

## Abstract

### Social Comparison, Health and Health Motivation: An Experimental Study

**Introduction:** Social Comparison (SC) or the tendency to compare oneself to others in the social environment has emerged as a salient component of physical and emotional functioning. This study assessed the impact of SC on cardiovascular reactivity to stress provocation, health motivation, and perceived health.

**Methods:** This repeated measures experimental study examined a sample of healthy graduate students ( $N = 78$ ; Mean Age = 26.4; 83.1% Female). Participants were assigned to receive downward, upward, or neutral SC feedback while being interviewed about a stressful event (adapted from the Social Competence Interview); Cardiovascular reactivity (systolic blood pressure; diastolic blood pressure; heart rate) was monitored during baseline, interview, and recovery. Other measures included: SC Orientation (Iowa Netherlands Comparison Orientation Measure), Subjective Social Status (MacArthur Ladder), self-rated health and health motivation (Health Self-Determinism Index). Analyses included: Chi-Square and Kruskal Wallis tests to evaluate between-group differences, ANOVA/ANCOVA to evaluate the impact of SC on reactivity and health motivation, multinomial logistic regression to evaluate the impact of SC on self-rated health, and repeated measures ANOVA/ANCOVA to evaluate changes in self-rated health and health motivation from pre-task to post-task.

Hierarchical multiple regression was used to evaluate moderating effects of SC orientation and subjective social status. MANOVA/MANCOVA were used for post-hoc analyses.

Results: Participants in the downward SC condition indicated a significant increase in total health motivation characterized by increased confidence in health behavior. Individuals in the neutral condition indicated a significant decrease in total health motivation characterized by decreased confidence in health-judgment. Neither SC orientation nor subjective social status moderated these relationships. There was no effect of SC on cardiovascular reactivity or self-rated health.

Conclusions: Downward SC (increased) and neutral SC (decreased) led to changes in intrinsic motivation from pre-task to post-task. Implications of these results suggest that SC impacts intrinsic motivation to improve or maintain health. Better understanding of these complex and multifaceted relationships will facilitate more targeted and efficacious intervention efforts at the micro and macro levels.

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by

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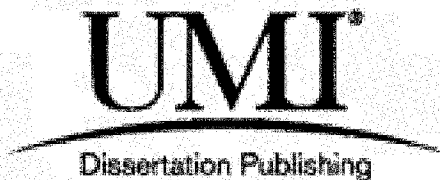
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## Dedication

To: All of my patients past, present, and future, for ensuring that I always remember the  
value of perspective.



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## **Chapter 1**

### **Introduction**

Psychological and social factors impact on health behavior, outcomes, and decisions related to health (Bandura, 1986, 1998, 2004). An adequate understanding of psychological and social processes that impact on health and related behaviors and decisions provides avenues of intervention at enhancing health and well-being (Bandura, 2004; Glanz & Bishop, 2010).

### **Social Comparison (SC): A Psychological Pathway Linking Person & Environment and Person & Behavior**

#### **What is SC?**

SC refers to the process by which individuals evaluate their own opinions and abilities by comparing themselves to other people in their social milieu (Festinger, 1954). Comparisons with people in your social circle enables answers to questions such as “Can I do this?” (ability) or “Is this correct?” (opinion) (Suls, Martin & Wheeler, 2002) and thus can either confirm or disprove individuals’ self-evaluations (Festinger, 1954). Historically, SC has also been observed in primate social hierarchies and Darwinian sexual selection (Gilbert, Price & Allan, 1995).

#### **Why do people engage in SC?**

Social comparison arises from a human drive for self-evaluation that exists regardless of the availability of objective criteria. This need for self-evaluation is intensified in social situations where data are ambiguous or insufficient. On an individual

or group level, SC can be used to determine standards or goals across domains including values, emotions, judgments, physical performance, or socioeconomic standing.

Current theories indicate that SC allows individuals to process information more efficiently than information based exclusively on objective criteria (Mussweiler & Epstude, 2009), implying that SC generated information will still be used even in the presence of objective or standardized data. Of note, when provided with a choice of either SC information (how am I doing now versus how are others doing now) or temporal comparison information (how am I doing now versus how was I doing before), people rely almost exclusively on SC information to make evaluations (Zell & Alicke, 2008).

### **Difficulty of researching SC**

Associations between SC and cognitions, behavior, and emotion are reciprocal in nature (see Figure 1). In other words, SC can predict cognition, behavior, and emotion (pathway 1) just as emotion, cognition and behavior can lead to changes in SC (pathway 2). This reciprocity makes SC a complex and multifaceted—albeit omnipresent—phenomenon (Corcoran, Crusius & Mussweiler, 2011). Adding to its complexity are the numerous ways by which SC can be measured and operationalized. Before providing a brief review of SC research and SC as it relates to the current study, SC will be operationally defined and relevant caveats of SC that are helpful in interpreting SC research will be discussed.

## **Operationally Defining SC**

### **Measurement**

SC is a multifaceted construct that comprises diverse domains and can be evaluated by various methodologies (Suls, Martin & Wheeler, 2002). Methodologies used to date include physiological measures (Fliessbach et al., 2007), field experiments (Cohn, Fehr,

Herrmann & Schneider, 2011), diaries (Wheeler & Miyake, 1992), and self-report questionnaires (Buunk & Gibbons, 2005) in both clinical and nonclinical samples. Typically, SC is operationalized as either “frequency of SC” or “direction of SC,” with subsequent models (i.e. identification-contrast; evaluation-contacts) developed to explain associated changes in emotions or behavior (Buunk & Ybema, 1987; Taylor & Lobel, 1989).

### **Dimensions of Measurement**

**Frequency of SC.** Frequency of SC refers to how often an individual engages in SC. Frequency of SC is positively associated with uncertainty; when faced with a paucity of clearly defined objective standards, individuals increase their SCs to obtain information (Festinger, 1954; Brown, Ferris, Heller & Keeping, 2007). Increased frequency of general SCs (regardless of direction) is associated with negative psychological sequelae including depression, anxiety, neuroticism, low self-esteem, guilt, regret, negative behaviors, and decreased job satisfaction (Butzer & Kuiper, 2006; White, Langer, Yariv & Welch, 2006; Swallow & Kuiper, 1992; Gibbons & Buunk, 1999).

**Direction of SC.** SC can occur as a lateral comparison (comparison targets are similar), downward comparison (comparison targets are less fortunate others), or upward comparison (comparison targets are more fortunate others) (Festinger, 1954).

**Downward SC.** Wills’ (1981) downward SC theory proposed two components: 1. Threatened people are more likely to engage in downward comparisons than upward comparisons and 2. Exposure to downward targets enhances subjective well-being. Both of these components are empirically supported. Downward SC has been shown to result in positive emotional states (Wood, Taylor & Lichtman, 1985; Hodges & Dibb, 2010) and negative behavioral consequences (Mahler, Kulik, Gerrard & Gibbons, 2010) including



decreased pain tolerance (Jackson & Phillips, 2010). Populations under threat or with decreased self-concept endorse robust benefits from downward SCs (Bauer & Wrosch, 2011; Cheng, Fung & Chan, 2008; Tennen, McKee & Affleck, 2000). This is likely due to the fact that these populations are motivated by a need for self-enhancement, which is typically associated with downward SC (Suls & Wheeler, 2000). Although downward SC is not always associated with positive affect and negative behavior—downward SC has been associated with decreased self-evaluation and increased positive, prevention-oriented behaviors (Lockwood, 2002) and with increased positive affect and less productive behavior. Notably, studies of downward SC at the neuropsychological level have connected downward SC with the activation of neurological reward pathways (Swencionis & Fiske, 2014).

*Upward SC.* Upward SC is frequently associated with more productive behavior (Buunk, Ybema, Gibbons & Ipenburg, 2001). Individuals motivated to improve themselves are likely to seek out upward SC targets to obtain information on how to self-improve (Dijkstra, Gibbons & Buunk, 2010) and the pursuit of performance or mastery based goals has been shown to facilitate upward SC (Bounoua et al., 2011). College students exposed to a successful role model reported increased levels of inspiration and goal-oriented career behavior compared to students exposed to an unsuccessful role model (Buunk, Peiro & Griffioen, 2007). Considering emotion, upward SC has been linked to negative emotional consequences including depression and jealousy (Hodges & Dibb, 2010). Although one study did find an association between upward SC and positive mood (Buunk & Ybema, 2003), upward SC is usually associated with negative emotions and more productive behavior. Neurologically, upward SC has been linked to the activation of neurological networks associated with envy and pain (Swencionis & Fiske, 2014).

## **Constructs Related to SC**

### **Level of Aspiration**

Level of aspiration is the idea that the ideal or goal for any behavior or ability is determined via comparisons with others' behaviors and abilities. Classic experiments have established that without knowledge of how others are performing, there is no defined goal or absolute ideal (Festinger, 1954). Presently, economic literature indicates that individual income aspirations are directly correlated with average community income (Stutzer, 2004) and that reference incomes are used to form income expectations in sectors with a less defined economic standard (Caporale, Georgellis, Tsitsianis & Yin, 2009). Extrapolated to health, it is possible that levels of health aspiration, i.e. health goals and health ideals, are partially determined by SC. This formulation is highly salient in body image literature, where body ideals, including definitions of descriptors such as "thin" or "slim," are thought to result from SCs with media images (Mussweiler & Strack, 2000) instead of medically defined BMI or weight categories.

### **Particularistic SC**

Particularistic SC refers to the idea that individuals are most likely to socially compare to those with whom they best identify or feel a bond. Festinger's (1954) original conceptualization of SC emphasized the particularistic nature of SC, postulating that SCs are performed with similar others whenever possible. Current research supports Festinger's theory; given the option, individuals chose comparison targets to which they are similar (Miller, Turnbull & McFarland, 1998). Particularistic SCs have also been shown to elicit stronger emotional responses (Heinberg & Thompson, 1992). Thus, individuals tend to

voluntarily choose particularistic SCs that, for better or worse, have increased psychological repercussions.

### **Reference Groups**

SC reference groups—to which group or target people are comparing—are highly relevant. Individuals who are forced to compare themselves with successful targets display more goal-directed and proactive behavior. Furthermore, those individuals that tended to compare more (higher frequency of SC) displayed the strongest increase in these productive actions (Buunk, Peiro & Griffioen, 2007). Extrapolated to health, this finding suggests that individuals presented with positive health role models may display more positive health behaviors, especially those individuals that compare more frequently.

### **Factors Moderating the Impact of SC**

#### **SC Orientation**

SC Orientation, or how likely an individual is to engage in SC, is an individual trait that remains consistent regardless of situational or environmental variation; SC orientation is hypothesized to moderate the extent to which individuals are affected by comparison information. Generally, sensitivity to SC information—the degree of emotional response (either positive or negative) to SCs—has been shown to moderate the impact of SC information (Brakel, Dijkstra, Buunk & Siero, 2012). Compared to those with low SC orientation, high SC orientation individuals are likely to endorse increased frequency of SC in their daily lives. These individuals report that they are more emotionally affected by SCs and place high value on others' opinions and abilities in forming their own self-evaluations (Buunk & Gibbons, 2006). A projective study evaluating quality of life in cancer patients determined that immediately after and 3 months after being provided SC information about a

radiation procedure, individuals higher in SC orientation endorsed a lower quality of life (Buunk et al., 2012).

### **Health, Economic and Psychological Status**

Differences in SES, self-efficacy, and health status have been shown to impact relationships between SC and health (Pham-Kanter, 2009), SC and motivation (Lockwood et al., 2005; Schokker et al., 2010), and SC and intervention efficacy (Anderson-Bill et al., 2011). Individuals who report being in good health benefited more from SC information relative to those with lower self-reported health (Brakel, Dijkstra, Buunk & Siero, 2012). Similarly, individuals with lower body satisfaction are more negatively impacted by SCs to media images of “body ideals” (Trampe, Stapel & Siero, 2007). It is likely that these findings are dependent on SC direction. Populations that are under threat, i.e. poor health, economic or psychological status, are likely to be more negatively impacted by upward SCs and, especially in terms of subjective well-being, more positively impacted by downward SCs. Given that subjective social status combines objective and subjective indicators of SES, self-efficacy, and health status, subjective social status is likely to impact the effect of SC on self-concept.

### **Interpretation of SC Research: The Identification-Contrast Model**

The Identification-Contrast model of SC (Buunk & Ybema, 1987), which is summarized in Table 1, is important in understanding and interpreting the current literature on SC. According to this model discrepancies in directional SC research can be explained by identifying or contrasting with comparison targets. When exposed to an upward target, identification SCs (upward-identification; focusing on similarities with the better-off comparison target) are likely to produce positive effects, while contrast SCs (upward-

contrast; focusing on differences from the better-off comparison target) are likely to produce negative effects (Dijkstra, Gibbons & Buunk, 2010; Collins, 2000). Similarly, when exposed to a downward target, identification SCs (downward-identification) are likely to produce negative psychological effects while contrast SCs (downward-contrast) are likely to produce positive psychological effects, i.e. Wills' downward SC theory. The efficacy of the identity-contrast model is supported in clinical and non-clinical populations (Dibb & Yardley, 2006; Buunk et al., 2001). Although the identification-contrast model appears to have a major role in general health behavior and health motivation, health researchers are just beginning to consider this model in both study design, interpretation of results, and discussion of findings.

### **An Overview of Classic SC Research**

SC is considered by social and behavioral scientists to be an omnipresent and influential force in human behavior that aids in psychological adaptation and influences self-concept (Buunk & Gibbons, 2005) based on empirical data from psychological, economic and academic domains.

### **SC in Psychological Research**

Increased frequency of appearance based SCs are associated with higher rates of body dissatisfaction and disordered eating (Cattarin, Thompson, Thomas & Williams, 2000; Halliwell & Harvey, 2006). According to a meta-analytic review, the association between unfavorable SCs and body dissatisfaction is moderated by measurement of SC, such that studies that incorporated direct self-report measurement of SC determined a stronger effect (Myers & Crowther, 2009). In body image research, unfavorable SCs are typically defined as upward appearance-based SCs that elicit negative feelings of guilt and body dissatisfaction. Notably, these upward SCs are also linked to increased thoughts of diet and exercise, which,

in overweight or normal weight population, may lead to positive health behavior change (Leahey, Crowther & Ciesla, 2011).

Expanding beyond body image, SC has been implicated in reward processing at the neurological level, with neuroanatomical data indicating that upward SC is associated with decreased ventral striatum activity and vice versa (Fliessbach et al., 2007). Clinical research has linked depression and anxiety—intolerance of uncertainty—to increased frequency of SC. Individuals who report an increased frequency of SC also endorse higher rates of envy, guilt, regret and defensiveness (White, Langer, Yariv & Welch, 2006). Considering direction, depressed individuals are likely to naturally seek out upward comparison targets that confirm their negative self-views. Specifically, an upward-contrast or downward-identification style (both of which are consistent with upward SC) is associated with depression (Buunk, Zurriaga & Gonzaléz, 2006). Generally, upward SCs are typical of depressed individuals and are implicated in such cognitive distortions as minimization, mental filtering, and disqualifying the positive (Beck, 1963).

### **SC in Economic Research**

Outside of the social science realm, economic literature has studied the role of SC in behaviors such as voting, charitable giving, and paying taxes, with results supporting the idea that SC processes predict behavior (Frey & Meier, 2004). Research on employee work performance and burnout has also emphasized the role of SC. According to the fair wage-effort hypothesis (Akerlof & Yellen, 1990), workers form an opinion of “fair wage” and decrease their effort if they are paid less than this amount. Current research has utilized SC theory to explore this hypothesis. A recent study by Cohn et al. (2011) suggested that work performance decreases more substantially when one member of an employee dyad receives a

pay deduction compared to a condition where both employees received the same pay deduction. This suggests that performance effects are even more pronounced in conditions that facilitate SC and presents a significant caveat to the fair wage hypothesis.

Considering SC direction, upward SC feedback has been linked to improvements in work productivity on an individual level (providing feedback that compares the target individual's performance to another individual's performance; Gino & Staats, 2011) and on a group level (providing feedback that compares one company's performance to another company's performance; Kim & Tsai, 2012). SC direction has also been applied to employee burnout. According to a study of nurses, positive reactions to spontaneously employed SCs predicted decreased burnout (Buunk, Zurriaga & Peiro, 2010). Generally, economic research has successfully linked SC to both behavioral and psychological (emotional) outcomes.

### **SC in Academic Research**

There is support for the role of SC in evaluation of one's academic abilities and formation of academic self-concept (Jackman, Wilson, Seaton & Craven, 2011). Students in high achieving classes tend to rate their academic abilities as lower than students with equal academic ability in low-achieving classes, supporting a frame of reference effect and highlighting the impact of reference groups (Trautwein, Ludtke, Marsh & Nagy, 2009) and the psychological impact of upward and downward SC. Findings related to this phenomenon, referred to as the big-fish-little-pond effect, are robust throughout educational psychology research (Marsh et al., 2008). Generally, the voluntary use of upward SCs is associated with increased academic performance (Huguet, Dumas, Monteil & Genestoux, 2001).

## **Relevance of SC to Health**

According to Corcoran, Crusius & Mussweiler (2011), health problems create an environment of stress, uncertainty (unclear progression of an illness or injury) and ambiguity (no objective standards on or “right” way to cope) that facilitates SC and advocates the application of SC theory to health research. These data are supported by data obtained from patients post haematopoietic stem cell transplant (Beeken, Eiser & Dalley, 2011) and men awaiting cardiac surgery (Kulik & Mahler, 1997). In addition to coping with illness and health problems (Taylor, Wood & Lichtman, 1985; Thoits, 2011), SC processes are relevant to the study of health evaluation, health behavior, health behavior change, and prevention (Buunk, Gibbons & Visser, 2002). Notably, health behavior norms, including tobacco use, drug use, exercise, diet, obtaining health services, and medication adherence are often ascertained via SC processes (Thoits, 2011). Individuals are likely to employ SC to evaluate their own health status, the acceptability of their health behaviors, and perceived vulnerability to injury or disease. In addition,

## **SC and Health Behavior**

### **The Role of Perceived Susceptibility**

Health behavior is etiologically related to an individual’s level of perceived susceptibility to a health condition (Rosenstock, 1966; Carpenter, 2010). SC may be an important factor in the evaluation of perceived susceptibility (Klein & Weinstein, 1997) and subsequent engagement in health behaviors. Two reciprocal pathways can be proposed to explain the relationship between SC and health behavior (see Figure 2). In pathway 1, individuals with preexisting beliefs about perceived susceptibility engage in certain health behaviors and then seek out SCs to confirm those beliefs and justify or normalize these



behaviors. This is referred to as the false consensus effect (Krueger & Clement, 1994), where individuals who engaged in risky health behavior are likely to select SC reference groups that allow them to overestimate the percentage of people that engage in this behavior (Van den Eiinden, Buunk & Bosveld, 2000). In pathway 2, individuals employ SCs to determine susceptibility, leading to specific health behaviors. Overestimations of smoking prevalence, i.e. “Everyone else smokes more than I do” are associated with increases in smoking (Gibbons & Gerrard, 1995) while smokers who believe that they are more vulnerable to negative consequences than non-smokers endorse a greater intent to stop smoking. Across both pathways, SC can lead to decreased perceived susceptibility and normalization of risky health behavior.

### **Current Findings on SC and Health Behavior**

Among adolescents, there is intriguing data that indicates that adolescents who naturally perceive themselves as dissimilar from the “prototypical drinker” report less willingness to drink than those who identify with the prototype. Similarly, individuals instructed to contrast themselves to the prototypical drinker subsequently reported less willingness to drink relative to those individuals instructed to identify with the prototype (Lane, Gibbons, O’Hara & Gerrard, 2011).

The impact of SC on health behavior is also supported by studies that utilize behavioral outcome measures. A UV protection intervention was found to have increased efficacy (as measured in hours of unprotected skin exposure) when it incorporated upward SC stimuli that conveyed to intervention participants that their skin was less healthy than average. Intervention efficacy was completely mitigated for participants in a downward SC condition that suggested that their skin was healthier than average (Mahler, Kulik, Gerrard &

Gibbons, 2010). The presence of SC information has also been found to predict differences in pain tolerance on a cold presser task such that verbally presented upward SC information was associated with the highest level of pain tolerance (Jackson & Philips, 2011). Elevated pain tolerance can have major implications for health behaviors and psychological (depression) functioning in both clinical (Edwards, Cahalan, Mensing, Smith & Haythornthwaite, 2011) and non-clinical populations.

### **SC and Health Motivation**

SC has been linked to motivation (Aspinwall, Hill & Leaf, 2002; Lockwood & Pinkus, 2007). In the fitness arena, research shows that exposure to positive fitness role models (upward SC targets) is associated with increased motivation to improve eating and exercise behaviors. Of note, individuals with lower baseline levels of body satisfaction were more motivated by negative fitness role models (downward SC targets; Lockwood, Wong, McShane & Dolderman, 2005). SC is also associated with motivation in clinical populations, where it has shown to impact self-care motivation in diabetics (Schokker et al., 2010).

### **Directional Considerations**

According to Martin, Haskard-Zolnierrek & DiMatteo (2010), downward SCs can result in complacency about one's own health behaviors, unawareness about one's position relative to objective health standards, and consequently, decreased motivation to improve one's health. The reverse is true for upward SCs, which can potentially increase motivation to improve one's health (Gibbons, 1999). While motivation to change health behavior cannot be assumed to be a proxy for health behavior change, empirical and theoretical research supports that SC is likely to influence motivation to improve one's health (upward SC) or maintain complacency that decreases motivation and inhibits behavior change.

## **SC and Subjective Health**

### **What is Subjective Health?**

Current health research incorporates both objective (e.g., morbidity, mortality, BMI, blood pressure) and subjective indices of health. Subjective health status, which refers to an individual's perception of his or her overall health, pain, physical ability, or emotional functioning, is thought to encompass both physical and psychosocial factors (Bentsen, 2008) and is considered to be an independently valid measure of health. Widely used measures of subjective health include but are not limited to the Short Form 36 health survey of physical and mental health (Ware, Snow, Kosinski & Gandek, 1997), the Cohen-Hoberman Inventory of Physical Symptoms (Cohen & Hoberman, 1983) and self-rated health.

### **Self-Rated Health: An Important Measure of Subjective Health**

Self-rated health is an essential component of health behavior and a construct worth studying independent of objective health indicators (Suchman, Phillips, & Streib, 1958). It predicts many components of physiological health and captures health perception using individually determined criteria. Reviews have concluded that the validity of self-rated health remains robust regardless of any semantic variations in its assessment (Idler & Benyamini, 1997; DeSalvo, Bloser, Reynolds, He & Munter, 2005). Of note, while self-rated health is typically considered a stable construct, studies have shown that self-appraisal of health status can be influenced by experimentally induced positive or negative mood states (Croyle & Uretsky, 1987) or physiological changes such as inflammation (Lekander et al., 2012).

Research on self-rated health supports its impact on physical and mental health outcomes. As substantiated in multiple studies, (e.g., DeSalvo et al., 2005; McFadden et al., 2009; Schnittker & Bacak, 2014) self-rated health is significantly associated with mortality,

particularly in older women (Ford, Spallek & Dobson, 2007). In medical populations, increased self-rated health predicts better prognosis post-myocardial infarction (Kennedy, 2001). Self-rated health has also been linked to chronic disease, medical comorbidity and functional limitations in both developed (Perruccio, Katz & Losina, 2012) and developing countries (Onadja, Bignami, Rossier & Zunzunegui, 2013). Mental health, research suggests that self-rated health is more strongly associated with quality of life (Vaez & Laflamme, 2003) and happiness (Agner, Ray, Saag & Allison, 2009) than objective health indicators. In addition to mental and physical health, high self-rated health has also been linked to increased engagement in healthy behaviors among healthy adults (Tsai et al., 2010). Given that self-rated health represents the intersection between psychological perception and physiological functioning, understanding the psychology that underlies it is critical (Jylha, 2009). Thus, the study of self-rated health advocates exploration into the specific psychological processes, such as SC, that might drive health evaluation.

### **Associations between SC and Subjective Health**

Similar to the association between SC and health behavior, the SC-subjective health relationship is also reciprocal in nature (see Figure 3). According to pathway 1, subjective health influences SC processes. Adults with low self-rated health appear to engage in frequent downward SCs in order to increase their subjective sense of well-being (VanderZee, Bunk & Sanderman, 1995). According to pathway 2, SC influences subjective health. Generally, SC has been found to predict self-rated health, such that perceiving oneself as physically healthier than others is associated with higher self-rated health (Cheng, Fung & Chan, 2007). Individuals with low relative position—surrounded only by upward SC targets—endorse lower self-rated health and increased health problems (Pham-Kanter, 2009).

In laboratory studies, individuals in the presence of a chronically ill or disabled confederate were found to endorse higher subjective health and increased life satisfaction (Strack, Schwarz, Chassein, Kern & Wagner, 1990). This finding is likely explained by the opportunity for downward-contrast SCs (focus on the differences between oneself and the less healthy confederate). Similarly, older adults assigned to listen to an interview with a less healthy target (downward SC) endorsed higher life satisfaction than those assigned to listen to an interview with a healthier target (upward SC). Notably, this effect was found only when participants contrasted with their downward targets, again highlighting the impact of downward-contrast SCs on subjective well-being (Nynke, Buunk, Nardj & Slaets, 2004). In another experimental study, adolescents assigned to write out expressions of gratitude each day were found to endorse higher subjective well-being. Analyses of these written expressions determined that downward contrast SCs were utilized to create the sense of gratitude that contributed to enhanced subjective well-being (Froh, Sefick, & Emmons, 2008). Generally, there is reason to speculate that providing downward-contrast SC feedback to participants in the present study is likely to result in higher health ratings.

### **SC as a Stressor & a Buffer against Stress**

#### **Diverse Pathways**

SC processes are associated with stress and coping (Taylor, Buunk & Aspinwall, 1990; Buunk, Gibbons & Visser, 2002). As shown in Figure 4, SC can be conceptualized as both a stressor and a buffer; both of these conceptualizations are evident throughout theoretical discussions of SC and are particularly relevant to discussions of upward and downward SC.

Typically, pathway 1 is associated with upward SC (specifically upward-contrast or downward-identification SCs) while pathway 2 is associated with downward SC (specifically downward-contrast or upward-identification SCs). Wills' (1981) downward SC theory describes the SC as buffer pathway: Threatened populations will utilize downward SC to decrease stress and exposure to downward targets increases subjective well-being (thereby decreasing stress). Additional research has supported the buffering hypothesis, resulting in the employment of downward SCs to mitigate stress and to cope with stressful events (Buunk & Ybema, 1995; Buunk, Gibbons & Visser, 2002).

### **Implications for Health**

Exposure to acute and chronic stress, at any point across the lifespan, has a significant, negative impact on psychological, cognitive, and physical functioning (Herbert & Cohen, 1993; Lupien, McEwen, Gunnar & Heim, 2009). Prolonged cortisol elevations, increased cardiovascular reactivity, depression, and decreased immune response have all been proposed as mechanisms by which stress impacts health (Herbert & Cohen, 1993; Miller, Chen & Cole, 2009; Lovallo & Gerin, 2003). Over the past 20 years, researchers have focused on elucidating the pathways by which stress impacts health and identifying factors that might buffer against the harmful effects of stress. Ideally, a more comprehensive understanding of the stress-health relationship will improve treatment and prevention to combat the impact of stress on physical and psychological functioning. Because SC is a fundamental and ubiquitous process (Corcoran, Crusius & Mussweiler, 2011), it is valuable to explore the role of SC in stress exacerbation or reduction.

## **Experimental Research: Cardiovascular Reactivity to Stress Provocation**

### **What is Cardiovascular Reactivity?**

Cardiovascular reactivity to stress, which can be measured in laboratory settings, refers to the physiologic change from a resting state that occurs in response to a psychological or physical stressor (Manuck et al., 1989). It has been used as a marker of cardiovascular health in adults and adolescents across ethnic and racial backgrounds (MacKenzie, Smith & Uchino, 2012; Lee, Suchday & Wylie-Rosett, 2011), and has been linked to health outcomes including cardiovascular disease, hypertension (Carroll et al., 2012), and prevalence of the metabolic syndrome (Countryman, Saab, Schneiderman, McCalla and Liabre, 2012). In experimental paradigms, psychological stressors typically employed to test cardiovascular reactivity include but are not limited to public speaking tasks (speech preparation time followed by a 3-5 minute speech; Roemmich et al., 2011), mental arithmetic tasks (i.e. serial 7 subtraction task, series of mental math problems), distress recall tasks such as the social competence interview (Ewart & Kolodner, 1991; Lee, Suchday & Wylie-Rosett, 2012), mirror star tracing (Allen, 2000), or stroop tasks (Franzen et al., 2011).

Reactivity is considered an indicator of cardiovascular health and potentially, a cause of cardiovascular disease (Chida & Steptoe, 2010; Bongard, al'Absi & Lovallo, 2012); large cardiovascular reactions to acute stress are associated with elevated cardiovascular risk (Schwartz et al., 2003). Cardiovascular reactivity is also thought of as the mechanism by which factors such as hostility, obesity and social isolation increase cardiovascular risk (Chida & Hamer, 2008).

To date, cardiovascular reactivity has been associated with psychological, physiological and social factors. These factors include but are not limited to social support,

anger, hostility, forgiveness, anxiety, depression, obesity and self-rated health. Of note, the influence of psychosocial variables (i.e. social support) exists independently of physical (i.e. being in the presence of another) or mental (thinking about relationships) activation of these factors (Phillips, 2011; Birmingham, Uchino, Smith, Light & Sanbonmatsu, 2009; Carlisle et al., 2012).

### **SC and Stress: Findings from Cardiovascular Reactivity Research**

Research using cardiovascular reactivity has explored the direct impact of SC information on reactivity and utilized SC theory to explain unique findings in reactivity research.

**Direct impacts of SC on cardiovascular reactivity.** There is empirical support for the impact of SC information on cardiovascular responses to stress. Generally, competition conditions that facilitate SC have been shown to impact cardiovascular reactivity to stress (Wittchen, Krimmel, Kohler & Hertel, 2012). More specifically, individuals paired with superior (higher performing; upward-contrast SC) confederates displayed higher cardiovascular reactivity during an individual performance task than individuals paired with inferior (lower performing; downward contrast SC) teammates. These results support that downward-contrast SCs serve as a buffer that lessens cardiovascular reactivity to stress (Cleveland, Blascovich, Gangi & Finez, 2011).

In an experiment by Gerin et al. (1992), students at a highly liberal university were asked to argue a pro-choice point of view in front of three confederates. For all students, two of the confederates argued a pro-life stance. The third confederate supported half of the students and offered no support for the other half. Despite all students' awareness that the majority of the student body was pro-choice, reactivity was significantly greater in those participants in



the no support condition. This work directly supports the importance of SC to physically present individuals in moderating stress reactions; in other words, although participants' arguments were consistent with the majority viewpoint at the institution, the presence of a non-supportive confederate led to elevated stress responses compared to a supportive confederate.

Performance feedback about group norms—designed to facilitate SC—has been shown to impact cardiovascular reactivity. Prior to completing a 5 minute puzzle, individuals told that the “standard number of words found” was either 3 (an easily achievable number) or 7 (a near unachievable number) exhibited much higher reactivity (systolic BP, diastolic BP and heart rate) relative to individuals who were not provided any performance norms (Christenfeld, Glynn, Kulik & Gerin, 1998). Furthermore, a recent study determined that diastolic BP and heart rate reactivity increased when told by a similar other that a task is challenging. When this information was delivered by a non-similar other, this same increase was not observed. In the context of the identification-contrast model and particularistic social comparison, this suggests that SC information directly impacts cardiovascular reactivity (Gallagher, Meaney & Muldoon, 2013).

Notably, one study has directly explored the impact of upward SC and downward SC on cardiovascular reactivity and stress management. According to Mendes, Blascovich, Major & Seery (2001), individuals exposed exclusively to upward SC information displayed a reactivity pattern consistent with a threat response (demand exceeds interpersonal resources) and reported negative affect. Conversely, individuals exposed exclusively to downward SC information displayed a reactivity pattern consistent with a challenge response (interpersonal resources exceed demand) and reported positive affect. These findings suggest

that individuals receiving downward SC feedback during an acute psychological stressor might display lower reactivity to stress. Similarly, individuals receiving upward SC feedback are likely to display elevated reactivity to stress provocation.

**Applying SC to findings from cardiovascular reactivity research.** Theorists have used SC theory to explain associations between social support and reactivity outcomes. Although social support typically reduces reactivity, some studies have found that females completing a performance-based task in the presence of similar others (other female collegians) exhibited an increase in cardiovascular reactivity (Allen, Blascovich, Tomaka & Kelsey, 1991; Phillips, Gallagher & Carroll, 2009). Using SC theory, researchers have suggested that the presence of a similar other provides an opportunity for negative SCs, augmenting the stress in the room and manifesting in increased reactivity. Generally, stressful situations (i.e. a performance-based task in a cardiovascular reactivity protocol), increase the desire for SC and increase the effects of information about similar others (Phillips, Gallagher & Carroll, 2009; Christenfeld & Gerin, 2000). In the presence of a similar other—facilitating particularistic SC—communication of approval has a stress-buffering effect while no communication of approval has a stress-exacerbating effect (Christenfeld & Gerin, 2000).

### **Implications for the Role of SC in Prevention and Intervention**

#### **Prevention-Focused Interventions**

Interventions that increase perceived vulnerability to negative health behaviors or environments are likely to have increased efficacy and effectiveness (Buunk, Gibbons & Visser, 2002). Health behavior and healthcare utilization is etiologically linked to an individual's degree of *perceived susceptibility* (to a health condition) or *perceived*

*effectiveness* (of a healthcare service or health behavior). Given that SC plays a major role in individual determination of perceived susceptibility (Gibbons & Gerard, 1995), parsing out the nuances of SC is an important step in designing more efficacious intervention programs. Amongst AIDS patients, SC has been shown to impact preventative behaviors as well as risk perception (Mivich, Fisher & Fisher, 1997). In non-clinical populations, upward SC has been shown to facilitate increased use of sun-protection behaviors, a critical component of skin cancer prevention (Mahler, Kulik, Gerrard & Gibbons, 2010). Generally, decisions to seek or avoid medical care can be the product of standards determined by SC with specific reference groups (Martin & Triadis, 2001).

### **Treatment-Focused Interventions**

In their seminal study on female breast cancer patients, Wood, Taylor & Lichtman (1985) determined that patients benefitted from heterogeneous groups that facilitated opportunities for downward SC. Recent research has extended these findings to men with prostate cancer, indicating a general tendency to socially compare, a positive correlation between use of downward SCs and quality of life, and a negative correlation between upward SCs and quality of life (Kalia, Madeo, Roter, Erby & Blank, 2011). Also among cancer patients, the use of upward-identification, downward contrast SCs has been linked to active, positive coping styles (Van der Zee, Buunk, Sanderman, Botke & Van den Bergh, 2000).

Generally, SC has been studied as an integral aspect of coping in medical problems including cancer, rheumatoid arthritis (Hooper, Ryan & Hassell, 2004) and HIV (Derlega, Greene, Henson & Winstead, 2008) and spinal cord injury (Buunk, Zurriaga & Gonzaelz, 2007), as well as non-medical issues including career burnout (Carmona, Buunk, Peiro, Rodriguez & Bravo, 2006) and caregiver burnout (Van der Zee, Bakker & Buunk, 2000).

Taken together, these findings suggest that treatment interventions can incorporate SC to help increase subjective well-being and positive coping behaviors—including treatment adherence—in clinical and non-clinical populations.

### **The Present Study**

The present study will explore the effects of upward SC and downward SC on health motivation, self-rated health, and cardiovascular reactivity to stress. Given prior data on the relationship between SC orientation (Trait) and the effects of SC, SC orientation and subjective social status will also be explored as potential moderators of the SC-health relationship. To account for differences in identification and contrast, the present study will only allow for upward-contrast (upward SC) or downward-contrast (downward SC) conditions. This is further elaborated in the methods section.

### **Hypotheses**

Hypotheses for the current study are as follows:

1. Downward-contrast SCs are hypothesized to decrease stress and increase satisfaction with current health status. Participants in a downward SC condition are likely to a. experience lower cardiovascular reactivity to stress; b. endorse lower motivation to improve health, and c. report higher self-rated health than participants in a lateral comparison condition or in an upward SC condition.
2. Generally, all participants in a directional comparison condition (downward SC or upward SC) will report a change in their a. motivation to improve health, and b. self-rated health from pre-task (before the stress task and SC feedback) to post-task (post stress task and SC feedback).

- 2a. Participants in the downward SC condition will report (i) a decrease in health motivation, and (ii) increase in self-rated health; Participants in the upward SC condition will report an increase in motivation to improve health and a decrease in self-rated health.
3. Adjusting for subjective social status and SC orientation will moderate effects of the directional comparison conditions on a. cardiovascular reactivity to stress, b. motivation to improve health, and c. self-rated health

## **Chapter II**

### **Methods**

#### **Participants, Setting, & Recruitment**

Participants were recruited through recruitment fliers and class listservs at a graduate school of psychology and medical school in the New York metro area. Every student received an individual, personalized email briefly explaining the purpose and requirements for the study. Interested students responded directly to the email in order to schedule a review of the study with the examiner. During this review, consents were completed, the survey portion of the study was disseminated, and a study interview was scheduled. Study interviews were conducted in two laboratory locations in the New York metro area.

Inclusion criteria were: adults (18 years of age or older) with the ability to speak, read and write in English and the capacity to sign informed consent. Individuals were told not to consume any caffeine 2 hours before the study interview.

Summary statistics for the study sample are shown in Table 2. Participants were a graduate student sample ( $N = 78$ ) from the NY metro area with a mean age of 26.4 years ( $SD = 3.53$ ) and were primarily female (83%) and white (83%) with a yearly income of under \$25,000.

#### **Risks**

Participants were warned of potential discomfort secondary to sharing personal information that may be difficult to talk about. Consequently, participants were informed

that they could stop the questionnaire or interview at any time. Participants were also warned of physical discomfort from the blood pressure cuff during repeated blood pressure readings. There were no additional anticipated risks. Confidentiality was ensured and there were no costs to study participation. The current study was approved by the institutional review board at the Albert Einstein College of Medicine.

Of note, this interview was meant to induce stress and raise blood pressure. Two participants exhibited elevated BP during the speech that required the examiner to end the task prematurely. These participants were then allowed 10 minutes to return to baseline, and both were able to return to baseline. Data from these participants, one of who was from the neutral SC condition and one from the upward SC condition, were not included in data analyses.

### **Benefits**

Though this study did not provide direct benefit, participants were informed at the broader advantages of furthering current knowledge about the role of SC in health, stress management, and health motivation.

## **Procedure**

### **Background**

The experimental procedure (see schematic in Figure 5) followed an adapted version of the Social Competence Interview (SCI: Ewart & Kolodner, 1991; Ewart, Ditmar, Suchday, & Sonnega, 2007). The SCI was developed to measure physiological changes associated with stress. Through guided imagery and specific, targeted questions, the SCI facilitates a detailed reconstruction of the stressful situation that attempts to recreate the same cognitions and

emotions that were present when the event actually took place (Ewart, Ditmar, Suchday & Sonnega, 2006).

The original SCI was divided into four phases: (I) Task Introduction. This phase contained two parts: 1. Explain the purpose of the interview and 2. Choose the most relevant stressor from a series of 8 “stress cards” containing problems that typically cause stress (II) Identify the problem. The participant is asked to talk about why the stressor is problematic, as well as explain how long it’s been a problem, how often it produces stress, and why it is problematic. (III) Re-experiencing the problem situation across four steps: 1. Recall stressful feelings, 2. Relate feelings to specific thoughts, 3. Re-explain the situation to intensify thoughts and feelings, 4. Assess the impact of the situation. (IV) Assess goals for coping, coping strategies, self-efficacy and anticipated consequences.

As mentioned, the current study utilized an adapted version of the SCI that employed phase I, and a modified phase II and III. Instead of being guided through the traditional phase II and III, participants were informed that they would be making a four minute speech about their chosen stressor. SCI phase II was replaced with a 2-minute planning period, where participants were told to plan and prepare their 4-minute speech. Phase III was replaced with the speech, during which participants were guided through steps 1, 2, 3 and 4 in order to maintain focus on the stressor and associated emotions and cognitions. Speech tasks have been shown to reliably induce cardiovascular activity. The protocol utilized in the current study was modeled after prior studies that have employed speech tasks in reactivity paradigms (Flocco, Joober & Lupien, 2007; Kotlyar et al., 2008; Armstead et al., 2010).



## Overall Procedural Outline

Participants were consented and then completed survey packets containing personality and demographic information prior to coming in to the laboratory. At the laboratory visit, anthropometric measures (height, weight, shoulder, hip, and waist) were taken. Following measurements, participants were asked to rate on a 1-7 scale the extent to which they were currently experiencing the following 10 emotions: anxious, angry, irritated, depressed, nervous, upset, frustrated, tired, interested and challenged (see appendix for exact measure). All participants were sequentially assigned to the upward SC, downward SC or neutral condition.

Prior to any blood pressure measurements, participants were informed that the study's overall purpose was to determine "how you respond to things that make you feel stressed." In order to prime participants for comparison feedback, the following task introduction was provided:

**Task Introduction:** *Before we begin this process I would like to give you some background information about this procedure. Our lab has utilized this process on many individuals of your same gender, age, and socioeconomic status (similar jobs and income) to see how the average person your age perceives and responds to stress.*

*As you proceed through this session, you will be hearing about how you are doing compared to how other (men/women) performed or felt throughout this procedure. It is important to remember that these (men/women) are just like you: similar age, background, occupation, income, and living in the same type of neighborhood. Throughout this task, compare yourself and think about the men/women that you hear about. In other words, when you receive feedback, think about how you, what you are saying, and what you are feeling compares to other people.*

Because individuals are most likely to engage in comparisons with similar others (Miller & Turnbull, 1994), this protocol emphasized that the experiment had previously been conducted

on socioeconomically and demographically similar others. In addition, this approach attempted to adjust for variations in identification vs. contrast approaches. Participants were encouraged to conceptualize the “other men or women” who performed the procedure as similar others in order to facilitate a literal interpretation of feedback that advocated a contrast approach. The feedback provided (see later in this section for a comprehensive description of feedback) described upward-contrast SCs (“others performed better than you;” negative affect induced) or downward-contrast SCs (“others performed worse than you;” positive affect induced). Following an opportunity for questions, participants rested for 10 minutes to obtain five baseline (pre-task) readings for systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP) and heart rate (HR). Feedback was provided immediately post baseline (see table 4).

Following the baseline rest period, participants in all 3 conditions were provided the same introduction to the laboratory task:

*We want to find out how you react to your own personal kinds of stress. During the next 4 minutes, I am going to ask you to discuss your most stressful life challenge in the form of a speech.*

*I will give you a list of situations that people of your similar age, education and background find stressful and I will ask you to choose one for you to make a speech about. Just think of this as your chance to tell us what you find stressful. I will ask you some questions and from time to time it may sound like I am repeating a question or emphasizing a particular point. I won't be doing this to give you a hard time, but to try to be sure I understand how that stress really feels to you.*

*We want you to feel in the interview for just a few minutes the way you feel outside this room when you are under stress. But if I start to ask about anything you don't want to discuss, just let me know. If there is anything you wouldn't like to talk about, you don't have to. This is not a test of any sort.*

To commence phase II, all participants were provided with the same 8 stress cards (described in measures section) and were told to choose one about which they would make their speech.

They were then given 2-minutes to plan out their speech, during which blood pressure

readings were taken every 1 minute. This planning period is employed to foster anticipatory anxiety (Armstead et al., 2010). Following this 2-minute period and immediately prior to the beginning of the speech, all participants were informed that their speech would be rated on three components: poise, content and delivery. This procedure aligns with previous studies that have utilized the speech stressor task, and has been used to increase the stress associated with the speech task. Overall, the speech task lasted a total of 6 minutes—2 minutes of speech preparation and planning followed by a four-minute speech—with SBP, DBP, HR and MAP readings taken every minute during the preparation period and speech. Feedback was provided immediately following speech culmination (see table 4).

Following the speech, participants rested for another 10 minutes to allow for cardiovascular recovery. The following post-task measures—which were also included in the pre-task packet—were then administered. Reliability and further description of each measure is provided in the “measures” section below. Copies of post-task measures are provided in the Appendix: 1) Health motivation, which was assessed using the health-self determinism index (HSDI; Cox, 1987), 2) SRH, for which participants answered the question “How is your health in general?” on a nine point Likert-type scale with the anchors “poor” and “excellent”, 3) experience of the following 10 emotions on a 7 point Likert scale: anxious, angry, irritated, depressed, nervous, upset, frustrated, tired, interested and challenged and 4) An experimental manipulation check where participants were answered the question “to what extent were you focused on the SC feedback?” on a 1-7 likert scale. prompts).

### **Experimental Conditions**

Once they entered the laboratory, participants were assigned to one of three experimental conditions. A sequential assignment strategy (upward, neutral, downward,

upward, neutral, downward etc.) was utilized in order to ensure equal numbers of participants in each comparison condition. A brief description of each condition is provided below. For all conditions, feedback was provided on pre-speech relaxation (1 prompt), speech delivery, poise and content (3 prompts total), and post-speech recovery (1 prompt). Specific feedback prompts are described in Table 4.

**Condition 1- Neutral SC.** The neutral condition served as the control group. Participants assigned to this condition received lateral, non-directional feedback about similar others who were *just as relaxed* pre-speech, performed *about the same* during the speech task, and were *just as recovered* post-speech.

**Condition 2 - Upward SC.** Participants in the upward SC condition received SC feedback in the upward direction that contained information about similar others who were *more relaxed* pre-speech, performed *better* during the speech task, and were *more recovered* post-speech.

**Condition 3 - Downward SC.** Participants in the downward SC condition received SC feedback in the downward direction that contained information about similar others who were *less relaxed* pre-speech, performed *worse* during the speech task, and were *less recovered* post-speech.

**Differences among the three SC conditions.** Chi-square (gender, marital status, race, personal income, personal education, subjective social status), one-way between subjects ANOVAs (age, depression, anxiety, comparison orientation, BMI) and Kruskal-Wallis (HSDI including its four factors: self-determinism in health judgment, perceived competence in health matters, internal external cue responsiveness, self-determinism in health behavior) tests were utilized to evaluate any significant differences among the three

SC conditions. Of note, no significant differences among the three SC conditions were observed. Descriptive statistics by condition are shown in Table 3.

## **Experimental Scenario**

### **Stressor Selection**

Participants chose the stressor that has “caused you the most stress during the past few months.” The 8 possible stressors were: 1) family stress, 2) stress with friends, 3) stress with relationships, 4) neighborhood stress, 5) stress about money, 6) work stress, 7) school stress, and 8) health/illness stress.

### **Speech**

Participants were asked to describe their stressor for four minutes, with intermittent questioning from the interviewer (utilizing questions from phase 3 of the social competence interview) in order to increase the stress response. Following their speech, participants were asked to rate “How stressed are you right now” on a 1-7 likert scale. For the current sample, ( $\mu = 4.13$   $SD = 1.9$ ), the distribution was as follows:

### **Post-task Debriefing**

Participants were debriefed post task. Debriefing included an explanation of the procedure, randomization to SC condition, and general purpose of the experiment.

## **Measures**

### **Psychological and Sociodemographic Measures**

**Subjective Social Status.** Subjective social status was measured using the McArthur Scale of Subjective Social Status (Adler, Epel, Castellazzo & Ickovics, 2000), a 10-rung self-anchoring scale (1 indicating the lowest status, 10 indicating the highest status) that assesses community comparison of social standing. The Macarthur Scale has high test-retest

reliability ( $\alpha=.62$ ; Operario et al., 2004). It has also been found to have strong construct validity as evidenced by clear convergent and discriminant validity; measures of subjective social status correlated more closely with each other than measures of income, household income, or psychosocial measures (e.g., depression, neuroticism, optimism, marital satisfaction) (Cundiff, Smith, Uchino & Berg, 2013)

**SC Orientation.** SC orientation was assessed using the Iowa Netherlands Comparison Orientation Measure (INCOM; Gibons & Buunk, 1999), an 11-item scale ( $\alpha=.83$ ) that conceptualizes SC as a trait and assesses how often individuals engage in opinion or ability related social comparisons.

#### **Measures Utilized during the Experimental Procedure.**

**Manipulation check.** Following the experimental procedure, participants were asked to rate the extent to which they were able to focus on the comparative feedback on a 1-7 Likert-type scale. For the current sample ( $\mu = 4.44$ ,  $SD = 1.42$ ), the distribution for the manipulation check was as follows: 1 (1.4%), 2 (6.8%), 3 (13.6%), 4 (17.5%), 6 (15.5%), 7 (4.9%). The majority of participants (52.1%) rated the experimental manipulation effect at least 4.

#### **Measures of Health**

**Self-rated health.** Self-rated health was assessed by asking “*How do you rate your health in general*” with responses ranging from 1 (“Very Poor”) to 9 (“Excellent”).

Experimental studies have successfully manipulated SRH using this 9-point measure (Croyle & Uretsky, 1987). Studies have determined moderate reliability for measures of self-rated health ( $\kappa = .43$ ) with decreased reliability in lower socioeconomic groups (Zajacova & Dowd, 2011). The validity of self-rated health has been shown to remain independent of

semantic variation (Idler & Benyamini, 1997; DeSalvo, Bloser, Reynolds, He & Munter, 2005) and no significant differences were found when using scales with anchored descriptor compared to scales that associate a descriptor with each Likert point (Eriksson, Unden & Elofsson, 2001). Additionally, no differences have been observed among different ethnic groups. Fair to poor SRH consistently correlates with increased odds of morbidity and mortality (Chandola & Jenkinson, 2010). For the current sample ( $\mu = 7.12$ ,  $SD = 1.13$ ), the distribution of SRH pre-task was as follows: 3 (1%); 4 (1%); 5 (3.9%); 6 (10.8%); 7 (28.4%); 8 (25.5%); 9 (4.9%).

**Health Self-Determinism Index (HSDI).** The HSDI (Cox, 1985) is a 17-item scale ( $\alpha = .82$ ) that evaluates health motivation across four domains: self-determined health judgments, self-determined health behavior, perceived competency in health matters and internal-external cue responsiveness. The HSDI is based on principles of self-determination theory; higher scores indicate greater intrinsic motivation. In the current sample, the distribution of HSDI scores pre-task were as follows: 1) Total motivation:  $\mu = 63.97$ ,  $SD = 7.03$ , 2) self-determinism in health judgment:  $\mu = 18.62$ ,  $SD = 2.57$ , 3) self-determinism in health behavior:  $\mu = 19.98$ ,  $SD = 2.61$ , 4) perceived competence in health matters:  $\mu = 11.5$ ,  $SD = 2.13$ , and 5) internal-external cue responsiveness:  $\mu = 13.87$ ,  $SD = 1.88$ .

**Blood pressure and heart rate.** Heart Rate (HR), Systolic Blood Pressure (SBP), Mean Arterial Pressure (MAP) and Diastolic Blood Pressure (DBP) were taken using the GE/Critikon Dinamap Pro 300 vital Signs Monitor. Measurements were taken at 2-minute intervals during a pre-task relaxation period (10 minute period producing 5 readings) and a post-task recovery period (10 minute period producing 5 readings). Measurements were

taken at 1-minute intervals during speech-planning (2-minutes producing 2 readings) and speech (4 minutes, readings taken at one-minute intervals) phases.

### **Computing Reactivity**

Three cardiovascular measures have been examined: SBP, DBP, and HR. In order to measure reactivity, change scores were computed by subtracting the mean of the four readings taken during the speech task from the mean of the last 3 baseline readings (Lee, Suchday & Wylie-Rosett, 2012). Change scores are considered an acceptable way to measure cardiovascular reactivity (Pickering, 1991).



## **Chapter III**

### **Results**

#### **Analysis Plan**

The present study employed a repeated measures experimental design. Data were evaluated to see if assumptions were met for the use of parametric tests. Transformations were used where assumptions of normality were not met. If transformed variables were not able to be meaningfully interpreted, non-parametric tests were utilized. Analysis of variance (ANOVA), chi square and Kruskal-Wallis were used to evaluate differences between the three SC conditions. Post-hoc power analyses were conducted using G\*Power 3.1. For one-way ANOVA, post-hoc power analyses indicated that with a two-sided alpha level of .05 and an effect size of .36 (medium effect), the number of participants to reach a sufficient level of power (.8) is  $N = 78$ . For repeated measures ANOVA, Analyses indicated that with a two-sided alpha level of .05 and effect size of .3 (medium effect), the number of participants to reach a sufficient level of power (.8) is  $n = 24$  (per condition) and  $N = 72$  overall. Because this study incorporated a pre-post design with only two data points, the assumption of sphericity is met for all repeated measures analyses. For all analyses, Levene's test was computed to assess homogeneity of variance ( $p > .05$ ) between the neutral, downward SC and upward SC conditions and K-S test of normality across the three conditions was computed to assess distribution of data. Given

that multiple ANOVAs and ANCOVAs were calculated, increased type I error is noted as a statistical limitation.

### **Tests of Normality and Assumptions**

#### **Cardiovascular Reactivity & Baseline Analyses: HR, SBP, DBP**

Data were checked for linearity (Kolmogorov-Smirnov [K-S] test), homogeneity of variance (Levene's test), and homogeneity of regression ( $F$  value of interaction between covariates and dependent variables).

**Baseline analyses.** Tests for homogeneity of variance and normality indicated that the spread of data were homogenous and linear across the neutral, downward SC and upward SC conditions for baseline HR data and baseline SBP data. For baseline DBP data, tests for homogeneity of variance indicated that the spread of data were homogenous across the neutral, downward SC and upward SC conditions. Tests of normality indicated that data significantly deviated from normal in the neutral and downward SC groups. After a log transformation, data no longer significantly deviated from normal across the three SC conditions.

**Reactivity Analyses.** HR and DBP reactivity scores in the neutral, downward SC and upward SC conditions did not vary significantly and were normally distributed. For SBP reactivity, tests for homogeneity of variance and normality indicated that the spread of data were homogenous across the neutral, downward SC and upward SC conditions for reactivity data. K-S test of normality indicated that SBP data in the downward SC condition  $D(26) = .20, p < .01$  significantly deviated from normal. After a reverse score and log transformation, SBP reactivity data were normally distributed across the three SC conditions.

## **Motivation**

Post-task total motivation scores in the neutral, downward SC and upward SC conditions did not vary significantly and were normally distributed.

## **Hypothesis Testing**

### **Hypothesis 1**

*Hypothesis 1: Post-task, downward SC participants will endorse less cardiovascular reactivity, lower health motivation, and higher SRH than participants in the other two groups.*

### **Cardiovascular Reactivity: HR, SBP, DBP**

Analyses were run on baseline data and cardiovascular reactivity data. For baseline data analyses, ANCOVAs were computed adjusting for age, gender, and BMI. For the cardiovascular reactivity data analyses, ANCOVAs were computed adjusting for age, gender, and BMI and baseline. All analyses controlled age, gender and BMI because these are three factors that have been shown to impact cardiovascular reactivity and are typically controlled for in reactivity analyses (Matthews et al., 2004). The ANCOVA approach is widely used in analysis of cardiovascular reactivity data (Lepore, et al., 2006; Grant, Hobkirk, Persons, Hwang & Danoff-burg, 2013; Masters & Knestel, 2011).

### **Baseline Analyses**

All baseline analyses were computed using ANCOVAs computed adjusting for age, gender, and BMI.

**Baseline Analyses – HR.** The between-subjects ANCOVA indicated that there was not a significant effect of SC on baseline HR at the  $p < .05$  level for the neutral SC, downward SC or upward SC conditions.

**Baseline Analyses – SBP.** The between-subjects ANCOVA indicated that there was not a significant effect of SC on baseline SBP at the  $p < .05$  level for the neutral SC, downward SC or upward SC conditions.

**Baseline Analyses – DBP.** The between-subjects ANCOVA indicated that baseline DBP did not vary at the  $p < .05$  level for the three SC conditions.

### **Reactivity Analyses**

All reactivity analyses were computed using ANCOVAs on change scores and adjusting for baseline, age, gender, and BMI.

**HR reactivity.** Results of the between-subjects ANCOVA comparing the effect of SC on HR reactivity in the neutral, upward, and downward conditions indicated that HR reactivity was not significantly affected by SC.

**SBP reactivity.** Results of the between subjects ANCOVA comparing the effect of SC on SBP reactivity in the neutral, upward and downward conditions indicated that SBP reactivity was not significantly affected by SC.

**DBP reactivity.** The between subjects ANCOVA conducted to compare the effect of SC on DBP reactivity in the neutral, upward and downward conditions indicated that DBP reactivity was not significantly affected by SC.

### **Post-task Motivation**

The one-way between subjects ANOVA to compare the effect of SC on post-task total health motivation in the neutral, upward and downward conditions indicated that post-task total motivation did not significantly differ at the  $p < .05$  level for the three SC conditions.

### **Post-task self-rated health**

The multinomial logistic regression to compare the effect of SC on post-task self-rated health in the neutral, downward SC and upward SC conditions indicated that post-task self-rated health did not significantly differ at the  $p < .05$  level for the three conditions.

### **Hypothesis 2**

*Hypothesis 2: Participants in upward SC and downward SC groups will report a change in their health-motivation and SRH from pre-task (before SC feedback) to post-task (post SC feedback).*

*2a. Participants in the downward SC group will report a decrease in health motivation and increase in SRH.*

### **Changes in health motivation from pre-task to post-task**

Pre-task total motivation scores in the neutral, downward SC and upward SC conditions did not vary significantly and were normally distributed. The 3x2 repeated measures ANOVA to compare the effect of SC on change in total motivation across the three conditions indicated a significant interaction effect of SC condition and time (pre-task to post-task) on change in total motivation scores,  $F(1, 62) = 7.36, p < .01$ .

Because a significant main effect for SC condition on change in motivation from pre-task to post-task was observed, one-way repeated measures ANOVAs were computed to assess changes in motivation within each of the neutral, downward SC and upward SC conditions. While the neutral SC condition was not hypothesized to impact changes in motivation, this condition was explored when there was a significant effect of SC condition on change in motivation.

The one-way repeated measures ANOVA to evaluate change in motivation within each condition indicated a significant increase in total motivation score from pre-task to post-task in the downward SC condition,  $F(1,23) = 4.69, p < .05$ , and a significant decrease in total health motivation scores from pre-task to post-task for participants in the neutral condition,  $F(1,24) = 9.41, p < .01$ . No significant change in total health motivation scores was observed at the  $p < .05$  level for participants in the upward SC condition.

### **Changes in self-rated health**

Pre-task self-rated health and post-task self-rated health in the neutral, downward SC and upward SC conditions did not vary significantly and all significantly deviated from normal. After multiple transformations, data still significantly deviated from normal. In order to compute the 3x2 repeated measures ANOVA, SRH change scores were calculated for all participants. Change scores in the neutral, downward SC and upward SC conditions did not vary significantly and were normally distributed. The 3x2 repeated measures ANOVA indicated no effect of SC condition on change in self-rated health at the  $p < .05$  level.

### **Hypothesis 3**

*Hypothesis 3: Adjusting for SC orientation and subjective social status will moderate associations between SC and reactivity, health motivation and self-rated health.*

To evaluate moderation effects, two interaction terms were created: [subjective social status \* SC condition] and [SC orientation \* SC condition]. Hierarchical multiple regressions were computed.

### **Effects of Subjective Social Status**

#### *Reactivity*

To test whether subjective social status moderates the relationship between SC and change in health motivation, hierarchical multiple regression analysis using the interaction term subjective social status\*SC condition were utilized. In block 1, baseline reactivity, age, gender, BMI and subjective social status were included. The subjective social status\*SC condition interaction term was entered in block 2.

**HR reactivity.** Results of the hierarchical multiple regression indicated that the interaction effect of SC condition and subjective social status on HR reactivity was not significant at the  $p<.05$  level.

**SBP reactivity.** Results of the hierarchical multiple regression indicated that the interaction effect of SC condition and subjective social status on SBP reactivity was not significant at the  $p<.05$  level.

**DBP reactivity.** Results of the hierarchical multiple regression indicated that the interaction effect of SC condition and subjective social status on DBP reactivity was not significant at the  $p<.05$  level.

### *Motivation*

To test whether subjective social status moderates the relationship between SC and change in health motivation, a hierarchical multiple regression analysis was conducted. In the first step, two variables were included: SC condition and subjective social status. These variables accounted for a significant amount of variance in change in health motivation,  $R^2=.17$ ,  $F(2,63) = 7.6$ ,  $p<.05$ . The SC condition subjective social status interaction term was added to the model in step 2. While this model was significant,  $R^2=.17$ ,  $F(1,62) = 1.3$ ,  $p<.05$ , the incorporation of the moderating variable did not

significantly improve the model,  $t(65) = -1.2, p > .05$ . Thus, subjective social status does not moderate the association between SC and change in health motivation.

### *Self-Rated Health*

Results of the hierarchical multiple regression, (which followed the same procedure as the motivation analysis above) indicated that the interaction effect of SC condition and subjective social status on self-rated health was not significant at the  $p < .05$  level.

### **Effects of SC Orientation**

#### *Reactivity*

To test whether SC orientation moderates the relationship between SC and change in health motivation, hierarchical multiple regression analysis using the interaction term SC orientation\*SC condition were utilized. In block 1, baseline reactivity, age, gender, BMI and subjective social status were included. The SC orientation\*SC condition interaction term was entered in block 2.

**HR reactivity.** Results of the hierarchical multiple regression indicated that the interaction effect of SC condition and SC orientation on HR reactivity was not significant at the  $p < .05$  level.

**SBP reactivity.** Results of the hierarchical multiple regression indicated that the interaction effect of SC condition and SC orientation on SBP reactivity was not significant at the  $p < .05$  level.

**DBP reactivity.** Results of the hierarchical multiple regression indicated that the interaction effect of SC condition and SC orientation on DBP reactivity was not significant at the  $p < .05$  level.

#### *Motivation*



To test whether social comparison orientation moderates the relationship between SC and change in health motivation, a hierarchical multiple regression analysis was conducted. In the first step, two variables were included: SC condition and SC orientation. These variables accounted for a significant amount of variance in change in health motivation,  $R^2=.17$ ,  $F(2,66) = 8.1$ ,  $p<.01$ . The SC condition SC orientation interaction term was added to the model in step 2. While this model was significant,  $R^2=.16$ ,  $F(3,65) = 5.4$ ,  $p<.05$ , the incorporation of the moderating variable did not significantly improve the model,  $t(68) = .47$ ,  $p>.05$ . Thus, SC orientation does not moderate the association between SC and change in health motivation.

### *Self-Rated Health*

Results of the hierarchical multiple regression (which followed the same procedure as the motivation analysis above) indicated that the interaction effect of SC condition and SC orientation on self-rated health was not significant at the  $p<.05$  level.

### **Post-Hoc Analyses**

Total health motivation has a four-factor structure (Cox, 1987): self-determinism in health behavior, self-determinism in health judgment, perceived competence in health matters, and internal-external cue responsiveness. Given significant associations between SC condition and change in motivation, post hoc analyses were conducted on the four factors of motivation to see where observed differences lied. Because the four factors are non-orthogonal, MANOVA was computed to evaluate the effect of SC condition on the four factors of motivation.

### **Post Hoc Analyses: Changes in Motivation**

For all analyses, Levene's test was computed to assess homogeneity of variance ( $p > .05$ ) between the neutral, downward SC and upward SC conditions and K-S test of normality across the three conditions was computed to assess distribution of data. For all factors of motivation, data did not vary significantly. Perceived competence in health matters scores (pre-task and post-task) and internal-external cue responsiveness scores (pre-task and post-task) were not normally distributed due to skewness. However,  $F$ -tests are considered robust to non-normality that is caused by skewness rather than outliers. Thus, the MANOVA was still computed. Table 6 includes a summary of findings of changes in motivation.

MANOVA results indicated that a trend was observed for the effect of SC condition on change in the four factors of motivation from pre-task to post-task,  $F(3,126) = 2.01, p = .05$ . The results of univariate tests indicated that a significant effect of SC condition was observed for change in self-determinism in health behavior,  $F(2) = 10.958, p < .05$  and change in self-determinism in health judgment,  $F(2) = 10.96, p < .01$ . One-way ANOVAs were utilized to evaluate change in self-determinism in health behavior and change in self-determinism in health judgment within each condition.

**Change in self-determinism in health behavior.** The one-way repeated measures ANOVA to evaluate change in self-determinism in health behavior within each condition indicated a significant increase in self-determinism in health behavior scores from pre-task to post-task for participants in the downward SC condition,  $F(1,23) = 7.1, p < .05$ . No significant change in self-determinism in health behavior scores was observed at the  $p < .05$  level for participants in the neutral or upward SC condition.

**Change in self-determinism in health judgment.** The one-way repeated measures ANOVA to evaluate change in self-determinism in health judgment within each condition indicated a significant decrease in self-determinism in health judgment from pre-task to post-task for participants in the neutral condition,  $F(1,24) = 19.83, p < .001$ . No significant change in self-determinism in health judgment scores was observed at the  $p < .05$  level for participants in the downward SC condition or upward SC condition.

## **Chapter IV**

### **Discussion**

The present study utilized a repeated measures experimental design to evaluate the impact of SC on cardiovascular reactivity to stress provocation, health motivation (including self-determinism in health judgment, self-determinism in health behavior, perceived health competence and internal-external cue responsiveness) and self-rated health in a sample of healthy graduate students from a university in the New York metro area. The study sample consisted primarily of Caucasian (83.1%) females (83.1%) with a yearly income of less than \$25,000 (85.5%).

After completing sociodemographic questionnaires, participants were assigned to receive neutral SC feedback, downward SC feedback or upward SC feedback during a speech stressor task designed to evaluate cardiovascular reactivity to stress provocation. Health motivation and self-rated health were assessed pre and post-task in order to evaluate changes associated with SC condition. Baseline analyses among the three experimental groups revealed no significant differences in personality or sociodemographic measures.

### **The Study Sample**

The homogeneity of the study sample can be considered both a strength and a limitation, and is worth mentioning before a discussion of experimental findings. Though a homogenous sample limited variability between groups, results cannot and should not be considered generalizable to minority or clinical populations. While most participants

reported their personal incomes as below \$25,000, it is highly likely that these individuals, whom were enrolled at a private institution, are not representative of a low socioeconomic bracket. Thus, it is important to assert that while findings from the present study are applicable to a healthy, predominantly Caucasian and female graduate student sample, results may not be generalizable to lower socioeconomic or minority groups with chronic medical or psychiatric conditions. As discussed below, these populations are worth exploring in future research efforts.

### **SC and Cardiovascular Reactivity to Stress Provocation**

There was no significant association between SC condition and cardiovascular reactivity to stress. Broadly, it is possible that the stress of the task outweighed the influence of SC; the increasing or buffering effects of SC were not observable at a physiological level. Though there may have been a marginal effect, the influence of SC on stress was not significant. Of note, only one feedback prompt was included within the reactivity change score window. This may explain the limited influence of SC.

Additionally, all of the current reactivity analyses controlled for baseline. Given that this is a high achieving graduate student population, it is possible that the current sample started out at a higher level of stress that limited the amount by which heart rate or blood pressure might increase during the task.

### **SC and Health Motivation**

There was a significant interaction effect of SC condition and time (pre-task to post-task) on change in total health motivation, change in self-determinism in health behavior and change in self-determinism in health judgment. Individuals in the downward SC condition indicated a significant increase in total health motivation characterized by increased self-

determinism in health behavior. Individuals in the neutral condition indicated a significant decrease in total health motivation, characterized by increased self-determinism in health judgment. For assistance with interpretation, Table 5 contains the items that constitute the perceived competence in health matters, self-determinism in health judgment and self-determinism in health behavior subscales. A summary of results for changes in motivation is provided in Table 6. Before further discussion of the impact of SC on health motivation, the background of the HSDI and definition of motivation will be discussed.

### **Theoretical background of the HSDI: Perspectives from Self Determination Theory (SDT)**

The HSDI was derived based on SDT, a theory of motivation centered on fostering natural tendencies towards healthy behavior. SDT conceptualizes motivation as intrinsic— inherent drive that comes from within—or extrinsic—presence of an external reward or incentive that facilitates a behavior (Deci & Ryan, 1985). In health arenas, many interventions have utilized SDT to foster motivation, facilitate behavior change and maintain results. While extrinsic motivation is linked to short-term health behavior change, intrinsic motivation is typically related to maintenance of healthy behaviors (Ryan, Deci & Williams, 2008) and is considered to be an essential component of successful and prolonged behavior change.

SDT theorists assert that increased intrinsic motivation is facilitated by competence (self-efficacy) and autonomy. Broadly, processes that enhance feelings of competence while maintaining individuals' sense of autonomy are likely to increase intrinsic motivation (Ryan & Deci, 2000). Relevant to the current study, there is empirical support for the association

between changes in perceived competence and provision of feedback during or following a task (Harackiewicz, 1989).

### **Downward SC and Increased Intrinsic Health Motivation**

Generally, positive affect induced by downward SC is likely to bolster a sense of perceived competence and facilitate increases in intrinsic motivation. Though there is a paucity of research in this area, downward SC has been linked to increased competence and, subsequently, increased intrinsic motivation (Elliot et al., 2000). In the current study, participants in the downward SC condition received downward SC feedback that was meant to convey a higher level of health and stress management ability, likely leading to increased competence. Though marginally significant, results indicated increased perceived competence in health matters for individuals receiving downward SC feedback.

Further examining the current results, individuals in the downward SC condition exhibited a significant increase in self-determinism in health behavior. Looking at these items (Table 5), it is likely that being told that others were less relaxed, less able to manage stress, etc., increased participants' confidence in their health knowledge. In turn, this created a sense of increased competence that decreased the need for external influences on health decision-making and increased intrinsic motivation.

***Level of aspiration.*** Level of aspiration is an additional mechanism that may explain the association between downward SC and increased intrinsic motivation. As described in the introduction to this paper, level of aspiration is the idea that the ideal or goal for any behavior or ability is determined via comparisons with others' behaviors and abilities. Empirically, level of aspiration has been linked to motivation (Goethals & Darley, 1977) and performance feedback (Mezias, Chen & Murphy, 2002), with downward SCs likely to elicit lower levels

of aspiration and increase individuals' sense of competence about their current abilities. In the present study, lower levels of aspiration (e.g., lower standards of health, stress management, ability to relax and ability to recover) established via downward SC feedback may have facilitated feelings of competence and culminated in increased intrinsic motivation.

### **Neutral SC: Impacts on total health motivation and self-determinism in health judgment**

Neutral SC feedback was associated with a significant decrease in total health motivation (more extrinsic motivation) and self-determinism in health judgment. According to literature, uncertainty is associated with elevations in cognitive and physiological indices of stress and anxiety (Hirsh, Mar & Peterson, 2012). Thus, it is likely that neutral, non-directional feedback established an uncertain and ambiguous environment that elevated anxiety, lowered feelings of competence, and caused individuals to question their confidence in health decision-making and general health matters. In turn, this contributed to an extrinsic motivational style where individuals indicated a preference for the opinions of third parties (doctors and nurses) over personal opinion. Generally, it may be concluded that a paucity of concrete, directional feedback causes one to question one's own knowledge, actions, and competence. Therefore, individuals are more likely to seek the opinions of third parties before engaging in any type of health behavior.

### **The Role of Subjective Social Status and SC Orientation**

Neither subjective social status nor SC orientation moderated associations between SC and motivation.

***Subjective social status.*** Subjective social status, perception of one's relative position in society, is an abstract concept that is thought to encapsulate constructs including



socioeconomic status (occupation, income, feeling of financial security), self-efficacy, self-concept (satisfaction with standard of living), race and ethnicity (Singh-Manoux, Adler & Marmot, 2003; Wolff, Acevedo-Garcia, Subramanian, Weber & Kawachi, 2010). In this relatively homogeneous sample, there was not a wide range of variability within subjective social status (6.7,  $SD = 1.5$ ), partially explaining why there was no moderating effect.

***SC orientation.*** The lack of impact of SC orientation on associations between SC and motivation is more difficult to explain. Of note, SC orientation was conceptualized as an individual trait that exists independent of environmental situations. The current study did not seek to manipulate SC orientation, but assumed that individuals entered into their respective SC condition with a preexisting sensitivity to SC information. Given that the experimenter and participants were graduate student peers, it is possible that the unique experimental environment manipulated SC orientation. Thus, original conceptualizations of SC orientation as a trait may not have been accurate. The potential manipulation of sensitivity to SC orientation is worth exploring in future studies.

#### **Lack of Impact on SRH**

Though SRH is generally considered robust, previous studies have found it to be sensitive to changes in mood states (Croyle & Uretsky, 1987). While likely impacting individual's perceived competence and physiological responses to stress, SC feedback probably did not change participants' mood states and overall health evaluation was not affected by the SC feedback provided in the current study. It is also possible that because feedback was tailored heavily to performance and stress-management, the experimental design did not facilitate the reevaluation of general health that an observable change in SRH would require.

## **Implications**

### **Impact of Ambiguous Information**

The current study lends strong empirical support for the negative impact of ambiguous information on intrinsic motivation. Generally, feedback that provides concrete information, regardless if that information is negative (upward SC) or positive (downward SC) is effective in fostering intrinsic motivation and increasing one's sense of competence.

### **Practical Implications**

Broadly, the current study supports the impact of SC on motivation; SC is an important source of information that complicates the dissemination of objective information in medical or interpersonal settings. Thus, healthcare providers, professors, and other individuals providing feedback should account for the influence of SC on information processing. For example, proactively accounting for the presence and impact of SC, by either providing concrete comparison information or directly exploring impacts of SC information on motivation, might provide for better control of individual reactions to feedback.

### **Implications for Health Settings**

Expanding beyond the laboratory setting, providers can begin to recognize that SC processes may impact patient's intrinsic motivation, and that this impact has different ramifications in different populations. Beyond objective information, social comparison provides individuals with additional information about their health status. For obese individuals who are provided objective information about their weight, SC processes may increase confidence in one's own health knowledge, limiting the impact of objective information. On medical rehabilitation units, information derived from SC may trump objective progress feedback, impacting patients' performance across therapeutic modalities.

As a caveat, SC should be explored in the aforementioned (and other medical) populations before any finite conclusions can be made.

### **Intrinsic and Extrinsic Motivation in the Current Sample**

As mentioned above, the current study included a healthy sample without chronic medical conditions. Thus, for individuals in the present study, perceived health competence is likely to match actual health competence; one's ideas about health standards likely align with the objective health standards that are advocated by health professionals. Thus, in the current sample, the association between downward SC and increased intrinsic motivation is positive and will likely lead to the maintenance of *positive* health behaviors. However, it is important to consider this same association in less healthy populations that lack an understanding of positive health behaviors. In these cases, increased confidence in one's health judgments and health behaviors (intrinsic motivation) may serve to maintain negative health behaviors that do not align with objective standards of health and wellness.

### **Behavioral Medicine**

According to the Society of Behavioral Medicine, behavioral health is an interdisciplinary field centered on the biopsychosocial factors that contribute to the etiology and course of illness (Society of Behavioral Medicine, 2014). Predicated on this definition, the task of unearthing the psychological factors that impact social and physiological functioning has become a central focus of modern health policy (Estabrooks et al., 2011). On micro (medical practice) and macro (public health) levels, better understanding the psychological correlates of health behavior, perceived competence and health motivation will likely facilitate more effective prevention and intervention efforts.

## **Health Communication**

SC is considered a fundamental and ubiquitous psychological process that occurs frequently in daily life (Corcoran, Crusius & Mussweiler, 2011; Pinkus, Lockwood, Schimmack & Fournier, 2008). More recently, SC has been conceptualized as a relevant component of health communication (Suls & Bruchman, 2013) that impacts perceived risk, worry, and screening and protective health behaviors (Suls, 2011). Messages conveyed from medical providers or through public health interventions are inevitably subject to individual interpretations; SC is an integral component of this interpretive process and impacts related constructs including motivation, willingness, and risk perception (Bigman, 2014).

Health messages are often targeted towards a specific sociodemographic group or clinical population. Thus, advanced knowledge of the ways that SCs operate in different groups will increase the efficacy of these communication efforts. Communicating negative or positive health information will have different manifestations in different groups. Considering level of aspiration, SC processes might also establish different health norms in different groups. From the motivational perspective, directional SCs are likely to impact individual motivation to engage in health behavior change. Generally, medical and psychological providers and public health interventionists equipped with a nuanced knowledge of SC will be more effective at disseminating efficacious health communication to target populations.

### **Generalizability of the Current Results**

As mentioned, it is important to note that while results may be typical of a healthy higher SES sample, SC may operate differently in different populations. Given established associations between SC and depression, decreased job satisfaction, anxiety, and low self-

esteem, and decreased self-rated health (Butzer & Kuiper, 2006; White, Langer, Yariv & Welch, 2006; Swallow & Kuiper, 1992; Gibbons & Buunk, 1999; Carrieri, 2010), it is possible that the effects of SC may be more pronounced in less healthy populations experiencing higher levels of medical or psychological distress. Further, it is postulated that SC operates differently depending on socioeconomic group (Sing-Manoux et al., 2007). As discussed above, the current sample was likely to have higher baseline levels of autonomy, somewhat accounting for the increases in intrinsic motivation secondary to downward SC feedback.

### **Future Directions**

SC has become increasingly relevant in health contexts, where researchers are tasked with operationalizing SC, understanding how it occurs in vivo, and parsing out the affective and behavioral effects of directional SCs at varying frequencies. Generally, the complexity of SC is rooted in its reciprocal relationship with environmental and individual characteristics; SC effects and is effected by social environments, ambiguity and personality.

### **Contributions to Extant Literature**

As a controlled experiment, the current study is useful in facilitating an improved conceptual understanding of SC at a basic and fundamental level. This type of understanding is important as a foundation for the study of any social psychological phenomena. Potentially, the complex relationship between SC and mental and physical health variables can begin to be understood via laboratory experiments—i.e., the current study—that attempt to simplify complex social psychological phenomena.

## SC Research

According to Buunk & Gibbons (2007), SC has evolved from a social psychological theory into an independent field of study with unique impacts in psychological, cognitive and physiological spheres. SC measures have recently been validated in German (INCOM; Schneider & Schupp, 2014) and Spanish (SC in Chronic Illness Scale; Terol, Lledo & Quiles, 2014) speaking populations, reflecting global respect for the diverse and robust impact of SC on individual functioning in clinical and non-clinical populations. With the rapid onset and evolution of social networking (e.g., Facebook), it is likely that SC will take on an even larger role in impacting physical and psychological functioning, further meriting the study of SC (Lee, 2014). Thus, understanding the emotional, motivational and behavioral impact of SC will become increasingly valuable and relevant.

As previously mentioned, SC remains a multifaceted and complex construct that is difficult to operationalize and, consequently, difficult to evaluate empirically. Further, it is likely to operate differently in different populations, limiting the generalizability of results. The current study was unique in its experimental manipulation of SC. Future research efforts that can apply this experimental approach to more diverse and larger populations would be useful in facilitating better understanding of how SC operates in different populations. More specifically, it would be useful to directly measure self-efficacy in order to get a sense of baseline self-confidence that may be impacted by SC feedback. Finally, future studies of SC should account for subjective social status and SC orientation in both study design and results interpretation. SC and subjective social status are two individual difference variables that greatly impact effects of SC information.

### **Strengths of the Current Study**

The impact of individual differences and environmental variation are major factors complicating the understanding of the impact of SC in daily life. While also adjusting for individual differences in statistical analyses, the current study utilized a quasi-randomized experimental design that provided the same environment for all participants, allowing for the isolation of SC as the main independent variable. Additional SC variables controlled for included: 1) SC frequency: Each participant received the same number of feedback prompts, 2) Reference group: All participants were provided with the same reference group that consisted exclusively of sociodemographically similar others, 3) Particularistic SC: reference groups contained exclusively similar others. Generally, experimental conditions allowed for the isolation of SC direction as the main variable of interest.

### **Limitations of the Current Study**

Firstly, it is important to note that a sequential assignment strategy was utilized in order to ensure equal numbers of participants in each comparison condition. Thus, the current study is considered a quasi-experimental. Methodologically, the current study was predicated on the idea that participants were engaging in a contrast approach; feedback was designed to elicit downward-contrast or upward-contrast SCs. Moving forward, better more targeted control of variations in this approach would have been useful in ensuring that the validity of directional feedback. Given significant impacts of SC on changes motivation, a measure of perceived competence (e.g., self-efficacy) would have been useful in better understanding these associations. The direct impact of downward SC on perceived competence could have been assessed, providing support for the above discussion of the mechanisms responsible for the positive impact of downward SC and upward SC on intrinsic motivation. Considering the

current sample, the use of graduate students attuned to research methodology and the use of deception may have decreased the believability of SC feedback. Of note, data from the manipulation check suggest that on average, participants reported that they focused on the SC feedback a 4.5 out of 7. Thus, it is possible that the current results may underrepresent the impact of SC.

Finally, all participants were interviewed by a graduate student peer. Being judged by a similar other may have buffered against (increased sense of familiarity) or exacerbated (less emotional distance from the interviewer) the stress resulting from the speech task. Delivery by a peer may have also been impacted the believability and validity of SC feedback. Reciprocally, the experimenter's delivery of feedback and speech judgments may have been effected by communication with similar others.

### **Conclusion**

The current study employed a repeated measures design to study the impact of direction of SC on cardiovascular reactivity to stress, health motivation and self-rated health. SC was found to impact motivation. Downward SC was linked to increases in intrinsic motivation, highlighted by increased confidence in knowledge about current health behaviors. Neutral SC was associated with decreased health motivation, attributed to decreased confidence in one's knowledge about health and health behaviors.

Though previous literature has attempted to delineate the different effects of upward versus downward SC, the current study also highlighted the relevance of comparison to neutral (or lateral) others, which was associated with motivational outcomes. Neutral SCs appeared to foster an ambiguous environment that facilitated a lack of confidence in one's own health knowledge and decreased intrinsic motivation.



Given the ubiquity of SC in daily life, the current findings have implications for prevention and intervention at the micro and macro levels. Better understanding of the personality and demographic factors related to SC will likely improve the efficacy and specificity of intervention efforts. The current results are also relevant for health communication; successful health communication necessitates an understanding of the SCs that impact processing of health information.

Given that results of the current study apply to a homogeneous sample of mostly white, female graduate students, any generalization or extrapolation of the current results should account for this caveat. In summation, the ubiquity of SC information and its significant impact on health motivation advocates that health psychology researchers continue to attempt to parse out the different components of this multifaceted and complex construct.

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**Tables**

Table 1: The Identification-Contrast Model

	<i>Upward-Contrast</i>	<i>Upward-Identification</i>	<i>Downward-Contrast</i>	<i>Downward-Identification</i>
<b>Emotion</b>	Negative	Positive	Positive	Negative
<b>Behavior</b>	Positive	Negative	Negative	Positive

Table 2: Descriptive Statistics for the Study Sample (N = 78)

Variable	Weighted Mean or Proportion
Female	83.1
Age	$\mu = 26.4$ , SD = 3.53
Race	
White	83.1
Black or African American	3.9
American Indian or Alaska Native	2.6
Asian	10.4
Personal Income	
Under \$25,000	85.5
\$25,000 - \$49,999	10.5
\$50,000 - \$74,999	2.6
\$75,000 - \$99,999	0
\$100,000+	1.3
Personal Education	
College degree	8.5
Some graduate school	50.0
Graduate Degree	35.4
BMI	$\mu = 22.57$ , SD = 3.69

Table 3: Descriptive Statistics by SC condition

	Neutral (N = 25)	Upward SC (N = 27)	Downward SC (N = 26)
<b>Gender</b>			
Female	70%	92%	88%
<b>Age</b>	$\mu = 27.29$ ; SD = 5.16	$\mu = 26.52$ ; SD = 2.63	$\mu = 25.40$ ; SD = 3.58
<b>Marital Status</b>			
Single	70.8%	66.7%	84%
Married	16.7%	25.0%	16%
Divorced	4.2%	4.2%	0%
Living as married	8.3%	4.2%	0%
<b>Race</b>			
White	83.3%	72%	92%
Black/African American	4.2%	8%	0%
American Indian or Alaska Native	4.2%	0%	4%
Asian	8.3%	20%	4%
<b>Personal Income</b>			
Under \$25,000	83%	83.3%	88%
\$25,000 - \$49,000	8.3%	16.7%	8%
\$50,000 - \$74,999	8.3%	0%	0%
\$75,000 - \$100,000	0%	0%	0%
\$100,000+	0%	0%	4%
<b>Personal Education</b>			
College degree	8.3%	8%	12%
Some graduate school	62.5%	44%	56%
Graduate degree	29.2%	48%	32%
<b>Subjective Social Status</b>	$\mu = 7.17$ ; SD = 1.47	$\mu = 6.56$ ; SD = 1.71	$\mu = 7.7$ ; SD = 1.51
<b>HSDI</b>			
Total Motivation	$\mu = 64.58$ ; SD = 8.33	$\mu = 63.73$ ; SD = 5.63	$\mu = 62.72$ ; SD = 6.97
Self-determinism in health judgment	$\mu = 18.72$ ; SD = 3.05	$\mu = 18.76$ ; SD = 2.34	$\mu = 18.28$ ; SD = 2.5
Self-determinism in health behavior	$\mu = 20.24$ ; SD = 2.89	$\mu = 19.92$ ; SD = 2.51	$\mu = 19.52$ ; SD = 2.45
Perceived competency in health matters	$\mu = 11.84$ ; SD = 2.13	$\mu = 11.0$ ; SD = 1.97	$\mu = 11.44$ ; SD = 2.23
Internal external cue responsiveness	$\mu = 13.79$ ; SD = 2.15	$\mu = 14.04$ ; SD = 1.75	$\mu = 13.48$ ; SD = 1.63
<b>SRH</b>	$\mu = 6.88$ ; SD = 1.22	$\mu = 7.00$ ; SD = 1.15	$\mu = 7.42$ ; SD = 1.02
<b>BMI</b>	$\mu = 22.58$ ; SD = 3.19	$\mu = 23.59$ ; SD = 4.9	$\mu = 21.82$ ; SD = 2.77
<b>CES-D</b>	$\mu = 30.05$ ; SD = 6.66	$\mu = 28.04$ ; SD = 5.87	$\mu = 29.12$ ; SD = 6.05
<b>STAI</b>	$\mu = 38.26$ ; SD = 7.61	$\mu = 35.33$ ; SD = 7.18	$\mu = 35.72$ ; SD = 8.67
<b>INCOM</b>	$\mu = 40.02$ ; SD = 7.0	$\mu = 39.28$ ; SD = 5.75	$\mu = 39.96$ ; SD = 5.67

Table 4: Feedback Prompts.

		Feedback Other people like you who we have interviewed were/had...		
Chronology	Dimension	<i>Upward SC</i>	<i>Neutral SC</i>	<i>Downward SC</i>
1 (Post-Baseline)	Pre-Task Relaxation	<b>more relaxed than you were</b>	<b>just as relaxed as you were</b>	<b>less relaxed than you were</b>
2 (Post-Speech)	Delivery	<b>better delivery than you did.</b>	<b>the same delivery as you did</b>	<b>worse delivery than you did</b>
3 (Post-Speech)	Poise	<b>more poised than you were.</b>	<b>just as poised as you were</b>	<b>less poised than you were</b>
4 (Post-Speech)	Content	<b>better able to describe their stressor compared to you.</b>	<b>described their stressor similarly to the way that you did</b>	<b>not as good at describing their stressor compared to you</b>
5 (Post-Recovery)	Recovery	<b>more recovered than you are right now.</b>	<b>just as recovered as you are right now</b>	<b>less recovered than you are right now</b>

Table 5: HSDI subscales

Factor	Item
Self-determinism in health judgment	<ul style="list-style-type: none"> <li>• <i>Only my doctor knows if I'm in good health</i></li> <li>• <i>Whatever the doctor suggests is ok</i></li> <li>• <i>I more often agree with the doctor and nurses instead of my own judgment</i></li> <li>• <i>I do things to help my health without a doctor or nurse's input</i></li> <li>• <i>What the doctor thinks is more important than what I think</i></li> </ul>
Self-determinism in health behavior	<ul style="list-style-type: none"> <li>• <i>I know what to do without contacting my doctor</i></li> <li>• <i>I know without someone else telling me when I'm in good health</i></li> <li>• <i>I more often agree with my doctor and nurse instead of my own judgments (reverse scored)</i></li> <li>• <i>My own ideas are better than a doctor</i></li> <li>• <i>I know without my doctor that I'm doing the right things for my health (reverse scored)</i></li> <li>• <i>I know what I'm doing when I'm taking care of my health</i></li> </ul>



Table 6: Impact of SC on motivation

	Total health motivation	Self-determinism in health judgment	Self-determinism in health behavior
Effect of SC condition on change in motivation	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>
Downward SC	<b>Increase</b>	X	<b>Increase</b>
Neutral SC	<b>Decrease</b>	<b>Decrease</b>	X
Upward SC	X	X	X

## Figures

Figure 1: Reciprocal relationship between SC and cognition, emotion and behavior

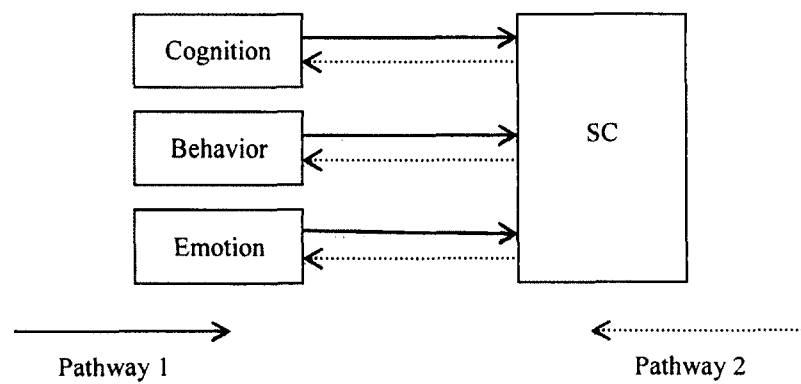
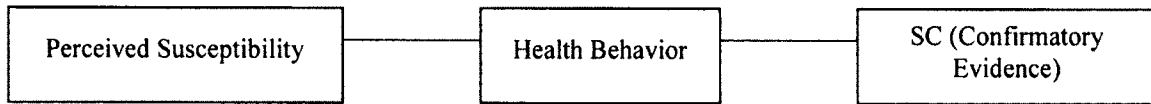


Figure 2: Pathways describing the relationship between SC and health behavior

Pathway I



Pathway II

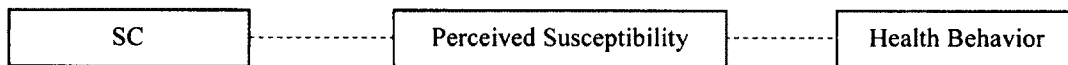


Figure 3: Reciprocal relationship between SC and Subjective Health

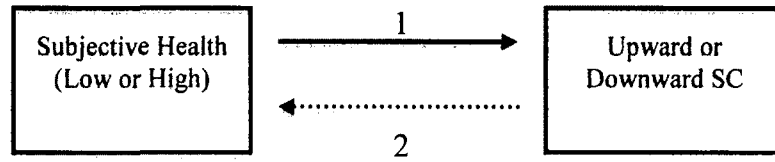


Figure 4: SC as a stressor &amp; buffer

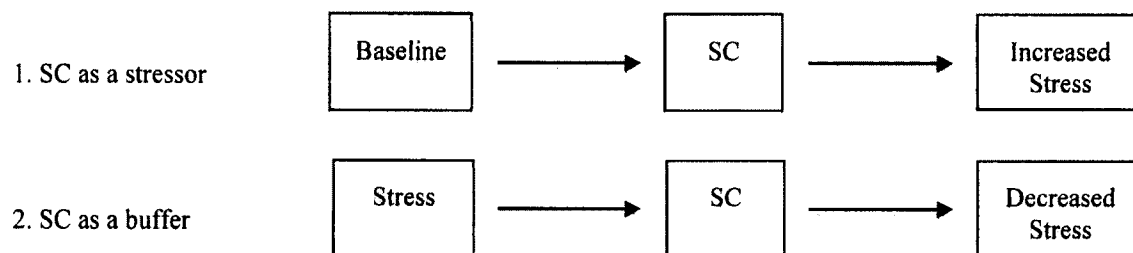


Figure 5: Schematic of the experimental procedure.

