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Does Socioeconomic Status Moderate the Link Between Daily, Received Social Support and Daily Psychological and Physiological Outcomes?

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2017

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Peer reviewed|Thesis/dissertation

UNIVERSITY OF CALIFORNIA,  
IRVINE

Does Socioeconomic Status Moderate the Link Between Daily, Received Social Support and  
Daily Psychological and Physiological Outcomes?

DISSERTATION

submitted in partial satisfaction of the requirements  
for the degree of

DOCTOR OF PHILOSOPHY

in Psychology and Social Behavior

by

Emily Diane Hooker

Dissertation Committee:  
Associate Professor Belinda Campos, Chair  
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Professor Karen Rook  
Associate Professor Sarah Pressman

2017



## **DEDICATION**

I dedicate this dissertation to my dad and my husband,

David Hooker and Nicholas Tate,

whose skillful support  
inspired my research.

Thank you for expert-level social support.

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## ACKNOWLEDGEMENTS

I would like to express my sincerest gratitude for those on my dissertation and dissertation advancement committees: Dr. Belinda Campos, Dr. Sally Dickerson, Dr. Sarah Pressman, Dr. Karen Rook, Dr. Paul Piff, Dr. Kristin Turney, and Dr. Dominik Schoebi. I am honored to have worked with these individuals and am grateful for the time and guidance they have provided on this project.

I would like to extend a special thank you to Dr. Schoebi and Tamara Luginbuehl for allowing me to work with their data and for making themselves available to answer all of my questions.

I would also like to thank Dr. Lesa Hoffman for offering a great deal of her time to guide me through the analyses for this project.

I would like to thank the Golden Key International Honour Society, the University of California, Irvine Graduate Division, and the National Science Foundation Research Fellowship Program for funding my graduate education. I would also like to thank the International Association for Relationship Research for a grant supporting this research.

--

At UCI, I am fortunate to have worked with a “dream team” of advisors. Support from Dr. Dickerson, Dr. Campos, and Dr. Pressman meant that I was never on my own—there was always someone looking out for my best interests and for opportunities to help me thrive. Sometimes the most important thing a mentor can do is have faith in their students, and I will finish graduate school because they believed I could. Through their examples, I am a better mentor and a better person. Thank you all for everything you’ve done for me.

Sally, I cannot tell you how grateful I am that I was able to keep working with you long-distance. I have been the beneficiary of your brilliant mind and thoughtful feedback, and throughout my graduate career, you have been a kind and calming voice amidst the difficulties of graduate school. Your confidence in me helped me persevere through the most challenging years of my graduate career.

Belinda, it feels serendipitous that I ended up in your path, and I could not be more appreciative that I did. Your thoughtful approach to research on cultural variation in close relationships has been the springboard from which I was able to pursue research on SES. Thank you for giving me the confidence to share my perspective.

Sarah, I don’t think either of us could have guessed that you would both oversee my honors thesis and serve on my dissertation committee, but it has been a gift to have your support every step of the way. I will forever be indebted to you for the opportunities and support that you provided me as an undergrad—opportunities that helped me get into graduate school and shaped my program of research.

I would also like to thank Dr. Rook, Dr. Roxane Silver, and Dr. Peter Ditto for their classes, which have been invaluable in the development of my work. I would also like to thank you all for warmly welcoming me to UCI and providing me mentorship along the way.

My research has been supported by many research assistants, and I would like to thank them for all their hard work. I would especially like to thank Wenbo Lin, Alicia Wang, Robert Stevenson, and Marzena Hiler for their leadership and commitment to my projects.

I would also like to thank the mentors and organizations at the University of Kansas and elsewhere who prepared me for graduate school. This list includes Dr. Robert Rodriguez, Allyson Flaster, Mulu Negash, and Dr. Ngondi Kamatuka of the McNair Scholars Program; Dr. Kathleen McCluskey-Fawcett; Dr. Paul Atchley; Dr. Monica Biernat; and Joddee Hobbs.

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I also want to thank all of my friends for their support. I would especially like to thank Sharon Shenhav, my dissertation wife, Arpine Hovasapian, Raquel Tatar, and Cory Clark. Your support got me through the most challenging years of graduate school, and there's no way to repay you for everything you've done for me. Thank you for your kindness and compassion and for brightening my day when I needed it the most. I would also like to thank Chris Marshburn for being the best "frientor" anyone could ask for and Lauren Davis for her support as my first work wife.

Finally, I would like to thank my family—my parents, my brother, my husband and his family, my grandparents, and my aunts and uncles—for a lifetime of love and support.

Dad, you've made sacrifices my entire life to give me every opportunity to succeed and make a life for myself. Thank you for everything you've done for me and for always being there to listen when I needed it.

Nick, since I started undergrad, your support has given me the strength I needed to get through school, and I want to thank you for that. I also want to thank you for your unending patience throughout this dissertation process. It's now my turn to do the dishes for at least a few months.

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Pressman, S. D., & Hooker E. D. (2012, *revised 2016*) Happiness and health. In M. Gellman and J. R. Turner (Eds.), *Encyclopedia of behavioral medicine*. New York, NY: Springer.

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  - Planned, organized, and chaired a lunchtime roundtable event open to all attendees entitled, “Scientific Integrity and Replication in Psychosomatic Medicine.”
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- American Psychosomatic Society
- International Association for Relationship Research
- Golden Key International Honour Society
- Phi Beta Kappa
- Psi Chi International Honor Society

## **ABSTRACT OF THE DISSERTATION**

Does Socioeconomic Status Moderate the Link Between Daily, Received Social Support and Daily Psychological and Physiological Outcomes?

By

Emily Diane Hooker

Doctor of Philosophy in Social Ecology

University of California, Irvine, 2017

Professor Belinda Campos, Chair

Despite the theorized benefits of receiving social support, an increasing number of studies have demonstrated that when individuals receive support, they are more likely to report poorer psychological outcomes and/or exhibit less adaptive physiological activity. Understanding these unexpected effects of receiving social support may require careful consideration of the sociocultural context that shapes these interactions (Berkman, Glass, Brissette, & Seeman, 2000). Social class, which is the social status individuals are afforded based on their income, education, and employment relative to others in their society (or socioeconomic status; SES), is one form of culture that exerts a powerful influence on thinking, feeling, and behaving (Kraus, Piff, Mendoza-Denton, Rheinschmidt, & Keltner, 2012; Stephens, Markus, & Phillips, 2014). Although understudied, it is possible that a greater need for resources, which characterizes lower SES contexts, may result in more frequent social support exchanges. As result, social support receipt and provision may be more normative and appreciated in these communities. My dissertation examined the relationship between daily, received social support and daily, psychological, physiological, and relational outcomes.

In two daily diary studies, SES was tested as a moderator in the relationships between daily, received social support and psychological, physiological, and relational outcomes. In Study 1, undergraduate students at a large research institution reported daily, received social support each evening for three days and psychological stress responses and diurnal cortisol throughout each day. Swiss couples from the community participated in Study 2. For 14 days, both members of the couple reported (1) their received and provided social support experiences after interacting with their partners for up to four times per day, (2) their psychological stress responses four times per day, and (3) their relationship satisfaction once per day (in the evening).

I found that SES moderated the association between received support and psychological and physiological outcomes. In both studies, the receipt of support (or visible support in study 2) was associated with positive psychological and relational outcomes, but not physiology. Subjective SES, however, moderated the association between received support and diurnal cortisol in Study 1. In this study, less received support was associated with a sleeper slope in diurnal cortisol in those who reported higher subjective SES. Furthermore, in Study 2, men who reported lower objective or subjective SES, reported lower daily psychological stress responses and higher relationship satisfaction when they received more visible support. Together, these findings suggest that SES may moderate the association between received support and psychological and relational outcomes. Finally, these results provide additional evidence for the benefits of receiving social support.

## CHAPTER 1: INTRODUCTION

Over a century of research has shown that social relationships are an essential and basic part of human life (Baumeister & Leary, 1995; Beckes & Coan, 2011). Social relationships can facilitate daily well-being and thriving, as well as serve as a resource during stressful events (Cohen & Wills, 1985; Feeney & Collins, 2014). Research consistently shows that deficits in needed or desired social relationships are associated with psychological and physiological costs (Berkman, 1995; Holt-Lunstad, Smith, & Layton, 2010; House, 2001; Pressman et al., 2005). Receiving social support (i.e., any aid, emotional or otherwise, that may help individuals cope) is typically thought to be one possible factor that may contribute to good health for those with better social relationships. Some research in this area finds that, for example, received social support is associated with more positive mood, fewer depressive symptoms, and lower anxiety (Biehle & Mickelson, 2012; Rafaeli et al., 2008). However, an increasing number of studies have now demonstrated that when individuals receive support, whether in laboratory settings or in their daily lives, they are more likely to report poorer psychological outcomes and/or exhibit less adaptive physiological activity. For example, if one member of a couple reports receiving support from their partner, they may also be more likely to report worse psychological well-being. This raises the question: In what circumstances does received support confer benefits?

Understanding the unexpected, negative effect of receiving social support may require careful consideration of the sociocultural context that shapes these interactions (Berkman et al., 2000). Social class, which is the social status individuals are afforded based on their income, education, and employment relative to others in their society (or socioeconomic status), is one form of culture that exerts a powerful influence on individuals. Lower socioeconomic status (SES) can influence a wide variety of social psychological processes, including prosocial

behavior (Piff, Kraus, Cote, Cheng, & Keltner, 2010), emotional expression (Park, Kitayama, Markus, et al., 2013), and situational attributions (Kraus, Piff, & Keltner, 2009). Thus, the socioeconomic background of a social support recipient may be an important factor when considering the conflicting findings in the area of received social support. However, participants' SES has not been considered as a potential moderator that may be associated with correlates of received support. Moreover, SES is often not reported in papers on received social support. When it is reported, it appears that many studies of received social support have been conducted predominantly with participants who tend to be of higher SES (e.g., college graduates, homeowners), which is a common problem in social psychological research (Henrich, Heine, & Norenzayan, 2010). Not surprisingly, very little research has examined variation in social support processes by SES. Does SES change the experience of receiving social support in daily life in such a way as to alter psychological, physiological, or relational outcomes? Lower SES is strongly associated with poorer psychological and physiological well-being (Adler, 2009). If it can shape support experiences, are these experiences influential enough to offset the psychological and physiological risks otherwise posed by lower SES? The current two studies examined the role of SES as a moderator of the relationship between daily, received social support and stressor appraisals, psychological distress, physiological activity, and relationship satisfaction.

### **Why Do Social Relationships Matter?**

#### **Social relationships and well-being.**

Humans are social animals with the need to form and maintain interpersonal relationships (Baumeister & Leary, 1995). This need is believed to have evolved over human history because social relationships provided protection and assistance in the face of threat (Beckes & Coan,

2011). Social connection with others is a basic and necessary component of human life (Beckes & Coan, 2011). Social relationships permeate all aspects of our lives and influence both our psychological and physiological well-being. Relationships with friends, family, colleagues, and acquaintances can “promote thriving through full participation in life opportunities for exploration, growth” and through support during stressors or adverse events (Feeney & Collins, 2014, p. 6). The influence of social relationships on individuals’ lives is so strong that being socially connected, or integrated into a larger network of individuals, is associated with living longer (Barger, 2013; Holt-Lunstad et al., 2010; House, 2001).

Several decades of research provide evidence for social relationships’ salubrious effects on psychological and physiological well-being (Taylor, 2011). Most notable is the impact of feeling supported (perceived social support) and being socially connected (social integration). For example, feeling supported is associated with lower perceived, chronic psychological stress or strain (Cohen & Wills, 1985), less rumination (Puterman, DeLongis, & Pomaki, 2010), fewer chronic health problems (Park, Kitayama, Karasawa, et al., 2013), and lower allostatic load (Brooks et al., 2014). Similarly, being socially connected or having more social roles is also associated with better psychological and physiological well-being (Barger, 2013; Berkman & Syme, 1979; Holt-Lunstad et al., 2010; House, 2001). Social relationships are believed to affect health in part by influencing individuals’ experiences of stressors (Cohen & Wills, 1985).

### **Social relationships and responses to stress.**

#### ***Responses to stress.***

Understanding the influence of social relationships on stressors requires consideration of how individuals react to stressful events. The experience of stress is determined by how threatened individuals feel when they encounter a stimulus or event and by how able to cope

with it or how in control they feel (Folkman, 1988; Lazarus & Folkman, 1984). The more threat individuals perceive, the fewer resources they believe they have, or the less control they feel they have over the situation, the more psychological and physiological “stress” they will experience. This may include experiencing greater negative emotions, higher blood pressure and heart rate, higher electrodermal activity (i.e., sweat production), and changes in stress-relevant hormones (e.g., cortisol). The stress response is thought to have developed as a way for the body to prepare to fight or flee when faced with threatening events (Cannon, 1932). A moderate number of life stressors may be adaptive in helping individuals learn to better cope with adverse events, but more or continuous experiences of stressors may entail psychological and physiological costs (Seery, Holman, & Silver, 2010). That is, repeated or chronic exposure to stressors may contribute to allostatic load, which is “wear and tear” on physiological systems needed to maintain a healthy body (McEwen, 1998). Strong evidence suggests that the experience of repeated or chronic stressors contributes to wear and tear and poorer health over time (Epel et al., 2004, 2006; McEwen & Seeman, 1999; Segerstrom & Miller, 2012).

To better understand factors that influence how individuals respond to stressors psychologically and physiologically, researchers have often used laboratory tasks to elicit stress responses (Krantz & Manuck, 1984). How individuals respond to these tasks is called “stress reactivity.” The idea underlying this research is that acute stress responses in the laboratory mimic real-life stress responses, and thus, those individuals who show greater stress reactivity in the lab are expected to also show greater stress reactivity outside the lab. Likewise, the types of situations that provoke physiological stress responses in the lab may also do so in daily life. Work in this area has revealed that not all stressors influence psychological and physiological outcomes equally. For example, uncontrollable threats to valued aspects of the self (i.e., social



evaluative threat), are associated with marked increases in the hormone cortisol, which are not observed following all types of stressors (Dickerson & Kemeny, 2004).

### ***Social relationships and stress buffering.***

Through several hypothesized pathways, social relationships may reduce, or buffer, stress responses. First, it has been theorized that social relationships may reduce the perception that potential stressors are threatening or increase the feeling that individuals have the needed resources to cope with the stressors (Cohen & Wills, 1985). As a result, individuals may experience fewer negative psychological and physiological outcomes associated with encountering a stressor (e.g., more negative emotion, greater physiological arousal). In other words, social relationships could buffer individuals' responses to stressors. Neuroimaging work suggests that positive social interactions are associated with activation in brain regions associated with regulating social threat (Eisenberger, Taylor, Gable, Hilmert, & Lieberman, 2007), providing a neural mechanism through which social support may alter threat-related responses. Second, it may also be the case that receiving social support allows individuals to allocate resources to other areas of their life or problems that arise (Fitzsimons & Finkel, 2011), thereby reducing their overall, subjective response to stressors. Third, the receipt of support may help address an immediate need, but it may also contribute to feeling loved, cared for, and supported (Reis & Clark, 2013), which, in turn, may reduce future perceptions of events as threatening. Related work finds that feeling as though your partner is trying to help you has been associated with lower next-day marital tension (O'Brien, DeLongis, Pomaki, Puterman, & Zwicker, 2009) and higher relationship satisfaction (Cohen, Schulz, Weiss, & Waldinger, 2012). By disrupting stress responses, social relationships may have the potential to improve individuals' psychological and physiological well-being.

Decades of research and theorizing have focused on social support's role in modulating stress responses (Berkman et al., 2000; Thoits, 2011). While considerable evidence suggests that *feeling* supported is beneficial, research on *actually receiving* social support is puzzling, with an accumulation of studies finding adverse effects of receiving social support. That is, when people report how supported they feel in general, this tends to be associated with positive psychological and physiological outcomes. However, despite the hypothesized benefits of social support, social support provided in the laboratory or in daily life is often not associated with these positive outcomes. The following sections provide a review of the literature on the correlates of received social support and present SES as one important factor that may contribute to the varied and unexpected findings.

## **Receiving Social Support**

### **What is social support?**

There is no single, agreed-upon definition of social support, but it is generally understood to be some behavior or piece of information that conveys that an individual is cared for, loved, esteemed, and valued, and that the individual belongs to a group (Cobb, 1976). *Perceived* social support is measured by having individuals report on how supported they feel in general. For example, individuals might report on whether or not they felt someone might help them with chores if they were ill. In contrast, *received* support is measured by observing support exchanges in the lab or by recording daily measures of support exchanges. In this case, individuals may simply answer the question: "Did your partner provide you with support?" Both types of support may be informational, instrumental, or emotional (Thoits, 2011). Informational support is the provision of information or advice that may be useful to the recipient. In instrumental support, individuals provide behavioral or material aid (e.g., money, housing, car rides). Finally,

emotional support conveys love, esteem, encouragement, and/or sympathy (Thoits, 2011). Research on dyadic support exchanges (i.e., support measured within pairs of individuals) led to the identification of two distinct types of received social support: visible and invisible (Bolger, Zuckerman, & Kessler, 2000). Visible support is support that the recipient reports receiving from another. In contrast, invisible support occurs when the recipient does not report receiving support, but another person reports providing the recipient with support. For example, partner A reports *not* receiving support, but partner B reports providing support during the same timeframe. In a behavioral observation study of support, behaviors were coded as invisibly supportive if they were subtle, and shifted focus from support provider and support recipient roles (Howland & Simpson, 2010). For example, the support provider may talk about how someone else handled a particular problem when discussing a similar problem with the support recipient (Howland & Simpson, 2010). In sum, social support is a nuanced, dyadic construct that seems to have a meaningful influence on individuals' psychological well-being.

The receipt of social support has been studied in both laboratory and daily-life settings. In-lab studies of support processes allow researchers to more easily collect an array of responses to support receipt and to control (1) the environment prior to support provision (e.g., degree of stressor intensity), (2) the timing of support provision, (3) the support-provider relationship to the recipient, and (4) the nature of the supportive message. Studies of support received in daily life allow researchers to examine within-person fluctuation in real-life received support and the emotional, physiological, and relational correlates of this experience—in addition to testing the between-person relationship of support with these outcomes. As a result, these studies account for between-person, mean differences in received support. Furthermore, for outcomes hypothesized to change over time (e.g., diurnal cortisol, which predictably decreases throughout

the day), daily-life studies of received support can test predictors of *change* in an outcome over time. In both settings, researchers have been able to explore support exchanges generally (with anyone) and also between romantic partners. Most studies of support in daily life focus on the provision of support between partners, whereas laboratory studies tend to include more friends and strangers.

In sum, social support is a nuanced construct that has been studied in a variety of ways. The following sections highlight variability of received social support's influence on psychological and physiological outcomes and propose SES as a possible moderator of this relationship.

### **Social support in daily life.**

A growing number of studies have examined the link between daily, received support and psychological and physiological well-being, and researchers have found conflicting evidence. One seminal study examined the provision of support between partners in couples in which one partner was studying for the bar exam after finishing law school (Bolger et al., 2000). For those taking the exam, receiving support from their partners was associated with *increased* anxiety; however, this was only the case when both partners reported that a support exchange occurred (Bolger et al., 2000). Specifically, if the individual preparing for the test reported receiving support and his/her partner reported providing it (visible support), the student reported greater anxiety. If the student did not report receiving support, but his/her partner reported providing it (invisible support), the student exhibited a lower increase in depression leading up to the exam. For example, perhaps the partner did additional household chores—the student may not have noticed that these chores were done, or may not have perceived doing chores as a supportive act, but they may, nevertheless, have felt lower levels of psychological distress as a result. The

authors speculated that receiving visible support might have drawn attention to the stressor, or to the fact that the individual's distress and difficulty in coping was noticeable to others.

This first study on invisible support generated additional research that has attempted to either replicate this unexpected finding or explore potential moderators. Two studies of daily, received support have found that daily support was associated with more contentment, passion, joy, and positive mood, as well as less anger, depression, and anxiety (Biehle & Mickelson, 2012; Rafaeli et al., 2008). Other studies have found that the influence of received support depends on key moderators. For example, receiving support has been associated with negative emotional outcomes when support was not reciprocated (i.e., when one partner provided support and the other did not; Gleason, Iida, Shrout, & Bolger, 2008; also see Gleason et al., 2003). Support has been associated with negative emotional outcomes when the support received did not convey understanding, care, and validation, or was not responsive (Maisel & Gable, 2009). In a study of married couples, researchers followed families in their daily life and video-recorded them. Behaviors in these videos were later coded and revealed that visible support was associated with more depressive symptoms only in wives (i.e., gender seems to moderate this effect; Wang & Repetti, 2014). Taken together, research in this area suggests that daily, received support is a complex dyadic process that may differentially impact individuals' psychological well-being and depends on the circumstances surrounding its provision.

Only three studies have examined the link between daily, received support and physiological responses, but individual difference moderators may play a role here as well. For example, receiving support in daily life in older adults was associated with lower diastolic blood pressure for those low in hostility, but greater diastolic blood pressure when high in hostility (Vella, Kamarck, & Shiffman, 2008). In another study, gender emerged as a moderator. Wives

exhibited more favorable stress-related endocrine responses throughout the day (steeper diurnal cortisol slopes) when they reported more support than usual; however, husbands exhibited more unfavorable patterns of responding when they reported more support than usual (Crockett & Neff, 2012). The third study measured daily interactions with individuals who are close, comforting, and supportive, and found that this was associated with lower cortisol stress reactivity to an acute, laboratory stressor (Eisenberger et al., 2007). These studies suggest that the influence of received support likely depends on key features of the support and the recipients.

Overall, research examining daily, received support and subsequent associations with daily emotional and physiological influences presents an unclear picture as to what kind of support is beneficial, for whom it is beneficial, and for which psychological or physiological outcomes it is beneficial. A number of factors make the interpretation of these findings difficult. One of these factors is SES. When reported, participants in these studies tend to be from higher SES backgrounds. Some papers do not report this information, which makes it difficult to discern the possible socioeconomic influence on support processes. Moreover, in this body of work, the influence of daily, received support on physiological processes is largely understudied. Understanding the influence of daily support on physiological functioning is critical to understanding how social relationships influence future well-being. However to my knowledge, only three studies have tested this association directly (Crockett & Neff, 2012; Eisenberger et al., 2007; Vella et al., 2008). Future work would benefit from an analysis of daily, received support and its influence on daily emotional and physiological outcomes, with careful consideration of participants' socioeconomic background.

### **Social support in the laboratory.**

Laboratory research on received social support, especially with experimental manipulations, has the potential to clarify some of the conflicting findings in studies of daily experiences of support. In studies that examined the effect of received support on psychological well-being, several have used a discussion task to elicit social support in couples. In this task, partners take turns sharing something about themselves that they would like to change, and the opposite partners are invited to respond in whatever way they see fit. One of these studies found that visible emotional and instrumental/informational support from a partner during this task was associated with more negative emotions following the task; however, invisible support (both emotional and practical) was associated with decreases in anger and increases in self-efficacy (Howland & Simpson, 2010). Another study found that (1) exhibiting more positive support behaviors toward those low in trait negative affect or (2) exhibiting fewer negative support behaviors toward wives was associated with lower marital distress two years later (Pasch & Bradbury, 1998), but this study did not account for invisible support. Another study utilizing this task found that visible emotional support was associated with higher discussion success, but only in more distressed participants (Girme, Overall, & Simpson, 2013). Invisible emotional support, on the other hand, was associated with improvements in personal goal success one year later (Girme et al., 2013). With this discussion task, the type of support seems to influence the outcome, with invisible support tending to be associated with more positive outcomes. These findings are consistent with a handful of studies examining receipt of daily support, which also found that support type moderates the influence of support on psychological outcomes.

One other laboratory study has examined the influence of received social support on emotional well-being. Utilizing an alternate design, Bolger & Amarel (2007) experimentally manipulated social support by having a confederate direct support toward the participant or by

conveying the same information, but in the form of a question posted to the experimenter. Those who received support were more emotionally reactive to a laboratory stressor, but only if the support threatened participants' sense of self-efficacy (i.e., their beliefs about being able to control and influence the world around them). That is, when support made people feel that others doubted their ability to cope with a stressor, it was associated with more negative emotional responses. Invisible support was associated with reduced distress (Bolger & Amarel, 2007). This study's experimental nature provides the most compelling evidence that received social support has potential psychological costs (e.g., threats to self-efficacy and autonomy) and benefits for individuals who are similar to those in this sample (i.e., NYU undergraduates).

The effect of receiving social support on physiological functioning has been extensively studied, and work in this area suggests that the context and type of support is critical to understanding its effects on physiological processes. A review of studies including experimentally manipulated social support found that, overall, support reduced physiological responses to laboratory stressors; however, the findings were not entirely consistent due to variability in the types of support manipulations and stressors (Thorsteinsson & James, 1999). This continues to be the case in more recent studies of support and physiological stress responses. For example, two studies found that receiving support from a friend or partner was associated with greater cardiovascular reactivity to acute stressors (Allen, Blascovich, & Mendes, 2002). However, two studies also found lower cardiovascular (Lepore, Mata Allen, & Evans, 1993) and cortisol (Heinrichs et al., 2003) responses to acute stressors following received support. Yet another found no effect of receiving support (van Well & Kolk, 2008). In a related study on the influence of social support via text messages, female partners exhibited higher cardiovascular responses to an acute laboratory stressor after receiving supportive text messages



from their boyfriends than did partners who received neutral messages (Hooker, Campos & Pressman, in prep). A critical factor in interpreting these results is the extent to which support providers elicit social evaluation. Across these studies, some support providers hear or watch participants complete a stressful task, while in others they are present, but prevented from doing so. Studies finding positive effects of support tend to be those that minimize the possibility of social evaluation (Fontana, Diegnan, Villeneuve, & Lepore, 1999). Thus, in terms of support's influence on physiological outcomes during a stressor, whether the support actually elicits social evaluative threat may be particularly important to consider.

Taken together, laboratory studies of received social support reveal some suggestion that invisible support is the type of received support that is most beneficial for emotional well-being. In the literature on social support and physiological reactivity the evidence is much more mixed, but threats to the self may play an important role in determining when received support has positive effects on physiological activity. Just as in daily diary studies of support, laboratory studies are also conducted primarily with participants from higher SES backgrounds: The tendency to include higher-SES participants may also contribute to the tendency for received support to be associated with poorer psychological and physiological well-being.

### **Conclusions.**

Not all social support is beneficial for all people. A growing literature on received social support suggests that for some, receiving social support may lower self-esteem if it is perceived as “a sign of personal incompetence or [. . .]. It may also contribute to ‘feelings of indebtedness or obligation.’” (Barrera, 1986, p. 430) or lack of independence (Park, Kitayama, Karasawa, et al., 2013). Likewise, it may also threaten individuals' self-efficacy (Bolger & Amarel, 2007). However, these concerns are most consistent with the sociocultural context of high SES, which

emphasizes independence and autonomy. The following sections review the literature on SES, and the potential for this cultural factor to minimize the costs of received social support on psychological and physiological outcomes.

### **Culture, SES, and Social Support**

There is evidence to suggest that SES is associated with experiences in close relationships (Kraus et al., 2012). For example, a large study of adults found a stronger association between relationship satisfaction and emotional well-being in lower-SES individuals than in higher-SES individuals (Maisel & Karney, 2012). Thus, it is possible that support processes may also be moderated by SES. The complexities of received support, with consideration of socioeconomic background, is new territory.

#### **What is SES?**

Socioeconomic status is an individual's relative rank in society based on their income, education, and employment. SES is also sometimes called social class or social status. SES is most commonly measured objectively by asking individuals to report their income, education, or employment, but it can also be measured subjectively. To measure subjective SES, participants are shown a picture of a ladder with ten rungs, and are asked to indicate where they rank compared to those with the highest income, most education, and most respected jobs (Adler, Epel, Castellazzo, & Ickovics, 2000). Subjective SES allows participants to consider prior SES, current SES, and future opportunities for changes in SES, and to differentially weight SES categories and consider family influences on their SES. Recent research suggests that both objective SES and subjective perceptions of SES contribute to the social class context that shapes' individuals view of the self and cultural norms (Kraus, Piff, Mendoza-Denton,

Rheinschmidt, & Keltner, 2012; Stephens, Markus, & Phillips, 2014)<sup>1</sup>. Development across the lifespan is shaped by the cultural norms prescribed by varying social class contexts (Greenfield, 2009).

**The need for resources.**

Lower SES “contexts are characterized by, less access to economic capital, lower power and status, more geographic mobility constraints, and fewer opportunities for choice, control, and influence [ . . .]” (Stephens et al., 2014, p. 615). In short, they have or perceive themselves to have fewer resources to meet their needs. This need for resources has the potential to shape close relationships in four key ways: by shaping (1) individuals’ views of the self, (2) consequences of social behavior, (3) norms around the provision and receipt of support, and (4) sensitivity to others. These factors not only have the potential to influence individuals’ close relationships and experiences around receiving social support, but may also contribute to the physiological consequences of receiving social support. There is accumulating evidence that brain regions responsible for glucocorticoid activity are influenced by early social experiences, and consequently “shape the psychobiological efficacy of support” (Hostinar, Sullivan, & Gunnar, 2014). The sections below highlight the potential for needs for resources to shape support experiences in those who report lower SES.

***(1) Views of the self.***

How individuals view the self is one area in which cultural variations in social psychological phenomena often emerge. Those with a more independent view of the self tend to value their independence, competence, and individual expression, and this pattern is typical of

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<sup>1</sup>When referring to specific studies, I indicated the type of SES measure that was used. However, because social class contexts are shaped by both objective and subjective SES, when discussing SES more generally, I did not specify objective or subjective SES.

European Americans (Markus & Kitayama, 1991). On the other hand, those who view the self as more interdependent attend more to others, incorporate others into their view of the self, and value harmonious relationships over personal expression. This is more common in people from East Asia and Latin American—including Americans of these ancestries. Power (i.e., control over resources) is a concept closely related to SES that may contribute to how individuals view the self. Prior research finds that those with more power have a greater need to feel competent (Fast & Joshi, 2014). Similarly, Aron, Mashek, and Aron (2004) argue that, “people are motivated (generally not consciously) to include another in the self in order to include that other’s resources” (Aron, Mashek, Debra, & Aron, 2004, p. 28). In line with this idea, recent work suggests that those who report lower objective or subjective SES are more interdependent or other-focused (Kraus et al., 2012). For example, those who report being in a lower social class are more drawn to faces and look at others more than those who report being in a higher social class (Dietze & Knowles, 2016). Furthermore, those who complete their formal education upon high school graduation may be more likely to value honesty, loyalty, and self-control in the self, whereas those who graduate from college may be more likely to value “expressing uniqueness and exerting environmental control” (Snibbe & Markus, 2005). For example, first-generation college students (i.e., lower in objective SES) are more likely to endorse interdependent motives for attending college (Stephens, Fryberg, Markus, Johnson, & Covarrubias, 2012). Adolescents also show ethnic background variation in the extent to which they expect to assist their families and the extent to which they value family respect. Work in this area has found that part of the explanation for the effect of ethnic background was due to education and employment (SES) differences (Fuligni, Tseng, & Lam, 1999). Those who expected to assist their families and those who value family respect were more likely to be from lower-SES backgrounds. These findings

hint at socioeconomic variation in how family is valued, which may also distinguish collectivists from individualists. Together this work suggests that SES is a form of culture that likely shapes individuals' fundamental view of themselves and how they relate to others. Consequently, where there is less concern about the self and less control over the external environment (as opposed to control over the self) for those who report lower SES, it is possible that the receipt of support is less threatening.

### ***(2) The consequences of social behavior.***

The need for resources may also change the consequences of social behavior, and thus, expectations that facilitate positive responses to receiving social support. “[L]imited control of material and social resources leaves low status people more dependent on others to fulfill their needs and wants. [. . .] If someone’s outcomes depend on forces outside of his/her direct control, then he/she would benefit from being more aware of social situations (and the influence of situations on behavior)” (Kafashan, Sparks, Griskevicius, & Barclay, 2014, p. 149). Consistent with this assertion, those who reported lower SES, or those who have been made to feel that they have lower SES, were more prosocial and compassionate (Piff et al., 2010; Stephens, Fryberg, & Markus, 2010), and less entitled and narcissistic (Piff, 2013). Similarly, those who are lower in subjective SES and objective SES are more affiliative with others of similar SES (Côté et al., 2017). On the other hand, prior research finds that those with more power perceived greater control over their environment and future and a high need for competence, which, in combination, may contribute to less consideration of others (Fast & Joshi, 2014). Furthermore, other research finds that individuals who are primed with money (a very important resource) behave much more independently and less prosocially (Vohs, Mead, & Goode, 2006). The authors argue that money allows for independent goal pursuit, and thus when primed with money

participants would want to “be free from dependency” (p. 1154). As a result, this may make support difficult to receive. In contrast, in those who report lower SES, and thus fewer resources and lower power, prosocial behavior may be more advantageous than independent behavior that maintains competence at the expense of social relationships. That is, failing to consider others may be more costly for those with fewer resources overall. Combined, this work suggests that for those of lower SES, their social behavior and experiences are shaped by their need for resources. The heightened need for resources in this group suggests that it would be more adaptive to perceive received support, aimed at fulfilling their needs, positively. So, while prior research suggests that those who reported higher SES might find receiving support more threatening, such a response in those who report lower SES may be less likely given the heightened need for resources.

### ***(3) Support norms.***

With fewer resources, those who report lower SES may be more likely to reach out to social network members in the face of adversity. In line with this idea, those who are more communally motivated (i.e., less self-focused) were better at detecting responsive partners and more likely to seek social support from others when experiencing stressors (Turan & Horowitz, 2012). Moreover, a series of studies with participants from multiple ethnic backgrounds found that those who reported lower objective and/or subjective SES or who were made to feel lower SES were most likely to seek out social networks when faced with future chaos (Piff, Stancato, Martinez, Kraus, & Keltner, 2012). Similarly, those in lower power positions laugh more, which is believed to elicit friendship and support (Stillman, Baumeister, & DeWall, 2007). Finally, in a study of parents, lower objective SES was associated with higher perceived support in foreign-born Mexicans and Latinos and U.S.-born Latinos (Almeida, Molnar, Kawachi, & Subramanian,

2009). Together, these studies suggest that support receipt may be more normative and accepted in those who report lower SES, for whom the psychological costs may be minimized. Further evidence of this hypothesis is observed in a laboratory task where those from lower objective SES backgrounds felt more self-conscious when an anonymous partner shared only 1/10 of their raffle tickets (Kraus & Park, 2014). In this study, participants were told that others participating in the study were given raffle tickets and could choose to share or not share these tickets with them. Sharing was experimentally manipulated, and when those who reported lower objective SES were only given one raffle ticket, they felt more self-conscious emotions (Kraus & Park, 2014). This adverse response may be because lower-SES social norms tend to be more prosocial, and the receipt of support may be more normative; therefore, when the partner behavior maximized self-gain, it may have violated the expectation of prosocial, supportive behavior from others.

#### ***(4) Sensitivity to others.***

The need for resources may also contribute to heightened sensitivity to others, which has implications for support processes. The study of the raffle tickets not only suggests that selfish behavior was a violation of norms for those who reported lower objective SES, but it also suggests that this behavior has a greater impact on those who reported lower objective SES—they are more sensitive to others' behaviors (Kraus & Park, 2014). Research in this area finds that those who reported lower subjective SES also reported lower control, which was associated with more contextual explanations/attributions; however, when control was enhanced, those who reported lower SES relied on contextual information less (Kraus et al., 2009). This work supports the idea that those who are lower in subjective SES are more attuned to their social context, and therefore others, than the self. This is consistent with the finding that lower-power participants

are more likely to have activation in neural circuits that are associated with attunement to others' experiences (i.e., mirroring; Hogeveen, Inzlicht, & Obhi, 2013). That is, those who perceive low control over resources show greater brain activity related to processing others' experiences. In addition, lower objective SES has been associated with greater trait and state compassion, greater heart rate deceleration, which is a marker of orienting to external stimuli, and sensitivity to distress in an interaction partner (Stellar, Manzo, Kraus, & Keltner, 2012). The authors of this paper explain the theory underlying this relationship:

“In certain situations, as other researchers suggest, lower-class individuals respond with greater hostile reactions to threat (Chen & Matthews, 2001; Gallo & Matthews, 2003; Kraus, Horberg, et al., 2011). In other situations, when another person is suffering or in need, more vigilant lower-class individuals may instead more directly attune to the way in which this event adversely affects the sufferer. As a result, lower-class individuals would perceive the suffering as feeling more distressed, and subsequently respond with greater compassion than their upper-class counterparts.” (Stellar et al., 2012, p. 8)

This work suggests that those who report lower SES are sensitive to social cues from others, which has implications for how received social support influences daily psychological and physiological well-being.

### ***Summary.***

Lower SES is linked with interdependence and attunement to others, different norms around the provision and receipt of support, and the possibility of greater costs to adversely responding to received support—all of which have implications for support processes. First, because those who report lower SES tend to value the self less (i.e., they are less independent), the receipt of support may be less threatening. Second, given their lack or perceived lack of



resources, experiencing threat in response to social support may be less likely given this need for resources. Third, those who report lower SES tend to be more prosocial, and therefore, it may be more culturally normative to receive support (i.e., less threatening). Finally, sensitivity to others may mean the receipt of support may have a greater impact on psychological and physiological well-being. This model, which suggests that the need or perceived lack of need shapes social support receipt and subsequent outcomes, has been unexplored.

### **SES and Stress**

Compelling theoretical evidence suggests that those who report lower SES may experience different psychological and physiological stress responses following the receipt of social support. Therefore, it is important to consider how stress responses might vary by SES.

#### **SES, threat, and stress responses.**

Research increasingly suggests that those who report lower SES may perceive more interpersonal threat in their daily lives, which has implications for psychological stress appraisals. Shame or stigma associated with social class may be one form of interpersonal threat that those who report lower SES perceive. As a result, they may come to expect more negative interactions with others. Gilbert argues that

“[I]ndividuals can come to believe that because of certain of their characteristics they will or will not be able to create positive/acceptable images in the mind of the other. In addition, they will form expectations of whether others will be supportive, helpful, and forgiving or harsh and rejecting if they fail in some way, or express certain feeling desires, or characteristics. It is when the world is seen as unsafe (and others are rejecting) that people will engage in defensive maneuvers.” (Gilbert, 2007, p. 302).

For example, prior research reported that those with lower educational attainment reported more interpersonal experiences of hostility and dominance, which were associated with poorer health, mental health, and social functioning (Gallo, Smith, & Cox, 2006). Lower objective SES has also been associated with lower perceived social support overall (Turney & Kao, 2009). Experimental evidence finds that those who report lower SES are more sensitive to hostility cues in others (Kraus, Horberg, Goetz, & Keltner, 2011), which may contribute to physiological stress responses. Similarly, those made to feel lower status perceived quieter applause from an audience and saw fewer smiling faces in the audience following several performance tasks, and this relationship was mediated by their negative expectations of the audience (i.e., they did not expect to be well-received; (Pettit & Sivanathan, 2012). In a study of police officers and male undergraduates, those of lower social status showed greater physiological threat responses (via cardiovascular reactivity; Akinola & Mendes, 2013). Finally, those with less power (i.e., less control over resources) perceive less control over their environment and future, perceive more threat, feel less optimistic, feel less positive about social interactions, and feel less free from “situational pressures” (Fast & Joshi, 2014, p. 11). Together, these studies suggest that those who report lower SES may perceive more interpersonal threat in their daily lives, which likely influences their psychological and physiological responses to these events.

The heightened experience of threat is reflected in research examining the link between SES and perceived stress. A study of adults found that those who reported lower SES experienced more daily severe stressors and perceived them as posing a greater threat to their financial situation and self-concept (Almeida et al., 2005). Similarly, adolescents of lower objective and subjective backgrounds also report greater perceived psychological stress (Goodman, McEwen, Dolan, Schafer-Kalkhoff, & Adler, 2005). Increased experiences of threat

or psychological distress are a strong candidate linking SES to physiological outcomes. The experience of greater psychological stress responses and physiological dysregulation in those who report lower SES likely contributes to poorer health outcomes over time.

### **SES and health.**

The experience of more stressors and greater responses to these stressors is believed to contribute, in part, to the development of poor health in those who report lower SES. For example, those who report lower SES have been shown to have higher allostatic load, which was mediated by higher cumulative adversity (Gustafsson, Janlert, Theorell, Westerlund, & Hammarström, 2012). In adolescents, concern about financial constraints as a measure of SES was strongly associated with poor health outcomes (Quon & McGrath, 2014). Those who report lower SES are more likely to have poorer psychological and physical well-being, dysregulated physiology, and earlier mortality compared to those who report higher SES (Adler, 2009; Manuck, Phillips, Gianaros, Flory, & Muldoon, 2010; Senn, Walsh, & Carey, 2014; Singh-Manoux, Adler, & Marmot, 2003)—even within countries, which suggests that relative status, as opposed to just objective SES, influences health outcomes (Adler et al., 1994). The list of poor health outcomes associated with lower SES includes higher allostatic load, obesity, chronic illnesses, functional impairment, pain, and perceptions of poor health (Daly, Boyce, & Wood, 2014); decreased beta adrenergic receptor responsivity, which is considered to be an indicator of sympathetic nervous system over-activity and cardiovascular risk (Euteneuer, Mills, Rief, Ziegler, & Dimsdale, 2012); higher risk for developing cold (Cohen, Alper, Adler, Treanor, & Turner, 2008); lower well-being (Sacks, Stevenson, & Wolfers, 2012); and more cortisol, epinephrine, and norepinephrine (stress-relevant hormones) during the day (Cohen, Doyle, & Baum, 2006) and evening (Cohen, Schwartz, et al., 2006).

### **SES and social relationships.**

The challenges facing those who report lower SES (i.e., their heightened experiences of stress) have implications for social relationships and the effects of received social support. The reserve capacity model posits that those who report lower SES (and those who are currently of lower SES) likely have lower psychosocial resources to cope with stressors (Gallo, Bogart, Vranceanu, & Matthews, 2005). With fewer resources to cope, heightened stress responses may negatively influence social relationships in those who report lower SES. For example, in lower-SES couples, outside stressors exerted a greater influence on relationship satisfaction than relational problems (e.g., poor communication; Jackson, Trail, Kennedy, Williamson, Bradbury, & Karney, 2016). Similarly, a study of couples showed a stronger relationship between the experience of stressful life events and relationship satisfaction in low-SES couples (Maisel & Karney, 2012). That is, experiencing stressful life events was a stronger predictor of worse relationship satisfaction than was experiencing stressful events in those who were of higher SES.

Nevertheless, social relationships, when available, may still provide a buffer to the adverse effects associated with being from a low-SES background. While those who report lower SES face challenges in meeting their needs, supportive relationships may prove helpful. The “Shift-and-Persist” model suggests that those who report lower SES who had mentors growing up who could aid in emotion regulation and encourage persistence and optimism might be resilient through socioeconomic adversity (Chen & Miller, 2012). A handful of studies have demonstrated social relationships’ buffering effects on health later in life in those who reported lower SES (Matthews, Gallo, & Taylor, 2010). For example, in an intervention for African American mothers and children focusing on improved parenting, “strengthening family relationships,” and “youth competencies,” children who received the intervention had lower

levels of inflammation eight years later (Miller, Brody, Yu, & Chen, 2014). In a sample of almost 30,000 adults in the U.S., social integration buffered the effect of not working on self-rated health (Gorman & Sivaganesan, 2007).

Those who report lower SES may face more stressors with the potential to negatively impact their lives. This may undermine the potential for social support to improve their psychological and physiological well-being; however, prior research finds that social integration and positive social relationships may still confer some benefits.

### **The Current Study**

Social support is believed to be a critical mechanism in the link between social relationships and better health, namely because support is theorized to help individuals cope with stressors. However, accumulating findings suggest that receiving social support can sometimes undermine psychological and physiological well-being. As described previously, the need or perceived need for resources may uniquely shape culture and support experiences for those who report lower SES. The extent to which SES influences daily, received support experiences and subsequent emotional and physiological outcomes is *entirely* unexplored.

The interaction between received social support and SES may subsequently influence psychological and physiological stress responses in three possible ways. **First**, it may be that those who report lower SES who receive more daily support report psychological and physiological outcomes akin to those who report higher SES who report lower daily support, which prior research suggests would be threatening to recipients. Thus, “While caring relationships cannot remove socioeconomic adversity (or take away illness or loss), they can increase the chances that the individuals will flourish in whatever ways are afforded by the environments in which they are situated” (Feeney & Collins, 2014). **Second**, given their need for

resources and the influence of this need on other areas of their experience, it may also be the case that social support is particularly protective for those who report lower SES. That is, those who report lower SES who receive support may experience even better psychological and physiological outcomes than those who report higher SES who receive less support. For example, one study did find, however, that in adult women, low-SES women compared to middle-SES women showed greater increases in positive affect in response to social support (Gallo et al., 2005), which suggests that social resources may be particularly beneficial for those from low-SES backgrounds. **Third** and finally, it is possible that the influence of SES on psychological and physiological well-being is too great for received social support to overcome.

Two studies tested the relationship between received social support, SES, and psychological, physiological, and relational outcomes in daily life. By examining support processes in daily life, both studies took into account the influence of daily experiences on emotional and physiological outcomes (Repetti, Wang, & Saxbe, 2011). The first study included three days of evening reports of daily, received social support and psychological stress responses, as well as assessments of diurnal cortisol. The participants in this study were undergraduate students at a large research institution. Study 2 recruited Swiss couples from the community. For two weeks, both members of the couple reported received and provided social support after interacting with their partners for up to four times per day. They also reported on their psychological stress responses four times per day and relationship satisfaction once per day (in the evening). These datasets allowed for the examination of the following overarching research question: Does SES moderate the association of daily, received social support with daily psychological, physiological, and relational outcomes. I hypothesized that among those who reported lower SES, those who had higher daily, received support would report lower levels of

psychological distress, healthier profiles of diurnal cortisol, and higher relationship satisfaction than those who received less daily support. Similarly, among those who received higher levels of support, those who reported lower SES would report lower levels of psychological distress, healthier profiles of diurnal cortisol, and higher relationship satisfaction than those who received less daily support than those who reported higher SES.

Accumulating evidence demonstrates that both objective and subjective reports of SES are both related to the cultural norms that shape beliefs and behaviors for those of varying socioeconomic statuses (Dietze & Knowles, 2016; Kraus et al., 2012; Stephens et al., 2014). Furthermore, both measures of SES are uniquely related to future health outcomes (e.g., Adler et al., 2000). As a result, in this study, I tested to see if either subjective or objective SES moderated the relationship between daily received support and psychological, physiological, and relational outcomes. Because both measures are related to the cultural norms shaped by social class, I did not hypothesize that one measure would be more likely to moderate these relationships than the other. Examining both measures of SES provides a more complete assessment of the potential moderating role of SES.

## CHAPTER 2: STUDY 1

### Overview and Hypotheses

Study 1 examined SES as a moderator in the relationship between daily, received support and both daily psychological stress responses. This study also allowed for the examination of a second research question: Does SES moderate the relationship between daily, received social support and one aspect of daily physiology—diurnal cortisol?

Both daily psychological stress responses and diurnal cortisol have important implications for future health. Psychological stress responses may become damaging to individuals' health if stressors occur frequently or if they are chronic. For example, greater perceived stress has also been associated with greater incidence of illnesses and illness symptoms (Cohen & Williamson, 1988). One potential mechanism linking stressors to negative health outcomes is cortisol. Cortisol is a glucocorticoid related to the regulation of immune activity, body temperature, and a number of physiological systems. One way to assess cortisol activity is to examine its diurnal pattern. Cortisol has a diurnal pattern characterized by an increase thirty minutes after waking and a decline throughout the day (Lovallo & Thomas, 2000). Higher cortisol in the morning and lower cortisol in the evening are associated with a steeper slope of cortisol through the day, whereas lower cortisol in the morning or evening is associated with a flatter (less steep) slope of cortisol throughout the day. Flatter cortisol slopes throughout the day have been associated with worse mental health (Shirtcliff & Essex, 2009), coronary calcification (Matthews, Schwartz, Cohen, & Seeman, 2006), and higher rates of all-cause mortality (Kumari, Shipley, Stafford, & Kivimaki, 2011).

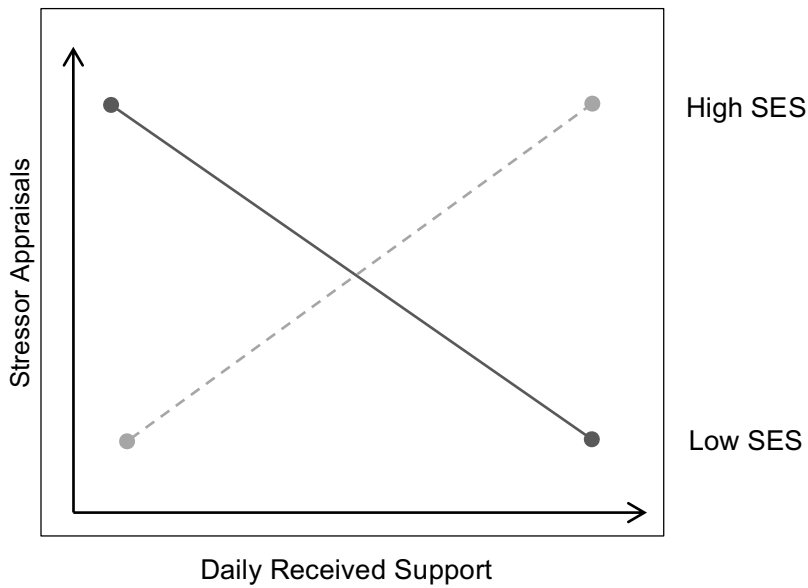
This risky pattern of diurnal cortisol has also been associated with SES and social relationship processes. For example, flatter diurnal cortisol slopes are related to the receipt of



social support in husbands (especially when their sense of self-efficacy was undermined; Crockett & Neff, 2012), greater interpersonal conflict (Almeida, McGonagle, & King, 2012), and lower marital satisfaction in wives (Saxbe, Repetti, & Nishina, 2008). Flatter diurnal cortisol slopes have also been associated with objective lower SES (Cohen et al., 2006; Kumari et al., 2010). Together this work illustrates that both social relationships and SES are associated with diurnal cortisol—an important biomarker of future health.

In sum, the two primary outcomes of Study 1, stressor appraisals and diurnal cortisol, are both sensitive to the social environment and are related to future health outcomes. The specific hypotheses of Study 1 were as follows.

Daily psychological stressor appraisals: I hypothesized that SES would moderate the relationship between daily, received support and daily psychological stressor appraisals. Among those who reported lower SES, I hypothesized that higher daily, received social support would be associated with lower stressor appraisals than those who reported lower daily support. Because prior research suggests receiving support for high-SES participants may be threatening to self-efficacy and autonomy, I hypothesized that those who reported higher SES and higher daily, received social support would also report higher stressor appraisals than those who reported lower daily, received support. Figure 1 illustrates the hypothesized relationship.



*Figure 1.* The hypothesized relationship between daily, received support, SES, and daily stressor appraisals.

Diurnal cortisol: Similarly, I hypothesized that SES would moderate the relationship between daily, received support and diurnal cortisol responses. For those who reported lower SES, I hypothesized that higher daily, received support would be associated with a steeper diurnal cortisol slope than when daily, received support was lower. Similarly, I hypothesized that the receipt of daily support would be associated with steeper diurnal cortisol slopes in those who reported lower SES than in those who reported higher SES (given that prior research suggests received support for high-SES participants may be threatening). Figure 2 illustrates the hypothesized relationship.

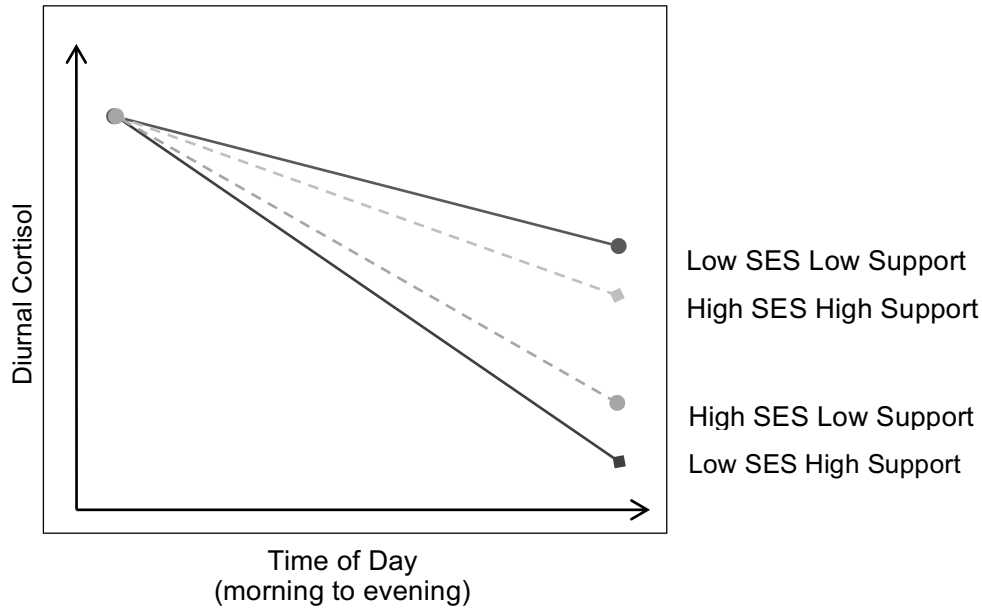


Figure 2. The hypothesized relationship between daily, received support, SES, and diurnal cortisol.

## Methods

### Participants

One hundred and twenty-eight undergraduate students were recruited via campus online announcements and participated in this study<sup>2</sup>. The eligibility criteria were as follows:

<sup>2</sup> Initially, 149 participants were recruited, and 21 participants were subsequently excluded due to smoking during the diary portion of the study (n = 3), use of oral contraceptives (n = 6), reported infectious illnesses or use of cold medication (n = 5), use of allergy medication (n = 1), a recent diagnosis of anxiety and/or depression (n = 1), error in data labeling (n = 1), and/or cortisol at awakening greater than three standard deviations away from the mean (n = 4). These participants were excluded from all analyses to maintain consistency in the participants included across dependent variables. In addition to these exclusions, it should be noted that if participants were missing data for a given predictor in a particular model, they were dropped from that specific model. For example, if a participant did not rate his/her sleep quality on day two, that participant would be dropped from the model where sleep quality is included as a covariate: participants must have had complete predictor data. As a result, each model presents slight variations in the number of participants.

1. Participants could not be regular smokers,
2. Female participants could not be taking hormonal contraceptives,
3. Participants could not have chronic medical or psychiatric conditions or sleep disorders (e.g., diabetes, asthma, cancer, clinical depression, apnea, insomnia, or sleep terrors),
4. Participants could not be minors (i.e., students 17 or under),
5. Participants must have been able to participate in English,
6. Participants could not be pregnant (as hormones during pregnancy can influence cortisol reactivity), and
7. Participants must have generally woken up by 10:00 a.m. on weekdays.

These exclusion criteria ensured that the physiological data collected was interpretable and protected the safety of those participating (Kirschbaum, Kudielka, Gaab, Schommer, & Hellhammer, 1999; Lovallo & Thomas, 2000; Rohleder & Kirschbaum, 2006). Participants were 48.09% female and had a mean age of 19.86 (SD=1.67) years, and 62.6% were of Asian background, 11.45% were of European background, and 25% were of multiethnic or other background groups.

### **Procedure**

This study was approved by the IRB at the University of California, Irvine. This research is part of a larger study on how stressors (in the laboratory and in daily life) affect psychological and physiological responses. Demographics and other individual difference measures were collected during the laboratory component of the study (during rest periods either before or after a speech stressor). In the laboratory session, participants were randomly assigned to complete a social-evaluative task (delivering a speech in front of an audience) or a non-social-evaluative

task (delivering a speech alone)<sup>3</sup>. At the end of the laboratory session, participants received instructions and materials needed to complete daily diaries. Participants completed one or more evening diaries the day of the laboratory session and then additional questionnaires upon awakening, at 12:00, 2:00, 4:00, 6:00, and 8:00 p.m., and at bedtime for the following two days. Morning and bedtime questionnaires were completed via paper diaries. All other diaries were completed on PDAs programmed to beep at each of these timepoints. At each assessment timepoint, participants were also prompted to take a saliva sample. These timepoints were selected to capture the full range of diurnal cortisol, which includes a peak 30 minutes after awakening and a steady decline over the course of the data. Similar protocols have been used to examine diurnal cortisol patterns (Smyth et al., 1998) and have been utilized in large epidemiological studies (Almeida et al., 2012; Kumari et al., 2011). After completing both portions of the study, participants returned to the lab to drop off their materials, fill out additional surveys unrelated to the present study, and complete the debriefing process. Those who were 90% or more compliant with their daily entries were entered into a lottery to win an Apple iPod. Participants were paid \$25 for their completion of the laboratory phase of the study and \$55 for the completion of the daily diary component.

## **Measures**

### **Laboratory assessments.**

#### ***Demographic information.***

Demographic information, including age, gender, and ethnic background, was collected during the laboratory portion of the study. Participants reported their ethnicity/cultural background in response to a list of the following options: Black, Chinese, East Asian/Indian,

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<sup>3</sup> This experimental manipulation was tested as a covariate in all models.

Korean, Middle Eastern, Filipino, Vietnamese, European, Chicano, Japanese, Latino, Native American, or Other/Multiethnic. In order to maintain statistical power, ethnic background groups were combined when cultural values about social support were likely to be shared or when the group's sample size was too small to be tested independently. Groups were reduced to three categories: Asian background (Chinese, East Asian/Indian, Korean, Filipino, Vietnamese, Japanese), European background, and Other/Multiethnic background (Black, Middle Eastern, Chicano, Latino, Native American; each group in this category represented <5% of the total sample). Demographic variables were entered as covariates in models predicting all outcomes.

***Socioeconomic status.***

*Subjective SES.*

Subjective SES was measured with the MacArthur Scale of Subjective Socioeconomic Status (Adler et al., 2000). This scale presented participants with a ladder and gave them the following prompt: "Think of a ladder with 10 steps representing where people stand in the United States. At step 10 are people who are the best off—those who have the most money, the most education, and the most respected jobs. At step 1 are the people who are worst off—those who have the least money, least education, and the least respected jobs or no job. Where would you place yourself on this ladder?" Their rank corresponded with a number from 1 to 10, with one being lower rank and 10 being higher rank. Subjective SES was grand-mean-centered for analyses to reduce multicollinearity between main effects and interaction terms and to facilitate the interpretation of simple main effects (Hoffman, 2015b).

*Objective SES.*

Participants reported the educational background of each of their parents by indicating their highest level of education from elementary school to graduate school. Parents' education

level was recoded into a categorical variable representing completing less than a bachelor's degree or completing at least a bachelor's degree. The following coding schema was used: 0 = both parents completed less than a bachelor's degree; 1 = one parent completed a bachelor's degree or more education beyond a bachelor's degree; 2 = both parents completed a bachelor's degree or more education beyond a bachelor's degree.

### ***Health information.***

Height and weight were collected via self-report during the laboratory session and were used to calculate Body Mass Index (BMI). Menstrual cycle stage was also recorded and was used to code for cycle phase. Because prior work finds that responses to the acute social-evaluative stressors are similar for men and women in the luteal phase of their menstrual cycles, cycle phase was coded as follows: 0 = follicular, 1 = men and women in luteal or menses phase (Kirschbaum et al., 1999). This health information was included in analyses predicting diurnal cortisol. Participants also indicated if they had any chronic physical or mental illness or recent illnesses, and they were excluded if any were reported (n = 2; see footnote 2).

### **Daily assessments.**

#### ***Time of day.***

Participants reported the time they completed each diary. This was converted into a variable representing the minutes since midnight. This variable was used to represent time of day. Time of day was centered on minutes since awakening in all analyses.

#### ***Social support.***

Daily receipt of social support was measured with one item at the end of the day: "Today, I felt that others responded to my needs/wishes." Participants could respond "not at all," "a little," "moderately," "quite a bit," or "extremely" (a scale from 1 to 5). Support items were

lagged such that day 1 support was entered into models predicting day 2 dependent variables and so on. Because there were two days, I was able to test both within-person and between-person effects of support as fixed effects. The within-person effect was created by subtracting an individual's support score on a given day from that individual's average support score across both days. This effect represents change in the outcome variable when support was higher or lower than that individual's support average across days. The between-person effect was created by subtracting the average of all individuals' averages across days from each individual's average across days. This effect represents change in the outcome variable when individuals receive higher or lower support than average.

### ***Stressor appraisals.***

Daily psychological stressor appraisals were measured up to four times the night of the laboratory session (day 1) and seven times throughout the following two full days of diary measurements. Stressor appraisals were measured with the following three questions: "Since the last beep, how often have you felt Stressed?," "Since the last beep, how often have you felt In Control?," "Since the last beep, how often have you felt you had Resources to Cope?" Participants could respond "0 = Never," "1 = Almost Never," "2 = Sometimes," "3 = Fairly Often," or "4 = Very Often." These items reflect aspects of the appraisal process that influence the psychological experience of stress (Lazarus & Folkman, 1984), and directly assess participants' subjective, psychological appraisals of stressors. A composite measure of stressor appraisals from each timepoint was created by reverse-scoring the resources to cope and control questions and averaging all three items. Averaging across all timepoints and then across all days, the alpha was .50 for these three items. Higher scores on this item reflected greater psychological stressor appraisals.



### ***Diurnal cortisol.***

Saliva samples were collected eight times per day on the full two days of the daily diary portion of the study. Saliva was collected with a salivette, which is a sterile cotton roll inside a plastic tube. Participants place the roll in their mouth for three minutes. Participants were given eight salivettes to collect their saliva upon awakening, 30 minutes after awakening, 12:00 p.m., 2:00 p.m., 4:00 p.m., 6:00 p.m., 8:00 p.m., and at bedtime on the two full days of the daily diary component. Participants were instructed to store their samples in their freezers until the completion of the daily portion of the study. After samples were returned, they were stored at -20°C until the end of the study. At study completion, samples were shipped on dry ice to a laboratory for cortisol assessment. Cortisol levels for each sample were determined using an enzyme-linked immunosorbent assay (IBL-International, Hamburg, Germany). The assay had a lower limit of sensitivity of 0.005 µg/dl, with average inter- and intra-assay coefficients of covariance of less than 10%. The initial rise in cortisol (i.e., the cortisol awakening response, 30–45 minutes after awakening) may be regulated by systems unrelated to diurnal cortisol patterns (Adam & Kumari, 2009; Clow, Thorn, Evans, & Hucklebridge, 2004). As a result, and consistent with prior research on diurnal cortisol, the cortisol measurement 30 minutes after awakening was not included (Adam & Kumari, 2009; Kumari et al., 2011). Given the positive skew in the cortisol data at each timepoint throughout the day, this variable was natural-log-transformed.

### ***Health-relevant behaviors.***

When participants woke up each morning, they were asked to rate their “overall sleep quality” from the previous night on a scale from “1 = very good,” to “4 = very bad.” Participants also reported the time they woke up. Each time participants completed a daily diary (except upon awakening), they reported the number of caffeinated beverages they consumed, the number of

cigarettes they smoked, the number of alcoholic drinks they consumed, the number of minutes of exercise they completed, and prescription medications they took since the last timepoint. If participants smoked during the daily diary portion of the study, they were excluded from all analyses (n = 3). For each participant, a total number of caffeinated beverages and alcoholic beverages was calculated for each day. If participants reported exercising at any time during the day they were coded as 1 (exercised today), and if not, as 0 (no exercise). If participants reported taking oral contraceptives or cold or allergy medication, they were excluded from all analyses (n = 5). All variables not used to determine exclusions were tested as potential covariates in models predicting diurnal cortisol.

### *Negative events.*

During each of the daily assessments (except upon awakening), participants were asked to record the number of negative events they experienced: “Since the last beep, have you experienced a significant negative event? (if yes, how many negative events?).” A daily sum of negative events was calculated for each day. Because the day 1 diary component included fewer assessments, all daily sums were converted to z-scores. Next, this variable was lagged such that the day 1 negative events sum was entered as a covariate into models predicting day 2 dependent variables, and so on. This variable was then multiplied by a dummy-coded day variable (0 = not day 2, 1 = day 2), which allowed us to test for a difference in the association between negative events and all outcome measures by day. Because the experience of daily negative events or interactions is likely to be associated with both the receipt of support and psychological and physiological stress (Rook, 1984), models for all outcomes controlled for negative events from the previous day.

### **Data Analysis Strategy**

### **Modeling building: Testing random intercepts and slopes.**

All daily diary timepoints were nested within days, which were nested within people. In order to determine if multilevel models should be used to account for the dependence within people across days, random intercepts for person and day and slopes for time of day were tested for each outcome using the xtmixed command in STATA IC13. First, for each outcome, day was included as a fixed effect, and a random intercept was included for each person (model a). Next, day was added as a random intercept (model b). Next, a log-likelihood ratio test determined if the day random intercept significantly improved the model fit (i.e., was model b a better fit for the outcome than model a?). For stressor appraisals and diurnal cortisol, the same process was used to determine the form of time (linear or quadratic) that best represented the daily pattern of change and to determine whether or not time (i.e., the actual time of the day) should be included as a random slope. Finally, all relevant covariates were entered and were only maintained if they were significantly associated with the outcome variable. Additional details about models for each specific outcome are below.

The covariance structure was set to unstructured. Given the sample size, restricted-maximum likelihood was used in order to minimize bias in the variance estimates (Hoffman, 2015, p. 190). After the fixed and random effects of time were determined and the effect of all covariates was accounted for, the primary variables of interest were added: daily social support, subjective SES, and the interaction between these variables.

### **Outcome-specific model specifications.**

#### ***Stressor appraisals.***

Stressor appraisals were measured six times a day and were nested within people. As a result, a three-level model with both person and day as random intercepts was tested. The linear

form of time of day and the quadratic form of time of day were also tested as fixed effects and random slopes. Prior to adding the interaction between SES and support, the following covariates were also entered as fixed effects: negative events\*day, age, gender, experimental condition (from the laboratory portion of the study), ethnicity, and average parents' education. Subsequent models dropped non-significant effects. Finally, the interaction between compliment support and subjective SES was included, and a second model added the interaction between needs and wishes support and subjective SES.

### ***Diurnal cortisol.***

Cortisol was measured seven times a day (excluding 30 minutes past waking measurement) and was nested within people. As a result, a three-level model with both person and day as random intercepts was tested. The linear form of time of day and the quadratic form of time of day were also tested as fixed effects and random slopes. The following covariates were also tested as fixed effects before entering the key variables of interest: negative events\*day, coffee sum, alcohol sum, exercise today, wake time, sleep quality, BMI, menstrual cycle phase, age, gender, condition, ethnicity, and objective SES. Subsequent covariate reduction and modeling building mirrored that of stressor appraisals models.

## **Results**

### **Descriptive Statistics**

The mean BMI for participants in this study was within the normal weight range. During the daily diary portion of the study, participants typically had less than one caffeinated beverage and less than one alcoholic beverage each day. The average time that participants woke up in the morning was 8:27 a.m., and the average sleep quality was rated as “fairly good.” Participants

reported an average of one negative event per day. Additional descriptive information and correlations for the covariates are available in Table 1.

Descriptive information and correlations for the key variables of interest are presented in Table 2. Across people and across days, participants reported that others responded to their needs and wishes “moderately” on average, which is the midpoint between “not at all” and “extremely.” The average level of subjective SES was 4.85 out 10, which is somewhat lower than in studies of similar undergraduate samples (e.g., Kraus, Piff, & Keltner, 2009; Piff, Kraus, Cote, Cheng, & Keltner, 2010). Twenty-six percent of participants reported that both of their parents completed less than a bachelor’s degree, 27.91% of participants reported that one of their parents completed a bachelor’s degree or more education beyond a bachelor’s degree, and 45.74% of participants reported that both of their parents completed at least a bachelor’s degree. In this sample, subjective SES and objective SES were not significantly correlated with each other ( $r = -.02, p = .53$ ). Subjective SES was significantly, negatively associated with receiving social support (i.e., others meeting needs/wishes), whereas objective SES was positively associated with support. Objective SES was also negatively associated with stressor appraisals.

Table 1

*Descriptive Statistics and Correlations of the Covariates*

Variable	M(SD)	Age	BMI	Caffeine	Alcohol	Wake Time	Sleep Quality	Negative Events	Gender <sup>a</sup>
Age	19.86(1.67)								
BMI	22.77(3.64)	.11**							
Caffeine	0.61(1.07)	.19**	.17**						
Alcohol	0.13(0.62)	.11**	.01	-.001					
Wake Time	8:28(67.46)	.02	.001	-.01	.12**				
Sleep Quality	2.97(0.56)	.23**	-.15**	.08*	.08**	.07*			
Negative Events	0.97(1.43)	-.06*	-.14**	-.04 <sup>o</sup>	.07*	-.08*	-.16**		
Gender <sup>a</sup>	.51	.18**	.19**	.04 <sup>o</sup>	.14**	.06*	-.04 <sup>o</sup>	.004	
Exercise <sup>b</sup>	.54	.04 <sup>o</sup>	-.003	.20**	.12**	-.05*	-.03	.03	.14**

Note: BMI = body mass index. Caffeine = total number of caffeinated beverages each day. Alcohol = total number of alcoholic beverages each day. Wake Time = time participants woke up in the morning (hh:mm), *SD* in minutes. Negative Events = total number of negative events each day. Pairwise Pearson correlation coefficients reported for continuous by continuous and dichotomous by dichotomous correlations. Point biserial correlations coefficients reported for continuous by dichotomous correlations.

<sup>a</sup>0 = female, 1 = male. <sup>b</sup>0 = did not exercise that day, 1 = did exercise that day.

<sup>o</sup> $p < .1$ . \* $p < .05$ . \*\* $p < .001$ .

Table 2

*Descriptive Statistics and Correlations of the Key Variables of Interest*

Variable	M(SD)	Support	Subjective SES	Objective SES	Appraisals
Support	2.83(0.91)				
Subjective SES	4.85(1.47)	-.15**			
Objective SES <sup>c</sup>		.14**	-.02		
Appraisals	2.77(0.63)	-.32**	.08**	-.14**	
Diurnal Cortisol	8.64(2.78)	-.09**	-.001	-.03	.10**

Note: Support = daily report that others responded to their needs/wishes. Appraisals = daily stressor appraisals. Diurnal Cortisol = diurnal cortisol (nmol/l). Pairwise Pearson correlation coefficients reported for continuous by continuous correlations. Spearman's rank correlation coefficients reported for continuous by ordinal correlations.

<sup>c</sup>0 = both parents completed less than a bachelor's degree, 1 = one parent completed at least a bachelor's degree, 2 = both parents completed at least a bachelor's degree.

<sup>o</sup> $p < .1$ . \* $p < .05$ . \*\* $p < .001$ .

## Stressor Appraisals

Stressor appraisals were best modeled with a random intercept for each day for each person. Ethnic background was the only significant predictor of appraisals,  $\chi^2(2, N = 128) = 10.74, p = .005$ , in a model with day, age, gender, experimental condition, and negative events included as fixed effects. Those of European backgrounds and Other/Multiethnic backgrounds reported lower stressor appraisals overall than those of Asian background,  $\gamma = -0.48, z = -2.69, p = .007$  and  $\gamma = -0.31, z = -2.43, p = .015$  respectively.

The primary aim was to test the following interactions: within-person support\*subjective SES and between-person support\*subjective SES. Controlling for ethnic background, neither interaction was significant,  $p$ -values  $> .14$ , nor was there a simple main effect for subjective SES. There was, however, a between-person simple main effect for support such that individuals who reported higher support also reported lower stressor appraisals,  $\gamma = -0.26, z = -4.62, p < .001$ . After removing the non-significant interactions, this effect remained when controlling for objective SES and previous-day negative events,  $\gamma = -0.25, z = -4.42, p < .001$ , and there were no main effects for objective SES or previous-day negative events.

I also tested whether objective SES interacted with within-person or between-person support to predict next-day stressor appraisals. Objective SES did not interact with within-person or between-person support,  $p$ -values  $> .39$ , but the main effect for between-person support remained,  $\gamma = -0.35, z = -3.22, p = .001$ . A model containing only the within-person and between-person support effects is presented in Table 3. Again, higher support on average was associated with lower next-day stressor appraisals,  $\gamma = -0.25, z = -4.65, p < .001$ .



Table 3

*The Effects Support on Daily Psychological Stressor Appraisals*

Fixed Effects	Coefficients (SE)	95% CI
Intercept	2.88(0.07)	[2.75, 3.01]
Day	0.02(0.04)	[-0.06, 0.10]
Ethnic Background Group <sup>a</sup>		
European American	-0.48(0.16)*	[-0.79, -0.18]
Multi/Other	-0.28(0.12)*	[-0.51, -0.06]
Within-person Support	0.003(0.03)	[-0.06, 0.07]
Between-person Support	-0.25(0.06)**	[-0.36, -0.15]
Random Effects Parameters	Estimate	
Random Intercept: Person	0.26(0.04)	[0.19, 0.35]
Random Intercept: Day	0.05(0.01)	[0.03, 0.09]
Residual Variance	0.27(0.01)	[0.25, 0.29]

Note: Based on 128 participants with 249 days and 1317 longitudinal records.

Day = form of time in this model.

<sup>a</sup>0 = Asian American background.

<sup>o</sup> $p < .1$ . \* $p < .05$ . \*\* $p < .001$ .

**Diurnal Cortisol**

Diurnal cortisol responses were best modeled with a random intercept for individuals, a linear random slope for hours since awakening, and a quadratic random slope for hours since awakening. Although few studies test the effect of fixed and/or random quadratic change in cortisol throughout the day, when tested, prior work shows that there is a quadratic pattern to the diurnal cortisol response (Hucklebridge, Hussain, Evans, & Clow, 2005; Hucklebridge, Clow, & Evans, 1998). When tested with all other possible covariates, gender,  $\gamma = 0.12$ ,  $z = 2.00$ ,  $p = .045$ , and BMI,  $\gamma = -0.02$ ,  $z = -2.60$ ,  $p = .009$ , were both significant predictors of diurnal cortisol and were maintained as covariates.

I first tested whether within-person support (needs/wishes) and between-person support would interact with subjective SES and either the linear or quadratic form of time. In other

words, I tested whether support and subjective SES would interact to predict the linear or quadratic rate of change in cortisol responses throughout the day. This model showed significant interactions between the quadratic form of time and the within-person effect of support,  $\gamma = 0.002$ ,  $z = 2.23$ ,  $p = .026$ , which was marginally moderated by subjective SES,  $\gamma = 0.001$ ,  $z = 1.66$ ,  $p = .096$ . There was also a significant interaction between the between-person effect of support and subjective SES,  $\gamma = -0.05$ ,  $z = -2.11$ ,  $p = .035$ . All of these effects remain the same when controlling for previous-day negative events and objective SES. To better understand these effects, the interactions between time, between-person support, and subjective SES were removed (see Table 4). In this model, within-person support was significantly associated with the quadratic rate of change in diurnal cortisol,  $\gamma = 0.002$ ,  $z = 2.24$ ,  $p = .025$ . This effect is illustrated in Figure 3 (support graphed at one standard deviation about the mean). Those who reported higher support on a given day than their average also exhibited a flatter slope in cortisol throughout the day. This effect was marginally moderated by subjective SES,  $\gamma = 0.001$ ,  $z = 1.68$ ,  $p = .093$ , which is shown in Figure 4. This figure illustrates a trend whereby support had a greater effect on diurnal cortisol responses for those who reported higher subjective SES. Finally, there was also an interaction of between-person support with subjective SES on average overall cortisol,  $\gamma = -0.03$ ,  $z = -1.98$ ,  $p = .048$ . Those receiving more support also exhibited lower average diurnal cortisol, and this effect became more negative, or stronger, as subjective SES increased. In other words, support was a stronger predictor of average diurnal cortisol for those who reported higher subjective SES. When subjective SES was set to one standard deviation above or below its mean, support was only marginally associated with average cortisol for those who reported high subjective SES. For them, receiving more support was associated with marginally lower average cortisol,  $\gamma = -0.06$ ,  $z = -1.68$ ,  $p = .092$ .

Table 4

*The Interactive Effect of Support and Subjective SES on Diurnal Cortisol*

Fixed Effects	Coefficients (SE)	95% CI
Intercept	2.27(0.16)**	[1.86, 2.48]
Day	-0.01(0.03)	[-0.07, 0.05]
Hours Since Midnight	-0.12(0.001)**	[-0.12, -0.11]
Hours Since Midnight <sup>2</sup>	0.001(0.001)	[-0.001, 0.002]
BMI	-0.02(0.01)*	[-0.03, -0.01]
Gender <sup>a</sup>	0.10(0.05)*	[0.001, 0.19]
Within-person Support	-0.03(0.03)	[-0.10, 0.03]
Hours Since Midnight*Within-person Support	-0.0001(0.01)	[-0.01, 0.01]
Hours Since Midnight <sup>2</sup> *Within-person Support	0.002(0.001)*	[0.0002, 0.003]
Subjective SES	-0.01(0.02)	[-0.05, 0.03]
Hours Since Midnight*Subjective SES	-0.001(0.003)	[-0.01, 0.01]
Hours Since Midnight <sup>2</sup> *Subjective SES	-0.0001(0.0004)	[-0.001, 0.001]
Within-person Support*Subjective SES	-0.01(0.02)	[-0.05, 0.03]
Hours Since Midnight*Within-person Support*Subjective SES	0.0002(0.003)	[-0.01, 0.01]
Hours Since Midnight <sup>2</sup> *Within-person Support*Subjective SES	0.001(0.001) °	[-0.0001, 0.002]
Between-person Support	-0.01(0.03)	[-0.07, 0.04]
Between-person Support*Subjective SES	-0.03(0.02)*	[-0.07, -0.0002]
Random Effects Parameters	Estimate	
Random Intercept: Person	0.08(0.02)	[0.05, 0.12]
Random Slope: Hours Since Midnight	0.002(0.0004)	[0.001, 0.003]
Random Slope: Hours Since Midnight <sup>2</sup>	0.00002(0.00)	[0.00, 0.00003]
Covariance: Person, Hours Since Midnight	0.01(0.002)	[0.004, 0.01]
Covariance: Person, Hours Since Midnight <sup>2</sup>	-0.0004(0.0003)	[-0.001, 0.0001]

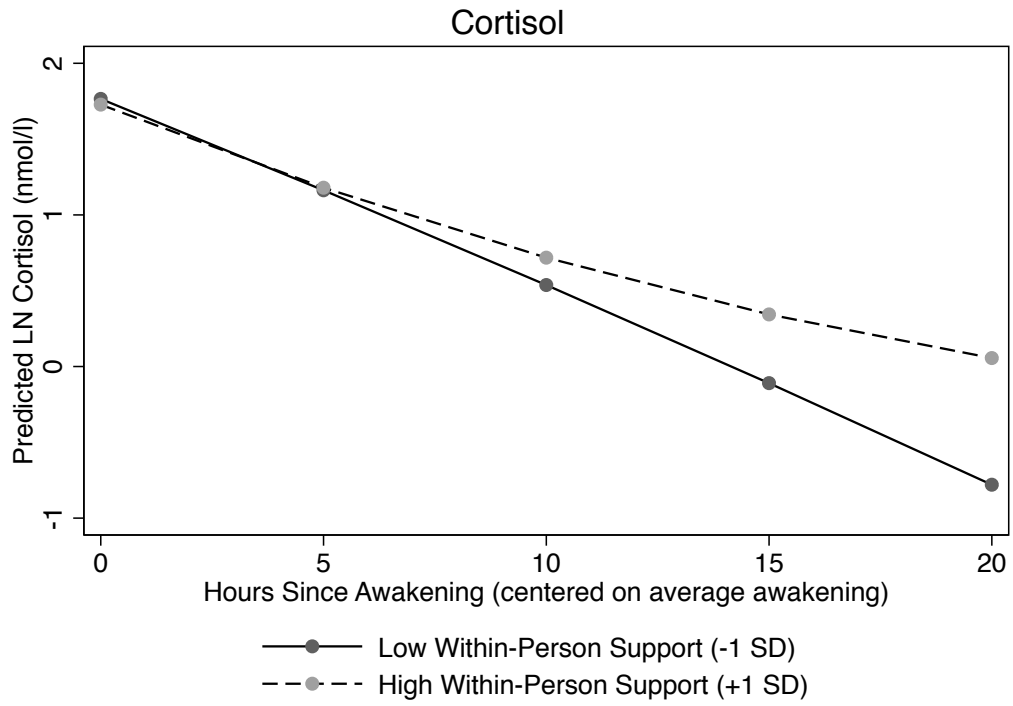
Covariance: Hours Since Midnight, Hours Since Midnight <sup>2</sup>	0.00004(0.00003)	[-0.00003, 0.0001]
Residual Variance	0.37(0.02)	[0.34, 0.40]

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Note: Based on 127 participants with 1618 longitudinal records. Day = highest level of time in this model. Hours Since Midnight = the number of hours since midnight that a cortisol sample was taken; lowest level of time in this model.

<sup>a</sup>0 = female, 1 = male.

<sup>o</sup>*p*<.1. \**p*<.05. \*\**p*<.001.



*Figure 3.* Support was significantly associated with the quadratic rate of change of diurnal cortisol.

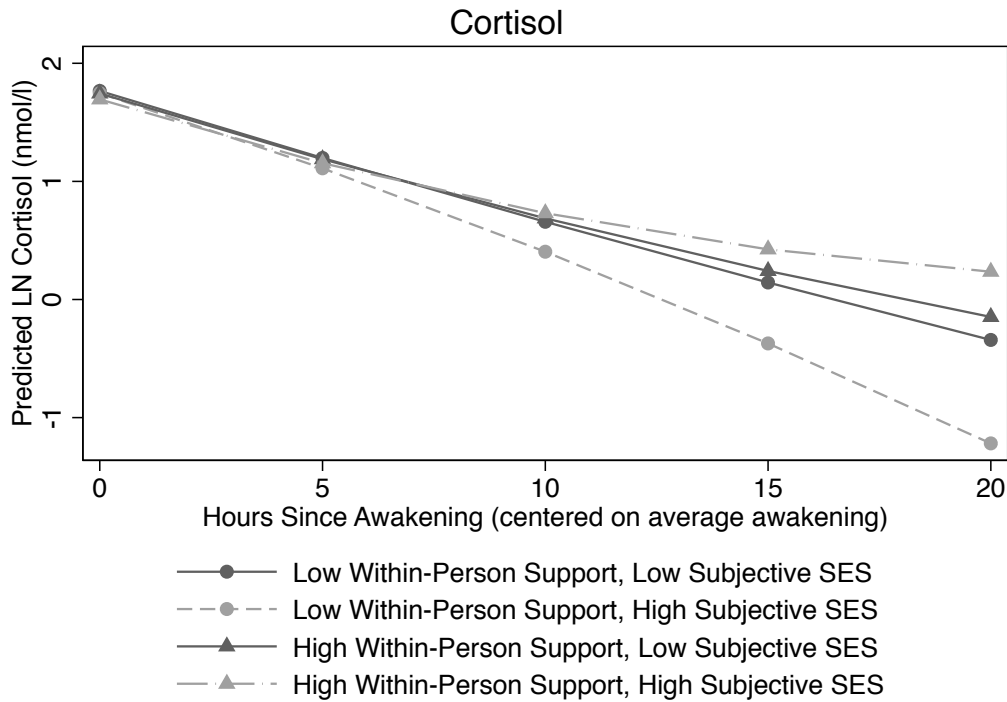


Figure 4. Within-Person Support and Subjective SES marginally interact with the quadratic rate of change in diurnal cortisol. The lines represent  $\pm 1$  *SD* above and below the mean on within-person support and subjective SES.

When a model with interactions between all forms of time, all forms of support, and objective SES was run, controlling for subjective SES, there was a significant interaction only between education and the linear rate of change in cortisol. To probe this effect, all non-significant interactions and main effects were removed (see Table 5). The effect remained significant,  $\chi^2(2, N = 128) = 8.19, p = .017$ . Participants with parents who both had bachelor's degrees exhibited steeper slopes in diurnal cortisol than those whose parents did not have bachelor's degrees.

Table 5

*The Effect of Objective SES on Diurnal Cortisol*

Fixed Effects	Coefficients (SE)	95% CI
Intercept	2.32(0.16)**	[2.00, 2.63]
Day	-0.02(0.03)	[-0.08, 0.04]
Hours Since Midnight	-0.10(0.01)**	[-0.11, -0.08]
Hours Since Midnight <sup>2</sup>	0.001(0.001)	[-0.001, 0.002]
BMI	-0.02(0.01)*	[-0.04, -0.01]
Gender <sup>a</sup>	0.09(0.05) <sup>o</sup>	[-0.01, 0.18]
Parents Education <sup>b</sup>		
One Parent Bachelor's	-0.14(0.08) <sup>o</sup>	[-0.29, 0.01]
Two Parents Bachelor's	-0.09(0.07)	[-0.22, 0.04]
Hours Since Midnight*Parents Education		
One Parent Bachelor's	-0.02(0.01)	[-0.04, 0.01]
Two Parents Bachelor's	-0.03(0.01)*	[-0.05, -0.01]
Random Effects Parameters	Estimate	
Random Intercept: Person	0.08(0.02)	[0.05, 0.12]
Random Slope: Hours Since Midnight	0.001(0.0003)	[0.001, 0.002]
Random Slope: Hours Since Midnight <sup>2</sup>	0.00002(0.00)	[0.00, 0.00004]
Covariance: Person, Hours Since Midnight	0.01(0.002)	[0.005, 0.01]
Covariance: Person, Hours Since Midnight <sup>2</sup>	-0.0004(0.0003)	[-0.001, 0.0001]
Covariance: Hours Since Midnight, Hours Since Midnight <sup>2</sup>	0.00002(0.00003)	[-0.0001, 0.0001]
Residual Variance	0.37(0.02)	[0.34, 0.40]

Note: Based on 128 participants with 1649 longitudinal records. Day = highest level of time in this model. Hours Since Midnight = the number of hours since midnight that a cortisol sample was taken; lowest level of time in this model.

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<sup>a</sup>0 = female, 1 = male. <sup>b</sup>0 = neither parent has a bachelor's degree.

<sup>o</sup> $p < .1$ . \* $p < .05$ . \*\* $p < .001$ .



## Discussion

In this study, I aimed to test the potential moderating role of subjective and objective SES in the relationship between daily, received social support and next-day psychological stressor appraisals and diurnal cortisol responses. The findings demonstrate that subjective SES is related to the receipt of support and can moderate the relationship between support receipt and next-day daily physiological outcomes. For those who reported higher subjective SES, receiving less support than usual was associated with a steeper slope in diurnal cortisol. Unexpectedly, neither subjective nor objective SES moderated the link between daily support and next-day stressor appraisals, but the receipt of more support on average was associated with lower stressor appraisals. This study is one of few to examine the relationship between SES and daily, received social support. Together, my findings suggest that daily responsive support is a predictor of lower daily stressor appraisals, but this support is not without physiological costs for those higher in subjective SES who may be sensitive to self-relevant threats to autonomy or competency (Gruenewald, Kemeny, & Aziz, 2006; Kraus et al., 2012).

Contrary to hypotheses, I did not find that subjective or objective SES moderated the association between daily, received social support (i.e., others meeting needs/wishes) and next-day stressor appraisals. Although unexpected, my measure of support at least partially represents responsive support, which may operate differently than other types of received support (e.g., visible or mismatched support). Responsive support is defined as support that is validating, understanding, caring, and responsive to the needs of the recipient (Reis & Clark, 2013). My daily support item asked participants to indicate the extent to which others responded to their needs/wishes, which closely reflects the validating, understanding, and responding-to-needs components of responsive support. Prior work has demonstrated that received support that is

responsive in nature is associated with positive psychological outcomes (Feeney, 2004; Maisel & Gable, 2009). This prior research suggests that responsive support may sidestep the threats to the self that can undermine the efficacy of received support in improving psychological outcomes. Because responsive support is validating, it may not threaten individuals' sense of self-efficacy, competency, or autonomy. My findings provide additional support for the idea that responsive support can be psychologically beneficial for those who may be particularly sensitive to self-relevant threats to autonomy and competency (i.e., those who are higher in objective or subjective SES).

Although lower support was associated with higher stressor appraisals, I did not find that those who reported lower objective or subjective SES and lower support were worse off than those who reported higher SES and lower support. This finding suggests that receiving social support was a more powerful predictor of daily psychological stressor appraisals than objective or subjective SES, which are both associated with perceived stress (Adler et al., 2000; Almeida et al., 2005; Senn et al., 2014). In this study, it may be the case that those who were lower in objective or subjective SES had “shifted and persisted” with the help of supportive others in the past, which contributed to their academic success (i.e., attending college; Chen & Miller, 2012). Therefore, those who were lower in objective and subjective SES in this study may have developed a reserve of psychological resources that buffered them from *especially* high psychological stressor appraisals (Gallo et al., 2005) when they reported lower support. In sum, I found no costs, in terms of stressor appraisals, of receiving daily support for those who were higher in subjective or objective SES and no exaggerated costs for those lower in objective or subjective SES who received less daily support.

Subjective SES was, however, an important moderator of next-day diurnal cortisol responses. For those who were lower in subjective SES, they exhibited cortisol that more closely reflected the pattern of those who reported higher subjective SES and higher support, which was a flatter diurnal cortisol slope. This pattern of diurnal cortisol is believed to represent risk of poorer future health (Kumari et al., 2011). Previous work has found an association between lower education, income, and occupational prestige and flatter diurnal cortisol (Sheldon Cohen et al., 2006; Kumari et al., 2010), and this may be contributing to the observed responses in this study for those lower in subjective SES. A small body of literature has demonstrated that lower-objective-SES African Americans who are high in academic achievement and emotional well-being simultaneously exhibit poorer physiological well-being (Brody et al., 2013; Miller, Cohen, Janicki-Deverts, Brody, & Chen, 2016). These authors called this “skin-deep resilience,” which reflects the diminishing health benefits of social mobility for these individuals. In the present study, although those of lower subjective or objective SES did not exhibit exaggerated stressor appraisals when support was lower, those lower in subjective SES did exhibit flatter diurnal cortisol slopes when support was lower. This suggests that (1) lower-subjective-SES individuals in our study were not as protected by their reserve of psychological resources in terms of diurnal cortisol and (2) the receipt of daily support was insufficient to offset the physiological costs of low subjective and objective SES on diurnal cortisol. This work also highlights the potential benefits and limitations of receiving support for those who report lower subjective or objective SES.

For those who were higher in subjective SES, support was a stronger predictor of diurnal cortisol. Those who were higher in subjective SES exhibited flatter diurnal cortisol when they received more support than usual. Prior research has demonstrated that acute threats to valued

aspects of the self are associated with significant increases in acute cortisol responses to stressors (Dickerson & Kemeny, 2004). However, the same threats that contribute to increases in acute cortisol are not always associated with similar increases in stressor appraisals but may instead be associated with increases in the more specific “negative self-related cognitive appraisals” or self-conscious emotions (e.g., shame; Dickerson & Kemeny, 2004). Future research could test the possibility that daily support may be linked with negative *self-related* cognitive appraisals or self-conscious emotions for those who report higher subjective SES. While prior work has demonstrated the psychological benefits of receiving responsive support (Feeney, 2004; Maisel & Gable, 2009), to the best of my knowledge, this literature has yet to demonstrate the effects of receiving responsive support on physiological biomarkers. These findings highlight the importance of examining both psychological and physiological outcomes when aiming to better understand the costs and consequences of receiving support.

In this sample, subjective and objective SES were not associated with each other. While this was unexpected, this university sample may be somewhat unique. At the university where the data were collected, there is a much higher number of first-generation college students than is typical of large public universities. This unique dynamic may shape the unexpected divergence between subjective SES and objective SES. For those lower in objective SES, this may foster a sense of belonging that promotes the belief that they will be successful in college (i.e., “I belong here, and therefore, I am able to complete college”), thereby increasing their reports of subjective SES (Stephens et al., 2014). However, individual variability in the extent to which these lower-objective-SES participants feel they belong (Rheinschmidt & Rudolfo, 2002) may have diminished the correlation between subjective and objective SES. Understanding the full scope of the impact of daily, received support or daily, received responsive support requires that future

researchers conduct similar studies at other universities and in socioeconomically-diverse community samples. Doing so would allow us to better understand how socioeconomic inequity shapes support processes.

The complexity inherent in determining one's own subjective SES may have contributed to different patterns in the relationship between SES and received support by type of SES. Although there was not a relationship between subjective SES and objective SES, both measures were correlated with average daily, received support. Lower subjective SES was associated with more received support on average, but lower objective SES was associated with less received support on average. Prior research would suggest that those who are lower in objective or subjective SES or who are made to feel lower in status (1) perceive less control or power over their situations, (2) prioritize relationships with others over the self, and (3) may find the provision and receipt of support to be more normative (Kraus et al., 2012; Piff et al., 2012). As a result, we predicted that lower subjective or objective SES would be associated with more daily support, but this was only the case for those who perceived lower status and not those who reported lower objective status. This could be because subjective SES best represents individuals' socioeconomic histories and cultures (Cundiff, Smith, Uchino, & Berg, 2013; Operario, Adler, & Williams, 2004), and objective SES is too limited in scope to capture the complex social phenomenon that contribute to variations in received support by SES. Prior work has also shown that, compared to those in the working class, women in poverty report fewer social connections and perceive less support (Stephens, Cameron, & Townsend, 2014), which may explain the observed pattern for those who reported lower objective SES. On other hand, the literature on power suggests that those who perceive more control over others and resources also perceive more respect from others (Anderson, John, & Keltner, 2012). This literature would lead

one to believe that higher status individuals would perceive more daily support (i.e., that others are more frequently meeting their needs/wishes). This may explain why those who were higher in objective SES reported higher daily support, but it is inconsistent with reports from those higher in subjective SES. Additional daily-experience research with socioeconomically-diverse participants is needed to test these competing hypotheses.

In interpreting the results, there is one limiting factor that should be taken into consideration. Although my measure of support appears to reflect responsive support, it has not been validated as a measure of responsive support. This measure also differs somewhat from how daily support and responsiveness have been assessed in prior studies. However, the literature has been plagued by the use of a single dichotomous item to measure received support in daily life. While validation of our support item is suggested, it has the advantage of being a continuous measure of support. Future studies should consider including multiple continuous items measuring the receipt of social support. This will undoubtedly contribute to a more complete understanding of the consequences of received support.

The effects of received support are complex and depend on a number of factors. These findings underscore the importance of examining physiological correlates of daily, received support and also the value of considering the effects of culture on close relationship processes. Study 2 builds on this study by incorporating dyadic reports of support in a sample that is lower in objective SES.

## CHAPTER 3: STUDY 2

### Overview and Hypotheses

Study 2 tested the interaction between daily, received support, SES, and daily psychological stress responses and reports of relationship satisfaction. In this study, couples completed two weeks of daily diaries, and therefore, I could examine dyadic support processes. I tested the interaction between the *type* of received support (i.e., visible or invisible) and SES as a predictor of daily psychological and relational outcomes.

Research thus far (conducted predominantly with higher SES participants) suggests that received support may threaten valued aspects of the self; however, the visibility of support may shape its effectiveness. Invisible support is when a support recipient does not report receiving support or when the recipient does not consider a particular behavior to be supportive (Bolger & Amarel, 2007; Bolger et al., 2000). For example, invisible support (both emotional and practical) has been associated with decreases in anger and increases in self-efficacy during an interaction task in which participants discussed something they would like to change about themselves with their romantic partner (Howland & Simpson, 2010). Invisible support from partners has also been associated with smaller increases in depression leading up to an exam (Bolger et al., 2000). However, the effect of visible support may be moderated by SES. Higher SES is associated with valuing autonomy, competency, and self-efficacy (Kraus et al., 2012; Stephens et al., 2014), and prior research has demonstrated that visible support can threaten these aspects of the self (Bolger & Amarel, 2007). This suggests that invisible support may be associated with more positive outcomes for those who report higher SES. Lower SES, however, is associated with greater inclusion of others in the self (Kraus et al., 2012; Stephens et al., 2014), and therefore, visible support may be less threatening for these individuals. The dyadic nature of Study 2 allowed for a

test of the interaction between received, visible support and SES and its association with daily psychological and relational outcomes.

Both psychological responses to stress and relationship satisfaction have important implications for health and well-being. Higher psychological responses to stress are associated with poorer mental and physical health (Charles, Piazza, Mogle, Sliwinski, & Almeida, 2013; Keller et al., 2012). However, higher relationship satisfaction is associated with better mental and physical health (Kiecolt-Glaser & Newton, 2001). I hypothesized the following about the effect of SES on the associations between daily visible support receipt and psychological stress responses and relationship satisfaction:

Daily psychological stress responses: I hypothesized that, for those who reported lower SES, higher daily, visible support would be associated with lower daily, psychological responses to stress than when receiving higher invisible support. However, for those who reported higher SES, I hypothesized that higher daily, *invisible* support would be associated with lower daily, psychological responses to stress than higher, daily visible support. Figure 5 illustrates the hypothesized relationship.



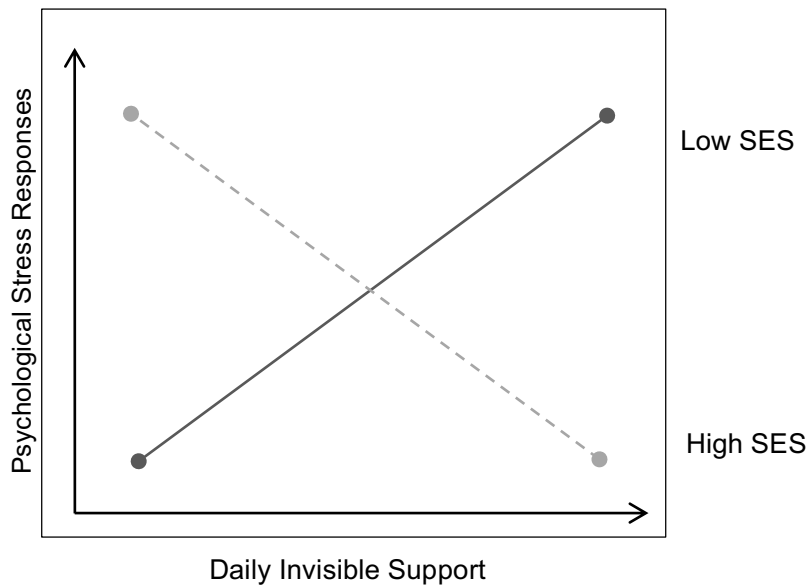


Figure 5. The hypothesized relationship between daily, received, invisible support, SES, and daily psychological stress responses.

Daily relationship satisfaction: For those who reported lower SES, I hypothesized that higher daily, visible support would be associated with higher daily, relationship satisfaction than those who reported more daily, invisible support. I further hypothesized that higher daily, *invisible* support would be associated with higher relationship satisfaction than higher daily, visible support in those who reported higher SES. Figure 6 illustrates the hypothesized relationship.

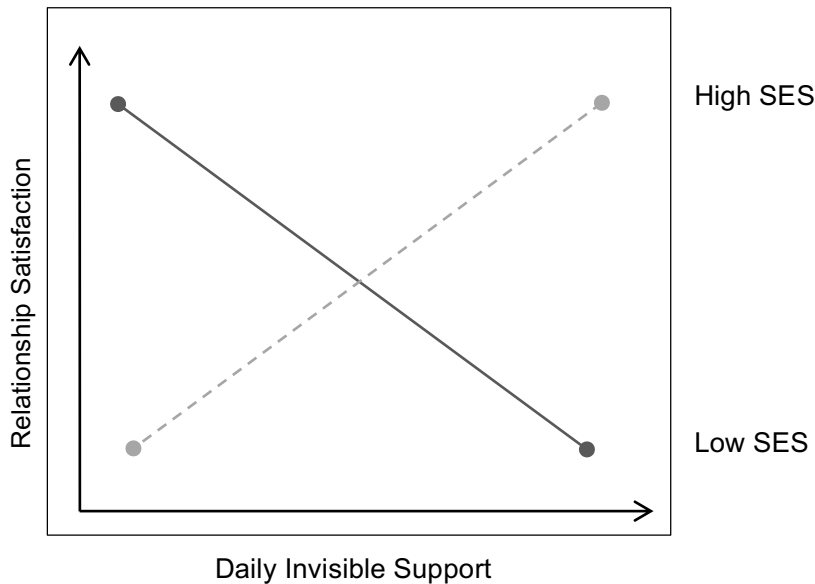


Figure 6. The hypothesized relationship between daily, received, invisible support, SES, and daily relationship satisfaction.

## Methods

### Participants

Seventy-four Swiss, German-speaking, heterosexual couples were recruited via newspaper ads, flyers, and word-of-mouth to participate in the daily diary and laboratory components of this study. To be eligible, participants had to be in a committed relationship for at least two months, 18 years old, and fluent in German. Women were 23.33 years old ( $SD = 6.91$ ) and men were 25.99 years old ( $SD = 7.34$ ) on average. Given the ethnic homogeneity in Switzerland, ethnic background was not collected. Each member of the couple was paid 50SFr (~\$53) for their completion of both components of the study.

### Procedure

This study was approved by the local ethical review board. The larger study was a comprehensive examination of daily and in-laboratory social interactions between partners, and only a subset of the data was used for the current investigation. All surveys and instructions were administered in German, but the English translations are presented here<sup>4</sup>. Eligible couples were in committed relationships for at least two months and were fluent in German. After providing informed consent, participants began the daily diary component of the research. Participants completed daily diaries four times per day: upon awakening, between 1:00 p.m. and 2:00 p.m., between 6:00 p.m. and 7:00 p.m., and before bed. These timepoints were established based on standard experience sampling methods (Wilhelm & Schoebi, 2007). Couples completed daily diaries for at least 14 consecutive days on smartphones provided by the researchers; reported information included support provided and received, feelings of distress, and reports of relationship satisfaction. Participants completed several questionnaire measures during the in-lab portion of the larger study. A subset of measures was the only aspect of the laboratory data collection used in the current project.

## **Measures**

### **Daily Assessments.**

#### *Social support.*

The dyadic nature of received support exchanges was captured with two items, which both partners completed when they indicated that they had interacted with their partner since their last diary. This allowed me to evaluate the effectiveness of receiving more or less support on a given day than an individual's average amount of support across all days. The first item was, "In our last contact, I treated my partner supportively," and participants could respond on a

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<sup>4</sup> Translations were provided by my collaborator, Dr. Dominik Schoebi, who collected this data.

sliding bar displayed on their device from “not at all” to “very.” Potential values (although hidden from participants) ranged from 1 = “not at all” to 7 = “very.” The second item was, “In our last contact, my partner was supportive,” and participants responded with the same scale. In order to create a support invisibility score, I used a coding scheme similar to those used previously for continuous measures of support (Biehle & Mickelson, 2012; Luscher et al., 2015). Table 6 illustrates the coding scheme and the three possible types of support that it generates. With continuous measures of support, support is higher in invisibility when there is a discrepancy in reports of support provision and support receipt: An individual reports providing more support than the recipient reports receiving. Higher support visibility reflects agreement between reports of support provision and receipt: An individual reports providing support and the recipient reports receiving it. With continuous measures of support provision a third category of support can be calculated, which has been called “imagined” support (Luscher et al., 2015). This category of support also reflects discrepancy in reporting, but in the opposite direction as invisible support. Imagined support occurs when recipient reports receiving more support than his/her partner reports providing. To create a score for the invisibility of received social support for women, women’s received support was subtracted from men’s provided support. The same methods were used to create a score for men’s invisibility of received support. Therefore, the highest and lowest possible scores are as follows: A difference score of 0 represents the receipt of visible support, 6.9 invisible support, and -6.9 imagined support.

In this study, only visible and invisible support interactions were used (women  $n = 585$ ; men  $n = 650$ ), and imagined interactions were coded as missing (women  $n = 602$ ; men  $n = 537$ ). Previous studies using continuous measures of support categorized imagined interactions as 0, or more visible support (e.g., Biehle & Mickelson, 2012; Luscher et al., 2015). However, others

using dichotomous measures categorized these interactions separately from visible support (e.g., Bolger, Zuckerman, & Kessler, 2000). Because these interactions potentially represent a unique psychological phenomenon, they were not included. In at least one study where these support interactions were coded dichotomously, these types of interactions were not collapsed with visible support interactions (Bolger et al., 2000). Therefore, high invisibility scores represent more invisible support and lower invisibility scores represent more visible support. This coding required that both partners complete the same diary timepoint and that they both indicated that they had an interaction with their partner since their last diary entry.

Table 6

*Coding Invisibility of Women's Received Social Support and Examples*

<b>Man Provided</b>	<b>- Woman Received</b>	<b>= Score</b>	<b>Type of Support</b>
7	- 7	= 0	Visible Support
7	-1	= 6.9	Invisible Support
.1	-7	= -6.9	Imagined Support

### *Time.*

At each diary timepoint (1-4), the actual time that the diary was completed was recorded by participants' devices (e.g., 8:00 p.m.). In this study, timepoints throughout the day, and not actual time, were used to match men's support responses with women's support responses. This was because, for example, if a man reported his provided support at 1:03 p.m. (timepoint 2—diaries between 1:00 and 2:00 p.m.) this report could not be matched with a woman's report of receiving support at 1:43 p.m. (timepoint 2) to create a support invisibly score. However, each person was reporting at timepoint 2, and timepoint could be used to match reports. As a result, timepoint, and not actual time, was used in all models as the form of time. Given that the awakening timepoint could have included supportive interactions from the previous day, therefore, this timepoint was dropped to facilitate the modeling of within-person, within-day change across timepoints. Participants completed at least 14 days of daily diaries, but some participants completed more than 14 days. I excluded any additional days of participation, because the vast majority of participants only completed 14 days.

### *Psychological stress responses.*

At each daily diary timepoint, participants were asked to indicate how upset, worried/fearful, and under control they felt. They could respond by moving a marker across a bar on their device from “not at all” (0.1) to “extremely” (7.0) or “absolutely” (7.0). Under control was reverse-scored, and all three items were averaged at each timepoint to create a composite psychological stress response measure where higher scores indicate higher stress. For women,  $\alpha = .58$ , and for men,  $\alpha = .61$ . Because low sense of control is highly associated with the experience of stress, this item should have captured psychological stress responses. Furthermore, feeling worried/fearful or upset is a likely consequence of feeling stress; thus, these two items

reflected subjective, psychological stress responses.

***Relationship satisfaction.***

Before bed each partner indicated the extent to which they were “content” with their relationship and the extent to which they felt their relationship was “satisfying/pleasurable.” Participants responded on a scale from “not at all” (0.1) to “absolutely” (7.0). These items were averaged, and higher scores represent greater relationship satisfaction. For women, standardized  $\alpha = .93$ , and for men, standardized  $\alpha = .89$ . Because there are only two items, a standardized alpha is a better test of reliability than an unstandardized alpha (Eisinga, Grotenhuis, & Pelzer, 2013).

**Laboratory Assessments.**

***Socioeconomic status (objective and subjective).***

During the laboratory session, participants reported their highest level of education completed. Participants responded using the following scale:

- 1 = no secondary school [7<sup>th</sup>, 8<sup>th</sup>, and 9<sup>th</sup> grade]
- 2 = secondary school [prepares for high school or professional schools]
- 3 = professional school [electrician, teacher, butcher]/high school without graduation]
- 4 = high school graduate or professional school graduate [necessary for admission into university or universities of applied sciences for professional school graduates]
- 5 = university or university of applied sciences

Given the cultural differences documented between those with and without a bachelor’s degree (Stephens et al., 2014), education was re-coded into two groups: those without a



university degree (1-4) and those with a university degree (5).

Subjective SES was measured with the MacArthur Scale of Subjective Socioeconomic Status (Adler et al., 2000) just as in Study 1; however, instead of comparing themselves to the U.S., participants used other people in Switzerland as a comparison point.

### **Covariates.**

#### ***Tensions or conflicts.***

For each daily diary completed, each participant reported whether they experienced tension or conflict with their partner since the last beep with a checkbox (i.e., yes or no). Since strain within individuals' social networks is associated with higher allostatic load (Seeman, Singer, Ryff, Dienberg Love, & Levy-Storms, 2002), the inclusion of this measure will partially account for the possibility that these experiences are driving psychological and physiological outcomes the following day. I created a variable that represented whether or not individuals reported experiencing a conflict on the previous day, which was used as a covariate in analyses.

#### ***Demographic information.***

Age, current relationship duration in years, and marital status (unmarried, married, or divorced) were collected during the laboratory portion of the study.

#### ***Attachment.***

Attachment was measured with the German version of the Experiences in Close Relationships-Revised scale (Fraley, Waller, & Brennan, 2000; Neumann, Rohmann, & Bierhoff, 2007 respectively). This 36-item scale measures both attachment-related anxiety and attachment-related avoidance. For example, attachment-related anxiety is measured with items such as, "I worry that romantic partners won't care about me as much as I care about them." Attachment-related avoidance is measured with items such as, "I don't feel comfortable opening up to

romantic partners.” Participants respond on a scale from “1 = strongly disagree” to “7 = strongly agree.” A subset of items was reverse-scored for higher scores to indicate more anxiety or avoidance. Eighteen items in each subscale (for a total of 36 items) were averaged and each subscale was included in all models as a covariate (women  $\alpha = .85-.86$ ; men  $\alpha = .85$ ).

## **Data Analysis Strategy**

### **Model building.**

#### *Models by Gender.*

In this study, timepoints are nested within days, days are nested within individuals, and individuals are nested within couples. As a result, I could, theoretically, test to see if a four-level model best represented daily distress and if a three-level model best represented relationship satisfaction. However, the highest level in both cases—couple—has only two groups, and members of each group are not exchangeable (i.e., men cannot be in the women group and women cannot be in the men group). There are drawbacks to conducting analyses where a level has two groups that are not exchangeable (Atkins, 2005; Hoffman, 2015b). For example, in these models it is only feasible to include one random effect, and therefore, slopes for men and women would be constrained to be equal. If there are gender differences in the direction or strength of the examined relationships, they would be obscured in a model with a random intercept for gender. To address the limitations of models with couple (or gender) as a level, the analyses are presented for women and men separately.

All models were run with the `xtmixed` command in STATA IC13. All models specified unstructured covariances and restricted maximum likelihood (Hoffman, 2015b). The primary interactions tested were between SES and each within- and between-person effects of invisible support. I hypothesized that more invisible support would be associated with lower daily

psychological stress responses and higher relationship satisfaction in those who reported higher SES compared to those who reported lower SES. Similarly, I hypothesized that more visible support would be associated with lower daily psychological stress responses and higher relationship satisfaction in those who reported lower SES compared to those who reported higher SES. Models were first run with interactions between subjective SES and each invisible support effect and controlling for objective SES. Next, they were run with interactions between objective SES and each invisible support effect and controlling for subjective SES. The models below are presented separately by objective and subjective SES.

***Daily social support.***

The longitudinal nature of this data allowed me to evaluate both within-person and between-person effects for invisibility of support. Two within-person invisibility of support variables were computed, which are detailed in Table 7, and one between-person score was computed. The within-person across timepoints effect represents change in the outcome variable when invisible support was higher or lower than that individual's average across timepoints for a given day. The within-person across days effect represents change in the outcome variable when invisible support was higher or lower on a given day than that individual's average across all day averages (an individual's overall average—the average of all the individual day averages of all timepoints). The between-person effect represents change in the outcome variable for individuals higher or lower on invisible support than the average of all individuals' overall average.

For each effect, there was a corresponding control variable to account for variation in how supportive interactions were. For example, if a man's support provided report was 7 and his partner's support received score was 7, the difference is 0 (which would be high visible support). Similarly, the difference would be 0 if both reported 1 and 1. However, one interaction was more

supportive than the other even though the difference is the same. Therefore, all models controlled for the opposite-gender support provision score. Because each model contains three invisible support effects, there are three corresponding control variables. Here is an example of what this looks like for a woman. For the within-person across timepoints effect, the actual man support provided score on a given day at a given time was controlled for. For the within-person across days effect, the average man support provided throughout the day for a given day was controlled for. For the between-person effect, an average man support provided score of all day averages for a given individual was controlled for.

Table 7			
<i>Within-person and Between-person Effects of Invisibility of Received Support</i>			
<b>Effect Name</b>	<b>Equation</b>	<b>Interpretation of the Effect</b>	<b>Random Variation</b>
Within-person Across Timepoints	An individual's timepoint score - The average of all timepoints that day for that individual	"At times when invisible support was higher/lower than individuals' own invisible support average on a given day..."	Allowed to randomly vary across days and individuals
Within-person Across Days	The average of all timepoints that day for an individual - The average of all day averages for that individual	"On days when invisible support was higher/lower than individuals' own invisible support average across all days..."	Allowed to randomly vary across individuals
Between Person	The average of all day averages for an individual - The average of all individuals' overall-average across all days	"Individuals with higher/lower than average invisible support than others..."	Cannot vary randomly

### ***Centering.***

Subjective SES was centered on the gender-specific grand mean to reduce multicollinearity between simple main effects and interaction terms in models examining the interaction between subjective SES and support. This study used three timepoints, which were centered at the first timepoint. Similarly, days were centered on the first day of participation.

### ***Model specification: Psychological stress responses.***

In models of psychological stress responses, individual and day were tested as random intercepts. Day was tested as a slope varying randomly across individuals. Timepoint was tested as a slope varying randomly across days and across individuals. The within-person across timepoints effect for invisible support was tested as a slope varying randomly across days and across individuals. Only the linear slope of timepoints and days was tested, because a visual inspection of the trend across time suggested only linear change in psychological stress responses across timepoints and across days. Invisible support within-person across days was tested as a slope varying randomly across individuals. To test each term (e.g., the random intercept for day or the random slope of time), the difference between a model with that variable and without it was tested with a log-likelihood ratio test. All terms were tested one at a time for women, and then again for men. The model best fitting the data is reported at the beginning of each results section.

### ***Model specification: Relationship satisfaction.***

Terms were tested in the same fashion, but there was one less level. Relationship was only measured once per day, and as a result, timepoint could not be included. Therefore, in models of relationship satisfaction, individual was tested as random intercepts, and day was tested as a slope varying randomly across individuals. The within-person across days invisible

support effect was tested as a slope varying randomly across individuals. To test each term (e.g., the random intercept for day or the random slope of time), the difference between a model with that variable and without it was tested with a log-likelihood ratio test. Again, the model best fitting the data is reported at the beginning of each results section.

### ***Covariates.***

After testing the primary interaction between subjective SES and the invisible support terms, previous-day conflict, anxious attachment, avoidant attachment, relationship duration, relationship status, educational attainment, and age were included as covariates. Covariates were maintained (1) if they were significant predictors of the outcome *or* (2) controlling for one lowered the *p*-value of an effect for invisible support or SES.

## **Results**

### **Descriptive Statistics**

Both women and men reported less than two tensions or conflicts during the duration of the study (excluding day 14). Couples had been together for around four years on average, and around 95% of the sample was unmarried. Men and women reported attachment-related anxiety and attachment-related avoidance around or below the midpoint of the scale (four), and both reported higher attachment-related avoidance than anxiety. Additional descriptive information and correlations for the covariates are available in Table 8.

Table 9 includes descriptive statistics and correlations for SES, received invisible support, psychological stress responses, and relationship satisfaction. Both men and women received more visible support than invisible on average. Seventeen percent of women graduated from a university, and almost twice as many men graduated from a university. However, the average age for men was higher than the average age for women. Although women and men

reported similar subjective SES (means around 6 out of 10, which is within range of averages observed for U.S. participants [e.g., Adler, Epel, Castellazzo, & Ickovics, 2000; Operario, Adler, & Williams, 2004]), subjective SES was not associated with objective SES for women,  $r = .03$ ,  $p = .11$ , but it was positively associated with men's objective SES,  $r = .14$ ,  $p < .001$ . For women, higher subjective SES and higher objective SES were both associated with the receipt of more invisible support. For men, only higher objective SES was associated with the receipt of more invisible support.



Table 8

*Descriptive Statistics and Correlations of the Covariates by Gender*

Variable	M(SD)	Age	Relationship Duration	Anxious	Avoidant
Women					
Age	23.33(6.91)				
Relationship Duration	4.13(2.24)	.55**			
Anxious	3.08(0.86)	-.04 <sup>o</sup>	.12**		
Avoidant	3.67(0.41)	-.33**	-.07**	.12**	
Conflict	1.60(1.88)	.04 <sup>o</sup>	.04 <sup>o</sup>	.11**	.21**
Men					
Age	25.77(7.04)				
Relationship Duration	4.12(2.11)	.34**			
Anxious	2.83(0.80)	-.03	-.18**		
Avoidant	3.72(0.40)	-.28**	-.03	.39**	
Conflict	1.83(1.96)	-.03	.10**	.06*	.14**

Note: Anxious = attachment-related anxiety. Avoidant = attachment-related avoidance. Conflict = average number of conflicts on days 1-13.

<sup>o</sup> $p < .1$ . \* $p < .05$ . \*\* $p < .001$ .

Table 9

*Descriptive Statistics and Correlations of the Key Variables of Interest by Gender*

Variable	M(SD)	Subjective SES	Objective SES	Invisible Support	Stress
Women					
Subjective SES	6.03(1.60)				
Objective SES <sup>a</sup>	0.17	.03			
Invisible Support	1.41(0.83)	.14**	.21**		
Stress	1.45(.66)	.17**	-.22**	.14**	
Relationship Satisfaction	4.97(1.11)	-.03 <sup>o</sup>	.03	-.23**	-.52**
Men					
Subjective SES	5.89(1.62)				
Objective SES <sup>a</sup>	0.28	.17**			
Invisible Support	1.51(0.94)	-.02	.23**		
Stress	1.39(0.60)	-.11**	.17**	.09**	
Relationship Satisfaction	4.69(0.99)	.31**	-.21**	-.40**	-.54**

Note: SES = socioeconomic status. Invisible Support = overall average of invisible support received. Stress = average daily psychological stress. <sup>a</sup>0 = did not graduate from a university, 1 = did graduate from a university.

<sup>o</sup> $p < .1$ . \* $p < .05$ . \*\* $p < .001$ .

## Psychological Stress Responses

### Women.

Psychological stress responses in women were best modeled with (1) a random intercept for individual and day, (2) a random slope for timepoint that varied across days, and (3) a random slope of day that varied across individuals. No covariates were significantly associated with psychological stress responses in women.

My initial model included fixed effects for day, time, invisible support within-person across timepoints\*subjective SES, invisible support within-person across days\*subjective SES, between-person invisible support, the corresponding invisible support control variables, and all lower order terms. In this model, none of these interactions were significantly associated with psychological stress responses  $p$  values  $> .53$ . After removing the interactions and only including main effects and controlling for objective SES<sup>5</sup>, there were significant effects for support provided from men at each timepoint, average overall support provided from men, and invisible support within-person across days (see Table 10). At any given timepoint, women reported lower psychological stress responses when men reported providing more support,  $\gamma = -0.16$ ,  $z = -3.38$ ,  $p = .001$ . Similarly, women reported lower psychological stress responses when men reported providing more overall average support,  $\gamma = -0.16$ ,  $z = -2.09$ ,  $p = .036$ . Finally, women who received more invisible support on a given day than their average invisible support across all days (within-person across days effect), also reported higher psychological stress responses on those days,  $\gamma = 0.12$ ,  $z = 4.29$ ,  $p < .001$ . Correspondingly, women who received more visible support on a given day than their average visible support across all days (within-person across

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<sup>5</sup> In this model, timepoint was also removed as a random slope because the model would not converge while estimating this variance component, which was close to 0.

days effect), also reported lower psychological stress responses. There were no main effects of subjective or objective SES in this model. When objective SES replaced subjective SES in the initial interaction model with all interactions (and controlling for subjective SES), there were no significant interactions,  $p$  values  $> .32$ <sup>6</sup>. All of the main effects described above remained significant with the exception of average overall support provided by men, which became marginally significant,  $p = .082$ .

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<sup>6</sup> Timepoint was also removed from this model. See footnote for subjective SES models of psychological stress responses in women.

Table 10

*The Effects of Provided and Invisible, Received Support and SES on Daily Psychological Stress Responses in Women*

Fixed Effects	Coefficients (SE)	95% CI
Intercept	2.98(0.33)**	[2.32, 3.63]
Day	-0.01(0.01) <sup>o</sup>	[-0.03, 0.002]
Subjective SES	0.08(0.05)	[-0.02, 0.17]
Objective SES <sup>a</sup>	-0.09(0.22)	[-0.53, 0.35]
Partner Provided Support: Timepoint	-0.16(0.05)*	[-0.26, 0.07]
Partner Provided Support: Day Average	0.05(0.06)	[-0.07, 0.16]
Partner Provided Support: Total Average	-0.15(0.08)*	[-0.30, -0.01]
Invisible Support: Within-person Across Timepoints	0.08(0.05)	[-0.03, 0.18]
Invisible Support: Within-person Across Days	0.12(0.03)**	[0.06, 0.17]
Invisible Support: Between-person	0.04(0.09)	[-0.14, 0.21]
Random Effects Parameters		Estimate
Random Intercept: Person	0.18(0.05)	[0.10, 0.32]
Random Slope: Day	0.0001(0.0001)	[0.0001, 0.0001]
Covariance: Person, Day	0.004(0.002)	[0.004, 0.01]
Random Intercept: Day	0.01(0.05)	[0.00, 413.05]
Residual Variance	0.39(0.05)	[0.31, 0.51]

Note: Based on 56 participants with 384 days and 518 longitudinal records. Day = form of time in this model.

<sup>a</sup>0 = did not graduate from a university, 1 = did graduate from a university.

<sup>o</sup> $p < .1$ . \* $p < .05$ . \*\* $p < .001$ .

**Men.**

In men, psychological stress responses were best modeled with the same random intercepts and slopes that were included for women: a random intercept for individual and day, a random slope of day that varied across individuals, and a random slope of timepoint that varied across days. No significant covariates were included—except for the corresponding women-support-provided variables, which were always included regardless of significance.

Just as in the initial model for women, I simultaneously tested the interactions between subjective SES and all the invisible support effects and all lower-order terms as fixed effects. This model showed a significant interaction between invisible support within-person across timepoints and subjective SES,  $\gamma = -0.06$ ,  $z = -2.37$ ,  $p = .018$ . To examine this interaction further, I removed the non-significant interactions and left only the main effects for the other invisible support effects, controlled for objective SES, and reran the model. This model showed significant effects for women-provided support at a given timepoint, within-person across timepoints invisible support, within-person across timepoints invisible support\*subjective SES, and within-person across days invisible support (see Table 11). Women reporting that they provide more support at any given timepoint was associated with lower psychological stress responses in men,  $\gamma = -0.17$ ,  $z = -2.88$ ,  $p = .004$ . When subjective SES is at its average, men who received more invisible support at a given timepoint than their average invisible support that day reported higher psychological stress responses,  $\gamma = 0.19$ ,  $z = 4.68$ ,  $p < .001$ , which is the simple main effect for within-person across timepoints invisible support. This effect is conditional on subjective SES such that as subjective SES increases, this relationship decreases or becomes weaker,  $\gamma = -0.06$ ,  $z = -2.26$ ,  $p = .024$ . In other words, type of support is more important for those who reported lower subjective SES, and for them, higher invisible support at a given timepoint than their average invisible support that day is more strongly associated with higher psychological stress responses, which provides partial support for our hypotheses. Similarly, higher visible support at given timepoint than men's average invisible support that day was associated with lower psychological stress responses. Figure 7 illustrates this relationship for those who are one standard deviation above and below the mean for subjective SES. Of these two groups, there was only a significant relationship between within-person across timepoints

invisible support and psychological responses to stress for those who reported lower subjective SES,  $\gamma = 0.29$ ,  $z = 4.59$ ,  $p < .001$ .

Table 11

*The Effect of the Interaction of Subjective SES with Invisible, Received Support on Daily Psychological Stress Responses in Men*

Fixed Effects	Coefficients (SE)	95% CI
Intercept	2.16(0.38)	[1.42, 2.91]
Day	0.001(0.01)	[-0.03, 0.03]
Time	0.05(0.04)	[-0.03, 0.13]
Objective SES <sup>a</sup>	0.22(0.20)	[-0.18, 0.61]
Partner Provided Support: Timepoint	-0.17(0.06)*	[-0.30, -0.05]
Partner Provided Support: Day Average	0.06(0.07)	[-0.07, 0.19]
Partner Provided Support: Total Average	-0.05(0.08)	[-0.21, 0.12]
Invisible Support: Within-person Across Timepoints	0.19(0.04)**	[0.11, 0.27]
Subjective SES	-0.01(0.05)	[-0.11, 0.10]
Invisible Support: Within-person Across Timepoints*Subjective SES	-0.06(0.03)*	[-0.11, -0.01]
Invisible Support: Within-person Across Days	0.11(0.03)**	[0.05, 0.16]
Invisible Support: Between-person	0.08(0.09)	[-0.10, 0.26]
Random Effects Parameters	Estimate	
Random Intercept: Person	0.59(0.16)	[0.35, 1.00]
Random Slope: Day	0.01(0.002)	[0.003, 0.01]
Covariance: Person, Day	-0.04(0.02)	[-0.07, -0.01]
Random Intercept: Day	0.13(0.05)	[0.06, 0.29]
Residual Variance	0.39(0.05)	[0.31, 0.49]

Note: Based on 61 participants with 440 days and 610 longitudinal records. Day = highest level of time in this model. Timepoint = lowest level of time in this model; represents timepoints throughout the day.

<sup>a</sup>0 = did not graduate from a university, 1 = did graduate from a university.

<sup>°</sup> $p < .1$ . \* $p < .05$ . \*\* $p < .001$ .



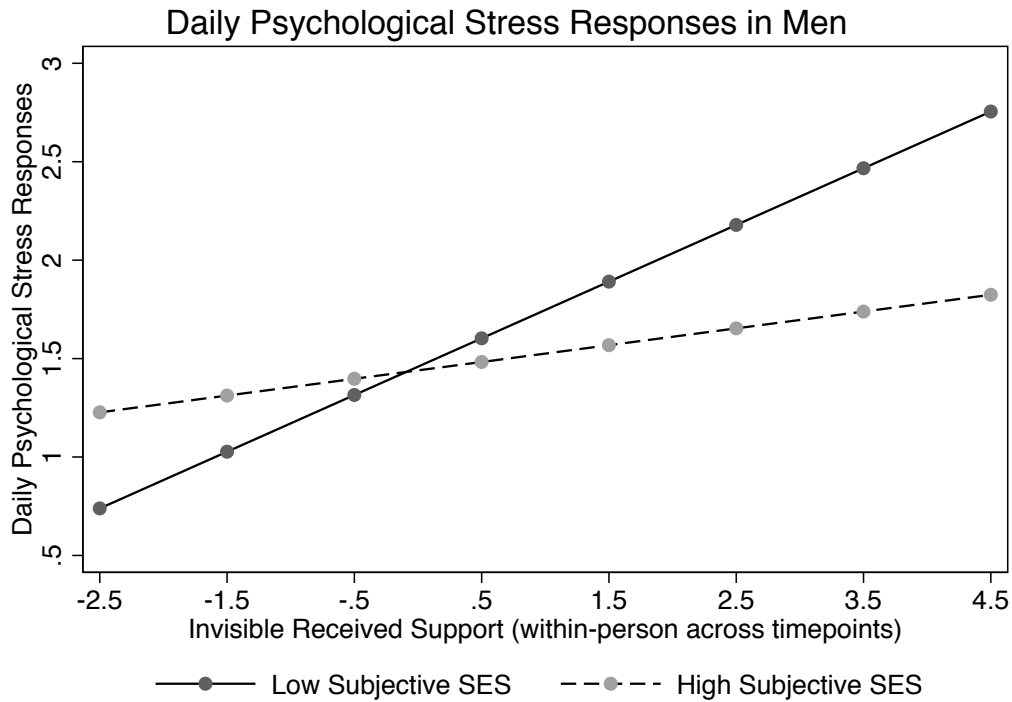


Figure 7. There was a significant relationship between within-person across timepoints invisible support and psychological distress for men one standard deviation below the mean on subjective SES.

Finally, those who received more invisible support on a given day than their overall average also reported greater psychological stress responses,  $\gamma = 0.10$ ,  $z = 3.56$ ,  $p < .001$ .

When I replaced subjective SES in the initial model with all the interaction terms included with objective SES (and controlled for subjective SES), there were no significant interactions between objective SES and any invisible support effects,  $p$  values  $> .39$ .

Furthermore, all the main effects presented with the subjective SES interaction described above remained the same. There was no main effect of objective SES on psychological responses to stress in men,  $p = .24$ .

### Relationship Satisfaction

## **Women.**

Relationship satisfaction in women was best modeled when a random intercept for individual was included and when random slopes for day and the within-person across days invisible support effect were included. Conflict and attachment-related anxiety were maintained as covariates.

In a model with the interactions between subjective SES and both invisible support effects included and all lower-order terms included as fixed effects, there were significant within- and between-person effects of invisible support, but there were no significant interactions,  $p$  values  $> .61$ . Therefore, I removed all interaction terms, maintained only main effects, and controlled for objective SES next. This model (see Table 12) showed significant effects of men-provided support on a given day, within-person across days invisible support, and between-person invisible support. For women, when their partners reported providing more support on a given day, they reported higher relationship satisfaction,  $\gamma = 0.34, z = 4.42, p < .001$ . When women received more invisible support on a given day than their overall invisible support average, they reported lower relationship satisfaction,  $\gamma = -0.30, z = -4.53, p < .001$ . In other words, when women received more visible support on a given day than their overall visible support average, they reported higher relationship satisfaction. Similarly, women who received more invisible support on average also reported lower relationship satisfaction,  $\gamma = 0.31, z = -2.46, p = .014$ . Again, women who received more visible support on average also reported higher relationship satisfaction. There was no effect of subjective SES, but there was an effect of objective SES. Women who graduated from a university reported lower relationship satisfaction than those who did not graduate from a university,  $\gamma = -0.68, z = -2.10, p = .036$ .

When subjective SES was replaced by objective SES in interactions predicting relationship satisfaction in women, there were no significant interactions between invisible support and objective SES,  $p$  values  $> .46$ . The main effects reported above did not change when the objective SES interactions were modeled.

Table 12

*The Effects of Provided and Invisible, Received Support and SES on Daily Relationship Satisfaction in Women*

Fixed Effects	Coefficients (SE)	95% CI
Intercept	3.62(0.64)**	[2.36, 4.89]
Day	0.01(0.02)	[-0.03, 0.05]
Conflict <sup>a</sup>	0.35(0.17)*	[0.02, 0.67]
Anxious	-0.47(0.12)**	[-0.71, -0.22]
Objective SES <sup>b</sup>	-0.68(0.32)*	[-1.31, -0.04]
Subjective SES	0.09(0.07)	[-0.04, 0.22]
Partner Provided Support: Day Average	0.34(0.08)**	[0.19, 0.49]
Partner Provided Support: Total Average	0.20(0.12)	[-0.04, 0.43]
Invisible Support: Within-person Across Days	-0.30(0.07)**	[-0.42, -0.17]
Invisible Support: Between-person	-0.31(0.13)*	[-0.57, -0.06]
Random Effects Parameters		
Random Intercept: Person	0.35(0.23)	[0.19, 1.26]
Random Slope: Day	0.01(0.004)	[0.001, 0.03]
Random Slope: Invisible Support Within-person Across Days	0.05(0.04)	[0.01, 0.20]
Covariance: Person, Day	0.01(0.03)	[-0.07, 0.04]
Covariance: Person, Invisible Support Within-person Across Days	0.01(0.07)	[-0.13, 0.14]
Covariance: Day, Invisible Support Within-person Across Days	-0.002(0.01)	[-0.02, 0.01]
Residual Variance	0.93(0.09)	[0.77, 1.12]

Note: Based on 56 participants with 333 longitudinal records. Day = form of time in this model. Conflict = whether or not participants reported conflict with their partners on a given day. Anxious = attachment-related anxiety.

<sup>a</sup>0 = did not report a partner conflict on a given day, 1 = did report a partner conflict on a given day. <sup>b</sup>0 = did not graduate from a university, 1 = did graduate from a university.

<sup>o</sup> $p < .1$ . \* $p < .05$ . \*\* $p < .001$ .

### **Men.**

Men's reports of relationship satisfaction were modeled in the same way as women's, with a random intercept for individuals and random slopes for days and the within-person across days invisible support effect. Age, attachment-related anxiety, and relationship status were significant covariates maintained in all models.

When the subjective SES\*within-person across days invisible support and subjective SES\*between-person invisible support terms were included as fixed effects, neither interaction was significantly associated with men's reports of relationship satisfaction,  $p$  values  $> .22$ . After removing the interactions, including only main effects, and controlling for objective SES, the following effects of interest were significant: subjective SES, objective SES, average women-provided support on a given day, and between-person invisible support (see Table 13). When women reported providing more support on any given day, men reported higher relationship satisfaction,  $\gamma = 0.56$ ,  $z = 8.46$ ,  $p < .001$ . High subjective SES was associated with higher relationship satisfaction in men,  $\gamma = 0.17$ ,  $z = 2.51$ ,  $p = .012$ ; whereas graduating from college (i.e., higher objective SES) was associated with lower relationship satisfaction,  $\gamma = -0.57$ ,  $z = -2.09$ ,  $p = .036$ . Furthermore, men who received more invisible support on average (between-person invisible support effect) reported lower relationship satisfaction,  $\gamma = -0.38$ ,  $z = -3.04$ ,  $p = .002$ . In other words, men who received more visible support on average also reported higher relationship satisfaction.

Table 13

*The Effects of Provided and Invisible, Received Support and SES on Daily Relationship Satisfaction in Men*

Fixed Effects	Coefficients (SE)	95% CI
Intercept	3.05(0.85)**	[1.38, 4.73]
Day	-0.02(0.02)	[-0.05, 0.02]
Anxious	0.22(0.12) <sup>o</sup>	[-0.02, 0.46]
Age	-0.03(0.03)	[-0.08, 0.02]
Relationship Status <sup>a</sup>		
Married	3.40(1.39)*	[0.67, 6.12]
Divorced	1.34(0.99)	[-0.60, 3.27]
Objective SES <sup>b</sup>	-0.57(0.27)*	[-1.09, -.04]
Subjective SES	0.17(0.07)*	[0.04, 0.31]
Partner Provided Support: Day Average	0.56(0.07)**	[0.43, 0.69]
Partner Provided Support: Total Average	-0.21(0.11) <sup>o</sup>	[-0.43, 0.01]
Invisible Support: Within-person Across Days	-0.13(0.07) <sup>o</sup>	[0.27, 0.01]
Invisible Support: Between-person	-0.38(0.12)*	[-0.62, -0.13]
Random Effects Parameters		
Random Intercept: Person	0.61(0.23)	[0.29, 1.26]
Random Slope: Day	0.003(0.03)	[0.001, 0.01]
Random Slope: Invisible Support Within-person Across Days	0.12(0.04)	[0.06, 0.24]
Covariance: Person, Day	-0.01(0.02)	[-0.05, 0.03]
Covariance: Person, Invisible Support Within-person Across Days	0.24(0.09)	[0.06, 0.42]
Covariance: Day, Invisible Support Within-person Across Days	-0.004(0.01)	[-0.02, 0.01]
Residual Variance	0.93(0.08)	[0.79, 1.10]

Note: Based on 57 participants with 392 longitudinal records. Day = form of time in this model. Anxious = attachment-related anxiety.

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<sup>a</sup>0 = not married. <sup>b</sup>0 = did not graduate from a university, 1 = did graduate from a university.

<sup>o</sup> $p < .1$ . \* $p < .05$ . \*\* $p < .001$ .

In a model containing interactions between objective SES and within-person invisible support across days and objective SES and between-person invisible support and subjective SES as a covariate, there were significant fixed effects. To ease the interpretation of these effects, the non-significant interaction was removed and the coefficients from this model were presented in Table 14 and below. All the main effects described above, when subjective SES was included instead, remained. There were, however, two additional effects: the within-person across days effect of invisible support and an interaction between between-person invisible support and education. In men, more invisible support on a given day than that individual's invisible support average across all days was associated with lower relationship satisfaction,  $\gamma = -0.14$ ,  $z = -1.96$ ,  $p = .049$ . Just as was previously reported, men who received more invisible support on average (between-person invisible support effect) reported lower relationship satisfaction,  $\gamma = -0.64$ ,  $z = -3.96$ ,  $p < .001$ . However, for men who completed college, the association between received invisible support was weaker,  $\gamma = 0.59$ ,  $z = 2.35$ ,  $p = .019$ . In other words, type of support was more important for those who did not complete college, and they reported lower relationship satisfaction when invisible support was high—or higher relationship satisfaction when invisible support was low. Figure 8 illustrates the relationship between received invisible support (between-person effect) and relationship satisfaction for those with and without a college degree. The relationship between invisible support receipt and relationship satisfaction was only significant for men who did not complete college,  $\gamma = -0.64$ ,  $z = -3.96$ ,  $p < .001$ .



Table 14

*The Effect of the Interaction of Objective SES with Invisible, Received Support on Daily Relationship Satisfaction in Men*

Fixed Effects	Coefficients (SE)	95% CI
Intercept	2.60(0.83)	[0.98, 4.23]
Day	-0.02(0.02)	[-0.05, 0.02]
Age	-0.01(0.03)	[-0.06, 0.05]
Anxious	0.21(0.12) <sup>°</sup>	[-0.02, 0.44]
Relationship Status <sup>a</sup>		
Married	2.61(1.39) <sup>°</sup>	[-0.12, 5.33]
Divorced	0.53(0.99)	[-1.31, 2.47]
Subjective SES	0.17(0.07)*	[0.05, 0.30]
Partner Provided Support: Day Average	0.55(0.07)**	[0.43, 0.68]
Partner Provided Support: Total Average	-0.21(0.11) <sup>°</sup>	[-0.43, 0.004]
Invisible Support: Within-person Across Days	-0.14(0.07)*	[-0.28, -0.0003]
Invisible Support: Between-person	-0.64(0.16)**	[-0.95, -0.32]
Objective SES <sup>b</sup>	-0.81(0.28)*	[-1.36, -0.27]
Invisible Support: Between-person*Objective SES <sup>b</sup>	0.59(0.25)*	[0.10, 1.08]
Random Effects Parameters		
Random Intercept: Person	0.59(0.23)	[0.28, 1.26]
Random Slope: Day	0.003(0.003)	[0.001, 0.01]
Random Slope: Invisible Support Within-person Across Days	0.12(0.04)	[0.06, 0.24]
Covariance: Person, Day	-0.01(0.02)	[-0.05, 0.02]
Covariance: Person, Invisible Support Within-person Across Days	0.24(0.09)	[0.06, 0.42]
Covariance: Day, Invisible Support Within-person Across Days	-0.003(0.01)	[-0.02, 0.01][
Residual Variance	0.93(0.08)	[0.79, 1.11]

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Note: Based on 57 participants with 392 longitudinal records. Day = form of time in this model. Anxious = attachment-related anxiety.

<sup>a</sup>0 = not married. <sup>b</sup>0 = did not graduate from a university, 1 = did graduate from a university.

<sup>o</sup> $p < .1$ . \* $p < .05$ . \*\* $p < .001$ .

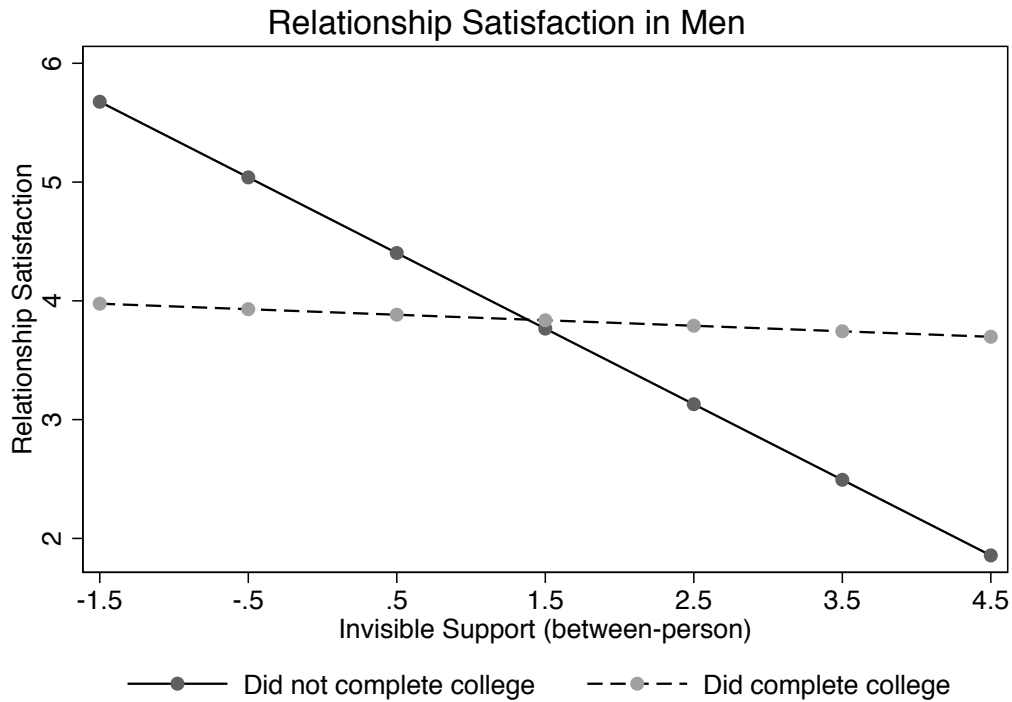


Figure 8. There was a significant relationship between invisible support and relationship satisfaction for men who did not complete college.

### Discussion

This study examined the potential moderating role of subjective and objective SES on the relationship between perceived support and daily psychological stress responses and relationship satisfaction in couples. For both men and women, when their partners reported providing more support, they reported lower same-day psychological stress responses and higher relationship satisfaction. However, receiving more invisible support was associated with higher, same-day psychological stress responses and lower relationship satisfaction. For men, the association of receiving more invisible support with more negative outcomes was stronger for those who were lower in SES. In sum, I found that the receipt of visible support, but not invisible support, was associated with beneficial psychological and relational outcomes, and SES was a key moderator of this effect for men. These findings build on the existing literature on daily, received social

support by demonstrating that the effect of support visibility for women and those lower in SES may vary from prior findings demonstrating that visibility can be associated with negative outcomes—potentially because these individuals are believed to be more interdependent (Cross & Madson, 1997; Kraus et al., 2012; Stephens et al., 2014).

My results showed that for both women and men, having a partner that reported providing more daily support was associated with lower same-day psychological distress and higher relationship satisfaction. Although the field has more recently focused on the distinction between visible and invisible support, early research in this area demonstrated a main effect for partner support provision. Namely, in the seminal study by Bolger, Zuckerman, and Kessler (2000), the main effect of partner support provision was similar, if not larger, than the effect of support visibility. This study examined the receipt of daily support from partners and depressive and anxiety symptoms over several weeks for support recipients about to take the bar exam. They found that support provision was associated with a significant decrease in depressive symptoms the week before the bar, but receiving invisible support was only associated with a marginal decrease in depressive symptoms (support provision was not associated with lower anxiety or depression during less stressful weeks of the study). Those whose partners reported providing more support reported a larger decrease in depressive symptoms over the course of the study, which is consistent with the findings from this investigation.

Across men and women and both outcomes, there was variation in the type of support provision effect that was significant. In some models, days with higher than usual support provision were significantly associated with the outcome variables, and in other models, having a partner that was providing more support on average was associated with the outcome variables. The most consistent trend was simply that the more support partners reported providing, the

lower recipients' psychological stress responses and the higher their relationship satisfaction. This finding suggests that, regardless of support visibility, having a partner who feels that they provided more support can be associated with positive, daily psychological outcomes. These reports of support provision may represent characteristics of the partners providing the support more than the supportive interactions. Partners who felt that they provided more support may be attuned to the needs of the support recipient and may engage in other positive behaviors. Daily responsiveness in partners has been associated with, for example, less negative daily emotion and higher relationship quality (Maisel & Gable, 2009). Therefore, reports of support provision may reflect positive behavior from support providers more generally—potentially explaining why support provision was associated with more positive psychological outcomes.

In addition to support provision, dyadic reports of more invisible support were also associated with higher psychological stress responses and lower relationship satisfaction for both men and women. Taking into account reports of both support provision and receipt at a given time, receiving more invisible support was associated with higher psychological stress responses and lower relationship satisfaction. Again, there was variability between genders as to which effects (within-person or between-person) were significantly associated with the outcomes, but there was a consistent adverse effect of invisible support. Conversely, receiving more visible support was associated with lower psychological stress responses and higher relationship satisfaction, but this effect was moderated by SES for men. For men, the associations between invisibility of support and both outcomes were stronger for those lower in SES than for those higher in SES. Consistent with hypotheses, men who were lower in subjective SES reported higher psychological stress responses when they received more invisible support. Similarly, for

men lower in objective SES, the receipt of invisible support was associated with lower relationship satisfaction.

I hypothesized that the receipt of visible support would be associated with positive psychological outcomes for those lower in SES. These findings provide some support for this hypothesis and hint to a potential mechanism of the observed effect. Reporting lower objective or subjective SES, or being made to feel of lower status, is associated with more inclusion of others in the self and greater focus on others (Kraus et al., 2012). As a result, these individuals may be more likely to provide and receive support (Piff et al., 2012), thereby making supportive interactions more normative. Because lower SES is also associated with placing higher value on social relationships than autonomy and competence on average (Kraus et al., 2012; Stephens et al., 2014), the receipt of support may be less threatening for these individuals. In fact, the receipt of support may be an important resource that these individuals count on. For men, I did find that for those lower in SES, visible support was associated with positive psychological and relational outcomes.

Why did SES not moderate the associations of support invisibility with psychological outcomes for women? Prior work has demonstrated that, like those lower in SES, women are more interdependent and focus more on others (Cross & Madson, 1997). Given that women are, on average, lower in objective SES than men, these gender norms may contribute more to their sense of self than their SES. As a result, the receipt of visible support may be less threatening to their valued aspects of the self—their social relationships.

Nevertheless, for women, these findings are difficult to reconcile with previous research. While a number of studies have found advantageous psychological correlates of daily visible support for both men and women (Biehle & Mickelson, 2012; Gleason et al., 2003, 2008; Maisel

& Gable, 2009; Rafaeli, Cranford, Green, Shrout, & Bolger, 2008), others have specifically found that the receipt of visible support was associated with more negative psychological outcomes in women (e.g., Wang & Repetti, 2014). In a daily diary study of received support in Swiss couples, researchers found that more invisible support was associated with lower daily negative affect, but also poorer health behaviors (i.e., more cigarettes smoked; (Luscher et al., 2015). In this study, couples were around twenty years older than the participants in the current research, and the discrepancy between the findings may suggest that the effect of visibility changes across the lifespan. However, it may also be an artifact of support-invisibility coding. In the study of smokers and their partners (Luscher et al., 2015), imagined support was coded as more visible support—in the present study these interactions were excluded. Although consistent methods of coding need to be established, the use of continuous measures of daily, received support in future studies will undoubtedly provide a more complete picture of the correlates of received support across age and context. Examining the association of women's received support and SES with men's outcomes and vice versa via actor-partner models may also help to reconcile these findings and shed light on the role of gender in these processes.

The complex relationship observed among support provision, support visibility, gender, and SES point to the need for additional research. For example, researchers need to better understand the various facets of SES. In this study, objective and subjective SES were not consistently associated with each other, support, or the outcomes in this study. For men, objective SES and subjective SES were significantly correlated, but the correlation was low. The measures of SES were not correlated for women. Lower objective and subjective SES were both associated with the receipt of more visible support. However, only subjective SES moderated the psychological stress responses and only objective moderated relationship satisfaction for men. In

this sample, those who were considered higher objective SES (i.e., those who had completed college) were a relatively small slice of the sample—especially when divided by gender. Therefore, there may have been too little variability in this measure to adequately test its association with support visibility, psychological responses to stress, and relationship satisfaction. Future studies may need to specifically recruit participants by college completion.

A primary strength of this study was the repeated daily measurement of both the provision and receipt of support and concurrent psychological and relational outcomes. By repeatedly measuring both support and outcomes throughout the day, around 500 visible and invisible support exchanges in around 60 couples were captured. As a result, I was able to test within-person effects at two levels and “capture life as it is lived” (Bolger, Davis, & Rafaeli, 2003). This study was comprised of couples, which allowed for support to be studied as the dyadic process that it is. A growing number of studies have examined daily, received social support in couples, but the cost of doing so has limited the socioeconomic diversity of the samples. A majority of these studies do not present SES information on participants, but it can often be inferred that participants are higher objective SES (e.g., those taking the bar exam are more likely to be second or higher generation college students). This study is one of the few to include a lower objective SES sample and doing so showed that SES is an important moderator of the visibility of support effect for men.

In sum, SES is an important moderator to consider when investigating the psychological and relational correlates of daily, received social support.



## CHAPTER 4: GENERAL DISCUSSION

The participants in these two studies are from different countries, ethnic backgrounds, and objective SES backgrounds, but a consistent finding emerged: the receipt of social support may not be as aversive as previously thought, and as hypothesized, SES can moderate the association between received support and psychological and physiological outcomes. These findings are consistent with prior research suggesting that receiving support may be beneficial when it does not threaten valued aspects of the self (i.e., autonomy and competency; e.g., Bolger & Amarel, 2007; Howland & Simpson, 2010). While lower subjective and objective SES has been associated with greater attunement or sensitivity to social threats (Kraus, Horberg, Goetz, & Keltner, 2011; for review see Kraus et al., 2012), this research hints that received support may not threaten valued aspects of the self for those who are lower SES (i.e., those who are more interdependent). Furthermore, SES may be one factor related to the relationship between received support and psychological and physiological outcomes.

These results also provide support for the idea that social resources, and received social support in particular, may be important sources of psychological resilience for those who report lower SES. In Study 1, I found that daily, received support was associated with lower stressor appraisals regardless of objective or subjective SES. Similarly, in Study 2, daily, received visible support in women was associated with lower psychological stress responses and higher relationship satisfaction regardless of objective or subjective SES. In lower-SES men, there was a strong relationship between the receipt of daily visible support and lower psychological stress responses and higher relationship satisfaction, suggesting that received support is an important factor for psychological and relational well-being in young adult men in relationships. In sum, for those who reported lower SES, and sometimes for those who reported higher SES, the receipt

of support was associated with positive psychological outcomes, but the same benefits may not extend to physiological outcomes. Future studies should examine diurnal cortisol for more than three days, as well as additional physiological biomarkers in daily life. Several studies have found lower objective SES to be associated with higher inflammation (Appleton et al., 2012; Gallo et al., 2012; Owen, Poulton, Hay, Mohamed-Ali, & Steptoe, 2003). Because inflammation can be reliability assessed in saliva, the relationship between daily, received support, SES, and inflammation could be examined.

Understanding the role of SES as moderator of the association of received daily support and psychological, physiological, and relational outcomes will require greater conceptual clarification between objective and subjective SES and many more studies of received support with participants from diverse sociodemographic backgrounds. Both material resources and social rank contribute to reports of subjective SES (Operario et al., 2004), but more generally, material resources and social rank both influence “social class contexts,” which shape “culture[ally]-specific selves and patterns of thinking, feeling, and acting” (Kraus, Piff, Mendoza-Denton, Rheinschmidt, & Keltner, 2012; Stephens, Markus, & Phillips, 2014, p. 611) and close relationships (Streib, 2015). Individuals’ social class contexts also shape and are shaped by their own and others’ feelings of power, influence, dominance, and prestige (Cundiff & Smith, 2017). Therefore, the relationship between perceptions of social rank and material resources and the potential for these factors to influence close relationship processes may be influenced by an array of related constructs. If future studies incorporate SES into their understanding of received support processes, consistent trends for material resources versus perceived status may emerge. Nevertheless, I found that SES is one cultural factor associated with the receipt of social support.

This work advances our understanding of close relationship processes in several ways. Research on close relationships has, in the past, given little attention to between- and within-culture variation in interpersonal relationship processes. Recent studies have focused on ethnic background variation in the effects of social support as well as in preferences for support seeking and have demonstrated meaningful variation in these processes by cultural background (Taylor et al., 2004). The findings from the studies presented here suggest that SES is one form of culture that should be considered when investigating close relationship processes—especially in correlational studies. This research also advances our understanding how received support influences daily physiological processes. The extent to which daily support influences physiological outcomes is largely unexplored, but the extent to which SES influences daily, received support experiences and subsequent emotional and physiological outcomes is *entirely* unexplored. In short, this research furthers our limited understanding of received social support in lower-SES contexts and helps to clarify the conditions under which there are potential links between support processes and future health. Future research in this area should consider threats to autonomy and competency as mediators of the relationship between support and psychological, physiological, and relational outcomes.

In conclusion, this study provides evidence, via two daily diary studies, that received social support may be associated with positive psychological and relational outcomes in young adults, and these findings contribute to a growing field of research that examines the ways that culture is related to social support processes.

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# APPENDIX A: STUDY 1 MEASURES

## Demographic Information

### How old are you?

(age in years)

### \* Gender

Male

Female

### What is your ethnicity/cultural background? Check all that apply.

African-American and/or Black

Chinese

East/Asian Indian

Korean

Middle Eastern

Pilipino/a

Vietnamese

European-American/White

Chicano/a

Japanese

Latino/a

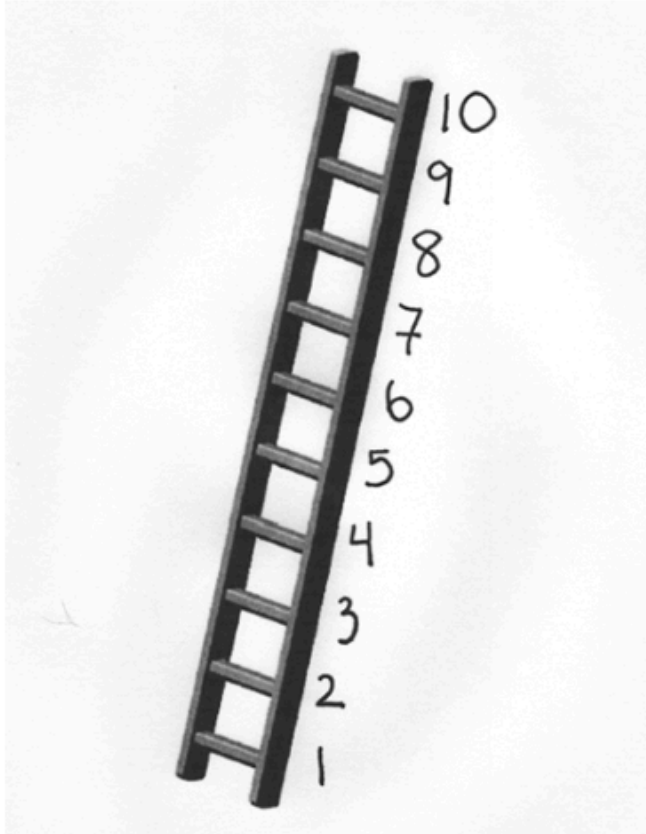
Native American or Aleutian

Islander/Eskimo

Other (please specify)

## Subjective SES

Think of this ladder as representing where people **stand in society** (e.g., the U.S.).



**\*At the top of the ladder are the people who are the best off--those who have the most money, the most education and the most respected jobs. At the bottom are those people who are worst off--who have the least money, least education, and the least respected jobs or no job. The higher up you are on this ladder, the closer you are to people at the very top; the lower you are, the closer you are to the very bottom.**

**Where would you place yourself on this ladder?**

## Objective SES

**What is the highest level of education you completed?**

- Elementary School (grades 1-6)
- Junior High School (grades 7-8)
- High School (grades 9-12)
- Some college, but no degree
- Junior College (Associate's Degree)
- College (Bachelor's Degree)
- Some graduate school, but no degree
- Graduate School (Master's Degree or Doctoral Degree)
- Other (please specify)

## Health Information

**14. How much do you weigh?**

(pounds)

**15. How tall are you?**

ft'in"

**Using the calendars above, when was the first day of your last menstrual period?**

MM DD YYYY  
Please give your best estimate.  /  /

**Often, women's cycles are about 28 days, but this widely varies. Approximately how many days is your cycle?**

**Note, this is *different* from the number of days of your period.**



### **Social Support**

Rate your agreement with the following statements about today.

1	2	3	4	5
not at all	a little	moderately	quite a bit	extremely

\_\_\_\_\_4. Today, I felt that others responded to my needs/wishes.

## Stressor Appraisals

1. Since the last beep, how often have you felt the following:

1	2	3	4	5
Never	Almost Never	Sometimes	Fairly Often	Very Often

\_\_\_\_\_ d. Stressed?

\_\_\_\_\_ e. In Control?

\_\_\_\_\_ f. You had the Resources to Cope?

## Health-relevant Behaviors

### Morning

6. Rate your overall sleep quality for last night:

*(Select one.)*

\_\_\_\_\_ 1 – Very good

\_\_\_\_\_ 2 – Fairly good

\_\_\_\_\_ 3 – Fairly bad

\_\_\_\_\_ 4 – Very bad

### Each Timepoint

1. Since the last beep, have you had any cups of coffee (or 8-12 oz. servings of another caffeinated drink, i.e. cola)? (circle one)

No(0) Yes(1) (# of cups of coffee or cola \_\_\_\_\_)

2. Since the last beep, have you smoked any cigarettes?

No(0) Yes(1) (# of cigarettes \_\_\_\_\_)

3. Since the last beep, have you consumed any drinks containing alcohol (beer, wine, a mixed drink)?

No(0) Yes(1) (# of drinks containing alcohol \_\_\_\_\_)

4. Since the last beep, have you engaged in any physical exercise?

No(0) Yes(1) (minutes of exercise \_\_\_\_\_)

5. Since the last beep, have you taken any prescription or over-the-counter medication?

No(0) Yes(1) If yes, please list:

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### Negative Events

3. Since the last beep, have you experienced any negative events? (circle one)

No(0) Yes(1) (how many negative events \_\_\_\_\_)

## APPENDIX B: STUDY 2 MEASURES

### Social Support

9. In our last contact my Partner was:

not at all  
supportive

very



10. In our last contact I treated my partner:

supportive

not at all

very



## Psychological Stress Responses

### 4. Emotions

My feelings can best be described as:

upset

not at all

extremely

worried, fearful

not at all

extremely

### 7. How I consider myself

How well do the following statement correspond to you?

I have everything under control

not at all

absolutely

## Relationship Satisfaction

13. Our relationship was today

satisfying, pleasurable

not at all

absolutely

I was very content with our relation

not at all

absolutely

## **Objective Socioeconomic Status**

Highest level of education

1 = no secondary school [7th, 8th, and 9<sup>th</sup> grade]

2 = secondary school [prepares for high school or professional schools]

3 = professional school [electrician, teacher, butcher]/high school without graduation]

4 = high school graduate or professional school graduate [necessary for admission into university or universities of applied sciences for professional school graduates]

5 = university or university of applied sciences

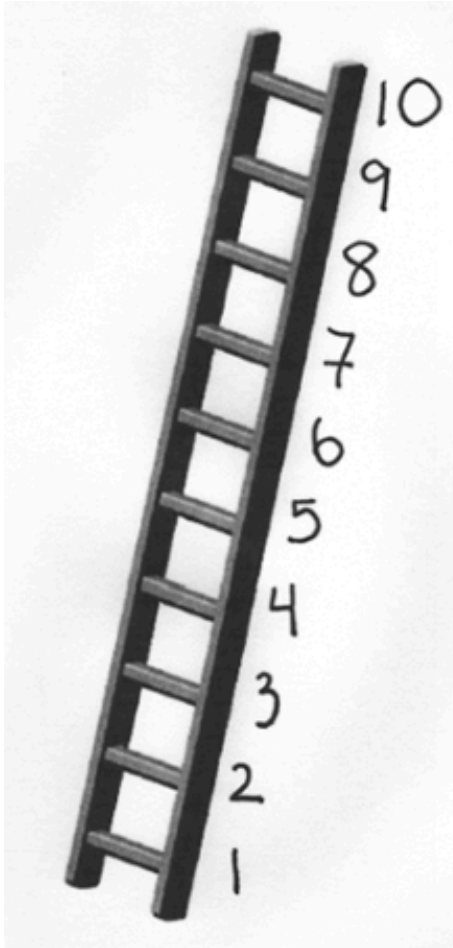


## Subjective Socioeconomic Status

Think of this ladder as representing where people stand in **Switzerland**.

At the **top** of the ladder are the people who are the best off – those who have the most money, the most education and the most respected jobs. At the **bottom** are the people who are the worst off – who have the least money, least education, and the least respected jobs or no job. The higher up you are on this ladder, the closer you are to the people at the very top; the lower you are, the closer you are to the people at the very bottom.

Where would you place yourself on this ladder?



## Tensions or Conflicts

### 2. Experience with Partner

Since the last questionnaire I experienced the following with my partner:

Tensions or conflicts

## Demographic Information

How old are you (in years)? \_\_\_\_\_

How long have you been in a relationship (in years)? \_\_\_\_\_

What is your current marital status?

Unmarried

Married

Divorced

## Attachment

The statements below concern how you feel in emotionally intimate relationships. We are interested in how you *generally* experience relationships, not just in what is happening in a current relationship. Respond to each statement by circling a number to indicate how much you agree or disagree with the statement.

1 = Strongly Disagree      2      3      4      5      6      7 = Strongly Agree

1. I'm afraid that I will lose my partner's love.
2. I often worry that my partner will not want to stay with me.
3. I often worry that my partner doesn't really love me.
4. I worry that romantic partners won't care about me as much as I care about them.
5. I often wish that my partner's feelings for me were as strong as my feelings for him or her.
6. I worry a lot about my relationships.
7. When my partner is out of sight, I worry that he or she might become interested in someone else.
8. When I show my feelings for romantic partners, I'm afraid they will not feel the same about me.
9. I rarely worry about my partner leaving me.

10. My romantic partner makes me doubt myself.
11. I do not often worry about being abandoned.
12. I find that my partner(s) don't want to get as close as I would like.
13. Sometimes romantic partners change their feelings about me for no apparent reason.
14. My desire to be very close sometimes scares people away.
15. I'm afraid that once a romantic partner gets to know me, he or she won't like who I really am.
16. It makes me mad that I don't get the affection and support I need from my partner.
17. I worry that I won't measure up to other people.
18. My partner only seems to notice me when I'm angry.
19. I prefer not to show a partner how I feel deep down.
20. I feel comfortable sharing my private thoughts and feelings with my partner.
21. I find it difficult to allow myself to depend on romantic partners.
22. I am very comfortable being close to romantic partners.
23. I don't feel comfortable opening up to romantic partners.
24. I prefer not to be too close to romantic partners.
25. I get uncomfortable when a romantic partner wants to be very close.

26. I find it relatively easy to get close to my partner.
27. It's not difficult for me to get close to my partner.
28. I usually discuss my problems and concerns with my partner.
29. It helps to turn to my romantic partner in times of need.
30. I tell my partner just about everything.
31. I talk things over with my partner.
32. I am nervous when partners get too close to me.
33. I feel comfortable depending on romantic partners.
34. I find it easy to depend on romantic partners.
35. It's easy for me to be affectionate with my partner.
36. My partner really understands me and my needs.