

**SOCIAL COMPETENCE: CARDIOVASCULAR ACTIVITY AND HUMOR  
AS MEDIATING MECHANISMS**

by

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## ABSTRACT

This study investigated respiratory sinus arrhythmia and heart rate as functions of social competence. It was hypothesized that during an anxiety provoking social task, the group rated as high social competence would exhibit greater vagal tone than the low social competence group. Consistent with expectations, the high social competence group exhibited significantly higher vagal tone than the low social competence group during the task. Further, the high social competence group reacted with higher mean heart rate while anticipating the task but recovered more rapidly than the low social competence group. Styles of humor were explored as a mediating variable between social competence and cardiovascular activity. This study found, for the males, significant negative relationships between heart rate and positive styles of humor and a significant positive relationship between heart rate and self-deprecating humor. Overall, the findings were in support of existing theories on social stress as a determinant of health.

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## Social Competence: Cardiovascular Activity and Humor as Mediating Mechanisms

### INTRODUCTION

The annual burden to treat cardiovascular diseases in Canada is over 18 billion dollars. Furthermore, cardiovascular diseases account for 33% of deaths in Canada every year (Heart & Stroke Foundation, 2002). Research suggests that stress produced during taxing social interactions is a determinant of cardiovascular diseases (Suchday & Larkin, 2004). Research has shown that blood pressure becomes elevated during an overt expression of anger while other research has found that blood pressure becomes elevated when anger is suppressed (Burns, Bruehl, & Quartana, 2006). Suchday and Larkin posited that these dual findings in the anger research may be the result of dysfunctional emotional expressions, which may contribute to cardiovascular diseases. Further, Thomas, Nelson, and Dimsdale (2004) speculated that higher levels of suspicion, which manifest from stable negative social environments, may be an equally important determinant of cardiovascular diseases. Dysfunctional anger expressions combined with high levels of suspicion may result in individuals who are hostile and create a social world that is not favorable to cardiovascular health (Smith, 1992).

#### *Conceptualizing Social Competence*

Social competence, or the ability to elicit positive responses from others through the employment of social, cognitive, and emotional awareness, may be a protective factor against cardiovascular diseases. Thomas et al. (2004) reported that individuals who were more socially skilled negotiated problematic situations with greater satisfaction than those who were socially unskilled. A socially skilled individual may experience fewer stress-related experiences over time, which may result in less physiological arousal (i.e., heart rate

or blood pressure). The individual would be less susceptible to cardiovascular diseases to the extent that diminished stress-linked physiological responses are linked to pathophysiologic processes underlying its development. In contrast, the socially incompetent individual's trajectory may include increased vigilance to perceived hostile interpersonal interactions resulting in chronic heightened physiological arousal and a trajectory towards the development of cardiovascular diseases.

An element of social competence is emotional competence. Eisenberg, Cumberland, and Spinrad (1998) contended that emotional competence was a complex internal process requiring an individual to recognize their own internal affective states as well as those of others, and subsequently up regulate or down regulate their physiological, cognitive, and behavioral components in order to accomplish their goals. Mayer, DiPaulo, and Salovey (1990) conceptualized emotional competence as an ability-based construct: (1) the ability to perceive emotions, (2) the ability to use emotions, (3) the ability to understand emotions, and (4) the ability to manage emotions. Similarly, Bar-On (2006) defined emotional competence as the ability to: (1) effectively understand oneself and others, (2) relate well to others, and (3) adapt and cope with the immediate surroundings. Bar-On speculated that emotional competence developed over time and that it could be improved through training. Petrides and Furnham (2003) considered emotional competence as a trait where some individuals have dispositions allowing them to recognize, process, and use emotions with greater ease than others. Although there are differences in the conceptualizations of emotional competence models, all posit that individuals with higher emotional competence are more successful at meeting environmental demands and pressures whereas a deficiency in emotional competence can mean a lack of success and correlated emotional problems.

However, emotional competence does not fully explain our ability to navigate successfully within a social interaction. Social cognitions, or the receiving, processing, and response to information underlie our social interactions (Herrald & Tomaka, 2002; Cohen, 2004). Cohen characterized the receiving stage as involving the perception and recognition of social cues. Such cues include not only overt behaviors and verbal dialogue, but also the emotional tone and nonverbal cues that help to define a social situation. Equally important is the cognitive processing that includes the interpretation of the incoming social information (i.e., overt behavior, verbal and non-verbal cues) (Herrald & Tomaka, 2002). Biased or deficient knowledge during a social interaction may lead to inappropriate responses or a failure to anticipate potential problems; hence, inadequate resolution during negative social interactions may lead to an increase in rumination and/or vigilance.

Social competence seems to be a more encompassing term to describe the interplay between emotions and cognitions for the purpose of navigating within interpersonal contexts. In the literature, the construct of social competence has been identified in a variety of ways. Ryan and Shim (2006) defined social competence as an individual's social abilities during the formation of friendships. Parker, Saklofske, Shaughnessy, Huang, Wood, and Eastabrooks (2005) defined social competence as the cognitive-emotional abilities displayed by an individual whereas Auerbach, Clore, Kiesler, Orr, Pegg, Quick, and Wagner (2001) constructed social competence as a set of behaviors emitted by an individual combined with the impressions or attributions made about an individual by another. Others define social competence as the quality of the overall interaction process including numerous inter-related components such as knowledge, motivation, skill, context, and outcomes (Ewart, Jorgensen, Suchday, Chen & Matthews, 2002).

Ewart et al. (2002) developed a measurement tool that coded individuals on a combination of behavioral expression and personal endeavors. The underlying framework of Ewart et al.'s measurement of social competence is that a vulnerability to chronic arousal arises as a three-way function of an individual's personal goals, their social skills and behavioral stylistics, and their effect on others. A socially competent individual has the ability, by moderating their emotions and actions, to choose and pursue their desirable and achievable goals. An understanding of emotional regulation allows one to connect with, understand and make connections with others in their social realm.

Ewart and Jorgenson (2004) built upon this existing model of social competence by dichotomizing personal goals into self-directed and other-directed goals. Self-directed goals are a reflection of an individual's desires for self-improvement with an internal focus, whereas other-directed goals are a reflection of an individual's focus on others for improvement and change, or an external focus. Ewart and Jorgenson found that socially competent individuals appeared to be more inner-focused when striving towards a goal. In contrast, individuals who were rated as less socially competent appeared to be focused on changing others to accomplish their goal. Based on the results from their research, Ewart and Jorgenson categorized three types of individuals, agonistic, transcendent and avoidant, with a combination of expressive style and personal strivings (other-directed or self-directed). The individuals that made up the agonistic cluster self-reported less proficiency in solving persisting personal problems, scored higher on the negative dimensions (critical-aggressive) of a social impact scale, and scored as significantly more negative on objective ratings by others. Further, the findings from Ewart and Jorgenson's research showed that during social interaction participants categorized as agonistic had significant higher diastolic blood

pressure during social interactions when compared to the transcendent and avoidant groups. However, a problem with Ewart et al.'s social competence measure is that it is limited to adolescent populations and stressful interpersonal conflicts.

Buhrmester, Furman, Wittenberg and Reis (1988) identified five interpersonal domains to quantify social competence. They then developed a questionnaire measure to assess these domains, the Interpersonal Competence Questionnaire (ICQ). The five domains, initiating relationships, personal disclosure, negative assertion, emotional support, and conflict management, were moderately positively correlated, suggesting that an individual may be scored as more competent in one domain of social behavior than another. However, the study also showed that there was generalizability across the domains. Thus, higher ranking on one dimension of social competence may provide the opportunity for the individual to develop greater social competence in another domain. For instance, an individual scoring higher on initiating relationships may construct a social world where more opportunities exist to develop in the conflict management domain compared to an individual scoring lower on initiating relationships.

The ICQ has been employed extensively in the literature to correlate social competence with other social functioning. Buhrmester (1990) found significant negative correlations between hostility, depression and the ICQ measure of social competence. Miller and deWinstanley (2002) conducted two studies with undergraduate students and found a significant positive correlation between the ICQ and involvement and enhancement of conversation. Herzberg et al. (1998) found that chronic interpersonal stress was predicted by the ICQ measure with more competent scores indicating less interpersonal stress. Gudleski and Shean (2000) found higher scores in initiation and assertion for nondepressed students

compared to depressed students. Further, the ICQ has been validated as a valuable assessment tool in adolescents, young adults and married couples (Kanning, 2006). This study used the ICQ as a measure of social competence.

#### *Humor as a Mediating Variable*

Humor as a mediating mechanism in social interactions is an interesting concept. There is evidence linking types of humor to maladaptive health outcomes. Lefcourt, Davidson, Prkachin, and Mills (1997) showed a significant difference in blood pressure between individuals scoring low versus high on a coping humor measure with the low humor scores having higher blood pressure recordings. Martin, Puhlik-Doris, Larsen, Gray, and Weir (2003) found that negative types of humor such as aggressive teasing and sarcasm may negatively influence social interactions. Aggressive teasing or sarcasm may be misattributed as humor, or may involve purposeful acts of aggression under the guise of positive affect. These types of humor may be indicative of a deficit in social skills, which may result in a bi-directional lack of empathy and/or loss of social support. Martin et al. further added that people who engage in aggressive humor also exhibit dysfunctional expressions of anger. Thus, the well judged use of humor may be as important as the regulation of anger expression during social interactions.

Humor is a multi-faceted construct that has been conceptualized in a number of ways. Ruch and Carroll (1998) considered humor a stable personality trait with individual differences observed in hedonic responses. Ruch and Carroll considered humor to be a habitual pattern in behavior categorized by frequency of laughter, frequency of joke telling and laughing at other's jokes. Feingold and Mazzella (1993) conceptualized humor as a cognitive ability such as being able to recall jokes or the ability to create jokes. Svebak

(1996) posited that humor was a global attitude on how an individual views the world while Lefcourt, Martin, Fick, and Saleh (1986) built on the notion that humor could be used as a coping mechanism during social interactions.

Equally relevant, methods of measuring humor are numerous and multi-faceted. Svebak (1996) developed a Sense of Humor Questionnaire to capture how an individual notices and enjoys humor. Martin and Lefcourt (1984) developed the Situational Humor Response to measure how often an individual smiles and laughs across a wide variety of situations. Martin and Lefcourt (1983) developed the Coping Humor Scale to quantify how humor was used as a coping strategy. Martin, Puhlik-Doris, Larsen, Gray, and Weir (2003) developed the Humor Styles Questionnaire (HSQ) to assess how individuals differ while using humor in everyday life. Martin et al. conducted correlations between the HSQ with other humor-related measures and found that the dimensions, 'affiliative' and 'self-enhancing', were positively correlated the Coping Humor Scale and the Sense of Humor Questionnaire.

Martin et al.'s (2003) argument for developing another humor measure was based on the need for capturing potentially harmful uses of humor. They argued that some individuals use humor to reduce conflict and enhance group cohesiveness, which they distinguished as benign humor; whereas, other individuals use humor in a hostile fashion to injure or ridicule, which the researchers distinguished as aggressive humor. Martin et al. noted that it was futile to suggest a simple dichotomization between benign and aggressive uses of humor. Rather, the authors suggested that benign and aggressive styles of humors may fall onto a broad spectrum with four distinguishable categories that individuals regularly employ in their daily interpersonal interactions. Affiliative and self-enhancing humor are thought to be beneficial



to interpersonal relationships whereas aggressive and self-deprecating humor are thought to be detrimental to relations. Research using the HSQ to measure individuals on these four dimensions has shown that self-enhancing and affiliative humor are positively related to measures of interpersonal adjustment and emotional well-being, whereas aggressive humor is related to hostility, and self-deprecating humor is related to negative emotions and low self-esteem. Inappropriate uses of humor (aggressive humor) during social interactions may be attributed, in part, to a dysfunction in the processing of emotional information.

#### *Heart Rate Variability as a Dependent Measure*

A valuable physiological tool when studying determinants of cardiovascular diseases is heart rate variability (HRV). Normally an adult human will have a resting heart rate ranging between 50 and 90 beats per minute. When challenged by exercise or other stressors, the heart rate will increase, often dramatically. Within the full range of the heart's changing rate, however, there is substantial variability from one beat to the next. HRV is measured by examining these differences in the variation between the beats of the heart. HRV is thought to reflect the heart's ability to adjust to changing circumstances and is a useful tool for understanding the autonomic nervous system. Heart rate is controlled by both branches of the autonomic nervous system (ANS), the sympathetic nervous system and the parasympathetic nervous system. When the body is functioning optimally, the sympathetic nervous system becomes the dominant system in response to an acute stress whereas the parasympathetic nervous system regulates the return of the body to homeostasis. Tools have been developed to measure the separate influences from the sympathetic and parasympathetic activity by investigating components of the power spectral density function taken from a time-series of cardiac inter-beat intervals. Specifically, sympathetic activity is associated with low range

frequencies (.04-.15 HZ) while parasympathetic activity is associated with the higher frequency range (0.15-0.4 Hz) during the R to R interval (R to R peak in the heart waveform) of the heart rate. Parasympathetic influences on heart rate have also been reliably quantified by respiratory sinus arrhythmia (RSA), which is the variation in heart rate that occurs during a breathing cycle. The RSA is mediated through inhibitory vagal fibres to the sinus node (Berntson et al., 1997; Task Force, 1996) and may be derived from the high frequency (HF) band of the heart rate variability spectrum.

Research has shown that a predominance of sympathetic activity and a reduction in parasympathetic activity occurs in patients after a myocardial infarction (Frasure-Smith and Lespérance, 2005). Recently it has been demonstrated that there is an association between depressive symptoms and myocardial infarction (Grippio & Johnson, 2003). Movius and Allen (2005) found that individuals who scored lower on social anxiety self report measures had greater HRV than individuals who self reported greater social anxiety. Further, individuals who scored higher on a defensiveness measure had lower resting vagal tone (an index of parasympathetic activity) than individuals who were not as defensive, which suggests several possibilities. The parasympathetic activity in high defensive individuals may not be influencing the heart as optimally as the low defensive individuals or the sympathetic activity may be higher in the high defensive individuals. Over time the implication of a lower resting vagal tone is an individual at a greater risk for cardiac damage.

#### *Purpose of the Present Study*

It is thought that individuals engaging in unfulfilling social interactions are at a greater risk for poor cardiovascular health. Chen, Mathews, Salomon and Ewart (2002) categorized adolescents using Ewart et al.'s (2002) social competence measurement as

scoring either high on acceptance-affiliation or self-defensiveness and found that they had less heart rate variability during a social stressor than individuals who did not display the characteristics for these categories. In the current study it was hypothesized that individuals scoring higher on a social competence measure, the ICQ, which is a global measure on self-efficacy across interpersonal task domains, would exhibit greater vagal tone than individuals scoring lower on the ICQ during a stressful task. Another purpose of the present study was to examine whether humor mediates the relationship between social competence and cardiovascular activity. Affiliative and self enhancing styles of humor were expected to have positive correlations with social competence whereas aggressive and self-deprecating styles were expected to have negative correlations with the overall ICQ measures. There were no directional hypotheses on how humor would relate to cardiovascular activity. Another measure, Fear of Negative Evaluation (FNE), was included in the psychometric testing as a manipulation check. The FNE is designed to categorize individuals on anxiety levels (Watson & Friend, 1969). The design of this study was built on the premise that there is an inverse relationship between social anxiety and social competence; bivariate correlations tested the hypothesis that social anxiety and social competence would be inversely related.

## METHODS

All necessary ethics forms were submitted for approval to the University of Northern British Columbia's (UNBC) research ethics board prior to commencing data collection. The ethics approved informed consent and participant debriefing forms can be found in Appendices E and F respectively.

### *Participants*

Eighty undergraduate students at UNBC participated in this study. Fifty one participants recruited through the psychology undergraduate research pool received one bonus credit applied to a psychology course and 29 participants recruited through flyers received \$15.00 for their time. There were equal numbers of males and females in the study (40 per cell) and an overall mean age of 22.45 ( $SD = 3.85$ , range =19-38).

### *Video Stimulus*

Participants observed three two minute video clips of other individuals participating in the Favorable Impressions (FI) task. Videos were previously collected as part of another study (Davidson, Prkachin, Mills & Lefcourt, 1994; Davidson, Prkachin, Lefcourt & Mills, 1996). The FI task is a reliable method for inducing social anxiety that was developed by Borkovec, Stone, O'Brien & Kaloupek (1974). Davidson et al. utilized the FI to examine physiological responses to psychological stressors. To induce a state of stress the FI task participants are told that they have two minutes to make a favorable impression on an unresponsive opposite sexed confederate. For the present study participants viewed videos of people of the same sex who had been reliably rated as displaying high levels of anxiety (Russell & Prkachin, 2008 unpublished).

### *Psychological Measures*

*Interpersonal Competence Questionnaire (ICQ)* (Buhrmester et al., 1988) (see Appendix A)

The ICQ is a 40-item self-report measure in which participants are asked to rate their ability to handle a variety of interpersonal tasks in different social competence domains: initiating relationships, personal disclosure, negative assertion, emotional support, and conflict management. This measure has been validated in young adult populations.

*Fear of negative evaluation scale (FNE)* (Watson & Friend, 1969) (see Appendix B)

The FNE is a series of 29 brief true/false statements that differentiates whether participants are experiencing low, moderate, or high levels of anxiety in social situations.

*Humor Styles Questionnaire (HSQ)* (Martin et al., 2003) (see Appendix C)

The Humor Styles Questionnaire (HSQ) was developed to assess individual differences in the use of humor. The HSQ differentiates four humor styles with a 32-item self report; affiliative and self-enhancing humor are thought to be beneficial to interpersonal relationships whereas aggressive and self-defeating humor are thought to be detrimental to relations.

#### *Apparatus and Materials*

A system consisting of a Dell Optiplex GX620 computer, AcqKnowledge 3.9 software, and BioPac physiological recording system was used to obtain continuous recordings of the electrocardiogram (ECG). Participants were connected to three leads using BioPac disposable ECG electrodes attached to each wrist and the right shin. The dependent variables were extracted from the ECG recordings, respiratory sinus arrhythmia (RSA), which quantified vagal tone, heart rate (HR) and overall index of cardiac reactivity, and low frequency-high frequency (LF/HF) ratio, an index of sympathovagal balance, offline using Mindware 2.6 software.

#### *Procedure*

When participants signed up for the study through the Sona System, an online participant management program, the pre-requisites were that they had completed a series of psychological prescreen tests, which included the Toronto Alexithymia Scale (TAS), the Crowne-Marlowe Social Desirability Scale (CM), and the State (STAIS) and Trait (STAIT) Anxiety inventories. To maintain continuity, the participants outside of the psychology

research pool completed the same series of psychological prescreen tests, using the same format as the Sona System, through the general UNBC survey system. The ICQ and the HSQ were uploaded on the Sona System and UNBC general system and administered in random order. To clarify, the online system did not allow for random orders of the tests, only random ordering of the questions within each test, therefore, the ICQ was answered first and the HSQ answered second. At the completion of the online testing, there were instructions to book a lab time and to refrain from consuming caffeine 2 hrs prior to the physiological testing and refrain from consuming alcohol 12 hrs prior to testing.

Participants reported to the laboratory in a single session. There was a brief habituation period where participants were informed of general reasons why researchers are interested in obtaining psychophysiological information and how those recordings are obtained. To ensure consistency and clarity, the researcher read the study instructions and the informed consent to each participant (see Appendix E). The participants were given the opportunity to ask any questions before signing the consent form. First, participants completed a comprehensive demographic and health form (Appendix D) that provided information about their medical history, familial health concerns, physical activity, smoking, and alcohol consumption and then they completed the FNE. Complete listings of the demographic and health variables are listed in Table 1 and Table 2.

#### *Obtaining Physiological Recordings*

Vicarious exposure to the anxiety of others was used to induce a state of anticipatory anxiety. Participants were seated comfortably in a chair with slightly elevated legs and were connected by electrodes to the physiological recording system. Participants were asked to remain as still as possible throughout the study. The room temperature was controlled and all

participants were covered with a blanket to reduce movement. The participants remained connected to the electrodes through all phases of the study, which were as follows: (1) - for six minutes the participants listened to an audio recording of another individual reading from a statistics text, this was the baseline phase of the study. The researcher was in the adjoining room monitoring the ECG recordings and flagging appropriate times in the Acknowledge software. The researcher reentered the room after six minutes to explain to the participants that during the next phase of the study, they would be shown some videos of other people who have gone through it. The researcher ensured the participants were comfortable, answered any questions and then left the room, (2) for the next six minutes the participants **viewed** video clips of three other same sexed people participating in the FI task. The videos were selected based on anxiety scores obtained in an earlier study (Russell & Prkachin, 2008) to show people displaying relatively high levels of anxiety, (3) at the end of six minutes, the following words came on the computer monitor “you now have six minutes to prepare for the same favorable impressions task, please remain as still as possible for the entire study.” At this point the researcher (in the adjoining room) flagged the ECG recordings as the beginning of the anticipation phase. It is important to note, that in order to obtain a pure physiological measurement that could be attributed to a shift in emotionality, the researcher **did not** re-enter the room at this point. The instructions remained on the computer monitor for one minute followed by a blank screen for the remainder of the study, (4) the researcher reentered the room after six minutes passed, the participant was informed that they would not actually participate in the FI task but were asked to remain seated quietly for another six minute recovery phase. After six minutes elapsed the participants were disconnected from the electrodes. Participants were debriefed at the end of the study (see

Appendix F), were given specific directions to **not** talk to their peers about the nature of deception within the study, given the opportunity to ask any questions, and thanked for their time before they left the lab.

## RESULTS

### *Overview of Analyses*

Data were initially collected from 84 students. Four participants' data were discarded immediately after data collection, two due to equipment malfunction, and two due to excessive movement during the recordings, which resulted in too many artifacts for accurate analyses as recommended by Berntson, Quigley, Jang, and Boysen, (1990). Further, a socioeconomic status indicator (postal code) from the general health/demographic form was discarded at the end of data collection because 23.75% ( $N = 19$ ) of the participants did not complete the response. When students were prompted for their postal code, they replied that they could not remember it and that they would email it to the researcher after the study. A follow up request for postal codes was emailed out via the Sona System resulting in two replies. There was no indication that these values were missing in a non-random fashion.

All participants completed pre-screen questionnaires, the Toronto Alexithymia Scale (TAS), the Crowne-Marlowe Social Desirability Scale (CM), a State Anxiety Inventory (STAIS) and a Trait Anxiety Inventory (STAIT) as well as the ICQ (social competence measure) and the HSQ (humor measure) prior to entering the lab by utilizing online questionnaire data collection capabilities of the Sona System and a general UNBC site. Raw data from both collection sites were downloaded directly into an Excel spreadsheet, scored using Excel mathematical functions, and then copied directly into SPSS, Version 17. The general health form and the FNE were paper and pencil based; therefore, a volunteer



undergraduate manually input the data into Excel spreadsheets. The FNE was scored by the researcher using the appropriate Excel mathematical function and the raw data was then copied directly into SPSS, Version 17. All psychometric data were screened for potential outliers and missing values. There were no missing values, which can be partially attributed to the fact that the online survey systems require participants to complete one section prior to advancing. Inspection of the variable histograms indicated that the variables were reasonably normally distributed.

The continuous ECG recordings from the AcqKnowledge 3.9 software were reformatted offline into individual files so that the baseline, observation, anticipation, and recovery phases were exactly 360 seconds in length. Reformatted data were entered into commercially available software (Mindware HRV 2.0, Mindware, Gahana, OH) to independently extract the physiological variables (heart rate, RSA and LF/HF ratio) in one minute intervals. The Mindware software flagged any abnormalities on the ECG recordings and judgments were made to correct for abnormal beats and artifacts using recommendations from Berntson et al., (1990). The initial physiological recordings were based on six one-minute epochs across four phases (baseline, observation, anticipation, recovery). Four cases were missing scores in the sixth epoch of the recovery phase; therefore, analyses were conducted using five epochs across the four phases.

The study design was a mixed model analysis of variance (ANOVA) testing the following hypotheses: (1) individuals who are more skilled socially would exhibit increased cardiac vagal tone (as indexed by RSA), to the anticipation of a social stressor than individuals who are not as skilled socially, and (2) individuals who are more skilled socially would exhibit a differential pattern of overall cardiac reactivity, indexed by heart rate (HR),

to the anticipation of a social stressor than individuals who are not as skilled socially. There was no specific hypothesis on the direction of difference for cardiac reactivity. There were no a priori hypotheses regarding gender differences; however, having equal number of males and females in the study allowed for this variable to be included in analyses. To form the between subjects groups, aggregate scores were obtained for the measure of social competence (SC), the ICQ ( $M = 135.31$ ,  $SD = 21.82$ ). The entire sample was split on the median ICQ score to form two equal size groups ( $N = 40$ ), a high SC group ( $M = 151.95$ ,  $SD = 12.10$ ) and a low SC group ( $M = 118.68$ ,  $SD = 15.81$ ). An independent samples  $t$ -test confirmed that the groups were significantly different on the SC measure,  $t(78) = 10.57$ ,  $p < .001$ . Following the recovery period, participants were asked to rate, on a scale of one to 10, the amount of anxiety, relative to other personal situations, that they were experiencing during the anticipation phase of the study. This was done as a manipulation check to determine whether participants were experiencing any anxiety. An overall mean of 6.42 ( $SD = 2.29$ , range 2-10) revealed that participants were experiencing what they personally considered anxiety.

### *Demographics*

Table 1 displays the overall demographic characteristics of the participants. To verify that there were no between-groups (high SC versus low SC) differences on the demographics listed in Table 1 Chi square or  $t$  tests, as appropriate to the nature of the data, were conducted. An independent  $t$  -test confirmed there were no significant group differences on age,  $t(78) = 1.22$ ,  $p = .23$ . Chi square tests confirmed that there were no significant group differences on gender  $\chi^2(1, N = 80) = 0.45$ ,  $p = .50$ , ethnicity,  $\chi^2(3, N = 80) = 2.27$ ,  $p = .52$ ,

relationship status,  $\chi^2(4, N = 80) = 4.90, p = .30$ , number of years in university,  $\chi^2(6, N = 80) = 4.71, p = .58$ , and hometown region,  $\chi^2(2, N = 80) = 2.90, p = .24$ .

Table 1

*Demographic Characteristics for the Sample*

Descriptor	<i>M</i>	<i>SD</i>	Frequency	Percent
Age (overall)	22.45	3.85		
Gender				
Male			40	50.0%
Female			40	50.0%
Ethnicity				
Caucasian			69	86.3%
Asian			7	8.8%
Indo-Canadian			2	2.5%
First Nations			2	2.5%
Relationship Status*				
Single			39	48.8%
Common-Law			11	13.8%
Dating			25	31.3%
Other			1	1.3%
Blank			4	5.0%
# of Years in University				
One			27	33.8%
Two			14	17.5%
Three			19	23.8%
Four			19	23.8%
Five			1	1.3%
Hometown Region**				
Urban			41	51.3%
Rural			37	46.3%
Blank			2	2.5%

\* no participants identified as married;\*\* participants were given verbal instructions if hometown population was <10,000 that it was considered rural.

Table 2 displays data on health characteristics that may affect physiological recordings. Table 2 displays the chi-square analyses conducted to confirm that there were no

significant between group differences on 15 medical history variables and eight family history variables. Further, chi square tests confirmed that there were no significant group differences on caffeine consumption in the past 2 hrs  $\chi^2(1, N = 80) = 2.14, p = .14$ , alcohol consumption in the past 24 hrs,  $\chi^2(1, N = 80) = 1.01, p = .31$ , smoker,  $\chi^2(1, N = 80) = 0.213, p = .64$ , and medication usage,  $\chi^2(1, N = 80) = 0.213, p = .64$ , and overall exercise frequency,  $\chi^2(2, N = 80) = 2.90, p = .24$ . Independent *t*-tests confirmed there were no significant between group differences on BMI,  $t(78) = 0.17, p = .87$  and minutes of exercise/week,  $t(78) = 1.25, p = .21$ .

Table 2

*Health Characteristics for the Sample*

Descriptor	<i>M</i>	<i>SD</i>	Frequency	Percent	Chi-square statistic for group differences
BMI (overall) (kg/m <sup>2</sup> )	23.39	5.50			
Minutes of exercise/week	242.43	256.91			
Caffeine in past 2 hrs			24	30.0%	
Alcohol in past 24 hrs			1	1.3%	
Smoker			5	6.3%	
Medication			50	62.5%	
Medical History checklist					
Rheumatic fever			1	1.3%	$\chi^2(1, N = 80) = 1.01$
Heart Murmur			8	10.0%	$\chi^2(1, N = 80) = 0.55$
High Blood Pressure			6	7.5%	$\chi^2(1, N = 80) = 0.00$
High Cholesterol			2	2.5%	$\chi^2(1, N = 80) = 2.05$
Heart Attack			0	0.0%	
Heart Operations			0	0.0%	
Diabetes (diet or insulin dependent)			1	1.3%	$\chi^2(1, N = 80) = 1.01$
Epilepsy			2	2.5%	$\chi^2(1, N = 80) = 2.05$
Varicose Veins			3	3.8%	$\chi^2(1, N = 80) = 0.35$
Disease of Arteries			0	0.0%	
Emphysema, Pneumonia, Asthma, Bronchitis			17	21.3%	$\chi^2(1, N = 80) = 0.67$
Back Injury			7	8.8%	$\chi^2(1, N = 80) = 0.16$

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*Table 2 cont.*

Drug Reaction	8	10.0%	$\chi^2(1, N = 80) = 0.56$
Psychiatric difficulty	7	8.8%	$\chi^2(1, N = 80) = 1.41$
Other	8	10.0%	$\chi^2(1, N = 80) = 0.56$

Family History Checklist

Heart Attack	33	41.3%	$\chi^2(2, N = 80) = 1.45$
High Blood Pressure	40	50.0%	$\chi^2(2, N = 80) = 2.54$
Stroke	21	25.0%	$\chi^2(2, N = 80) = 2.68$
High Cholesterol	36	45.0%	$\chi^2(2, N = 80) = 0.20$
Diabetes	28	35.0%	$\chi^2(2, N = 80) = 4.09$
Congenital Heart Disease	8	10.0%	$\chi^2(2, N = 80) = 2.23$
Heart Operations	19	23.8%	$\chi^2(2, N = 80) = 1.85$
Other	10	12.5%	$\chi^2(2, N = 80) = 1.67$

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*Analyses of psychometric variables*

A maximum likelihood factor analysis was conducted as a preliminary step to determine the shared variance among the set of four psychometric variables of interest, the ICQ and the HSQ, which contains four subscales and the eight pre-screen psychometrics, the FNE, the TAS, which contains three subscales, the CM, STAIS, and the STAIT. The initial eigenvalues greater than one indicated that nine of the variables loaded onto two factors; therefore, the data were submitted to a varimax rotation. The rotated solution, shown in Table 3, yielded two interpretable factors, a social skill factor and an aversive use of humor to connect factor. The social skill factor (loading on six variables) accounted for 39.52% of the variance. The aversive use of humor to connect factor (loading on three variables) accounted for an additional 14.84% of the variance. Based on the results of the final factor analysis, it was determined that the social competence measure (ICQ) was a valid measure of social skill. Further since the design of this study was built on the premise that there is an inverse relationship between social competence and social anxiety, a bivariate correlation

was conducted between the ICQ and the FNE. The analysis revealed a significant negative relationship,  $r = -.355$ ,  $p < .001$ , indicating that the higher an individual scored on the social competence measure the lower they scored on the social anxiety measure.

Table 3

*Factor Pattern Matrix for the ICQ, FNE, HSQ, TAS, CM, STAIS and STAIT scales*

Psychometric variables	Factor	
	1	2
TAS - difficult identifying feelings	<b>.743</b>	.306
TAS – difficulty describing feeling	<b>.609</b>	.359
TAS – external oriented thinking	.447	.378
CM – social desirability	.468	<b>.475</b>
STAIS – state anxiety	<b>.819</b>	-.311
STAIT – trait anxiety	<b>.953</b>	-.112
ICQ – social competence	<b>-.642</b>	-.341
HSQ – affiliative humor	-.305	-.177
HSQ – self-enhancing humor	-.379	-.018
HSQ – aggressive humor	.078	<b>.707</b>
HSQ – self-deprecating humor	.352	<b>.445</b>
FNE– fear of negative evaluation	<b>.571</b>	-.164

*Note:*  $N = 80$ , 40 males, 40 females; TAS = Toronto Alexithymia Scale; CM = Crowne Marlowe Social Desirability Scale; STAIS = State Anxiety Inventory; STAIT = Trait Anxiety Inventory; ICQ = Interpersonal Competence Questionnaire; FNE = Fear of negative evaluation measure; HSQ = Humor Styles Questionnaire.

#### *Analyses of RSA*

As an outlier check, z-scores were calculated on the 20 one minute epochs. All z-scores fell below the necessary cut off of 3.29, confirming a uniform data set. Table 4 displays the means and standard deviations for the RSA ( $ms^2$ ) data set. A 2 (gender) x 2 (low SC, high SC) X 4 (baseline, observation, anticipation, recovery) x 5 (epochs) analysis of variance (ANOVA) with repeated measures on the last two factors was conducted to test the

hypothesis that the group that scored high on the ICQ would have greater vagal tone than the group that scored low on the ICQ. Initial examination of the analysis indicated the sphericity assumption was met for phase and epoch but not for the phase by epoch interaction; hence the Greenhouse-Geisser correction was applied only to the phase by epoch results.

Table 4

*Descriptive Statistics for the RSA (ms<sup>2</sup>)*

Phase	Epoch	<i>M</i>	<i>SD</i>
Baseline	1	6.99	1.21
	2	6.89	1.49
	3	6.77	1.15
	4	6.70	1.36
	5	6.65	1.24
Observation	1	6.71	1.34
	2	6.72	1.21
	3	6.68	1.24
	4	6.60	1.27
	5	6.69	1.20
Anticipation	1	6.54	1.28
	2	6.47	1.39
	3	6.82	1.37
	4	7.04	1.96
	5	6.73	1.31
Recovery	1	6.96	1.41
	2	6.91	1.47
	3	6.93	1.47
	4	6.82	1.38
	5	7.11	1.46

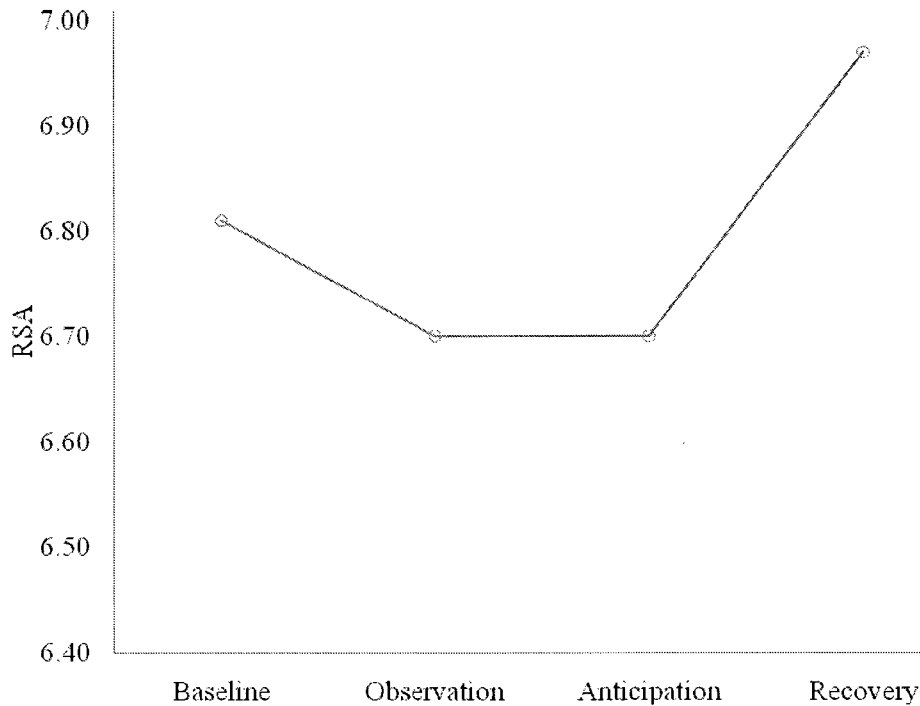
*Note:* *N* =80, 40 males, 40 females.

*Between- Groups Effects.* The main effect of SC approached significance  $F(1, 76) = 2.98, p < .10 \eta^2 = .04$ . Neither the main effect of gender,  $F(1, 76) = 0.26, \eta^2 = .01$  nor the gender by SC interaction was significant  $F(1, 76) = 0.33 \eta^2 = .01$ .

*Within-Groups Effects.* The main effect of phase was significant  $F(3, 228) = 3.85, p < .01, \eta^2 = .05$ . Figure 1 shows the overall pattern of RSA. Follow up using pairwise comparisons, adjusted with the Holms- Bonferroni correction to control for family wise error, showed that RSA during anticipation ( $M = 6.72, SD = 0.21$ ) was significantly lower than that during recovery ( $M = 6.94, SD = .18$ ) with a mean difference of 0.23. The mean RSA during observation ( $M = 6.72, SD = .22$ ) was significantly lower than that during recovery with a mean difference of 0.27. There were no other significant mean differences between the conditions. The main effect of epoch was not significant  $F(4, 912) = 0.42$ .

Figure 1

*Main Effect of RSA ( $ms^2$ )*

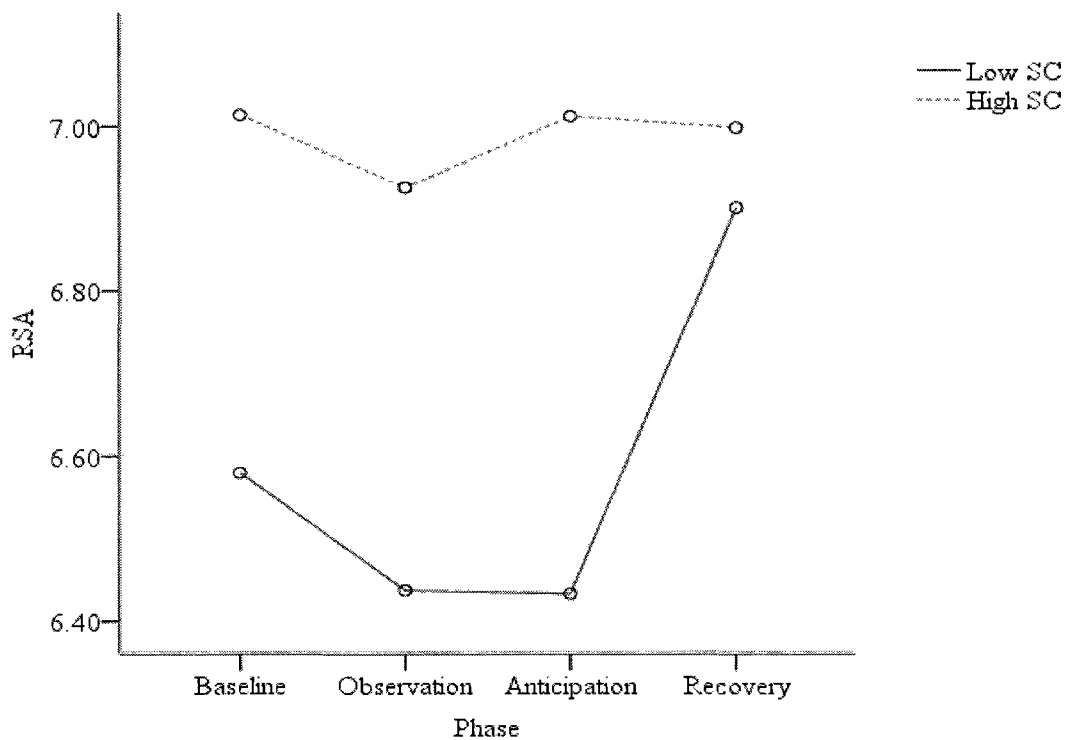




The main effect of phase was qualified by significant phase by SC,  $F(3, 228) = 2.91$ ,  $p < .05$ ,  $\eta^2 = .04$ , and phase by epoch,  $F(7.41, 563) = 3.22$ ,  $p < .01$ ,  $\eta^2 = .04$ , interactions. Figure 2 shows the overall pattern of RSA as a function of SC. There was no significant phase by gender interaction  $F(3, 228) = 0.68$ . The remainder of the three and four-way interaction effects were not significant.

Figure 2

*RSA as a Function of Social Competence*



To gain clarity to where the significant differences lay in the phase X SC interaction, follow ups using independent  $t$ -tests to compare groups at each level of phase were conducted using the Holms-Bonferroni correction to control for family wise error. There was a mean difference of 0.58 between the low SC group and the high SC group at anticipation

(phase 3),  $t(78) = 2.17$ ,  $SEM = 0.27$ ,  $p < .05$  with the low SC group having significantly lower RSA than the high SC group. There were no significant group differences at baseline,  $t(78) = 1.75$ , observation,  $t(78) = 2.00$  and recovery  $t(78) = 0.37$ .

#### *Analyses of Heart Rate*

As an outlier check, z-scores were calculated on the 20 one minute epochs. All z-scores fell below the necessary cut off of 3.29, confirming a uniform data set. Figure 3 displays the means for the heart rate data set. A 2 (gender) x 2 (low SC, high SC) X 4 (baseline, observation, anticipation, recovery) x 5 (epochs) analysis of variance (ANOVA) with repeated measures on the last two factors was conducted to test the hypothesis that the group that scored high on the ICQ would have differential cardiovascular reactivity than the group that scored low. Initial examination of the analysis indicated the sphericity assumption was not met ( $p < .001$ ) for phase, epoch and the phase by epoch interaction; hence the Greenhouse-Geisser correction was applied.

*Between- Groups Effects.* The main effect of gender was not significant  $F(1, 76) = 2.56$ ,  $\eta^2 = .03$ , nor was the main effect of SC  $F(1, 76) = 0.49$ ,  $\eta^2 = .01$  and interaction between gender and SC  $F(1, 76) = 0.52$ ,  $\eta^2 = .01$

*Within-Groups Effects.* The main effect of phase was significant  $F(1.47, 112.03) = 119.99$ ,  $p < .001$ ,  $\eta^2 = .61$ . Follow up using pairwise comparisons, adjusted with the Holms-Bonferroni correction, showed that mean HR during anticipation ( $M = 80.87$ ,  $SD = 1.64$ ) was significantly higher than that during baseline, ( $M = 70.29$ ,  $SD = 1.19$ ), observation ( $M = 70.19$ ,  $SD = 1.20$ ), and recovery ( $M = 70.19$ ,  $SD = 1.27$ ) with mean differences of 10.59, 10.68, and 10.69, respectively. There were no significant mean differences between baseline, observation, and recovery.

Figure 3

*Descriptive Statistics for the Heart Rate Data (beats per minute)*

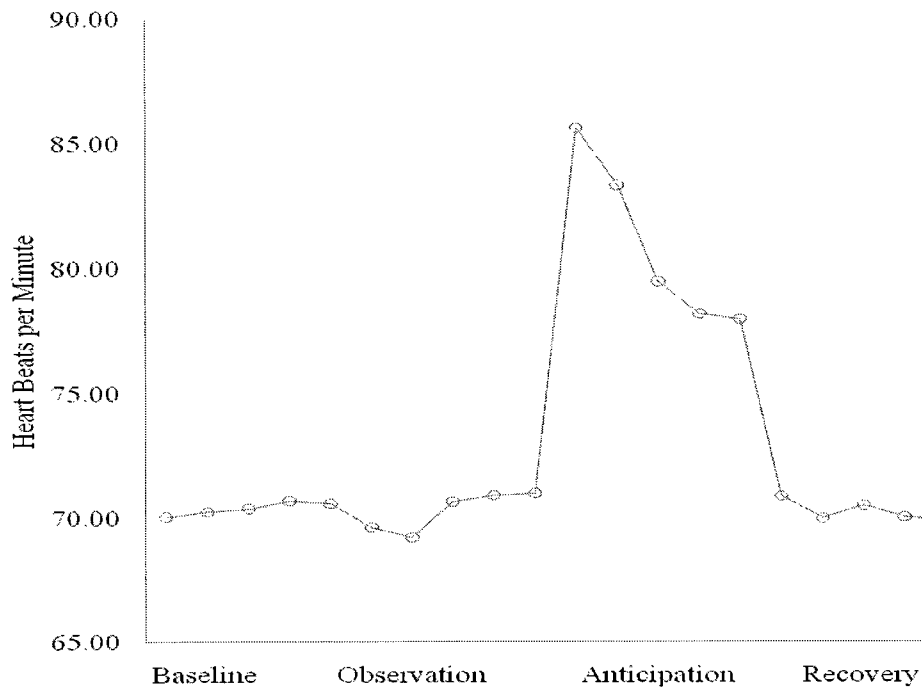


Figure 4 displays the mean HR as a function of SC across the four phases. There were significant phase by SC,  $F(1.47, 112.03) = 4.21, p < .05, \eta^2 = .05$ , and phase by epoch by SC,  $F(5.57, 423) = 2.26, p < .05, \eta^2 = .03$  interactions. Knowledge of the significant main effect of phase combined with an inspection of Figure 4, led to specific interaction contrasts being conducted to provide a better understanding of whether the patterns of mean HR change were different dependent upon the level of SC. Two single *df* interaction contrasts tested whether the slopes between observation (phase 2) and anticipation (phase 3) were the same for low SC versus high SC and whether the slopes between anticipation (phase 3) and recovery (phase 4) were the same for low SC versus high SC. There were significant interaction contrasts between observation and anticipation,  $F(1,78) = 7.06, p < .05$  and anticipation and recovery,  $F(1,78) = 8.72, p < .05$ . Together, these two differential slopes

suggest that the high SC group reacted with a greater acceleration of HR during the anticipation phase but recovered more quickly during the recovery phase than the low SC group. To add greater clarity to the speed of recovery the significant three way interaction (phase\*epoch\*SC) was followed up with one single *df* interaction contrast. Figure 5 displays the mean HR as a function of SC across the 20 epochs; a visual inspection of Figure 5 revealed a marked difference between SC groups during the anticipation phase.

Figure 4

*Mean Heart Rate as a Function of Social Competence Shown by Phase*

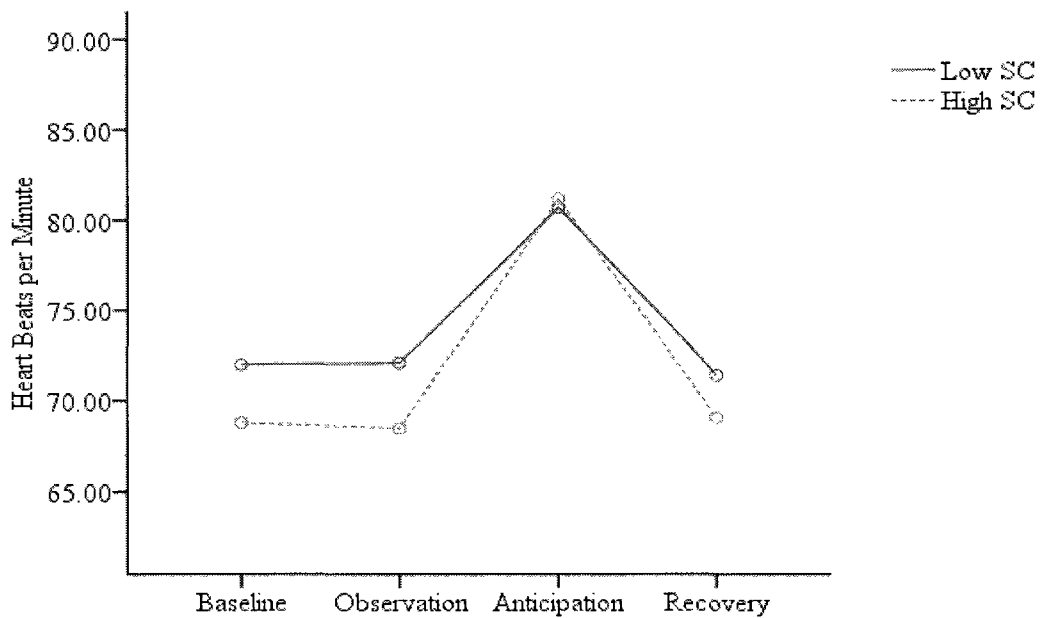
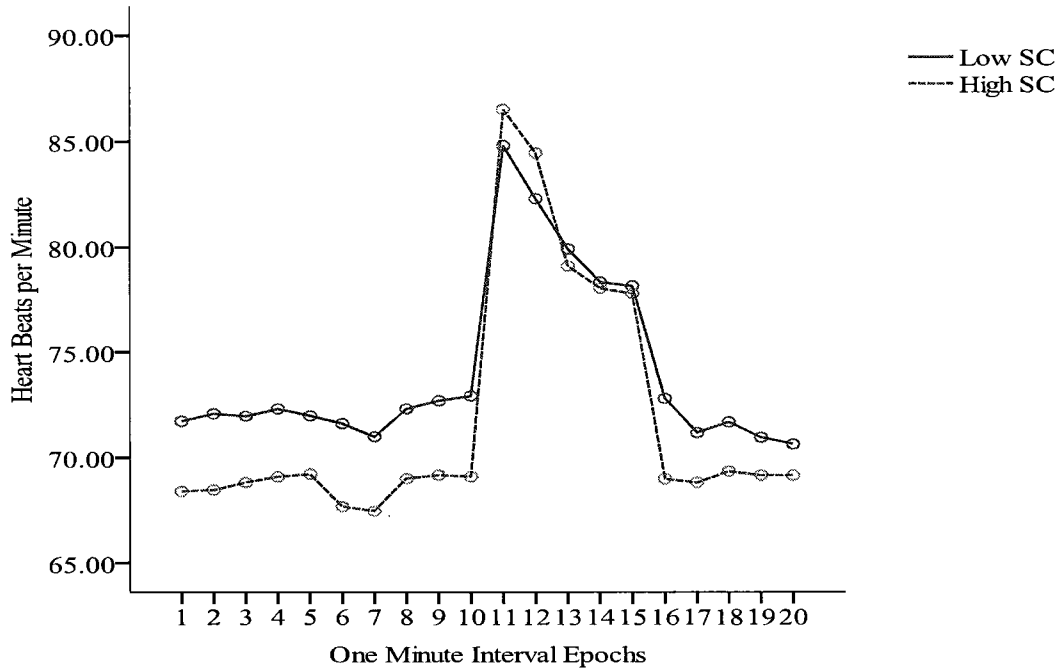


Figure 5

Mean Heart Rate as a Function of Social Competence Shown by Epoch



The interaction contrast that was conducted determined that the slope between epoch 12 and epoch 13 (this is between minute 2 and 3 in the anticipation phase) was significantly different for the low SC versus high SC,  $F(1,78) = 4.96, p < .05$ , which showed that before three minutes had elapsed the high SC group's mean HR was dropping much faster than the low SC group. The source tables in Appendix G show the hand calculations and means of interest for all the interaction contrasts.

The main effect of epoch was significant  $F(3.2, 243) = 20.39, p < .001, \eta^2 = .21$  but was not deemed meaningful to follow up since the main effect was qualified by the significant phase by epoch by SC interaction. There were no significant epoch by SC,  $F(3.2, 243) = 0.49$  and epoch by gender,  $F(3.2, 243) = 0.11$  interactions. The epoch by gender by

SC,  $F(3.2, 243) = 0.62$ , and epoch by phase by gender by SC,  $F(3.2, 243) = 0.48$ , were not significant.

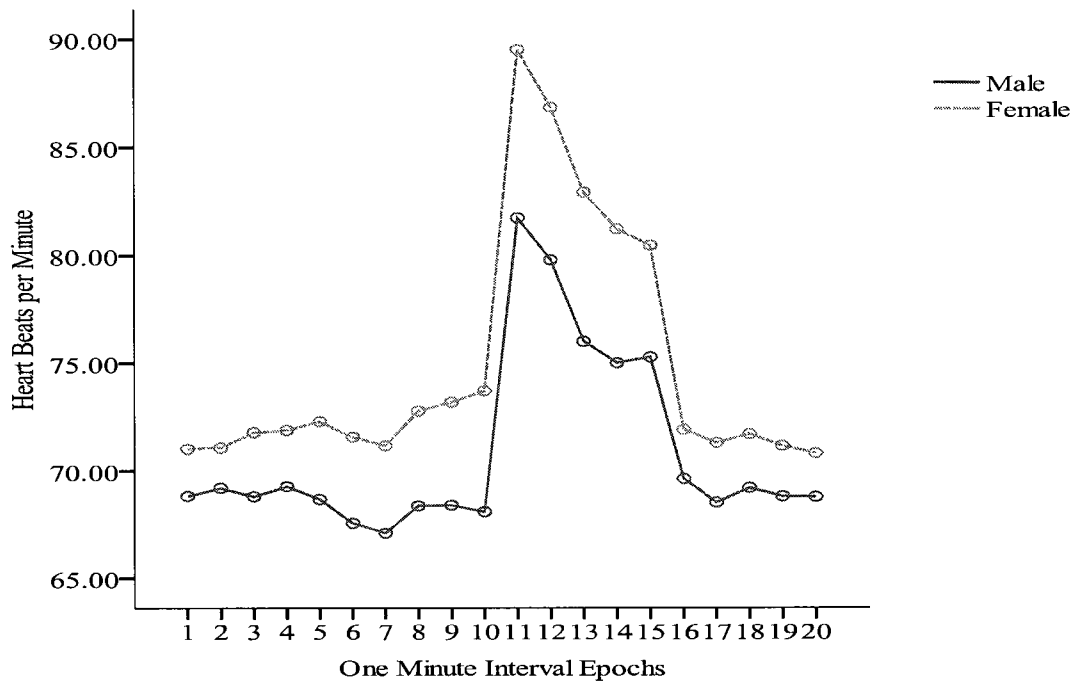
Figure 6 displays the overall pattern of minute-by-minute mean HR changes as a function of gender. There was a significant phase by gender,  $F(1.47, 112.03) = 4.11$ ,  $p < .05$ ,  $\eta^2 = .05$ , interaction, which was followed up using a simple main effects test. There were significant effects of gender during observation,  $F(1, 78) = 4.19$ ,  $p < .05$ ,  $\eta^2 = .05$  and anticipation,  $F(1, 78) = 4.09$ ,  $p < .05$ ,  $\eta^2 = .05$ , with females recording higher mean HR across both conditions than males (observation  $f = 72.73$ ,  $m = 67.85$ ; anticipation  $f = 84.20$ ,  $m = 77.68$ ). There were no significant effects of gender during baseline,  $F(1, 78) = 1.53$ , and recovery,  $F(1, 78) = 1.07$ . The phase by gender by SC interaction,  $F(1.47, 112.03) = 0.21$ , was not significant.

#### *Analyses of LF/HF Ratio*

To reduce the variability in LF/HF ratio data set log transformations were conducted using the  $\lg_{10}(X + 3)$  formula based on Tabachnick and Fidell's recommendations (2007) that if there is an original number in the data under one to add a numeric value to the  $\lg_{10}$  formula. As an outlier check, z-scores were calculated on the 20 one-minute epochs. All z-scores fell below the necessary cut off of 3.29, confirming a uniform data set. Figure 7 displays the means LF/HF ratio data set.

Figure 6

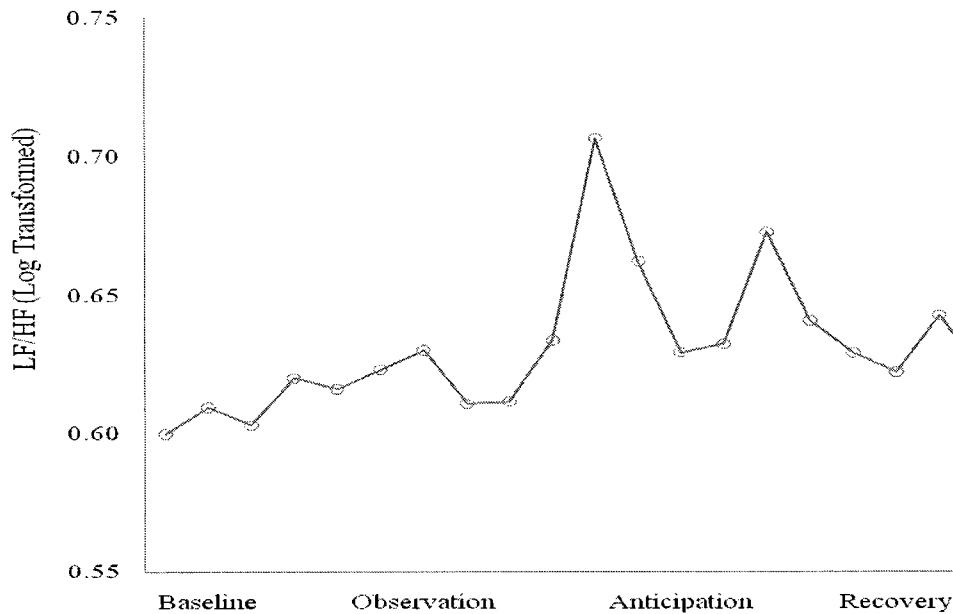
*Mean Heart Rate as a Function of Gender*



It should be noted that due to the log transformations, results must be interpreted with caution. A 2 (gender) x 2 (low SC, high SC) X 4 (baseline, observation, anticipation, recovery) x 5 (epochs) analysis of variance (ANOVA) with repeated measures on the last two factors was conducted to test the hypothesis that the group that scored high on the ICQ would have differential sympathovagal balance than the group that scored low. Initial examination of the analyses indicated the sphericity assumption was not met for the epoch effect but not for the phase effect and the phase by epoch interaction therefore the Greenhouse-Geisser correction method was applied to the latter two analyses.

Figure 7

*Descriptive Statistics for the Sympathovagal Balance (LF/HF Ratio log transformed)*



*Between- Groups Effects.* The main effect of gender was significant  $F(1, 76) = 8.75$ ,  $p < .01$ ,  $\eta^2 = .10$ , with males ( $M = .66$ ,  $SD = .01$ ) displaying higher overall sympathovagal balance than females ( $M = .60$ ,  $SD = .01$ ). The main effect of SC was not significant,  $F(1, 76) = 2.99$  nor was the gender by SC interaction  $F(1, 76) = 0.007$ .

*Within-Groups Effects.* The main effect of phase was significant  $F(3, 193) = 8.88$ ,  $p < .01$ ,  $\eta^2 = .11$ . Follow up using pairwise comparisons, adjusted with the Holms- Bonferroni correction to control for family-wise error, showed that anticipation ( $M = 0.66$ ,  $SD = 0.12$ ) was significantly different, at the  $p < .01$  level, from baseline ( $M = 0.61$ ,  $SD = 0.09$ ), observation, ( $M = 0.62$ ,  $SD = 0.09$ ), and recovery, ( $M = 0.63$ ,  $SD = 0.10$ ) There were no other significant mean differences between the conditions.

The main effect of epoch was significant,  $F(4,304) = 2.94$ ,  $p < .05$ ,  $\eta^2 = .04$ , and it was qualified by two significant interactions, epoch by phase,  $F(9, 704) = 2.29$ ,  $p < .01$ ,  $\eta^2 =$



.03, and epoch by gender by SCMS,  $F(4,304) = 3.01, p < .05, \eta^2 = .04$ . There were no other significant two way, three way, or four way interactions.

Complex comparisons were used to follow up the significant phase by epoch interaction to determine whether the level of anticipation differed, at each epoch, from the other three levels, baseline, observation, and recovery; in other words, to determine whether the pattern of sympathovagal balance was different during the anticipation phase compared to the other three phases. There were significant differences between anticipation and the other three levels at epochs one,  $F(1, 79) = 33.23, p < .001, \eta^2 = .30$ , two,  $F(1, 79) = 13.87, p < .001, \eta^2 = .10$ , and five,  $F(1, 79) = 14.44, p < .001, \eta^2 = .16$ . There were no significant differences between anticipation and the other three levels at epochs three,  $F(1, 79) = 0.08$ , and four,  $F(1, 79) = 0.89$ . These results clarify how the patterns of sympathovagal balance were not as stable during anticipation compared to baseline, observation, and recovery. The significant three-way interaction, epoch by gender by SC was followed up by examining the level of gender separately. Independent samples *t*-tests revealed no significant findings. This was not unexpected given the high number of comparisons. The interaction was not followed up in any other manner.

#### *Humor as a Mediating Variable*

To test the proposed hypothesis that humor is a mediating variable in the relationship between SC and cardiovascular reactivity, bivariate correlations were first conducted using the ICQ and the four dimensions of the HSQ. As well, because previous research (Martin et al., 2003) supports the idea that men and women use humor in distinct manners; relationships between SC and humor were investigated separately for each gender. Table 5 shows the bivariate relationships between SC and the four styles of humor, affiliative, self-enhancing,

aggressive and self-deprecating. For the males, significant positive relationships were observed between the ICQ and the affiliative and self-enhancing styles of humor whereas significant negative relationships were observed between the ICQ and the aggressive and self-deprecating styles of humor. The results did not reveal any significant relationships between the ICQ and the styles of humor for this female sample.

Next, bivariate correlations were conducted to determine whether there were any relationships between styles of humor and HR. To do this, the baseline HR was considered a tonic score of HR and HR change scores were calculated for observation, anticipation, and recovery and considered as phasic scores. Table 6 shows the associations among the four styles of humor and the phases of HR. For the males, during baseline, there was a significant negative relationship between HR and self-enhancing humor; furthermore, during observation, there were significant negative correlations between HR and the affiliative and self-enhancing styles of humor and a significant positive correlation between the self-deprecating style of humor and HR. For the females, during anticipation, there was a significant positive correlation between HR and the self-enhancing style of humor and a significant positive correlation between HR and the self-deprecating style of humor during the recovery.

Table 5

*Associations among the ICQ, the four dimensions of the HSQ, and Gender*

Gender	Style of Humor	ICQ
Male	Affiliative	.468**
	Self-enhancing	.317*
	Aggressive	-.327*
	Self-deprecating	-.450**
Female	Affiliative	.011
	Self-enhancing	.249
	Aggressive	.029
	Self-deprecating	-.048

*Note:*  $N = 80$ , 40 males and 40 females. ICQ = Interpersonal Competence Questionnaire; HSQ = Humor Styles Questionnaire. \*\* $p < .01$ ; \* $p < .05$  (two tailed)

Table 6

*Associations among the Four Styles of Humor and the Phases of Heart Rate*

Gender	Styles of humor	Baseline	Observation	Anticipation	Recovery
Male	Affiliative	.060	-.436**	-.030	-.051
	Self-enhancing	-.530**	-.400*	.042	-.271
	Aggressive	.014	.099	.084	.210
	Self-deprecating	-.108	.440**	-.157	.154
Female	Affiliative	.025	-.051	.097	.212
	Self-enhancing	-.086	-.053	.412**	.200
	Aggressive	.027	.155	.199	.137
	Self-deprecating	.068	.252	.076	.336*

*Note:*  $N = 80$ , 40 males and 40 females. \*\* $p < .01$ ; \* $p < .05$  (two tailed)

## DISCUSSION

This study examined cardiovascular activity as a function of social competence by independently examining the influences of anticipating a socially provocative task on respiratory sinus arrhythmia (RSA) and heart rate (HR). It is known that cardiovascular activity is regulated, in part, by an increase in the activation in the sympathetic nervous system (SNS), a decrease in the parasympathetic nervous system (PNS) or some interplay between the two systems. This study independently examined the influence of the PNS using power spectral analyses to decompose the variance in the overall heart period time series into frequency bands, specifically high frequency for the RSA measure. Individuals high in social competence maintained a higher, although not significantly, vagal tone

(indexed by RSA) across three of the four tasks (baseline, observation, and recovery) than the low social competence group; further, the low social competence group showed a significant lower vagal tone compared to the high social competence group when preparing for a socially provocative task (anticipation phase). These findings supported the original hypothesis that individuals scored as high social competence with a valid social competence measure would exhibit greater vagal tone than individuals scored as low social competence during a stressful task. There were no significant gender differences in the RSA analyses.

Second, this study independently examined heart rate as a function of social competence. The findings indicated that individuals scored as high social competence had greater cardiac reactivity (indexed by HR) while anticipating a social anxiety provoking event; at the same time, the high social competence group showed faster and more substantial cardiac recovery than those scored as low social competence. There were no directional hypotheses with the heart rate component of the study, as the main purpose of the study was to examine RSA. There were significant gender differences, with females consistently displaying a higher heart rate across all four conditions, and females had significantly higher heart rate than males at observation and anticipation. The gender findings are consistent with the literature with females typically having a higher heart rate than males.

The results from the sympathovagal balance (indexed by LF/HF ratio) data, where higher numbers indicate a greater relative SNS dominance, revealed that the sympathovagal balance changed for the entire group while they were anticipating that they had to impress a member of the opposite sex; In this study, the methodology relied on vicarious exposure to the anxiety of others to induce a state of anticipatory anxiety in the current participants, this

significant change in sympathovagal balance validated the methodology employed to induce arousal.

The final purpose of the present study was to examine whether humor mediates the relationship between social competence and cardiovascular activity. Affiliative and self-enhancing styles of humor were expected to have positive correlations with the social competence measure whereas the aggressive and self-deprecating styles of humor were expected to have negative correlations. There were no directional hypotheses as to how humor would relate to cardiovascular activity and what the gender differences would be. For the males, significant positive relationships were observed between the social competence measure and the affiliative and self-enhancing styles of humor whereas significant negative relationships were observed between the ICQ and the aggressive and self-deprecating styles of humor. The results did not reveal any significant relationships between social competence and styles of humor among women. These findings support Martin et al.'s (2003) theory that men and women use humor in distinct manners.

Bivariate correlations were conducted to determine whether there were any relationships between styles of humor and HR. For the males, during baseline, there was a significant negative relationship between HR and self-enhancing humor. Furthermore, during observation, there were significant negative correlations between HR and the affiliative and self-enhancing styles of humor and a significant positive correlation between the self-deprecating style of humor and HR. The high social competence group had lower mean HR during baseline and observation; the positive styles of humor are significantly associated with these lower heart rates while a negative style of humor is associated with higher heart rate (perhaps reflecting less social competence.). It may be that humor plays a role, for

males, in social skill, which in turn may be influencing cardiovascular activity. For females there was a significant positive correlation between HR and the self-enhancing style of humor during anticipation and a significant positive correlation between HR and the self-deprecating style of humor during recovery. The findings for the females are somewhat harder to interpret because there were no significant relationships between the social competence measure and the styles of humor.

#### *The relationships between RSA and HR*

It is important to note that, in this study, significant differences in cardiovascular activity were found in a relatively homogeneous population of young adults. The knowledge that there were any significant differences based on a measure of social competence is exciting. Some of the underlying pathways that may give rise to these differential cardiovascular patterns can be considered. Brosschot, Gerin, and Thayer (2006) proposed a perseverative cognition hypothesis that states that rumination, worry, and anticipatory stress can lead to prolonged states of activation in the cardiovascular and neuroendocrine systems. This type of theory is not new in the stress literature; Selye's seminal work through the 1960's stated that physiological systems may remain in prolonged states of activation in response to stress. Incomplete in Selye's model of stress were the psychological factors, such as emotions and individual perceptions. Richard Lazarus, another forefather in the stress literature, provided a greater depth of understanding with the inclusion of cognitive processes in whether an individual perceives an event to be stressful or not. Still lacking from Lazarus's model of stress is what may be occurring before what an individual identifies as "the stressful event". The perseverative cognitive hypothesis proposes that stressors have the potential for physiological activation in advance of any given stressor. To put this in a social

context, an inability to dis-engage (ruminating) from a previous interpersonal interaction may result in prolonged activation. Not detaching from these ruminative thoughts will reduce the likelihood of any subsequent interactions occurring in a positive framework, thereby increasing the likelihood that the individual will perceive that another stressful event occurred. Further the authors point out, that much perseverative thinking occurs at a relatively unconscious level. This type of model seems to be a good fit when contextualizing stress within a social framework and explaining some of the results of this study.

Under normal physiological circumstances, it is thought that humans display an inverse relationship between resting RSA and HR. One would anticipate then, that when the high social competence group's HR increased that their RSA values would decrease; however, this was not the overall pattern of results in this study. HR increased significantly while RSA remained stable for the high social competence group; whereas, in the low social competence condition, HR increased while RSA significantly decreased compared to the high social competence group. To clarify, the high social competence group had a relative higher degree of cardiac reactivity while they were anticipating a socially provocative event compared to the low social competence group. What did not happen were significant changes in HR between the two groups during any phase. Further, the high social competence group recovered more rapidly within the same phase than the low social competence group. We cannot conclude that the high social competence group had significantly higher HR than the low social competence group while preparing for a socially provocative task; we can conclude that the high social competence group's response to a socially provocative request was at a higher level of intensity but recovery within that same phase was also at a greater intensity relative to the low social competence group. The results did reveal that the low



social competence group had significantly lower RSA while preparing for a socially provocative event.

Applying the perseverative cognition hypothesis to explain these results may shed some light as to the differences in the groups split on social competence. First, all the participants were informed during the instructions phase of the study that they would be asked to prepare for a task similar to what they observed during the observation phase so the anticipatory phase did not come as a surprise to anyone. It is plausible that previous negative social interactions influenced the low social competence group through all phases of the study, resulting in a prolonged response across the entire study, which is reflected in the higher resting HR at baseline, observation, and recovery. In contrast, the high social competence individuals, who most likely had a higher sense of self-efficacy in a social context, may have experienced less anticipatory stress until they were reminded by the instructions that they had to prepare for a socially provocative event. Their intensity of response was greater but within two minutes they may have begun using re-appraisal strategies to prepare in a constructive manner for the task at hand. If this hypothesis is plausible, then the low social competence group would not have had access to the same resources (resulting from a cardiovascular system that has been activated for a longer period of time) to engage in constructive thoughts as quickly. This would also account for why the low social competence group had lower RSA scores through the entire study; their resources were mobilized at a stable low-level intensity during the entire study.

### *Social Competence and Respiratory Sinus Arrhythmia*

It was hypothesized that during the anticipation of a stressful social task, the group rated as high in social skill would exhibit greater vagal tone than the group rated as low social skill. This prediction arose from the literature linking psychiatric disorders such as anxiety and depression to lower resting vagal tone (Brosschot, Van Dijk, & Thayer, 2007). As well, the seminal work of Eisenberg et al. (1998) has resulted in substantial literature linking social competence to better vagal tone in children. There is evidence that individuals with a greater capacity for cardiac vagal tone, a physiological index of the parasympathetic nervous system's influence on the heart, calm down faster and respond quicker to stimuli (Bosch, Riese, Ormel, Verhulst, & Oldehinkel, 2009; Brosschot et al.; Eisenberg et al., 1998). This study revealed that the low social competence group had a decrease in RSA while under challenge while the high social competence group maintained a stable RSA. Maintenance of RSA under challenge would suggest that the high social competence group may be better at self-regulating their emotional response to stress, or have a faster ability to employ cognitive processes to cope with the task at hand, or a combination of emotional regulatory and cognitive processes.

Porges (1992) developed a theoretical basis for the link between cardiac vagal tone and attention; he proposed that higher resting levels of cardiac vagal tone were associated with improved attentional capacity and adaption to the environment. It was shown in school age children, that perceptual capacity was positively associated with higher resting RSA (Suess, Porges, & Plude, 1994). Hansen, Johnsen, and Thayer (2003) found that a group of sailors with higher heart rate variability displayed better performance on working memory and continuous performance tests than those with lower heart rate variability. These

attentional qualities may allow for an individual to attend the most salient features of any given situation and adapt more effectively to the current environment. According to Ewart et al. (2002), a socially competent individual has the skills necessary to modify their actions and pursue their achievable goals. This definition of social competence implies that an individual will have a superior ability to attend to the stressor at hand. The findings from the present study provide support for the relationship between social competence and vagal tone. The high social competence group had higher RSA scores, which according to Porges, is associated with improved attentional capacity across all tasks than the low social competence group.

A function of parasympathetic influence is to inhibit sympathetic arousal, which may result in a calmer state thereby allowing an individual to employ other functioning mechanisms such as cognitive re-appraisal. Pieper and Brosschot (2005) reported that the intensity of a stress response is linked to the level of controllability that an individual can exert over a certain situation. A more relaxed state resulting from the higher levels of RSA, as observed in this sample's high social competence group, may be a determinant of successful social networking by allowing for engagement, signals of cooperative and approachable behaviors, which Auerbach et al. (2001) define as social competence. Conversely, Thomas et al. (2004) reported that individuals, who were unable to negotiate problematic situations competently, experienced higher levels of suspicion which then manifested into stable negative social environments. Dampened vagal tone, as observed in the low social competence group, may have deleterious effects on social behaviours with the trajectory being one of poor resolution during interpersonal engagements.

This study did not find any gender differences in RSA. These results are inconsistent with the broader literature on gender and RSA. De Meersman and Stein, (2007) in a review on RSA, reported that men typically have higher RSA scores than women in the over 30 age group but age differences disappear after 50. Umetani, Singer, McCraty, and Atkinson (1998) reported that the female population ages 10-29 have lower RSA scores than their male counterparts. A main difference between this study and the other studies reviewed was the time frame used to collect the data. The other studies used 24 ambulatory measures unlike this study where the collection period lasted 20 minutes. At rest, the parasympathetic nervous system becomes most influential; a 24 hr time frame that includes sleep may contribute to significant gender differences in RSA compared to a 20 minute time frame during the daytime. Another potential explanation for the lack of gender differences is the sample size in this study. Typically, HRV studies are large with well over 100 participants, in comparison to this study's 80 participants. Perhaps gender differences are a function of sample size as opposed to true gender differences since there was no effect size observed in this sample.

Vagal tone is only one component of multi-layered behavioral systems; this presents potential complications to the conceptual development of emotional regulatory capacity being an index for RSA. Berntson et al. (2007) reported that RSA is multiply determined. A number of determinants such as drug regimes, activity levels, and disease states (i.e., hypertension) may confound the results. In this study the groups were screened for a host of known potential confounds. This study employed a between-groups design and preliminary analyses revealed that any potential confounds were evenly distributed between the groups. This does not mean that the study sample did not have the some of the potential confounds

that Berntson et al. warn against, but it does mean that the potential confounds were evenly distributed across both groups. Hence, the findings from this study make for a stronger argument for emotional regulatory capacity being an index for RSA.

#### *Social Competence and Heart Rate*

Goldstein, Fink, and Mettee (1972) quoted Schachter and Singer's (1962) assertion "that emotion is a function of a state of physiological arousal and cognition appropriate to this state of arousal (p. 41)". Social competence can be conceptualized as linked to this interplay between arousal and cognitions. Successful navigation in the social world requires that people not only process emotional information, but also intelligently manage their emotional state by simultaneously employing cognition. The purpose of the present study was to determine relationships between social competence and cardiovascular activity. The findings indicated that people who were rated high social competence had lower, albeit not significantly lower, heart rate during a state of non arousal than the low social competence group. Yet, when anticipating a provocative social task, those rated as high social competence responded with a significantly greater magnitude initially but were able to employ some coping mechanism to reduce their heart rates' at a faster pace than the low social competence group.

Typically, humans want to be viewed in a favorable light. Through social interactions, individuals develop skill sets that act as aids or barriers to navigating the social world. Arguably the high social competence group in this study had a more positively developed set of social skills. According to Ewart et al. (2002), a socially competent individual has the ability, by moderating their emotions and actions, to choose and pursue their desirable and achievable interpersonal goals. The finding of significantly enhanced HR

recovery during anticipation of social anxiety among participants high in social competence lends support to Ewart et al.'s characterization of social competence. Although the high social competence group had greater cardiovascular reactivity, they were also more adept at regulating their initial emotional response, thereby reducing their heart rate. Ewart and Jorgenson (2004) expanded the model of social competence by dichotomizing personal goals into self-directed goals and other-directed goals. Self-directed goals are a reflection of an individual's desires for self-improvement with an internal focus, whereas other-directed goals are a reflection of an individual's focus on others for improvement and change, or an external focus. Perhaps, the ability to quickly modulate heart rate through cognitive processes is a behavioral component more typical of self-directed goals.

#### *Phase Effects of RSA, HR, and LF/HF*

It is known that the intensity of a stress response is linked to the level of controllability that an individual can exert over a certain situation (Pieper & Brosschot, 2005). In other words, the lesser the controllability the greater the amplitude of the response and the susceptibility to develop stress related illnesses. In the literature, the reactivity model has been used extensively to explain how stress is a determinant of cardiovascular diseases. The reactivity model suggests that an increased cardiovascular activity, resulting in response to stressors; individuals with a tendency to have large and/or frequent responses to stress may experience physiological changes in their vasculature. Schwartz, Gerin, Davidson, Pickering, Brosschot, Thayer, et al. (2003) critiqued the reactivity model stating that while animal studies have been fruitful in supporting a reactivity model, human studies have not been replicated with consistency. Schwartz et al. stated that methodological issues such as inability to replicate chronic daily events in the laboratory setting, overlooking the

importance of the length of the stress response, and disregard for anticipation of a stressor are potential problems of a simple reactivity model. Rather, Schwartz et al. suggest the need for methodological frameworks that induce qualitatively different components of what is defined as a stressor.

This study developed a novel method to induce anticipatory stress to address Schwartz et al.'s (2003) concerns about the gap in the literature. Vicarious exposure to stress to induce anticipatory physiological arousal came out of the social anxiety literature that purports that human beings are typically motivated to present themselves in a favorable light. Christensen and Stein (2003) reported that self-perceptions play a greater role in the fear of negative perceptions than do other perceptions. The knowledge that self-evaluative processes are a prominent feature of social anxiety afforded us the opportunity to present videos of others in a socially provocative task with the expectation that when individuals were asked to prepare for the same task that they would be fearful that they would act in a manner that could be humiliating or embarrassing and physiological arousal would occur. There were significant main effects of phase for all three physiological measures utilized in this study, RSA, HR, and LF/HF. The results, with significant phase effects across all three physiological measures, suggest that this methodology is a valid manipulation.

#### *Social Competence, Humor and Heart Rate*

The finding of significant relationships between humor and social competence was not surprising. Kuiper, McKenzie, & Belanger (1995) found that individuals with a greater sense of humor were more likely to cognitively re-frame a stressful event and put greater emotional distance from the stressor. Kuiper et al. utilized a different measure of humor than in this study. These effects could be modulated by the different styles of humor that were

used in this study with the positive styles of humor possibly replicating Kuiper et al.'s findings (for males, higher social competence was positively related to affiliative and self-enhancing humor) and the negative styles not being related to positive re-framing. Cann, and Calhoun, (2001) reported that good sense of humor is associated with socially desirable characteristics. Yip and Martin (2006) found trait cheerfulness positively related to social competence while trait bad mood was negatively related to social competence.

These findings support the notion that men and women use humor differently (Martin et al. 2003). For men, there were significant relationships between social competence and the styles of humor; whereas, there were no significant relationships between social competence and the styles of humor among women. For the males only, significant positive relationships were observed between social competence and the affiliative and self-enhancing styles of humor whereas significant negative relationships were observed between social competence and the aggressive and self-deprecating styles of humor. Humor is a distinct communication medium as its purpose is to undermine the serious component of the intended message. Sarcasm then, may be considered socially acceptable when it is communicated as humor. Martin et al. consider sarcasm to be an aggressive style of humor, which belittles others (or the self) under the veil of amusement. Ford and Ferguson (2004) reported that disparagement styles of humor have the potential to denigrate the target while simultaneously stifling challenge or criticism. The findings found that the aggressive and self-deprecating styles of humor were negatively correlated with social competence for males. Perhaps these negative uses of humor may act as releasers for aggression and are more closely related to hostility than previously thought.



The question then becomes what purpose does humor serve in interpersonal relationships? Ford, Boxer, Armstrong, and Edell (2007) found that when males were allowed to release sexist forms of humor, they displayed more negative, prejudicial behaviours towards women than in a neutral condition. Ford et al. proposed that for men who have antagonistic attitudes, aggressive styles of humor may allow them to express their hostility while remaining within acceptable social norms. Essentially, the authors argue that aggressive forms of humor may be justifying a wider range of negative responses towards others with little or no backlash. However, the findings from this study, with social competence being negatively correlated to both forms of negative humor, would not support the view that negative forms of humor have no social consequences. Instead, the results from this study reveal the potential for fewer meaningful social interactions combined with the potential for negative cardiovascular outcomes.

Szabo, Ainsworth, and Danks (2005) found that watching a humorous video reduced state anxiety, measured by a validated self-report tool, and overall negative affect at an equivalent rate to physical exercise. Kuiper and Nicholl (2004) found that those scoring higher on various humor measures reported having higher perceptions of their own physical health. The existing research provides us with some answers to the many components of humor; however, missing in the research is how some styles of humor may act as a stress-buffer while other styles of humor may be stress-enhancing in terms of cardiovascular functioning. Given the growing interest in positive psychology (e.g., humor as an adaptive feature) and the increased recognition that many humans reside in multi-cultural/multi-religiosity societies, it would serve the research to examine how and why the physical body (a pan-cultural feature of our species) plays a role in humor production. These immediate

psychological benefits of humor make it a worthy construct to examine in relationship to social skill and cardiovascular activity. The results from this study provide an entry point for examining styles of humor in the context of cardiovascular health.

#### LIMITATIONS

Despite these novel findings, it is important to recognize that the associations found here came from observations within a laboratory setting using a moderately homogenous group. For further validation this study should be repeated in various social settings with a wider range of individuals in order to permit generalizability of these results. In other words, it still needs to be determined whether the interactions between cardiovascular activity and social competence would occur in the same way during everyday interpersonal interactions. Further, since the ICQ is a global measure of ability across interpersonal task domains, it would be valuable to determine whether an induction of emotional states such as sadness, anger, or joy (as opposed to anxiety) would interact differentially with cardiovascular activity. This study examined the relationship between social competence and cardiovascular activity. What it did not examine was how underlying cognitions may have influenced the physiological response. For instance, it is unclear what the participants were actually thinking about in the six minutes of preparation time. It would be valuable information to know whether the high social competence group employed a differential coping strategy such as reappraisal in relation to the low social competence group.

Grossman and Taylor (2007) reported that respiration rate and depth can influence RSA independent of vagal tone. Their findings are in accordance with the recommendations set forth by the Task Force (1996) to control for respiration rate. Currently there is considerable debate in the literature on the necessity to include respiratory measures when

evaluating RSA. Houtveen, Rietveld, and De Gues (2002) examined differences between studies that measured respiratory parameters (rate and depth) and studies similar to this one that did not measure respiratory parameters. Concerning RSA outcomes, Houtveen et al. found that there were strong correlations between both types of studies. There has been some consensus that assessments of RSA are less likely to be confounded by respiratory measures when there is no physical load placed on participants (Oveis, Cohen, Gruber, Shiota, Haidt & Ketlner, 2009; Houtveen et al., 2002). This study did not control for respiration rate; as such, this introduces a potential confound in the findings. Likely, as there was no physical movement during this study and it was a within-groups design, which would have lessened the overall variability, respiration parameters would not account for the changes in RSA in the low social competence group while they were preparing for a socially provocative event. However, controlling for respiration parameters in a future study would be a worthy endeavor.

Finally, a possible limitation in the findings may be that some of the participants had consumed caffeine and/or alcohol prior to the physiological testing; as such, these known confounds may be accounting for some of the variability found in the study. However, there were no significant between-groups differences found on these measures, meaning that any variance due to caffeine and/or alcohol was equally distributed between the high and low social competence groups.

## IMPLICATIONS

Applying the results from this study provides an explanation for how deficits in social skills may be determinants for cardiovascular diseases. The results from this study showed that in early adulthood individuals rated as low on a social competence measure experience

vagal suppression while anticipating a socially provocative event in a laboratory setting. While laboratory settings have been criticized for an inability to generalize to a larger population, for this study there is no motivation for a laboratory setting to be more provocative than a genuine social encounter. Therefore, vagal suppression in an individual with less social skill may well disadvantage that individual with a reduced ability to respond appropriately in a social context. Over time, poor resolution in a social context, may prevent an individual from developing skills within any of the five domains of the social competence measured by the ICQ, negative assertion, conflict management, emotional support, disclosure, or initiating relationships. A deficit in any of these domains will likely reduce the success in other components of social competence. Consistent with this supposition, Herzberg et al., (1998) found that inability to provide emotional support was a risk factor for interpersonal stress. If vagal suppression, as found in this study, is a stable feature of low social competence, which still needs to be determined, this group of individuals would be at a continual deficit to respond to the interpersonal demands, which may result in heightened arousal and a trajectory of poor cardiovascular health as a consequence.

While the results did not show significant group differences in heart rate between the baseline, observation and recovery phase, it is still important to discuss the potential clinical applications of this study. Figure 4 shows that the resting heart rate for the group scored as high social competence is approximately three beats per minute lower than the low social competence group. Over the period of 24 hours if resting heart was maintained, the low social competence group's hearts would beat approximately 4000 more times than the high social competence group. It would be valuable to test the group differences over time, both for a 24 hr ambulatory measure and in the context of longitudinal studies. By speculating that

social competence is a stable feature it may suggest a direct pathway to an overworked heart in the low social competence group.

The potential that social competence, using a simple self-report measure, could be used as a valid indicator for cardiovascular health is exciting. This has important implications in social development and possibly in the prevention of disease states. Behavioral skills can be modified using various strategies. A person may be able improve on emotional regulatory processes, which in turn, may increase their success during interpersonal interactions. Thus, it may be possible to heighten a person's social competence over time, which may provide a protective mechanism against cardiovascular diseases.

## REFERENCES

- Auerbach, S.M., Clore, J.N., Kiesler, D.J., Orr, T., Pegg, P.O., Quick, B.G., & Wagner, C. (2002). Relation of diabetic patients' health-related control appraisals and physician-patient interpersonal impacts to patients' metabolic control and satisfaction with treatment. *Journal of Behavioral Medicine, 25*, 17-31.
- Bar-On, R. (2006) The Bar-on model of emotional-social intelligence (ESI). *Psicothema, 18*, 13-25.
- Berntson, G.G., Quigley, K.S., Jang, J.F., & Boysen, S.T. (1990). An approach to artifact identification: application of heart period data. *Psychophysiology, 27*, 586-598.
- Berntson, G.G., Bigger Jr., J.T., Eckberg, D.L., Grossman, P., Kaufmann, P.G., Malik, M., et al. (1997). Heart rate variability: origins, methods, and interpretive caveats. *Psychophysiology, 34*, 623-648. *Psychophysiology, 39*, 427-436.
- Borkovec, T.D., Stone, N.M., O'Brien, G.T., & Kaloupek, D.G. (1974). Evaluation of a clinically-relevant target behavior for analog outcome research. *Behavior Therapy, 5*, 503-513.
- Bosch, N., Riese, H., Ormel, J., Verhulst, F., Oldehinkel, A.J. (2009). Stressful life events and depressive symptoms in young adolescents: Modulation by respiratory sinus arrhythmia? The Trails study. *Biological Psychology, 81*, 40-47.
- Brosschot, J.F., Gerin, W., Thayer, J.F. (2006). The perseverative cognition hypothesis: A review of worry, prolonged stress-related physiological activation, and health. *Journal of Psychosomatic Research, 60*, 113-124.

- Brosschot, J.F., Van Dijk, E., Thayer, J.F. (2007). Daily worry is related to low heart rate variability during wake and the subsequent nocturnal sleep period. *International Journal of Psychophysiology*, 63, 39-47.
- Buhrmester, D. (1990). Intimacy of friendship, interpersonal competence, and adjustment during preadolescence and adolescence. *Child Development*, 61, 1101-1111.
- Buhrmester, D., Furman, W., Wittenberg, M., & Reis, H. (1988). Five domains of interpersonal competence in peer relationships. *Journal of Personality and Social Psychology*, 55, 991-1008.
- Burns, J. W., Bruehl, S., & Quartana, P. J. (2006). Anger management style and hostility among patients with chronic pain: Effects on symptom-specific physiological reactivity during anger- and sadness-recall interviews. *Psychosomatic Medicine*, 68(5), 786-793.
- Cann, A., & Calhoun, L. G. (2001). Perceived personality associations with differences in sense of humor: Stereotypes of hypothetical others with high or low senses of humor. *Humor: International Journal of Humor Research*, 14, 117-131.
- Chen, E., Matthews, K., Salomon, K., & Ewart, C. (2002). Cardiovascular reactivity during social and nonsocial stressors: Do children's personal goals and expressive skills matter? *Health Psychology*, 21, 16-24.
- Christensen, P.N, & Stein, M.B. (2003). Social Anxiety and Interpersonal Perception: A Social Relations Model Analysis. *Behaviour Research and Therapy*, 41, 1355-1371.
- Cohen, S. (2004). Social relationships and health. *American Psychologist*, 59, 676-684.
- Davidson, K.W., Prkachin, K.M., Lefcourt, H.M. & Mills, D.E. (1996). Towards a psychosocial mediator model of hostility and CHD. *Psychology and Health*, 11, 421-429.

- Davidson, K., Prkachin, K.M., Mills, D.E. & Lefcourt, H.M. (1994). Comparison of three theories relating facial expressiveness to blood pressure in male and female undergraduates. *Health Psychology, 13*, 404-411.
- De Meersman, R.R., Stein, P.K. (2007). Vagal modulation and aging. *Biological Psychology, 74*, 165-173.
- Denver, J.W., Reed, S.F., Porges, S.W. (2007). Methodological issues in the quantification of respiratory sinus arrhythmia. *Biological Psychology, 74*, 286-294.
- Eisenberg, N., Cumberland, A., & Spinrad, T. L. (1998). Parental socialization of emotion. *Psychological Inquiry, 9*, 241-274.
- Ewart, C. K., Jorgenson, R.S., Suchday, S. Chen, E. & Matthews, K.A. (2002). Measuring stress resilience and coping in vulnerable youth: The social competence interview. *Psychological Assessment, 14*, 339-352.
- Ewart, C. K., & Jorgenson, R.S. (2004) Agonistic interpersonal strivings: Social-cognitive mechanism of cardiovascular risk in youth? *Health Psychology, 23*, 75-85.
- Feingold, A., & Mazzella, R. (1993). Preliminary validation of a multidimensional model of wittiness. *Journal of Personality, 61*, 439-456.
- Ford, T.E., Boxer, C.F., Armstrong, J., & Edell, J.R. (2008). More than “just a joke”: The prejudice-releasing function of sexist humor. *Personality and social psychology bulletin, 34*, 159-170.
- Ford, T.E., & Ferguson, M.A. (2004). Social consequences of disparagement humor: A prejudiced horn theory. *Personality and Social Psychology Review, 8*, 79-94.



- Frasure-Smith, N., & Lespérance, F. (2005). Depression and coronary heart disease: Complex synergism of mind, body, and environment. *Current Directions in Psychological Science, 14*, 39-43.
- Glynn, L.M., Christenfeld, N., & Gerin, W. (2002). The role of rumination in recovery from reactivity: Cardiovascular consequences of emotional states. *Psychosomatic Medicine, 64*, 714-726.
- Goldstein, D., Fink, D., & Mettee, D.R. (1972). Cognition of arousal and actual arousal as determinants of emotion. *Journal of Personality and Social Psychology, 21*, 41-51.
- Grippe, A. J., & Johnson, A. K. (2002). Biological mechanisms in the relationship between depression and heart disease. *Neuroscience & Biobehavioral Reviews, 26*, 941-962.
- Grossman, P., & Taylor, E. W. (2007). Toward understanding respiratory sinus arrhythmia: Relations to cardiac vagal tone, evolution, and bio-behavioral functions. *Biological Psychology, 74*, 263-285.
- Gudleski, G.D., & Shean, G.D. (2000). Depressed and nondepressed students: Difference in interpersonal perceptions. *Journal of Psychology: Interdisciplinary & Applied, 134*, 56-62.
- Hansen, A.L., Johnsen, B.H., Thayer, J.F. (2003). Vagal influence on working memory and attention. *International Journal of Psychophysiology, 48*, 263-274.
- Heart and Stroke Foundation (2002). *Incidence of Cardiovascular Disease*. Retrieved Sep 24, 2008 from <http://ww2.heartandstroke.bc.ca/Page.asp?PageID=24>.
- Herrald, M.M., & Tomaka, J. (2002). Patterns of the motion-specific appraisal, coping, and cardiovascular reactivity during an ongoing emotional episode. *Journal of Personality and Social Psychology, 83*, 434-450.

- Herzberg, D.S., Hammen, C., Burge, D., Daley, S.E., Davila, J., & Lindberg, N. (1998). Social competence as a predictor of chronic interpersonal stress. *Personal Relationship, 5*, 207–218.
- Houtveen, J. H., Rietveld, S., & De Geus, E. J. C. (2002). Contribution of tonic vagal modulation of heart rate, central respiratory drive, respiratory depth, and respiratory frequency to respiratory sinus arrhythmia during mental stress and physical exercise.
- Kanning, U. (2006). Development and validation of a German-language version of the Interpersonal Competence Questionnaire (ICQ). *European Journal of Psychological Assessment, 22*, 43-51.
- Kuiper, N. A., McKenzie, S. D., & Belanger, K. A. (1995). Cognitive appraisals and individual differences in sense of humor: Motivational and affective implications. *Personality and Individual Differences, 19*, 359-372.
- Kuiper, N. A., & Nicoll, S. (2004). Thoughts of feeling better? Sense of humor and physical health. *Humor, 17*, 37-66.
- Lefcourt, H. M., Davidson, K., Prkachin, K. M., & Mills, D. E. (1997). Humor as a stress moderator in the prediction of blood pressure obtained during five stressful tasks. *Journal of Research in Personality, 31*, 523-542.
- Lefcourt, H. M., Martin, R. A., Fick, C. M., & Saleh, W. E. (1985). Locus of control for affiliation and behavior in social interactions. *Journal of Personality and Social Psychology, 48*, 755-759.
- Martin, R. A., & Lefcourt, H. M. (1983). Sense of humor as a moderator of the relation between stressors and moods. *Journal of Personality and Social Psychology, 45*, 1313-1324.

- Martin, R. A., & Lefcourt, H. M. (1984). Situational humor response questionnaire: Quantitative measure of sense of humor. *Journal of Personality and Social Psychology*, 47, 145-155.
- Martin, R. A., Puhlik-Doris, P., Larsen, G., Gray, J., & Weir, K. (2003). Individual differences in uses of humor and their relation to psychological well-being: Development of the humor styles questionnaire. *Journal of Research in Personality*, 37, 48-75.
- Mayer, J. D., DiPaulo, M., & Salovey, P. (1990). Perceiving affective content in ambiguous visual stimuli: A component of emotional intelligence. *Journal of Personality Assessment*, 54, 772-782.
- Miller, J.B., & deWinstanley, P.A. (2002). The role of interpersonal competence in memory for conversation. *Personality and Social Psychology Bulletin*, 28, 78-89.
- Oveis, C., Cohen, A.B., Gruber, J., Shiota, M.N., Haidt, J., Ketlner, D. (2009). Respiratory sinus arrhythmia is associated with tonic positive emotionality. *Emotion*, 9, 265-270.
- Parker, J.D., Saklofske, D.H., Shaughnessy, P.A., Huang, S.H., Wood, L.M., & Eastabrooks, J.M. (2005). Generalizability of the emotional intelligence construct: A cross-cultural study of North American aboriginal youth. *Personality and Individual Differences*, 39, 215-227.
- Petrides, K., & Furnham, A. (2003). Trait emotional intelligence: Behavioural validation in two studies of emotion recognition and reactivity to mood induction. *European Journal of Personality*, 17, 39-57.
- Pieper, S., & Brosschot, J. (2005). Prolonged Stress-Related Cardiovascular Activation: Is There Any? *Annals of Behavioral Medicine*, 30, 91-103.

- Ruch, W., & Carroll, A. (1998). Trait cheerfulness and the sense of humour. *Personality and Individual Differences, 24*, 551-558.
- Russell, V., & Prkachin, K.M. (2008). Perceptual Sensitivity: Measurements of Displays of Social Anxiety in Others. *Unpublished Honor's Thesis, University of Northern British Columbia.*
- Ryan, A.M., & Shim, S.S. (2006) Social achievement goals: the nature and consequences of different orientations toward social competence. *PSPB, 32*, 1246-1263.
- Schwartz, A., Gerin, W., Davidson, K., Pickering, T., Brosschot, J., Thayer, J., et al. (2003). Toward a causal model of cardiovascular responses to stress and the development of cardiovascular disease. *Psychosomatic Medicine, 65*, 22-35.
- Smith, T. W. (1992). Hostility and health: Current status of a psychosomatic hypothesis. *Health Psychology: Official Journal of the Division of Health Psychology, American Psychological Association, 11*, 139-150.
- Suchday, S., & Larkin, K.T. (2004). Psychophysiological responses to anger provocation among Asian Indian and White men. *International Journal of Behavioral Medicine, 11*, 71-80.
- Suess, P.E., Porges, S.W., Plude, D.J. (1994). Cardiac vagal tone and sustained attention in school-age children. *Psychophysiology, 31*, 17-22.
- Svebak, S. (1996). The development of the sense of humor questionnaire: From SHQ to SHQ-6. *Humor: International Journal of Humor Research, 9*, 341-361.
- Szabo, A., Ainsworth, S., & Danks, P. (2005). Experimental comparison of the psychological benefits of aerobic exercise, humor, and music. *Humor: International Journal of Humor Research, 18*, 235-246.

- Tabachnick, B.G., & Fidell, L.S. (2007). *Using multivariate statistics*, (5<sup>th</sup> ed.). Toronto: Allyn and Bacon. (p 88).
- Task Force of the European Society of Cardiology and the North American Society of Pacing and Electrophysiology, 1996. Heart rate variability: standards of measurement, physiological interpretation and clinical use. *Circulation*, *93*, 1043–1065.
- Thomas, K.S., Nelsen, R.A., & Dimsdale, J.E. (2004). Relationships between hostility anger expression and blood pressure dipping in an ethnically diverse sample. *Psychosomatic Medicine*, *66*, 298-304.
- Umetani, K., Singer, D.H., McCraty, R., & Atkinson, M. (1998). Twenty-four hour time domain heart rate and blood pressure variability: a 5 yr randomized trial. *American Journal of Physiology, (Heart Circulatory Physiology)*, *286*, H1821-H1826.
- Yip, J.A., & Martin, R. A. (2006). Sense of humor, emotional intelligence, and social competence. *Journal of Research in Personality*, *40*, 1202-1208.
- Watson, D., & Friend, R. (1969). Measurement of Social-Evaluative Anxiety. *Journal of Consulting and Clinical Psychology*, *33*, 448-457.

## Appendix A

### Interpersonal Competence Questionnaire (ICQ)

Please rate the extent to which you are comfortable with the following statement by circling the corresponding number.

1 = I am poor at this; I feel so uncomfortable and unable to handle this situation, I'd avoid it if possible.

2 = I am only fair at this; I'd feel uncomfortable and would have lots of difficulty handling the situation.

3 = I am okay at this; I'd feel somewhat uncomfortable and have some difficulty handling the situation.

4 = I am good at this; I'd feel quite comfortable and able to handle the situation

5 = I am extremely good at this; I feel very comfortable and could handle the situation very well

1. Asking or suggesting to someone new that you get together and do something, e.g., go out together.

1                      2                      3                      4                      5

2. Telling a companion you don't like a certain way he or she has been treating you.

1                      2                      3                      4                      5

3. Revealing something intimate about yourself while talking with someone you're just getting to know.

1                      2                      3                      4                      5

4. Helping a close companion work through his or her thoughts and feelings about a major life decision, e.g., a career choice.

1                      2                      3                      4                      5

5. Being able to admit that you might be wrong when a disagreement with a close companion begins to build into a serious fight.

1                      2                      3                      4                      5

6. Finding and suggesting things to do with new people whom you find interesting and attractive

1                      2                      3                      4                      5

7. Saying “no” when a date/acquaintance asks you to do something you don't want to do.  
 1            2            3            4            5
8. Confiding in a new friend/date and letting him or her see your softer, more sensitive side.  
 1            2            3            4            5
9. Being able to patiently and sensitively listen to a companion “let off steam” about outside problems s/he is having.  
 1            2            3            4            5
10. Being able to put begrudging (resentful) feelings aside when having a fight with a close companion.  
 1            2            3            4            5
11. Carrying on a conversation with someone new whom you think you might like to get to know.  
 1            2            3            4            5
12. Turning down a request by a companion that is unreasonable.  
 1            2            3            4            5
13. Telling a close companion things about yourself that you're ashamed of.  
 1            2            3            4            5
14. Helping a close companion get to the heart of the problem s/he is experiencing.  
 1            2            3            4            5
15. When having a conflict with a close companion, really listening to his or her complaints and not trying to “read” his/her mind.  
 1            2            3            4            5
16. Being an interesting and enjoyable person to be with when first getting to know people.  
 1            2            3            4            5
17. Standing up for your rights to a companion that is neglecting you or being inconsiderate.  
 1            2            3            4            5
18. Letting a new companion get to know the “real you”.  
 1            2            3            4            5

19. Helping a close companion cope with family or roommate problems.  
 1            2            3            4            5
20. Being able to take a companion's perspective in a fight and really understand his or her point of view.  
 1            2            3            4            5
21. Introducing yourself to someone you might like to get to know (or date).  
 1            2            3            4            5
22. Telling a date/acquaintance that he or she is doing something that embarrasses you.  
 1            2            3            4            5
23. Letting down your protective "outer shell" and trusting a close companion.  
 1            2            3            4            5
24. Being a good and sensitive listener for a companion who is upset.  
 1            2            3            4            5
25. Refraining from saying things that might cause a disagreement to build into a bigger fight.  
 1            2            3            4            5
26. Calling or texting a new date/acquaintance to set up a time to get together and do something.  
 1            2            3            4            5
27. Confronting your close companion when he or she has broken a promise.  
 1            2            3            4            5
28. Telling a close companion about the things that secretly make you feel anxious or afraid.  
 1            2            3            4            5
29. Being able to say and do things to support a close companion when s/he is feeling down.  
 1            2            3            4            5
30. Being able to work through a specific problem with a companion without resorting to global accusations ("you always do that")  
 1            2            3            4            5
31. Presenting good impression to people you might like to become friends with (or date).  
 1            2            3            4            5



32. Telling a companion that he or she has done something to hurt your feelings.  
 1            2            3            4            5
33. Telling a close companion how much you appreciate and care for him or her.  
 1            2            3            4            5
34. Being able to show genuine empathetic concern even when the companion's problem is uninteresting to you.  
 1            2            3            4            5
35. When angry with a companion, being able to accept that s/he has a valid point of view even if you don't agree with that view.  
 1            2            3            4            5
36. Going to parties or gatherings where you don't know people well in order to start up new relationships.  
 1            2            3            4            5
37. Telling a date/ acquaintance that he or she has done something that made you angry.  
 1            2            3            4            5
38. Knowing how to move a conversation with a date/acquaintance beyond superficial talk to really get to know each other.  
 1            2            3            4            5
39. When a close companion needs help and support, being able to give advice in ways that are well received.  
 1            2            3            4            5
40. Not exploding at a close companion (even when it is justified) in order to avoid a damaging conflict.  
 1            2            3            4            5

## Appendix B

### Fear of Negative Evaluation (FNE)

Answer the following questions as true or false

1. I rarely worry about seeming foolish to others
2. I worry about what people will think of me even when I know it doesn't make any difference.
3. I become tense and jittery if I know someone is sizing me up.
4. I am unconcerned even if I know people are forming an unfavorable impression of me.
5. I feel very upset when I commit some social error.
6. The opinions that important people have of me cause me little concern.
7. I am often afraid that I may look ridiculous or make a fool of myself.
8. I react very little when other people disapprove of me.
9. I am frequently afraid of other people noticing my shortcomings.
10. The disapproval of others would have little effect on me.
11. If someone is evaluating me I tend to expect the worst.
12. I rarely worry about what kind of impression I am making on someone.
13. I am afraid that others will not approve of me.
14. I am afraid that people will find fault with me.
15. Other people's opinions of me do not bother me.
16. I am not necessarily upset if I do not please someone.
17. When I am talking to someone, I worry about what they may be thinking about me.
18. I feel that you can't help making social errors sometimes, so why worry about it.
19. I am usually worried about what kind of impression I make.
20. I worry a lot about what my superiors think of me.

21. If I know someone is judging me, it has little effect on me.
22. I worry that others will think I am not worthwhile.
23. I worry very little about what others may think of me.
24. Sometimes I think I am too concerned with what other people think of me.
25. I often worry that I will say or do the wrong things.
26. I am often indifferent to the opinions others have of me.
27. I am usually confident that others will have a favorable impression of me.
28. I often worry that people who are important to me won't think very much of me.
29. I brood about the opinions my friends have about me.

## Appendix C

### Humor Styles Questionnaire (HSQ)

Please indicate the extent to which you agree or disagree with each statement by circling the appropriate number.

1. I usually don't laugh or joke around much with other people.  
1            2            3    4            5            6            7  
strongly   moderately   mildly   neutral   mildly   moderately   Strongly  
disagree   disagree   disagree            agree            agree            agree
2. If I am feeling depressed, I can usually cheer myself up with humor.  
1            2            3            4            5            6            7
3. If someone makes a mistake, I will often tease them about it.  
1            2            3            4            5            6            7
4. I let people laugh at me or make fun at my expense more than I should.  
1            2            3            4            5            6            7
5. I don't have to work very hard at making other people laugh, I seem to be a naturally humorous person.  
1            2            3            4            5            6            7
6. Even when I'm by myself, I'm often amused by the absurdities of life.  
1            2            3            4            5            6            7
7. People are never offended or hurt by my sense of humor.  
1            2            3            4            5            6            7
8. I will often get carried away in putting myself down if it makes my family or friends laugh.  
1            2            3            4            5            6            7
9. I rarely make other people laugh by telling them funny stories about myself.  
1            2            3            4            5            6            7
10. If I'm feeling upset or unhappy I usually try to think of something funny about the situation to make myself feel better.  
1            2            3            4            5            6            7

11. When telling jokes or saying funny things, I am usually not very concerned about how other people are taking it.
- 1            2            3            4            5            6            7
12. I often try to make people laugh or accept me more by saying something funny about my own weaknesses, blunders, or faults.
- 1            2            3            4            5            6            7
13. I don't like it when people use humor as a way of criticizing or putting someone down.
- 1            2            3            4            5            6            7
14. I don't often say funny things to put myself down.
- 1            2            3            4            5            6            7
15. I usually don't like to tell jokes or amuse people.
- 1            2            3            4            5            6            7
16. If I'm by myself and I'm feeling unhappy, I make an effort to think of something funny to cheer myself up.
- 1            2            3            4            5            6            7
17. Sometimes I think of something that is so funny that I can't stop myself from saying it, even if it is not appropriate for the situation.
- 1            2            3            4            5            6            7
18. I often go overboard in putting myself down and making jokes while trying to be funny.
- 1            2            3            4            5            6            7
19. I enjoy making people laugh.
- 1            2            3            4            5            6            7
20. If I'm feeling sad or upset, I usually lose my sense of humor.
- 1            2            3            4            5            6            7
21. I never participate in laughing at others even if all my friends are doing it.
- 1            2            3            4            5            6            7
22. When I am with friends or family, I often seem to be the one that other people make fun of or joke about.
- 1            2            3            4            5            6            7
23. I don't often joke around with my friends.
- 1            2            3            4            5            6            7

24. It is my experience that thinking about some amusing aspect of the situation is often a very effective way of coping with problems.
- 1            2            3            4            5            6            7
25. If I don't like someone, I often use humor or teasing to put them down.
- 1            2            3            4            5            6            7
26. If I am having problems or feeling unhappy, I often cover it up by joking around, so that even my closest friends don't know how I really feel.
- 1            2            3            4            5            6            7
27. I usually can't think of witty things to say when I'm with other people.
- 1            2            3            4            5            6            7
28. I don't need to be with other people to feel amused; I can usually find things to laugh about even when I'm by myself.
- 1            2            3            4            5            6            7
29. Even if something is really funny to me, I will not laugh or joke about it if someone will be offended.
- 1            2            3            4            5            6            7
30. Letting others laugh at me is my way of keeping my friends and family in good spirits.
- 1            2            3            4            5            6            7
31. I laugh and joke a lot with my closest friends.
- 1            2            3            4            5            6            7
32. My humorous outlook on life keeps me from getting overly upset or depressed about things.
- 1            2            3            4            5            6            7

Appendix D  
General Health Form

We would like to start the survey by getting a sense of who you are:

Name: \_\_\_\_\_ Height: \_\_\_\_\_

Date of Birth (Month/Day/Yr): \_\_\_\_\_ Weight \_\_\_\_\_

Gender: M F

Mailing Address: \_\_\_\_\_

Relationship Status: \_\_\_\_\_

Hometown region: Rural or Urban

Have you consumed caffeine in the past 2 hrs? If yes what?

Have you consumed alcohol in the past 24 hrs?

Ethnicity: \_\_\_\_\_

Number of Years in University: \_\_\_\_\_

Please answer the questions on this form to the best of your ability. Remember that the information you provide will be treated as strictly confidential.

Medical History Checklist:

Please review each of the following items and place a checkmark beside any that you have experienced (to the best of your knowledge):

1. Rheumatic fever
2. Heart Murmur
3. High Blood Pressure
4. High Cholesterol
5. Heart Attack
6. Heart Operations
7. Diabetes ( diet or insulin dependent)
8. Epilepsy
9. Varicose Veins
10. Disease of Arteries
11. Emphysema, Pneumonia,  
Asthma, Bronchitis

- 12. Back Injury
- 13. Drug Reaction
- 14. Nervous or Psychiatric Difficulty
- 15. Other (describe on back)

Family Health Problems:

Indicate below whether anyone in your immediate family (grandparents, parents, sibling) has experienced any of the following problems.

	No	Yes	Don't Know		No	Yes	Don't Know
1. Heart Attack	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	5. Diabetes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. High Blood Pressure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	6. Congenital Heart Disease	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Stroke	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	7. Heart Operations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. High Cholesterol	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	8. Other (describe on back)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Present Health:

List below any current health problem(s) you may be experiencing:

Medications:

List below any medications you are currently taking, or have taken in the past month; these include vitamins.

Symptoms:

Indicate below whether you have experienced any of the following symptoms in the last week, or last year.

		Last Week	Last Year			Last Week	Last Year
16. Irregular heart beat		<input type="radio"/>	<input type="radio"/>	6. Fatigue		<input type="radio"/>	<input type="radio"/>
17. Chest pain		<input type="radio"/>	<input type="radio"/>	7. Cough up blood		<input type="radio"/>	<input type="radio"/>
18. Shortness of breath		<input type="radio"/>	<input type="radio"/>	8. Back pain/injury		<input type="radio"/>	<input type="radio"/>
19. Persistent cough		<input type="radio"/>	<input type="radio"/>	9. Leg pain/injury		<input type="radio"/>	<input type="radio"/>
20. Wheezing (asthma)		<input type="radio"/>	<input type="radio"/>	10. Dizziness		<input type="radio"/>	<input type="radio"/>



Have you undergone a physical examination by your physician in the past year? Yes No

Activity Level:

During the last week how many times did you do any of the following exercises, sports or recreational activities?

Activity	# of times in last week	Approximate length each time (1-15 min, 16-30 min, 31-60 min or >60 min)
Walking (include to and from work/school)		
Jogging or running		
Calisthenics		
Bicycling (include to and from work/school)		
Vigorous Dancing		
Skating		
Skiing (downhill or cross-country)		
Racquet Sports		
Team Sports		
Golf		
Swimming		
Other:		

Smoking History:

Do you currently smoke cigarettes daily?                      Yes      No

If yes,

How many cigarettes do you smoke on an average day?      \_\_\_\_\_ per day.

At what age did you start smoking cigarettes daily?      \_\_\_\_\_ years old.

What brand of cigarettes do you normally smoke?      \_\_\_\_\_

Alcohol Consumption:

Do you currently drink?      Yes      No

If yes,

- One standard unit of alcohol is equivalent to 1 bottle of beer, or one small glass of wine, or 1 oz of hard liquor.

On average, how many standard units of alcohol do you consume?

Per Month \_\_\_\_\_ Per Week \_\_\_\_\_

Menstruation Cycle: (applies to female participants only)

In order to prevent differences in hormonal events from affecting the physiological data being collected, it is necessary for female participants to be observed in this experiment during only the luteal phase of their menstrual cycle. Most menstrual cycles last about 28 days starting with the first day of one menstrual period and ending with the first day of the next menstrual period. The luteal phase takes place between day 15 and day 28.

**To calculate your own luteal phase**, count the **first day** of your next period as **day one** and continue counting each day until you get to **day 15**. The 15th day after the first day your period begins is the first day of the luteal phase. The luteal phase goes from **the 15<sup>th</sup> day** and then ends on **the 28<sup>th</sup> day**, or, when your next period begins.

**When will the first day of your next period be?** \_\_\_\_\_

Fifteen days following this day will be the start of the luteal phase. The luteal phase will then last for approximately the next 12 days. Your experimental appointments should be scheduled only during those 12 days. Remember all information recorded on these sheets remains completely confidential. **(The female research assistant will help you calculate your luteal phase. All you need to do is to figure out when the first day of your next period will be.)**

Appendix E  
Consent Form

Purpose and Objectives of the Study: The purpose of this study is to examine how people's cardiovascular systems (heart-rate) respond during various sensory and social tasks.

Possible Benefits: The benefit to you is the opportunity to participate in psychophysiology research and to learn about your own physiological reactions during challenging tasks.

Procedure: In this study, you will complete three questionnaires, one on your general health, one on how you use humor in your daily life and a questionnaire about how you think others evaluate you. Next, you will be seated in a reclining chair and have three electrodes attached to you, two across your chest and one on your leg. These electrodes will be connected to a physiological recording device that continuously records your heart beat while you engage in different tasks. You will go through four tasks. First, you will listen to an audio recording of an individual talking, And then you will observe videos of people engaging in an interpersonal task. Next, we will ask that you prepare for and engage in the same task. The entire study will take approximately

Risks: There are no physical risks to you from taking part; the recording equipment is safe and designed so that there is no chance of you being harmed. There are no known psychological risks, although it is possible that the tasks may cause you some momentary anxiety or social discomfort.

Withdrawal from the study: You are under no obligation to participate in this study, and once the study has begun, you may terminate your participation at any time without penalty and your data will be destroyed.

Confidentiality and Anonymity: The data you provide will be confidential and will remain strictly anonymous. Data collected are stored on a secure computer and/or in locked rooms while unattended. In the data-set, you will be identified only by a number; no data are referenced with participant names. Any report on the study will present only grouped or anonymized data. Dr. K. Prkachin, will retain the data indefinitely. Dr. K. Prkachin and other qualified members of his research team may periodically access parts of the data collected today.

Use: The data collected is to be used for Sherri Tillotson's Master's thesis. It is possible that some or all of the data may be published in scientific journals and/or at conferences. In such cases, no information that would allow you to be identified will be presented.

Questions: Questions concerning this study can be directed to Sherri Tillotson at [holm@unbc.ca](mailto:holm@unbc.ca) or 250-564-4441. Concerns regarding this study may be directed to the Office of Research (UNBC), 250-960-5820, [reb@unbc.ca](mailto:reb@unbc.ca) or Dr. Ken Prkachin, 250-960-6633, [kmprk@unbc.ca](mailto:kmprk@unbc.ca).

I, \_\_\_\_\_, have read the above description and agree to participate. A copy of this form has been given to me for my records. I understand that I am free to withdraw from this study at any time without penalty of any type.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Researcher

\_\_\_\_\_  
Date

## Appendix F

### Is Social Competence a Protective Mechanism against Cardiovascular Diseases?

Primary Researcher: Sherri Tillotson

Project Supervisor: Dr. Ken Prkachin

#### Information Debriefing Sheet

Thank you for participating in one of the Psychophysiology Lab's research studies.

The purpose of this research is to investigate social abilities and characteristics and their role in stress responses. Research has shown that stress contributes to increased risk of cardiovascular disease, and other chronic illnesses, partly due to increased chronic physiological arousal (e.g., higher blood pressure). Individuals with certain social and personal characteristics may have an ability to negotiate stressful situations with greater satisfaction and achieve their goals more easily than others. There is reason to believe that these characteristics also affect the physiological processes that occur during stress. As a result, some people may experience fewer stress-related experiences over time and be less susceptible to chronic illnesses such as cardiovascular disease.

In order to study how you respond to stress, we had to mislead you by leading you to believe that you would have to go through the same task as the people you saw in the videos. We had to do this in order to stimulate in you the appropriate psychological and physiological anticipatory states and in order to stimulate your coping activity. We expected that it would be stressful for you and the effects of that stress are what we are interested in.

As part of this study we are also interested in how humor might be a helpful coping technique. There is evidence linking types of humor to maladaptive health outcomes and we are interested in whether this might work through changes in the variability of the heart rate (Lefcourt, Davidson, Prkachin, & Mills, 1997; Martin, Puhlik-Doris, Larsen, Gray, & Weir, 2003)

**As you can probably appreciate, the deception that we used is crucially important for the study to be realistic and successful. Consequently, we ask that you do not talk about this aspect of the experiment with other potential participants. Speaking with others will jeopardize the validity of our research, which also means that the time you have spent here will be undermined.**

Again, thank you for participating in this project – your contribution is greatly appreciated. If you have any questions about any aspect of the project, or would like more information about the results of the study, please feel free to contact Sherri Tillotson ([holm@unbc.ca](mailto:holm@unbc.ca)) at the end of Aug 2009.

## Appendix G

Source Table For interaction contrasts for SC \* Phase

Marginal means for main effect of social competence

	Low SC	High SC
Baseline Mean HR	72.01	68.80
Observation Mean HR	72.10 <sup>1</sup>	68.48 <sup>1</sup>
Anticipation Mean HR	80.70 <sup>1 2</sup>	81.18 <sup>1 2</sup>
Recovery Mean HR	71.45 <sup>2</sup>	69.09 <sup>2</sup>

$N= 40$  per cell; <sup>1</sup> = used in 1<sup>st</sup> interaction contrast; <sup>2</sup>= used in 2nd interaction contrast

Omnibus Source Table

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Phase* SCMS	205.07	3	68.36	3.55	.015
Error	4510.80	234	<b>19.28</b>		

Calculations for interaction contrast must exceed critical  $F$  cut-off (1, 78) of 3.96 since these are single  $df$  tests.

Is the slope between observation and anticipation the same for low social competence versus high social competence?

$$(40 * (72.10-81.18-68.48+80.7)^2) / (1^2 + -1^2+1^2+-1^2) = 168.1/19.28 = 8.72; p < .05$$

Is the slope between anticipation and recovery the same for low social competence versus high social competence?

$$(40 * (80.70-81.18-71.45+69.09)^2) / (1^2 + -1^2+1^2+-1^2) = 80.7/19.28 = 4.18; p < .05$$

Source Table For interaction contrast for phase\*epoch\*SC

Marginal means for main effect of social competence during anticipation phase

	Low SC	High SC
Epoch 12 Mean HR	82.30	84.45
Epoch 13 Mean HR	79.92	79.10

$N= 40$  per cell

Omnibus Source Table

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Phase* Epoch*SCMS	223.58	6	40.15	2.26	.04
Error	7522.91	423	<b>17.77</b>		

Calculations for interaction contrast must exceed critical  $F$  cut-off (1, 78) of 3.96 since these are single  $df$  tests.

Is the slope between epoch 12 and epoch 13 the same for low social competence versus high social competence?

$$(40 * (82.30-84.45-79.92-79.10)^2) / (1^2 + -1^2+1^2+-1^2) = 88.21/17.77 = 4.96; p < .05.$$