PERCEIVED SUPPORTS EFFECT ON CARDIOVASCULAR REACTIVITY AND HEALTH BEHAVIOR AS DETERMINED BY RELATIONSHIP TYPE

by

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STATEMENT OF THESIS APPROVAL

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ABSTRACT

Previous research has demonstrated that perceived social support influences physical health outcomes. However, prior work has focused on activating general support perceptions and as a result, the influence of specific relationship schemata is less clear. Additionally, although the link between perceived social support and physical health outcomes have been established, less is known on how perceived social support impacts specific health behavior that may contribute to the development of chronic diseases. In this study, we supraliminally activated the perception of support by having participants write about a close friend, a parent, or an acquaintance (control group). Participants then completed a stress test while cardiovascular measures were simultaneously collected. After completing the stress test, participants were then given the choice between healthy and unhealthy snack choices and their responses were recorded. It was hypothesized that activating support schemas across the parent and friend conditions would result in lower cardiovascular reactivity and the healthiest dietary choices (compared to the control group). It was also hypothesized that the perception of support within the parental condition specifically would result in the lowest cardiovascular reactivity and the healthiest dietary choices. Data were collected from 62 men and 62 women enrolled at a large university. Contrary to the aforementioned hypotheses, there were no significant differences in cardiovascular reactivity or health behavior as a result of the support condition. Implications for how our methods differed from other studies in this area that

found opposite results, as well as how we define healthy dietary choices, will be discussed.

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INTRODUCTION

The influence of social support on physical health outcomes has long been documented (Berkman et al., 2000; Cohen, 1988; Uchino, 2004). Previous research has found that higher levels of social support were related to greater quality of life and increased disease-free years (Reblin & Uchino, 2008). Further supporting this notion, a longitudinal study conducted by Berkman and colleagues (1992) found that social support was related to lower cardiovascular mortality following a heart attack. Additionally, in a recent intervention, Orth-Gomér (2009) implemented a clinical trial for women who recently suffered an acute coronary event. The intervention focused on reducing stress, increasing positive social ties, and decreasing negative social ties. Results suggested that mortality due to coronary disease was reduced by 2/3 nine years later. Overall, these findings warrant serious attention as cardiovascular disease is one of the most prevalent diseases in the United States accounting for one in four deaths (CDC, 2015).

Although previous research has suggested robust associations between social support and cardiovascular disease, social support is a very broad construct. However, perceived support, a more specific social support construct, appears to be most predictive of cardiovascular outcomes (Uchino, 2009). Perceived support refers to one's perception that support is available to them if they need it (Uchino, 2009). Emphasizing the health benefits of perceived support, Uchino (2009) highlighted the importance of a lifespan

approach that focuses on the early developmental antecedents of perceived support. Further supporting this, Sarason and colleagues (1986) suggest that perceived support is likely to develop as a result of early family interactions that lay a foundation for the development of supportive relational schemas. Additionally, researchers have proposed that attachment styles, which develop during infancy as a result of a child's interactions with their caregivers, may influence perceptions of support early in life, thereby impacting chronic disease development and health behaviors in general (Sarason et al., 1986; Uchino, 2009). Specifically, individuals with a more secure attachment to their caregiver(s) have higher perceptions of support than other attachment styles (Boyce, 1985; Graves, Want, Mead, Johnson, & Klag, 1998). Taken together, this suggests that some individuals may develop "positive health trajectories" and others "negative health trajectories" based on the early development of perceived support within the family (Uchino, 2009).

The data to date suggest that perceived support is likely to influence the development of cardiovascular disease and that more so, supportive ties among family members (especially parents) above and beyond other close relational ties should be the most predictive of disease development. However, the specific types of relationships that contribute to perceived support and their subsequent health benefits have been relatively underexplored (Uchino, 2009). In one exception, Spitzer and colleagues (1992) assessed blood pressure every 20 minutes for a 12-hour period among participants. These researchers found that blood pressure was lowest when participants were with a family member (as opposed to being alone, with a friend, or a stranger) and highest when they were with a stranger (also see Holt-Lunstad et al., 2003). This study thus provides

evidence for familial members' increased influence on health above and beyond that of a friend.

One important context for examining the specificity of links between relationships and health are laboratory reactivity studies. Such studies allow for well-controlled tests of links between social ties and cardiovascular changes during stress. Previous research has found cardiovascular reactivity to be predictive of subsequent health. Specifically, in a meta-analysis conducted by Chida and Steptoe (2010), cardiovascular reactivity was found to be related longitudinally to the risk of developing cardiovascular disease, making it an important variable to consider when looking at cardiovascular disease development. Furthermore, lab studies examining social support have had largely consistent findings, suggesting that supportive ties are related to lower cardiovascular reactivity during stress (Gerin, Pieper, Levy, & Pickering, 1992; Gramer & Reitbauer, 2010; Heinrichs, Baumgartner, Kirschbaum, & Ehlert, 2003; O'Donovan & Hughes, 2008; Roy, Steptoe, & Kirschbaum, 1998; Thorenstein & James, 1998; but see Hughes et al., 2000; Hughes, 2002).

Most of the prior social support studies in the laboratory have examined direct support interactions typically from a friend directly providing social support. Consistent with the benefits of simply perceiving support, more recent research suggests that activating social support schemas can reduce stress reactivity independent of any actual interpersonal interactions. In one of the first studies in this area, Smith, Ruiz, and Uchino (2004) found that to reap the benefits of perceived support, participants did not need to have a social interaction with a close other. They found when the perception of support was activated by having participants write about a supportive person in their life, this

resulted in reduced heart rate and blood pressure during a stress task. Supporting this finding, Ratnasingam and Bishop (2007) also found that they were able to prime participants with the perception of support, which resulted in less heart rate and blood pressure reactivity without having to have any type of direct interaction with a supportive partner. Data from Carlisle and colleagues (2012) and Lee, Suchday, and Wylie-Rosett (2012) also suggest that subliminally priming participants with existing supportive relational schemas can reduce cardiovascular reactivity. Although prior work has focused on activating general support perceptions, the influence of specific relationship schemata is less clear. The lifespan model of social support would predict that early familial ties would be the strongest predictors of health as they are more closely linked to the development of support perceptions (Uchino, 2009). Thus, one major aim of this study was to contrast the effect of activating relationship schemas of parents versus friends on cardiovascular functioning.

A second major aim of this study was to examine if the activation of supportive relational schemas influence health behaviors. Although it has been established that the perception of support influences health, it is much less clear how the perception of support impacts specific health behavior that may contribute to the development of chronic diseases. For example, Emmons and colleagues (2007) found that those with larger social networks were more likely to consume greater amounts of fruits and vegetables (more than five servings a day). Additionally, their findings also suggest that physical exercise adherence (2.5 hours of moderate to vigorous exercise a week) was greatest among those with larger social networks and more social support (Emmons et al., 2007). Additionally, Umberson (1987) found that familial social support, specifically

spousal and parental support, promoted positive health behaviors. Taken together, this suggests that increasing social support from nuclear family members may be better at promoting positive health behavior than other supportive ties. These data are consistent with the lifespan model of support, which suggest that health behaviors are an important but understudied mechanism linking perceived support to health outcomes (Uchino, 2009).

The current study tested the major aims above by supraliminally activating the perception of support among participants by having them write about either a close friend, a parent, or an acquaintance (control group). Participants then completed a stress test while cardiovascular measures were simultaneously collected. After completing the stress test, participants were given a healthy and unhealthy snack options as a reward for being in the study and their snack choices along with their behavioral intentions to eat healthy foods were recorded. It was hypothesized based on the results of the aforementioned studies that compared to the control condition, activating support schemas across the parent and friend conditions would result in lower cardiovascular reactivity and the most healthy dietary choices. It was also hypothesized that the perception of support within the parental condition specifically would result in the lowest cardiovascular reactivity and the most healthy dietary choices.

METHOD

Participants

We recruited 62 healthy men and 62 healthy women from a large university for partial course credit. Participants were between the ages of 18-33 (M = 21.1; SD = 2.71). The majority of participants were White (71.8%) followed by Hispanic (11.3%), Asian/Pacific Islander (8.9%), biracial (7.3%), and other (.8%). Additionally, the wide majority of participants were single (91.1%) and all participants were screened for cardiovascular medication that could influence acute stress responses, including beta-blockers and calcium-channel blockers.

Materials

Interpersonal Support Evaluation List. Participants were asked to complete the 12-item Interpersonal Support Evaluation List, which served as a manipulation check (ISEL; S. Cohen, Mermelstein, Kamarck, & Hoberman, 1985). This 12-item scale assesses participant's general perception of available social support. Previous research has found the ISEL to be internally reliable and have strong test-retest reliability for the factor structure, subscale, and total scores, along with strong predictive validity (Brookings & Bolton, 1988; Cohen & Hoberman, 1983; Heitzman & Kaplan, 1988; Smith, Uchino, & Ruiz, 2004;).

Social Relationships Index. Participants were asked to complete the Social Relationships Index (SRI), which acted as a second manipulation check. The SRI measures the presence of positivity and negativity in specific social ties. Previous research has found the SRI to have high convergent validity with the Quality Relationship Index (QRI) and moderate convergent validity with the Interpersonal Support Evaluation List (ISEL) and Test of Negative Social Exchange (TENSE) (all of which measure the general quality of social relationships) (Campo, Uchino, Vaughn, Reblin, Smith, & Holt-Lunstad, 2009). Additionally, the SRI has been found to have strong temporal stability and predictive validity of both physical and psychological outcomes, specifically related to ambulatory blood pressure and cardiovascular reactivity (Campo, Uchino, Vaughn, Reblin, Smith, & Holt-Lunstad, 2009; Holt-Lunstad, Uchino, Smith, Olsen-Cerny, & Nealey-Moore, 2003).

Planned Eating Behavior Questionnaire. This survey was adapted from the theory of planned behavior (Ajzen & Fishbein, 1980), which measures participant's overall attitudes towards eating a healthy diet. The scale consists of two questions to assess dietary behavioral intentions. Previous research has found this to be a reliable measure of eating behavior (Povey et al., 2000).

State anxiety. Participants completed several of these assessments after each task in order to measure their state anxiety throughout the study. This questionnaire consists of six items on a 4-point Likert-scale ranging from not at all to extremely. This questionnaire assesses how participants feel at that moment. These questions were taken from the State-Trait Personality Inventory (STPI; Spielberger, 1980).

Self-Assessment Manikin. The Self Assessment Manikin (SAM) is a self-reported

pictorial assessment of participants' immediate emotional reactions. This assessment consists of three questions that measure pleasure, dominance, and arousal responses on a 9-point scale. Participants saw five figures depicting various levels of emotional responses and were instructed to choose either of the five figures or in between the figures, indicating that they feel somewhere in the middle between the two pictorial emotions. Previous researchers have found this scale to demonstrate high test-retest reliability (Ali, Ghasim, Shahram, & Mohammad, 2012).

Positive and Negative Affect Schedule (PANAS). The 3-item version of the PANAS was used, which assesses positive and negative affect. This scale uses different words reflecting positive affect. Participants were asked to look at these words and indicate on a 5-point scale (1 being very slightly or not at all and 5 being extremely) to what extent they were feeling that way in the present moment.

Physiological measures. A Dinamap Model 100 was used to measure Systolic Blood Pressure (SBP) and Diastolic Blood Pressure (DBP). The Dinamap uses the occillometric method to calculate blood pressure. Blood pressure assessments were obtained by using a properly sized occluding cuff positioned on the upper left arm of the participant according to manufacturer's specifications. Mean SBP and DBP for each epoch (i.e., baselines and speech tasks) were averaged across minutes to increase the reliability of these assessments (Kamarck, 1992). A Mindware 2000D Impedance Module was used to measure cardiac output (CO), preejection period (PEP), total peripheral resistance (TPR), and respiratory sinus arrhythmia (RSA). Seven spot-electrodes were placed according to manufacturer and published guidelines (Hoetink et al., 2002; Sherwood et al., 1990). The electrocardiogram (ECG) was digitized at 1000 Hz and each

waveform was verified or edited prior to analyses. Respiratory sinus arrhythmia (RSA) was calculated based on the digitized interbeat intervals that were checked and edited for artifacts using the detection algorithm of Bernston, Quigley, Jang, and Boysen (1990). Following linear de-trending (Bernston, Cacioppo, & Quigley, 1995; Litvack, Oberlander, Carney, & Saul, 1995), the heart-period time series was band-pass-filtered from 0.12 to 0.40 Hz (Neuvo, Cheng-Yu, & Mitra, 1984). The power spectrum of heart-period time series was calculated using a Fast Fourier Transform and scaled to ms2/Hz. All measures were calculated as the natural log of the area under the heart-period power spectrum within the corner frequencies of the band-pass filter (Litvack et al., 1995). RSA was calculated on a minute-by-minute basis and aggregated across minutes within each epoch to increase measurement reliability.

Procedure

Participants were randomly assigned to a support and speech condition. After participants completed the informed consent process, seven spot-electrodes were placed on participants according to manufacturer and published guidelines (Hoetink et al., 2002; Sherwood et al., 1990). A BP cuff was then placed on the upper portion of the non-dominant arm. Participants were then asked to complete background and health questionnaires as well as the ISEL and the AQHQ as part of the 5-minute adaptation period. They then completed an initial 10-minute resting baseline period, a 3-minute social support manipulation, a speech stressor task, and a 5-minute recovery period.

Baseline period. A 10-minute vanilla baseline was conducted before the support manipulation (Jennings, Kamarck, Stewart, Eddy, & Johnson, 1992; Smith, Uchino, &

Ruiz, 2004). Participants viewed two neutral pictures of national parks and indicated their preference quietly to themselves. This continued for the duration of the 10 minutes. Blood pressure assessments were taken every minute and heart rate was recorded continuously. After completing the baseline measure, participants completed the state anxiety questionnaire, the PANAS, and the self-assessment manikin.

Social support manipulation. Participants were randomly assigned to the parent, friend, or control condition. Participants were then asked to write and then think about the target individual (parent, friend, or acquaintance) and their associated thoughts and feelings with that person. During the written response task, participants were given 30 seconds for each question and were asked to write about what they appreciate the most about this person, what this person values or appreciates about them, what the person does for them that is supportive or helpful, and how they feel when they see this person after spending time apart from this person (a few hours or days). Physiological responses were then recorded while participants complete this task. Participants were then asked to silently think about their responses to the written task for 1 minute. Participants then completed a second state anxiety questionnaire, PANAS, and Self-Assessment Manikin assessing how they felt while reflecting about their answers to the written response task.

Evaluative speech task (stressor). Participants were then randomly assigned to a speech condition (counterbalanced across conditions and sex) either arguing for or against requiring uniforms at public schools to discourage gang participation, or for or against raising the social security retirement age. Participants were then told that a recording of a previous student who completed a speech on the opposite view point they were assigned to was obtained and that their speech would be recorded as well in order to

evaluate if their speech was as "clear, organized and effective" as the other students (previous research has found that evaluative tasks increase cardiovascular responses and negative affect; Smith, Nealey, Kircher, & Limon, 1997; Smith, Uchino, & Ruiz, 2004). Participants were then given 3 minutes to prepare for their speech task while blood pressure was assessed each minute and heart rate was assessed continuously throughout this task. Participants were then given a third state anxiety questionnaire, PANAS, and Self-Assessment Manikin to complete. After completing the questionnaires, participants listened to one of four recordings of a 1-minute speech with the opposite view point they were assigned to (if they are to present the 'pro' side to the topic they listened to a speech about the 'cons' and vice versa). Participants were then asked to perform a speech responding to what they had just heard. This continued for two additional turns. Blood pressure again was collected every minute during the speaking tasks and heart rate was collected continuously. After the speech task concluded, participants completed a final state anxiety questionnaire, PANAS, and Self-Assessment Manikin along with the behavioral intentions scale. Participants were then told that as a reward for being in the study, they could choose from a basket of snacks (six healthy snack options [dried fruit or nuts] mixed with six unhealthy snack options [fun size candy bars]). Participants were then thanked, debriefed, and compensated. Dietary choices were recorded after participants had left the lab.

RESULTS

Manipulation Checks and Preliminary Analyses

Several one-way ANOVAS were conducted looking at the quality of relationship within each condition, as indexed by the SRI. As predicted, parents (*m* = 5.71) were rated as being significantly more important than friends (*m* = 5.49) or acquaintances (*m* = 3.2), $F(2,120) = 144.36$, $p < .001$. However, contrary to the expected results, parents (*m* = 2.28) were also rated as significantly more upsetting than friends (*m* = 1.9) or acquaintances (*m* = 1.7) $F(2,121) = 3.677$, $p = .03$. No differences were found in positivity, $F(2,121) = .883$, $p = .42$, mixed/conflicted feelings, $F(2,121) = .795$, $p = .45$, or unpredictability, $F(2,121) = 1.52$, $p = .22$, between the groups. A one-way ANOVA was then conducted as a second manipulation check looking at the perception of support among the groups as indexed by the ISEL. No differences were found between groups, $F(2,116) = .98$, $p = .38$.

Self-Report and Cardiovascular Reactivity Measures

Change scores were first created by subtracting the speech task from the baseline in order to get an idea of how much change in stress reactivity took place (looking at both physiological results as well as questionnaire results). The anxiety questionnaire, PANAS, and the self-assessment manikin were then analyzed by conducting several one-way ANOVAS. Contrary to the hypothesis, there were no differences between groups in

state anxiety levels, $F(2,119) = 2.22$, $p = .11$, positive affect, $F(2,121) = .597$, $p = .552$, arousal, $F(2,106) = 1.69$, $p = .19$, dominance, $F(2,103) = 1.21$, $p = .30$, or pleasure, $F(2,117) = 1.06$, $p = .35$ (see Table 1; df vary for the Self-Assessment Manikin due to missing data).

Several ANCOVAS were then conducted looking at support conditions effect on cardiovascular reactivity as indexed by systolic blood pressure (SBP), diastolic blood pressure (DBP), heart rate (HR), pre-ejection period (PEP), cardiac output (CO), and respiratory sinus arrhythmia (RSA) controlling for baseline cardiovascular measures. Due to missing data, df vary accordingly. Contrary to the aforementioned hypotheses, there were no significant differences in cardiovascular reactivity as a result of the support condition (see Table 2); SBP: $F(2,117) = 1.85$, $p = .16$; DBP: $F(2,117) = 2.6$, $p = .08$; HR: $F(2,107) = .172$, $p = .84$; PEP: $F(2,60) = 1.85$, $p = .17$; CO: $F(2,51) = .016$, $p = .99$; RSA: $F(2,87) = .454$, $p = .636$. One-way ANOVAS were then conducted to look at support conditions effect on intention as well as well as the desire to eat a healthy diet (PEQ). No significant differences were found for intention to eat a healthy diet among groups, $F(2,121) = 1.6$, $p = .21$ (see Table 3 for means). However, those in the parent condition were significantly more likely to indicate that they wanted to eat a healthy diet ($m = 6.65$) than those in the friends ($m = 6.2$), or acquaintances ($m = 6.2$) conditions, $F(2,121) = 3.09$, $p = .049$. However, no differences were found in snack choices among the groups for both healthy choices, $F(2,121) = .32$, $p = .73$, and unhealthy choices, $F(2,121) = 1.23$, $p = .29$ (see Table 4)

Table 1.

Means and Standard Deviations of Changes in Stress Across Groups for Survey Measures.

Change Scores (stress-baseline)	Parent	Friend	Acquaintance
State Anxiety	*M* = .46; *SD* = .4	*M* = .64; *SD* = .48	*M* = .44; *SD* =.5
Positive Affect	*M* = -.1; *SD* = .56	*M* = -.2; *SD* = .73	*M* = -.28; *SD* = .88
Pleasure (SAM)	*M* = -.9; *SD* = 1.1	*M* = -1.1; *SD* = 1.6	*M* = -.66; *SD* = 1.46
Arousal (SAM)	*M* = .94; *SD* = 1.9	*M* = 1.3; *SD* = 1.8	*M* = .53; *SD* = 2.05
Dominance (SAM)	*M* = -.24; *SD* = 1.3	*M* = -.39; *SD* = 1.92	*M* = .23; *SD* = 1.96

Table 2.

Means and Standard Deviations of Changes in Stress Across Group for Physiological Measures.

Change Score (Stress-Baseline)	Parent	Friend	Acquaintance
SBP	*M* = 22.4; *SD* = 11.64	*M* = 18.8; *SD* = 12.9	*M* = 17.5; *SD* = 10.6
DBP	*M* = 15.3; *SD* = 7.26	*M* = 13.9; *SD* = 7.87	*M* = 11.7; *SD* = 6.78
HR	*M* = 10.29; *SD* = 7.09	*M* = 9.97 *SD* = 8.01	*M* = 7.62; *SD* = 7.54
RSA	*M* = .28; *SD* =1.68	*M* = -.04; *SD* =1.8	*M* = .12; *SD* =1.8
CO	*M* = 1.44 *SD* = 2.1	*M* = 1.3; *SD* = 2.11	*M* = 1.34 *SD* =1.97
PEP	*M* = 2.47; *SD* = 21.78	*M* = -4.52 *SD* = 25.23	*M* = -11.91; *SD* =31.27

Table 3.

Means and Standard Deviations for the Planned Eating Questionnaire.

Measure	Parent	Friend	Acquaintance
Intention	M = 6.3 SD = .86	M = 6.02 SD = .94	M = 5.9 SD = 1.32

Table 4.

Means and Standard Deviations of Snack Choices Across Groups.

Snack Choice	Parent	Friend	Acquaintance
Unhealthy	$M = .65$ $SD = .95$	$M = .78$ $SD = .94$	$M = .98$ $SD = .95$
Healthy	$M = .79$ $SD = .83$	$M = .8$ $SD = .81$	$M = .93$ $SD = .86$

DISCUSSION

It was hypothesized based on the results from prior work (e.g., Ratnasingam & Bishop, 2007; Smith, Ruiz, & Uchino, 2004) and the lifespan model of social support (Uchino, 2009) that perceived support from a parental figure would result in lower cardiovascular reactivity during a stress task; however, the results did not support this hypothesis. Activating a support schema more generally was also not related to self-reports or cardiovascular reactivity during stress. In addition, there was only limited evidence for an impact of activating support schemas on health behavior choices.

The main aim of this study was to test if activating a support schema from parents was associated with greater decreases in cardiovascular reactivity compared to a friend or acquaintance. Surprisingly, no differences were found as a function of the schema activation group. Upon inspection of the prior work on this topic (Gramer & Supp, 2014; Ratnasingam & Bishop, 2007; Smith, Ruiz, & Uchio, 2004), it was found that our means across the conditions were much higher compared to previous research on the topic. One explanation for the higher cardiovascular reactivity we observed in the support conditions may be because the prior studies had originally compared differences between supportive partners more generally and acquaintances. It is possible that by attempting to differentiate between relationship schemata, the current study may have inadvertently forced people to perceive support from someone in a category they may not receive high-quality support from. This explanation is supported when looking at the results of the

SRI, indicating that the parent condition was significantly more upsetting than the friend and acquaintance conditions. Such ambivalence in relationships has been related to increased cardiovascular reactivity during schema activation (Carlisle et al., 2012; Gramer & Supp, 2014) and hence might have added increased variability to the study results. This is an important caveat for research to consider as this suggests that the quality of support may be more indicative of cardiovascular reactivity than who you are perceiving support from. Additionally, it is possible that by having participants perceive support from a specific relationship category, we could have been activating perceptions about that category as a whole. If a participant has a highly ambivalent social network of friends, even if they have one positive friend, by having them think about friends more generally, we may have activated this relationship schemata category as a whole. This suggests that it may be important to be careful in activating supportive perceptions more specifically instead of broadly like this study attempted to do. Future research may be able to avoid these issues if they preselect the specific supportive relationship based on separate positivity and negativity ratings.

These findings, however, are consistent with one available study in this area (Creaven & Hughes, 2012). Creaven and Hughes (2012) manipulated the type of support that was mentally activated by having participants think about a specific person and write about a time they were either supportive of this person or they were supported by this person. Although no significant group differences were found, they did find higher levels of cardiovascular reactivity during the stress and recovery task for the perception of provided support. The author interpreted their findings as reflecting that possibility that activation of support from positive supportive partners increased participant’s sensitivity

to an evaluative stress task leading to more effort being expended on the task and thus higher cardiovascular reactivity (Creaven & Hughes, 2012; Gramer & Reitbauer, 2010). We did not collect measures of task effort so future work will be needed to address this issue. Another potential explanation is offered by the results of Roy, Steptoe, and Kirschbaum (1998). Their study showed that previous life events may interact with the perception of support in unique ways. Specifically, they found that when participants had high levels of support, previous life stressors in the last year, especially those that happened frequently, made participants more sensitive to stress tasks and thus increased their cardiovascular reactivity. It is possible that there were chance differences in previous life stressors over the last year across groups despite random assignment and this may have affected our results. Future work should consider examining differences in life stressors across groups, especially those that have occurred within the last year. Although each of these explanations offers some insight into these null results, more work will surely be needed in order to fully explain how the mental activation of support schemas influence cardiovascular reactivity.

Results from the PEQ suggest that contradictory to hypotheses, the perception of support from parents may influence a desire to eat a healthier diet but not intention. These results were confirmed when no differences emerged between groups in healthy or unhealthy snack choices. However, upon closer inspection of these results, a pattern emerged where participants in the parental condition chose the least amounts of both healthy and unhealthy snacks, and acquaintances consistently consumed the most amount of snacks. Perhaps not snacking at all is actually healthier than consuming a healthy snack. From that perspective, these results are not as surprising. However, future

research should reexamine this question looking at less ambiguous health measures such as exercise or risk seeking behavior. This also brings up the validity of testing health behavior choices in a lab setting. Future research should aim to compare results obtained in the lab with ecological momentary assessments on health behavior as well.

This study has important limitations. Although this was an attempted replication of the Smith, Ruiz, and Uchino (2004) findings, there were several notable differences between the studies. Along with the aforementioned differences, Smith, Ruiz, and Uchino (2004) included a cold pressor task during the stress task that was omitted from the current studies procedure although previous research has replicated this study with a similar task as utilized here (Rastingham & Bishop, 2007). The cold pressor task is more likely to activate an alpha-adrenergic mechanism, which may influence subsequent reactions to the evaluative stress protocol that tends to elicit more of a beta-adrenergic change in reactivity (Sherwood et al., 1990). Future research should compare the results of activating support schemas on different tasks that produce variations in patterns of reactivity. Additionally, this was a young and homogenous sample. Future research should aim to collect more diverse samples to see if these results replicate among older, less educated, and more ethnically diverse populations.

REFERENCES

Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*. Englewood Cliffs, NJ: Prentice-Hall.

Ali, N., Ghasim, N., Shahram, V., & Mohammad, R. (2012). Validity and reliability of the Self-Assessment Manikin. *Research in Psychological Health, 6,* 52-61.

Barrot-Connor, E. (1991). Nutrition epidemiology: How do we know what they ate? *American Journal of Clinical Nutrition, 54,* 182S-187S.

Berkman, L., Summers, L., & Horwitz R. (1992). Emotional support and survival after myocardial infarction. A prospective, population based study of the elderly. *Annals of Internal Medicine, 117,* 1003-1009. DOI: 10.7326/0003-4819-117-12-1003.

Berkman, L. F., Glass, T., Brissette, I., & Seeman, T. E. (2000). From social integration to health: Durkheim in the new millennium. *Social Science & Medicine, 51,* 843–857. DOI: 10.1016/S0277-9536(00)00065-4.

Berntson, G. G., Quigley, K. S., Jang, J. F., & Boysen, S. T. (1990), An approach to artifact identification: Application to heart period data. *Psychophysiology, 27*, 586–598. DOI: 10.1111/j.1469-8986.1990.tb01982.x.

Berntson, G. G., Cacioppo, J. T., & Quigley, K. S. (1995). The metrics of cardiac chronotropism: Biometric perspectives. *Psychophysiology, 32*, 162-171. DOI: 10.1111/j.1469-8986.1995.tb03308.x.

Boyce, W.T. (1985). Social support, family relations, and children. *Social Support and Health, 9,* 151–173.

Brookings J. B., & Bolton B. (1988). Confirmatory factor analysis of the Interpersonal Support Evaluation List. *American Journal of Community Psychology*, *16*, 137-147. DOI: 10.1007/BF00906076.

Campo, R.A., Uchino, B.N., Holt-Lunstad, J., Vaughn, A.A., Reblin, M., & Smith, T.W. (2009) The assessment of positivity and negativity in social networks: The reliability and validity of the Social Relationships Index. *Journal of Community Psychology*, *37*, 471-486. DOI: 10.1002/jcop.20308.

Carlisle, M., Uchino, B.N., Sanbonmatsu, D.M., Smith, T.W., Cribbet, M.R., Birmingham, W., Light, K.A., & Vaughn, A.A. (2012). Subliminal activation of social ties moderates cardiovascular reactivity during acute stress. *Health Psychology, 31*, 217-225. DOI: 10.1037/a0025187.

Cohen, S., & Hoberman, H. (1983). Positive events and social supports as buffers of life change stress. *Journal of Applied Social Psychology, 13*, 99-125. DOI: 10.1111/j.1559-1816.1983.tb02325.x.

Cohen S., Mermelstein R., Kamarck T., & Hoberman, H.M. (1985). Measuring the functional components of social support. In I.G. Sarason & B.R. Sarason (Eds.), *Social support: Theory, research, and applications* (pp. 90-121). The Hague, Netherlands: Martinus Niijhoff.

Cohen, S. (1988). Psychosocial models of social support in the etiology of physical disease. *Health Psychology, 7*, 269 –297.

Creaven, A., & Hughes, B. (2012). Cardiovascular responses to mental activation of social support schemas. *International Journal of Psychophysiology, 84*, 113-119. DOI: https://doi.org/10.1016/j.ijpsycho.2012.01.018.

Emmons K. M., Barbeau E. M., & Gutheil, C. (2007). Social influences, social context and health behaviors among working-class, multi-ethnic adults. *Health Education & Behavior, 34*, 315–334. DOI: 10.1177/109019810628801.

Gerin, W., Pieper, C., Levy, R., & Pickering, T.G. (1992). Social support in social interaction: A moderator of cardiovascular re- activity. *Psychosomatic Medicine, 54*, 324–336. DOI: 10.1097/00006842-199205000-00008.

Graves, P.L., Want, N.-Y., Mead, L.A., Johnson, J.V., & Klag, M.J. (1998). Youthful precursors of midlife social support. *Journal of Personality and Social Psychology, 74,* 1329–1336. DOI: 10.1037//0022-3514.74.5.1329.

Gramer, M., & Reitbauer, C. (2010). The influence of social support on cardiovascular responses during stressor anticipation and active coping. *Biological Psychology*, *85*, 268-274. DOI: 10.1016/j.biopsycho.2010.07.013.

Gramer, M., & Supp, N. (2014). Social support and prolonged cardiovascular reactivity: The moderating influence of relationship quality and type of support. *Biological Psychology, 101*, 1-8. DOI: 10.1016/j.biopsycho.2014.06.002

Heinrichs, M., Baumgartner, T., Kirschbaum, C., & Ehlert, U. (2003). Social support and oxytocin interact to suppress cortisol and subjective responses to psychosocial stress. *Biological Psychiatry*, *54*, 1389-1398. DOI:10.1016/S0006-3223(03)00465-7.

Heitzmann, C., & Kaplan, R. (1988). Assessment of methods for measuring social support. *Health Psychology, 7*, 75-109. DOI: 10.1037/0278-6133.7.1.75.

Hoetink, A. E., Faes, T., Schuur, E. H., Gorkink, R., Goovaerts, H. G., Meijer, J. H., & Heethaar, R. M .(2002). Comparing spot electrode arrangements for electric impedance cardiography. *Physiological Measurement, 23*, 457-467. DOI: 10.1088/0967-3334/23/2/319.

Holt-Lunstad, J., Uchino, B. N., Smith, T. W., Olson-Cerny, C., & Nealey-Moore, J. B. (2003). Social relationships and ambulatory blood pressure: Structural and qualitative predictors of cardiovascular function during everyday social interactions. *Health Psychology*, *22*, 388-397. DOI: 10.1037/0278-6133.22.4.388.

Hughes, B., & Curtis, R. (2000). Quality and quantity of social support as differential predictors of cardiovascular reactivity. *The Irish Journal of Psychology*, *21*, 16-31. DOI: 10.1080/03033910.2000.10558237.

Hughes, B. M. (2002). Research on psychometrically evaluated social support and cardiovascular reactivity to stress: Accumulated findings and implications. *Studia Psychologica*, *44*, 311-326.

Jennings, J. R., Kamarck, T. W., Stewart, C., Eddy, M., & Johnson, P. (1992). Alternative cardiovascular baseline assessment techniques: Vanilla or resting baseline. *Psychophysiology, 29,* 742–750. DOI: 10.1007/BF02872671.

Kamarck, T. W. (1992). Recent developments in the study of cardiovascular reactivity: Contributions from psychometric theory and social psychology. *Psychophysiology, 29*, 491-503.

Lee-Han, H., McGuire, V., & Boyd, N. F. (1989). A review of the methods used by studies of dietary measurement. *Journal of Clinical Epidemiology, 42*, 269-279. DOI: 10.1111/j.1469-8986.1992.tb02023.x.

Lee, Y. C., Suchday, S., & Wylie-Rosett, J. (2012). Perceived social support, coping styles, and Chinese immigrants' cardiovascular responses to stress. *International Journal of Behavioral Medicine*, *19*, 174-185. DOI: 10.1007/s12529-011-9156-7.

Linusson, E. E. I., Sanjur, D., & Erickson, E. C. (1974). Validating the 24-hour recall method as a dietary survey tool. *Archives of Latin American Nutrition, 24,* 277-281.

Litvack, D. A., Oberlander, T. F., Carney, L. H., & Saul, J. P. (1995), Time and frequency domain methods for heart rate variability analysis: A methodological comparison. *Psychophysiology, 32,* 492–504. DOI: 10.1111/j.1469-8986.1995.tb02101.x.

Miller, G. E., & Chen, E. (2010). Harsh family climate in early life presages the

emergence of pro-inflammatory phenotype in adolescence. *Psychological Science, 21*, 848-856. DOI: 10.1177/0956797610370161.

National Center for Chronic Disease Prevention and Health Promotion, Division for Heart Disease and Stroke Prevention. Centers for Disease Control and Prevention. (2015). Heart Disease Facts. Retrieved from http://www.cdc.gov/heartdisease/facts.htm.

Neuvo, Y., Cheng-Yu,D., & Mitra, S. K. (1984). Interpolated finite impulse response filters. *IEERTransactions on Acoustics Speech and Signal Processing, 2*, 563-570. DOI: 10.1109/TASSP.1984.1164348.

O'Donovan, A., & Hughes, B.M. (2008). Access to social support in life and in the laboratory: Combined effects on anxiety and cardiovascular reactivity to stress. *Journal of Health Psychology*, *13*, 1147-1156. DOI:10.1177/1359105308095968.

Orth-Gomer, K., Schneiderman, N., Wang, H.X., & Walldin, C. (2009). Stress reduction prolongs life in women with coronary disease: The Stockholm Women's Intervention Trial for Coronary Heart Disease (SWITCHD). *Circulation Cardiovascular Quality and Outcomes, 2*, 25-32. DOI: 10.1161/CIRCOUTCOMES.108.812859.

Povey, R., Conner, M., Sparks, P., James, R., & Shepherd, R. (2000). Application of the theory of planned behavior to two dietary behaviors: Roles of perceived control and self-efficacy. *British Journal of Health Psychology*, *5*, 121–139. DOI: 10.1348/135910700168810.

Ratnasingam, P., & Bishop, G. D. (2007). Social support schemas, trait anger, and cardiovascular responses. *International Journal of Psychophysiology*, *63*, 308-316. DOI: 10.1016/j.ijpsycho.2007.01.002.

Reblin, M., & Uchino, B. N. (2008). Social and emotional support and its implication for health. *Current Opinion In Psychiatry*, *21*, 201-205. DOI: 10.1097/YCO.0b013e3282f3ad89

Roy M. P., Steptoe A., & Kirschbaum C. (1988). Life events and social support as moderators of individual differences in cardiovascular and cortisol reactivity. *Journal of Personality and Social Psychology, 75*, 1273–1281.DOI: 10.1037//0022-3514.75.5.1273.

Sarason, I.G., & Sarason, B.R. (1986). Experimentally provided social support*. Journal of Personality and Social Psychology, 50,* 1222– 1225. DOI: 10.1037/0022-3514.50.6.1222.

Sherwood, A., Dolan, C. A., & Light, K. C. (1990). Hemodynamics of blood pressure responses during active and passive coping. *Psychophysiology*, *27*, 656-668.

DOI:10.1111/j.1469-8986.1990.tb03189.x

Sherwood, A., Allen, M., Fahrenberg, J., Kelsey, R., Lovallo, W., & van Doornen, L. (1990). Methodological guidelines for impedance cardiography. *Psychophysiology, 27,* 1–23.

Smith, T. W., Nealey, J. B., Kircher, J. C., & Limon, J. (1997). Social determinants of cardiovascular reactivity: Effects of incentive to exert influence and evaluative threat. *Psychophysiology, 34,* 65–73. DOI: 10.1111/j.1469-8986.1990.tb02171.x.

Smith, T.W., Ruiz, J.M., & Uchino, B.N. (2004). Mental activation of supportive ties reduces cardiovascular reactivity to lab- oratory stress in young men and women. *Health Psychology, 23*, 476–485. DOI: 10.1037/0278-6133.23.5.476.

Spielberger, C.D., Vagg, P.R., Barker, L.R., Donham, G.W., & Westberry, L.G. (1980). The factor structure of the State-Trait Anxiety Inventory. *Stress and Anxiety, 7,* 95–109. DOI: 10.1037/1040- 3590.19.4.369.

Spitzer, S. B., Llabre, M. M., Ironson, G. H., Gellman, M. D., & Schneiderman, N. (1992). The influence of social situations on ambulatory blood pressure. *Psychosomatic Medicine, 54,* 79–86. DOI: 10.1097/00006842-199201000-00010.

Thorsteinsson, E. B., & James, J. E. (1999). A meta-analysis of the effects of experimental manipulations of social support during laboratory stress. *Psychology and Health, 14*, 869-886. DOI: 10.1080/08870449908407353.

Uchino, B. N. (2004). Social support and physical health: Understanding the health consequences of our relationships. New Haven, CT: Yale University Press. DOI: 10.12987/yale/9780300102185.001.0001.

Uchino, B. N. (2009). Understanding the links between social support and health: A life-span perspective with emphasis on the separability of perceived and received support. *Perspectives on Psychological Science, 4,* 236–255. DOI:10.1111/j.1745-6924.2009.01122.x.

Umberson, D. (1987). Family status and health behaviors: Social control as a dimension of social integration. *Journal of Health and Social Behavior, 28*, 306-319. DOI: 10.2307/2136848.