline, (2) following the task period, participants in the Pseudo-apology condition reported more fear than those in the Control ($p < .01$) and Good Apology ($p < .05$) conditions but did not differ from the Delayed Apology condition, and (3) that participants in the
Pseudo-apology condition reported significantly more fear than those in the Control condition ($p < .05$) during the recovery period but did not differ from those in the Good apology and Delayed apology conditions.

Raw change scores were computed for each emotion subscale examining change from the end of baseline to the end of the task, the end of task to the end of the first half of the recovery period, and the end of the first to the end of the second half of the recovery period. Graphs portraying mean raw change scores are displayed in Figures 7-9. Series of two-tailed One Sample $t$-tests were performed to determine significant differences between change scores. All tests were run at $\alpha = .01$ level of significance to control for Type I error.

Results of these tests showed that Anger subscale ratings increased significantly more following the task than any other subscale. There was a corresponding decrease in Happiness subscale ratings (see Figure 7). Following the first half of the recovery period, Surprise and Anger ratings showed significantly greater decrease than any other subscale. Happiness ratings increased significantly. During the last half of the recovery period, Anger, Fear, Sadness, Disgust and Surprise ratings decreased equally significantly. They all differed significantly from Happiness ratings which showed a significant increase.

**Physiological Data**

Data were analyzed by first converting raw BP values to residualized change scores. This is the recommended manner of analyzing such data (Linden, Earle, Gerin, & Christenfeld, 1997; Manuck, Kasprowicz, & Muldoon, 1990), because residuals represent unique variance not accounted for by baseline levels. These residualized change scores were then entered into three Independent Samples $t$-tests to test Hypothesis 1, that harassed participants displayed greater reactivity compared to the non-harassed control group.
Harassed participants showed greater increases in SBP, \( t(175) = -3.334, p < .01 \), in DBP, \( t(174) = -3.687, p < .001 \), and in HR, \( t(177) = -4.380, p < .001 \), than did those in the Control condition.

Recovery was defined as the amount of change from the final task reading to each recovery reading. Therefore, raw change for each of the four measurement time points in the recovery period may be computed by subtracting each recovery BP level from the last task BP level. However, since recovery BP values are partly a function of one's task BP values, raw BP values were converted to residualized change scores in the same manner as those computed to assess reactivity, to account for task BP levels.

### Comparing Harassed Participants to Non-harassed Controls

To test Hypothesis 2, that harassed participants will display delayed recovery relative to the control group, a series of Independent Samples t-tests were first performed at each recovery measurement time point, comparing non-harassed participants to harasses participants in the Delayed Apology condition. Results of these t-tests for SBP failed to show a significant difference between groups at Recovery 1, \( t(81) = .20, \text{ ns} \), Recovery 2, \( t(80) = .26, \text{ ns} \), Recovery 3, \( t(80) = .87, \text{ ns} \), or Recovery 4, \( t(81) = 1.34, \text{ ns} \). Results of these t-tests for DBP failed to show a significant difference between groups at Recovery 1, \( t(81) = .81, \text{ ns} \), Recovery 2, \( t(80) = .18, \text{ ns} \), Recovery 3, \( t(80) = -.91, \text{ ns} \), or Recovery 4, \( t(81) = .49, \text{ ns} \).

The same series of t-tests were performed for HR, and results for these tests were significant at Recovery 1, \( t(83) = 2.23, p < .05 \), and Recovery 2, \( t(82) = 2.01, p < .05 \). These are displayed in Figures 10 and 11. As shown by the figures, participants in the Delayed Apology condition showed faster HR recovery than did those in the control condition.
Comparing Harassed Participants according to Apology Condition

Systolic Blood Pressure.

Four 3 (condition) × 2 (gender) × 2 (ethnicity) × 2 (cynicism) factorial ANOVAs were performed comparing residualized change scores from Task to Recovery 1, Task to Recovery 2, Task to Recovery 3 and Task to Recovery 4. This analysis revealed a main effect of Gender at Recovery 1, \( F(1, 98) = 9.11, p < .01 \), Recovery 2, \( F(1, 98) = 5.78, p < .05 \), and Recovery 4, \( F(1, 97) = 5.85, p < .05 \). An examination of Figures 12, 13, and 14 reveals that males display slower recovery than females regardless of apology condition. Because gender did not interact with any other factor it was subsequently dropped from the model, allowing for a less convoluted analysis of the remaining factors involving four 3(condition) × 2(cynicism) × 2(ethnicity) factorial ANOVAs. The results are displayed in Table 2.

Five minutes after the end of the task period, there was a significant interaction between Condition and Cynicism. As can be seen from Figure 15, participants scoring high in cynicism showed the largest recovery in the Good Apology condition and less recovery in the Pseudo-apology and Delayed Apology conditions, while those scoring low in cynicism showed an opposite pattern. Post-hoc comparisons using Tukey's HSD showed that for Low-cynical participants, SBP recovery did not differ across apology condition, although for High-cynical participants, those in the Good Apology condition showed larger recovery compared to those in the Delayed apology condition (\( p < .05 \)). An Independent Samples t-test performed at each level of apology condition showed that High and Low-cynical participants did not show differential recovery in the Good Apology condition, but that High-cynical participants showed less recovery than Low-cynical participants in the Pseudo-apology (\( p < .01 \)) and Delayed Apology (\( p < .05 \)) conditions.

There was a significant interaction between condition and ethnicity, when comparing Caucasian to Asian participants. This interaction is displayed in Figure 16. Post-hoc
comparisons using Tukey’s HSD showed that Caucasian participants’ SBP recovery did not differ across apology conditions. There was a trend for Asians to show significantly less SBP recovery in the Delayed Apology condition compared to the Good and Pseudo-apology conditions \((p = .053)\). Independent Samples \(t\)-tests performed at each level of apology condition showed that Caucasians and Asians did not differ in the Good Apology and Pseudo-apology conditions, but that Asians showed attenuated recovery compared to Caucasians in the Delayed Apology condition \((p < .05)\).

Ten minutes following the end of the task period, there was a significant interaction between apology condition and Cynicism. This is displayed in Figure 17. Post-hoc comparisons performed using Tukey’s HSD showed that Low-cynical participants did not differ in their SBP recovery across apology conditions, but that High-cynical participants showed significantly greater recovery in the Good Apology condition when compared to the Delayed Apology condition. Independent Samples \(t\)-tests performed at each level of apology condition, showed that High and Low-cynical participants do not differ in their recovery in the Good Apology condition but that High-cynical participants show less recovery compared to Low-cynicals in the Pseudo-apology \((p < .05)\) and Delayed Apology \((p < .01)\) conditions.

There was a significant interaction between apology condition and Ethnicity, displayed in Figure 18. Post-hoc comparisons using Tukey’s HSD showed that neither Caucasians nor Asians show differential recovery within-groups across apology conditions. Independent-samples \(t\)-tests performed at each level of apology condition showed that Caucasians and Asians do not differ in their SBP recovery when in the Good Apology Condition, but that Caucasians showed significantly less recovery than Asians in the Pseudo-apology condition \((p < .05)\) and that Asians showed significantly less recovery than Caucasians in the Delayed apology condition.

Fifteen minutes following the end of the task period, there was a significant interaction between apology condition and Cynicism. This is displayed in Figure 19. Post-hoc comparisons
performed using Tukey’s HSD showed that High-cynical participants did not differ in their SBP recovery across apology conditions, but that Low-cynical participants showed significantly greater recovery in the Good Apology condition when compared to the Pseudo-apology condition. Independent Samples t-tests performed at each level of apology condition showed that High and Low-cynical participants do not differ in their recovery in the Good Apology condition but that High-cynical participants show less recovery compared to Low-cynicals in the Pseudo-apology ($p < .01$) condition.

Twenty minutes following the end of the task period, there was a significant interaction between apology condition and Cynicism. This is displayed in Figure 20. Post-hoc comparisons performed using Tukey’s HSD showed that neither High-cynical nor Low-cynical participants differed in their SBP recovery across apology conditions. Independent-samples t-tests performed at each level of apology condition, showed that High and Low-cynical participants do not differ in their recovery in the Good Apology condition but that High-cynical participants show less recovery compared to Low-cynicals in the Pseudo-apology ($p = .01$) condition.

**Diastolic Blood Pressure.**

Four 3 (condition) × 2 (gender) × 2 (ethnicity) × 2 (cynicism) factorial ANOVAs were performed comparing residualized change scores from Task to Recovery 1, Task to Recovery 2, Task to Recovery 3 and Task to Recovery 4. This analysis revealed no significant main effect or interaction of any kind. As with SBP, Gender was subsequently dropped as a factor in order to increase power and the data were re-analyzed in a series of 3(condition) × 2(cynicism) × 2(ethnicity) factorial ANOVAs. The results are displayed in Table 3.

As can be seen from the table, there was a single significant interaction between apology condition and Cynicism at Recovery 4. This is displayed in Figure 21. Post-hoc comparisons using Tukey’s HSD revealed that High-cynicals do not differ in their DBP recovery across apology conditions but that Low-cynicals show slower recovery in the Good Apology condition
than in the Pseudo-apology and Delayed Apology conditions. Independent Samples t-tests performed at each level of apology condition failed to reveal a significant difference in DBP recovery between High and Low-cynicals.

**Heart Rate.**

Analysis then turned to recovery for harassed participants only. Four 3 (condition) × 2 (gender) × 2 (ethnicity) × 2 (cynicism) factorial ANOVAs were performed comparing residualized change scores from Task to Recovery 1, Task to Recovery 2, Task to Recovery 3 and Task to Recovery 4.

Of note, the only significant F-test results involved two 3-way interactions between apology condition, gender and cynicism occurring for Task to Recovery 1 and Task to Recovery 4, and a 2-way Condition by Gender interaction for Task to Recovery 4. The 3-way interactions must be treated with caution due to small n’s encountered at this fine-grained analysis. Given that Ethnicity showed neither a significant main effect or an interaction with another variable, it was dropped from a subsequent analysis involving a series of four 3(condition) × 2(gender) × 2(cynicism) factorial ANOVAs, resulting in larger cell sizes. The results are displayed in Table 4. In this analysis, there was a significant interaction between apology condition and Gender at Recovery points 2, 3, & 4. These are displayed in Figures 22, 23, & 24.

Post-hoc comparisons using Tukey’s HSD revealed that men only show differential HR recovery at Recovery 4 (p < .05). In this case, men in the Pseudo-apology condition recovered faster than those in the Good Apology condition. Women however, displayed faster recovery in the Delayed Apology condition than the Good Apology condition only at Recovery 2.

Further, Independent Samples t-tests performed at each level of apology condition revealed that males and females only differed significantly in their HR recovery by Recovery 4. As can be seen from the figure, males showed faster HR recovery than females when in the Pseudo-apology condition, t (48) = -2.39, p < .05.
Discussion

The purpose of this study was to induce feelings of anger in participants such that different apology strategies might be evaluated for their effect on recovery, that is, negative affect, and the concurrent cardiovascular activity. The manipulation appears to have been successful. The data from the self-report ERS forms indicate strongly that harassed participants experienced significantly more anger, within the context of general affective arousal, than did non-harassed participants. Further, physiological measures show clearly that harassed participants experienced significantly greater increases in SBP, DBP and HR during the task period than did non-harassed control participants. Therefore one may conclude that the data support Hypothesis 1 of this study, that harassed participants will demonstrate greater cardiovascular reactivity than non-harassed participants performing a similar stress task.

Hypothesis 2, that harassed participants will show attenuated cardiovascular recovery to baseline relative to non-harassed controls, was not supported by the data. All other things being equal, harassed participants did not show slower recovery than those in the Control condition. In fact, the HR data show that in some cases harassment was associated with faster recovery than no harassment. This suggests that verbal harassment by itself does not result in slower cardiovascular recovery. This is puzzling, and inconsistent with previous research upon which the current study is based.

An observation of the recovery data reveals DBP is largely uninfluenced by factors examined in this study, such as apology condition, cynicism, gender or ethnicity. SBP on the other hand, is clearly influenced by cynicism and ethnicity. The most robust effect noted for SBP recovery was the interaction between apology condition and cynicism. Low-cynical participants were, for the most part, unaffected by apology condition. However, High-cynical participants consistently displayed less recovery than did Low-cynical participants, when in the pseudo-apology condition. And frequently throughout the recovery period, High-cynical
participants displayed less recovery when in the Pseudo-apology and Delayed Apology conditions than in the Good Apology condition.

Of note, at one point during the recovery period (R3) High-cynical participants actually displayed significantly greater recovery than Low-cynicals when in the Good Apology condition. This is a curious finding, in fact the opposite of what one might expect. It might be the case that Low-cynicals are able to become more personally engaged with the apologizer and thus find his/her apology more physiologically arousing. Or perhaps Low-cynical individuals not being angry find the Good Apology to be “over-doing it,” and that it then becomes ingenuine-sounding such that they then display the pattern of High-cynicals in the Pseudo-apology condition. These are questions to be examined in a future study.

These data suggest that the type of apology is largely irrelevant for Low-cynical individuals, however, it is particularly important for more cynical participants. These people respond with particularly quick recovery when presented with a genuine display of remorse and particularly slow recovery when presented with an ingenuine expression of remorse. Looking at the ERS data, participants in the Pseudo-apology condition at recovery generally rate their anger higher than those in the Good apology condition. However, it is only the High cynicals who demonstrate delayed physiological recovery in coincidence with that reported anger.

Therefore, the data provide partial support for Hypothesis 4, that cynical participants will show attenuated recovery relative to non-cynicals. When angered, cynicals do in fact show attenuated recovery if they are not offered an expression of remorse or if that offering sounds ingenuine. However, cynicism does not result in delayed recovery per se, for when offered a genuine expression of remorse they respond favorably to it, and periodically show greater recovery than Low-cynicals.

Due to the ethnic composition of the undergraduate population at the University of B.C. from which participants in this study were drawn, researchers were fortunate to be able to
examine cardiovascular differences between Asians and Caucasians. As can be seen from Figures 16 and 18, Asians and Caucasians display an opposite recovery profile demonstrating significant effects in the first half of the recovery period. Ten minutes following the end of the task period, groups do not differ in the good apology condition, although Caucasians demonstrate attenuated recovery relative to Asians when in the Pseudo-apology condition and Asians demonstrate attenuated recovery relative to Caucasians when in the Delayed-apology condition.

This interaction is interesting in the sense that Caucasians show the pattern of recovery expected by the researchers: they show the least recovery in response to an ingenuine expression of remorse, but recover well following displays of genuine remorse or when left alone. Asians on the other hand, recover well when they receive an apology, regardless of its quality, but show attenuated recovery if not offered an apology. This is an unexpected finding, and suggests that Asians place more importance on the receipt of an apology rather than the supposed sincerity of that apology. This is consistent with some cross-cultural studies examining Asian/North American use of the apology. Ide (1998) and Haley (1998) argue that Japanese use of apologies occurs within a separate social context than North American use of apologies. Within Japanese culture, an apology is a perfunctory remark made in a wide number of social engagements. Embedded within this is the concept of “face,” one’s social reputation, and the importance of allowing one to save and/or maintain face. In North America, the apology appears to be reserved for cases of social conflict in which the speaker wishes to communicate a feeling of remorse for his/her actions. Further, Cupach and Imahori (1993) found that the Japanese tend to utilize different components when giving an apology than do Americans. Specifically, Americans tend to include humor, excuses or aggression more than the Japanese.

It is difficult to estimate to what degree this research applies to findings in the current study, as the Asian sample is largely Chinese, not Japanese. However it may be that an apology
for these participants ought not necessarily represent a feeling of deep remorse and therefore the
distinct qualities of the apology are not necessarily attended to, accounting for the lack of
difference between the Good and Pseudo-apology conditions. Rather, the essential element may
in fact be the adherence to social convention (i.e., offering of an apology following a social
transgression or other interaction) and allowing recipients to facilitate face-saving of the
transgressor. This might account for Asians displaying delayed recovery in the Delayed apology
condition. Having not received an apology, the participant is not able to perform his/her social
duty to assist the harasser in saving face. This could be the focus of a future study comparing
Asians’ responses to more varying and culturally-specific apologies.

There was a main effect of gender on SBP recovery throughout the recovery period. As
can be seen from Figures 12, 13, & 14, males typically displayed slower recovery than females.
Ten minutes following the end of the task period, males demonstrated particularly less recovery
than females when in the Delayed apology condition. These results are consistent with Earle,
Linden, and Weinberg (1999) who found that males showed delayed SBP recovery to baseline
relative to females.

Further, in looking at the HR data, males appear to show the fastest HR recovery when
they receive a pseudo-apology and they tend to show faster HR recovery than females when in
this condition. This is consistent perhaps, with popular perception that men are put off by the
expression of feelings. Does the relatively slow HR recovery displayed by male participants
who received a good apology represent physiological arousal due to the discomfort of having
another man express his feelings? It is difficult to offer a definitive answer, as the HR data are
not consistent with some of the other measures. However, it may be a question to address in
future research.
Conclusions

First, the current study is consistent with earlier research arguing that laboratory stress tasks involving an affective component result in greater cardiovascular reactivity. In this study, verbal harassment produced increased feelings of anger in participants and was associated with increased reactivity. One may conclude that verbal harassment is an effective paradigm for studying anger and reactivity.

Second, Cynical Hostility is a factor which can in some conditions result in decreased SBP recovery following a laboratory stress task involving negative affect. The current study examined the interaction between apology strategy and Cynical Hostility, adding useful information to current debate in the area. It appears that apologies, viewed as verbal strategies for resolving interpersonal conflict, are effective at reducing negative affect such as anger when they communicate genuine remorse. Ingenuine expressions of remorse, termed pseudo-apologies, result in maintained anger. Physiologically, expressions of remorse influence cardiovascular recovery very little in Low-cynicism individuals; they react to stress and recover adequately. Conversely, expressions of remorse following interpersonal conflict affect SBP recovery very much in High-cynicism individuals. Given a genuine apology, these individuals recover well, at times showing faster recovery than Low-cynicals. However, an ingenuine expression of remorse is worthless for these people and results in delayed cardiovascular recovery comparable with receiving no apology at all.

The above finding is significant, because it links cynical hostility, a personality variable thought to be related to cardiovascular disease, to delayed cardiovascular recovery, a potential mechanism by which stress influences the development of such disease. By manipulating the quality of apologies participants received following anger induction, researchers were able to demonstrate the effects of social interaction and cynicism on cardiovascular functioning.
In the real world, conflict is usually followed by some sort of social interaction between the offender and the offended, often involving remedial strategies such as the apology. In this manner the results of this study shed light on the current debate in this area, explaining perhaps why some researchers find a relationship between personality variables and cardiovascular functioning, while others do not. Were other researchers studying cardiovascular reactivity and recovery to include in their examination an analysis of the social interactions which can occur following stressful activities involving interpersonal conflict, they would likely find relationships with personality variables as well. For the crucial element in the current study is the interaction of apologies with cynicism, not one or the other per se. One may conclude that examining the influence of apology strategies is a useful paradigm for studying the relationship between personality variables and cardiovascular reactivity/recovery.

Third, consistent with previous research by Earle, Linden, and Weinberg (1999) and others, males largely demonstrated attenuated cardiovascular recovery relative to females. Finally, Asians demonstrated different cardiovascular response to apologies than did Caucasians.

Future Research

One puzzling feature of the current study is that when High Cynical participants receive a Good apology, they actually show greater decreases in SBP than do Low-cynicals at times. It is puzzling, for if Cynical hostility is related to a cardiovascular response to stress that results in excessive or maintained arousal leading to hypertension and eventually CVD, then one might have expected these individuals to show delayed cardiovascular recovery regardless of the apology they receive. Yet the current study’s finding suggests that these individuals do not show attenuated cardiovascular recovery in all circumstances and rather are perhaps especially sensitive to the interpersonal dynamics involved in verbal exchanges. So it may be that these individuals, who would benefit physiologically from positive remedial efforts following conflict, construct social environments in which they are unlikely to receive such remedial social
interactions and are left to ruminate about wrongs done to them. Future study should address this issue.

A novel feature of this study is the effect of ethnicity on recovery. It appears that whereas Caucasians attend to specific qualities of apologies, Asians perhaps place greater importance on simply receiving apologies. Whether this is because of the different normative context in which Asians and Caucasians give and receive apologies, or because of cultural differences in apology styles, is not addressed by the results of this study. It should be pursued by researchers in the future.

Finally, future research may be directed at the concept of forgiveness. It would seem that the next logical social interaction following an apology would be an offer or denial of forgiveness. Scobie and Scobie (1998) have identified four models of forgiveness, including a health model, and comment on the advantages of adopting a forgiveness strategy as opposed to one of anger, denial or condoning. It has been suggested by some authors that forgiveness is a therapeutic process (Denton & Martin, 1998) in therapy. Most relevant to the current findings is research demonstrating a tentative link between individuals' level of stress response to a laboratory stress task (mirror tracing) and assessed level of forgiveness (Neumann & Chi, 1999). Whether the findings of these authors and those of the current study reflect two sides of the same coin cannot be addressed in this paper, although the topic warrants future investigation.
References


Habra, M., Linden, W., & Anderson, J. Manuscript in progress.


Endnotes

1. Harassment Scripts

Script #1: “Look [participant name], you’re always subtracting way too slow. You’ve got to do it much faster. Continue where you stopped.”

Script #2: “[participant name], you’re still too slow and also inaccurate. This can’t be your best. Now try it again from where you left off.”

Script #3: “You’re obviously not good enough at doing this, now try harder. Keep going!”

2. Apology Scripts

Good Apology: “Listen [participant name], I’m really sorry for being so rude to you a few minutes ago. If I upset you while you were counting that’s totally my fault. I was speaking to you that way on purpose as part of the experiment. I’m usually more courteous and professional. But I do feel bad about this. I’m sorry.”

Pseudo-apology: “You seemed a little agitated there. Well, I’m sorry if you got upset during the task, but it’s important for you to go really fast, or the experiment isn’t going to work.”
Table 1

Analysis of Variance for Emotion Rating Scales

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Note. Terms in parentheses represent mean square error.

*p < .05

**p < .01

***p < .001
Table 2

Systolic Blood Pressure: 3-Way Factorial ANOVAs Performed at Separate Recovery Time Points

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<td>Cynicism</td>
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<td>6.608*</td>
<td>3.095</td>
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<tr>
<td>Ethnicity</td>
<td>1</td>
<td>.044</td>
<td>.006</td>
<td>2.017</td>
<td>.007</td>
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<tr>
<td>Condition × Cynicism</td>
<td>2</td>
<td>4.245*</td>
<td>5.074**</td>
<td>6.193**</td>
<td>6.074**</td>
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<tr>
<td>Condition × Ethnicity</td>
<td>2</td>
<td>4.250*</td>
<td>5.000**</td>
<td>2.821</td>
<td>1.386</td>
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<tr>
<td>Cynicism × Ethnicity</td>
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<td>Condition × Cynicism × Ethnicity</td>
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<td>.563</td>
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<td>.223</td>
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<tr>
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<td>(51.134)</td>
<td>(46.070)</td>
<td>(47.461)</td>
<td>(44.751)</td>
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<tr>
<td>Error df</td>
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<td>109</td>
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<td>108</td>
<td>108</td>
<td></td>
</tr>
</tbody>
</table>

Note. Error terms in parentheses represent Mean Square Error.

*p < .05

**p < .01
Table 3

**Diastolic Blood Pressure: 3-Way Factorial ANOVAs Performed at Separate Recovery Time Points**

<table>
<thead>
<tr>
<th>Source</th>
<th>F</th>
<th>Task to Recovery 1</th>
<th>Task to Recovery 2</th>
<th>Task to Recovery 3</th>
<th>Task to Recovery 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condition</td>
<td>2</td>
<td>.453</td>
<td>.435</td>
<td>1.532</td>
<td>2.274</td>
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<tr>
<td>Cynicism</td>
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<td>.452</td>
<td>.003</td>
<td>.732</td>
<td>.288</td>
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<tr>
<td>Ethnicity</td>
<td>1</td>
<td>.142</td>
<td>.205</td>
<td>.457</td>
<td>.017</td>
</tr>
<tr>
<td>Condition × Cynicism</td>
<td>2</td>
<td>.517</td>
<td>.520</td>
<td>1.200</td>
<td>3.596*</td>
</tr>
<tr>
<td>Condition × Ethnicity</td>
<td>2</td>
<td>1.626</td>
<td>1.039</td>
<td>1.595</td>
<td>.439</td>
</tr>
<tr>
<td>Cynicism × Ethnicity</td>
<td>1</td>
<td>2.461</td>
<td>2.142</td>
<td>1.119</td>
<td>2.361</td>
</tr>
<tr>
<td>Condition × Cynicism × Ethnicity</td>
<td>2</td>
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<td>1.605</td>
<td>2.602</td>
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<tr>
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<td>(51.002)</td>
<td>(40.252)</td>
<td>(46.568)</td>
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</tr>
</tbody>
</table>

*Note.* Error terms in parentheses represent Mean Square Error.

*p* < .05
Table 4

Heart Rate: 3-Way Factorial ANOVAs Performed at Separate Recovery Time Points

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>Task to Recovery 1</th>
<th>Task to Recovery 2</th>
<th>Task to Recovery 3</th>
<th>Task to Recovery 4</th>
</tr>
</thead>
<tbody>
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<td>3.392*</td>
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<td>1.547</td>
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<td>1.126</td>
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<td>Gender</td>
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<td>.152</td>
</tr>
<tr>
<td>Condition × Cynicism</td>
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<td>1.371</td>
<td>1.311</td>
<td>.965</td>
<td>1.699</td>
</tr>
<tr>
<td>Condition × Gender</td>
<td>2</td>
<td>2.781</td>
<td>4.648*</td>
<td>3.499*</td>
<td>6.555**</td>
</tr>
<tr>
<td>Cynicism × Gender</td>
<td>1</td>
<td>.002</td>
<td>1.332</td>
<td>.225</td>
<td>.010</td>
</tr>
<tr>
<td>Condition × Cynicism × Gender</td>
<td>2</td>
<td>1.910</td>
<td>1.362</td>
<td>1.056</td>
<td>2.929</td>
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<tr>
<td>Error</td>
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<td>127</td>
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<td>126</td>
</tr>
</tbody>
</table>

Note. Error terms in parentheses represent Mean Square Error.

*p < .05

**p < .01
Figure 1
ERS Happiness Ratings

- Condition
- Control
- Good Apology
- Pseudo-apology
- Delayed Apology

Mean Distance in cm

Baseline | Recovery 1 | Task | Recovery 2

Time
Figure 2
ERS Anger Ratings

![Graph showing mean distance in cm over time for different conditions: Condition, Control, Good Apology, Pseudo-apology, Delayed Apology. The x-axis represents time with Baseline, Task, Recovery 1, and Recovery 2. The y-axis represents mean distance in cm with values from 0.0 to 3.5.](image-url)
Figure 3
ERS Fear Ratings

Condition
Control
Good Apology
Pseudo-apology
Delayed Apology

Mean Distance in cm

Baseline Recovery 1
Task Recovery 2
Time
Figure 4
ERS Sadness Ratings

Condition
Control
Good Apology
Pseudo-apology
Delayed Apology

Mean Distance in cm

Baseline | Recovery 1 | Task | Recovery 2
---|---|---|---
0.0 | 0.5 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5

Time
Figure 5
ERS Disgust Ratings

Condition
Control
Good Apology
Pseudo-apology
Delayed Apology

Mean Distance in cm

Baseline           Recovery 1
Task               Recovery 2
Time
Figure 6
ERS Surprise Ratings

![Graph showing ERS Surprise Ratings with different conditions: Control, Good Apology, Pseudo-apology, and Delayed Apology. The graph plots mean distance in cm over time with distinct lines for each condition, showing baseline, task, recovery 1, and recovery 2 phases.](image-url)
Figure 7.
Baseline to Task ERS Raw Change Scores

- Happiness
- Fear
- Disgust
- Anger
- Sadness
- Surprise
Figure 8.

Task to 1st Recovery ERS Raw Change Scores

Mean Change

Happiness, Fear, Disgust, Anger, Sadness, Surprise
Figure 9.

1st Recovery to Final Recovery ERS Raw Change Scores
Figure 10.

Task to 1st Recovery Residual Heart Rate Change

![Bar chart showing mean unstandardized residual for Control and No Apology conditions. The chart indicates a positive residual for Control and a negative residual for No Apology.]
Figure 11.

Task to 2nd Recovery Residual Heart Rate Change

Control No Apology
Condition

Mean Unstandardized Residual

6
4
2
0
-2
-4
-6
Figure 12.

Task to 1st Recovery Residual SBP Change: Apology Condition by Gender

![Bar chart showing mean unstandardized residual for different conditions and genders.](chart.png)
Figure 13.

Task to 2nd Recovery Residual SBP Change: Apology Condition by Gender
Figure 14.

Task to 4th Recovery Residual SBP Change: Apology Condition by Gender
Figure 15.

Task to 1st Recovery Residual SBP Change: Apology Condition by Cynicism

![Graph showing mean unstandardized residual for different apology conditions and cynicism levels. The x-axis represents Good Apology, No Apology, and Pseudo-apology conditions, while the y-axis represents mean unstandardized residuals. The graph indicates differences in SBP changes under low and high cynicism.]
Figure 16.

Task to 1st Recovery Residual SBP Change: Apology Condition by Ethnicity

Mean Unstandardized Residual

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Good Apology</th>
<th>No Apology</th>
<th>Pseudo-apology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caucasian</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Condition
Figure 17.

Task to 2nd Recovery Residual SBP Change: Apology Condition by Cynicism

![Graph showing mean unstandardized residual across good apology, no apology, and pseudo-apology conditions with high and low cynicism levels.]
Figure 18.

Task to 2nd Recovery Residual SBP Change: Apology Condition by Ethnicity

![Graph showing mean unstandardized residual by ethnicity and apology condition.]

- X-axis: Good Apology, No Apology, Pseudo-apology Condition
- Y-axis: Mean Unstandardized Residual
- Legend: Ethnicity
  - Caucasian
  - Asian

The graph compares the mean unstandardized residual across different apology conditions and ethnicities.
Figure 19.

Task to 3rd Recovery Residual SBP Change: Apology Condition by Cynicism
Figure 20.

Task to 4th Recovery Residual SBP Change: Apology Condition by Cynicism

![Bar chart showing the mean unstandardized residual for different apology conditions and cynicism levels. The x-axis represents the conditions: Good Apology, No Apology, and Pseudo-apology Condition. The y-axis represents the mean unstandardized residual. The chart distinguishes between low and high cynicism levels.]
Figure 21.

Task to 4th Recovery Residual DBP Change: Apology Condition by Cynicism

![Bar chart showing mean unstandardized residual for Good Apology and No Apology conditions across low and high cynicism levels.](chart.png)
Figure 22.

Task to 2nd Recovery Residual HR Change: Apology Condition by Gender

![Bar chart showing mean unstandardized residual for Good Apology and No Apology conditions by gender. Male and Female groups are differentiated by shading.]
Figure 23.

Task to 3rd Recovery Residual HR Change: Apology Condition by Gender

![Bar chart showing mean unstandardized residual for gender and apology conditions.]

- Gender:
  - Male: Good Apology
  - Female: No Apology, Pseudo-apology Condition
Figure 24.

Task to 4th Recovery Residual HR Change: Apology Condition by Gender

![Graph showing mean unstandardized residual for gender (male vs. female) across conditions of good apology, no apology, and pseudo-apology.](image-url)