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# Supportive Interactions between Close Others: The Influence of Context on the Outcomes of Support Receipt

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Supportive Interactions between Close Others:  
The Influence of Context on the Outcomes of Support Receipt

by

Jessica Goren

A Thesis

Presented to the Graduate and Research Committee

of Lehigh University

in Candidacy for the Degree of

Master of Science

in

Psychology

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Supportive Interactions between Close Others: The Influence of Context on the Outcomes of Support Receipt  
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## **Abstract**

The goal of the present work was to examine the Experiences in Supportive Interactions (ESI) model, which is an integrative approach to understanding the mixed consequences that have been associated with support receipt. A basic premise of the model is that the self-relevance of a stressor will influence the subsequent construal of support receipt and result in primarily either positive relational evaluations or negative self-evaluations depending on the context of the task. While past research has provided support for the model both in a naturalistic setting (using a diary design) and an experimental study (using the experimenter as a support provider), this work is the first to test this model using intact dyads in an experimental setting as well as to examine this model using physiological reactions to support receipt. It was expected that when a task was framed as self-relevant, support would result primarily in negative self-evaluations and, thus, unfavorable changes in affect, such as increased distress. On the other hand, it was expected that support receipt would be associated with positive relational evaluations in the absence of self-relevant concerns and, thus, no such costs to self-evaluations or affect. The patterns of cardiovascular reactivity followed those predicted by the ESI model. The results of other measures were inconclusive. Overall, this work highlights both the complexity of understanding supportive experiences as well as the difficulty of accurately assessing such processes.

*Keywords:* social support, enacted support, self-efficacy, distress, negative self-evaluation, skin conductance, heart rate

## **Introduction**

### **Overview**

Social support is an integral part of life for most people. While lay beliefs suggest that support is generally a beneficial experience, empirical research on support receipt reveals that reactions to receiving social support can range from positive to negative. However, the literature lacks a coherent understanding of what mechanisms drive reactions to support receipt. The present work examines the merits of the Experiences in Supportive Interactions (ESI) model (Burke, Ignarri, & Goren, in preparation) in explaining reactions to supportive events and the mechanisms that determine them. This model focuses on the importance of contextual factors in shaping the mindset of support recipients and, in turn, construal of the support event. A basic assertion of this model is that the relative likelihood of interpreting support with regard to its personal, as opposed to interpersonal, significance is the self-relevance of the stressor such that support in a self-relevant context is more likely to lead to construal in terms of its negative personal connotations. This research contributes to the existing work by testing this premise of the ESI model using physiological measures to examine reactions to support within a lab-based experimental paradigm involving intact dyads.

### **Background**

In understanding the support process, it is essential to distinguish between two related but distinct concepts: perceived and enacted support. Perceived support is a cognitive appraisal that encapsulates one's beliefs about the availability of support if the need were to arise, whereas enacted (or received) support denotes actual instances of interpersonal helping efforts (Barrera, 1986). Despite the fact that the perceived



availability of support has been connected to a wide range of physical and psychological benefits, including lower mortality rates, improved resistance to and recovery from illness, and more effective coping with stress (Cobb, 1976; Cohen, 2004; Cohen & Wills, 1985; Uchino, 2009), the advantages conferred by social support do not seem to extend to support receipt. Research on enacted support provides evidence that it can be both beneficial (Abraido-Lanza, 2004; Kroelinger & Oths, 2000) and detrimental (Burke, 2009; Bolger, Zuckerman, & Kessler, 2000; Lepore, Glaser, & Roberts, 2008; Newsom, 1999; Shrout, Herman, & Bolger, 2006) to the well-being of recipients, sometimes simultaneously (Burke, 2009; Liang, Krause, & Bennett, 2001).

If the mere belief about the availability of support is powerful enough to contribute to better health and longer lives, this would seem to imply that support is both highly valuable and desirable. Why, then, would the research suggest that it is not uncommon for support to be detrimental? For many, the idea that enacted support could be disadvantageous might seem counterintuitive. A range of explanations has been developed to try to explain these seemingly puzzling outcomes of enacted support.

One response to claims that support leads to detrimental outcomes has been to question the nature of the association, contending that such causal conclusions are incorrect. For example, the correlation between support receipt and distress might be a result of increasing levels of distress contributing to escalations in enacted support. Another line of reasoning contends that the seemingly negative outcomes seen to co-occur with support receipt are not a result of the support, but rather a consequence of the fact that both distress and support are brought on by stressful events (Barrera, 1986). In order to investigate the merit of such explanations, Seidman, Shrout, and Bolger (2006)

conducted a series of data simulation studies in which they created computer-generated data sets according to each of these two alternative models. These data were then analyzed using the support-leading-to-distress model to test for spurious effects. They concluded that neither of the proposed alternatives was a plausible explanation for the findings in question. In other words, the above sources of spuriousness could not account for the relationship between support and distress reported in these naturalistic studies. Furthermore, experimental work by Bolger and Amarel (2007) has provided evidence to suggest that support does, in fact, lead to increases in distress when the supportive behavior is experienced in ways that undermine self-efficacy.

Others have contended that the critical aspect in determining the consequences of a supportive event lies in the nature of support provision (Cohen & Wills, 1985; Cutrona & Russell, 1990). These perspectives, such as optimal matching theory (Cutrona & Russell, 1990), generally reason that it is the match between the support provided and the demands of the specific situation that determine whether support will have a positive or negative outcome. Although poor quality support might contribute to suboptimal outcomes to the extent that its tangible effects contribute to increased stress, explanations of poor quality support as responsible for the range of situations in which negative outcomes result from enacted support are insufficient. First, explanations based on the characteristics of support provision would require that poor quality support represent a relatively substantial amount of the supportive efforts in order to fully account for the pervasiveness of negative outcomes. Furthermore, explanations that attribute outcomes of enacted support to qualities of the support cannot account for the fact that a given supportive behavior can have different consequences even for an identical stressor.

The literature illustrates many cases where identical support provision for a given stressor leads to differential outcomes depending on contextual factors. Given the fact that the support and stressor are the same and, thus, are equally matched to one another, these differences must occur as the result of something other than the nature of the support provision itself. By eliminating the tangible characteristics of support as a potential explanation, these studies point to the cognitive construal of interactions as the mechanism through which enacted support can and does lead to differential outcomes. For example, Christenfeld and colleagues (1997) trained friends and confederates to perform the same supportive behaviors such that the only difference between these supportive conditions was the support recipients' relationship to the provider. They gauged reactions to the support via physiological correlates of the stress response including increases in blood pressure and heart rate. Despite the similarity in behavior, support from a friend was associated with significantly smaller increases in physiological reactivity in response to a stressful speech task than support from a stranger. The attenuated stress response associated with support from a friend, as opposed to a stranger, provides evidence that it is not merely the quality of support provision alone that impacts reactions to support.

In another experimental study that demonstrates differential reactions to enacted support despite the qualitative equivalence of both stressor and support, Glynn, Christenfeld, and Gerin (1999) trained male and female confederates to provide identical support while the participant gave a speech. They found a significant interaction between gender of the audience and support, where support provided by a female was associated with attenuated physiological reactivity compared to nonsupport by a female observer,

whereas male support provided no such benefits compared to nonsupport by a male observer. In fact, for male participants, support from another male tended to have a somewhat detrimental impact compared to nonsupport. Although their research does not examine the reason for the gender effects on reactions to social support, the authors suggest that “[t]he smiles and nods of a woman mean something different from the smiles and nods of a man” (p. 240) or that the observed interaction between support provision and gender may be a result of differing expectations about the provision of support. Regardless of the specific explanation, the fact that both stressor and support are comparable across conditions suggests that differences in reactions must result from differential construal of the support event. Both of these studies provide evidence that contextual characteristics surrounding support can produce different reactions despite the apparent qualitative equivalence of the situations.

Another example of the importance of context in impacting reactions to supportive behavior is evident in work performed by Nadler, Fisher, and Ben Itzhak (1983). This work provides an illustration of how contextual factors can interact with one another to shape the experience of support. In this study, the researchers asked participants to complete a detective task in which the goal was to identify the murderer. The task was framed as being either ego-relevant or not and participants were told they were paired with either a friend or stranger, although they worked in separate rooms. Participants received the same support provided via clues reportedly sent by their teammate. While only repeated support ostensibly coming from a friend had a significant effect on outcomes, the ego-relevance of the task impacted whether reactions to support

were beneficial or detrimental to affect and self-evaluation<sup>1</sup>. The results illustrate differences in the magnitude of effects as a function of the reported provider and the direction of effects as a function of the framing of the task despite the fact that the stressor and support both remained unchanged. These effects further reveal how contextual factors can influence perceptions of supportive interactions and, consequently, dictate reactions to such experiences.

Research by Collins and Feeney (2004) provides additional evidence of the importance of individual differences in cognitive appraisal processes involved in the experience of support. Couples participated in a lab-based paradigm in which one member was assigned to prepare and deliver a speech while separated from his/her partner. Two standardized notes seemingly from the participant's significant other were sent to the individual in the speech role during the course of the task. When the message was an ambiguous one, the authors found that construal of the note varied as a function of attachment style such that the individuals tended to interpret the messages in line with their attachment-related working models. This work provides evidence that chronically-accessible cognitive orientations hold the power to predictably influence the processing and understanding of supportive (or nonsupportive) interactions to the degree that they produce meaningfully different outcomes.

Altogether, the literature documents many examples where differential outcomes of enacted support occur in spite of experimental conditions that hold both the stressor and support constant. In these cases, the divergence of reactions to support can only be attributed to the recipients' cognitive appraisal processes. These examples draw attention

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<sup>1</sup> Although not reaching significance, the overall trends for reactions to support from strangers were in line with these effects.

to the subjective nature of the construal processes through which people give meaning to their experiences. The capacity of individual and contextual factors to influence social cognition preclude the ability to assume that a given behavior or interaction can have a clear and distinct meaning. Instead, a variety of interpretations can result from a single event. For example, a behavior can be noticed or not. If it is noticed, it may be assumed to be supportive, unsupportive, or irrelevant. Likewise, it can be attributed to any number of different motivations on the part of the provider and it can be interpreted as an indication of characteristics of the other, the self, or their relationship. Given that this process of construal gives meaning to an event, it is not unreasonable to expect that the nature of the conclusions derived from it play an important role in defining the experience and, thus, are critical to outcomes of support, such as its implications for feelings about oneself and emotional consequences of the event.

The importance of cognitive evaluations in shaping the experience of support receipt is also apparent in work examining the concept of “invisible support.” This term refers to instances of support provision (as reported by the provider) where the recipient does not recognize having received support. Invisible support has repeatedly been shown to benefit the recipient without imposing any of the costs that are often linked to enacted support (Bolger & Amarel, 2007; Bolger et al., 2000; Shrout et al., 2006). In a series of experimental studies by Bolger and Amarel (2007), the authors varied the information communicated to support recipients by manipulating the visibility of the support. More specifically, the visibility of support was varied via the phrasing of the statement such that the wording in the visible support condition made it clear that the intention was to provide help (i.e., the confederate addressed the participant directly and gave suggestions

on how to give a good speech) whereas, in the invisible support condition, the speaker provided the same information without making it apparent that their intention was to provide support (i.e., the confederate asked the experimenter a question about what they were supposed to be doing while mentioning what they thought were the elements of a good speech). Awareness of having received support was either ineffective or detrimental in terms of its impact on emotional reactivity to the stressor. Meanwhile, the receipt of invisible support was not harmful, but instead helpful. Importantly, the authors found that feelings of inefficacy mediated the relationship between support receipt and changes in distress. Hence, this work suggests that the distress caused by visible support is a product of its tendency to engender negative self-evaluations such as inefficacy. Likewise, the benefits of invisible support lie primarily in its ability to provide help without the costs that visible support can sometimes impose. In essence, this research provides evidence that it is the cognitions that result from recognition of support receipt (and the related cognitive evaluations that assign meaning to the event) and not the presence of support itself that imposes costs.

The recognition of the cognitive processes through which individuals assign meaning to their everyday experiences as having a meaningful impact on the outcomes of support receipt is an important step in making sense of the consequences that have been documented in the literature. At the same time, it underscores the need for such processes to be accounted for if a comprehensive understanding of the mixed consequences of support is to be attained. We believe that the recent development of the Experiences in Supportive Interactions (ESI) model (Burke et al., in preparation)

represents a step towards achieving a better understanding of the mechanisms that determine the outcomes of enacted support.

### **ESI Model**

The ESI Model (Burke et al., in preparation; see Figure 1) provides an integrative approach to understanding the mixed consequences of enacted support that are evident within the literature. Although it is beyond the scope of this thesis to describe all parts of the ESI model in detail, it is important to have a general understanding of its premises. The model proposes that both the stress context and an individual's general beliefs about self and other contribute to the active beliefs that they hold within a given situation. These active beliefs subsequently moderate the cognitive appraisals that occur during supportive interactions. For instance, as mentioned earlier, these beliefs can influence whether a behavior is noticed and/or coded as supportive. Once an interaction has been recognized as supportive, these active beliefs influence how the individual assigns meaning to the event by determining the degree to which they interpret the support with respect to its implications about the self or their relationships. The resulting construal will largely determine whether the support contributes to increases or decreases in overall levels of distress.

The present work focuses on how the stress context influences active beliefs and subsequently shapes self- and relational-evaluations that ultimately impact the consequences of support in contributing to or reducing distress. We argue in the ESI model that the outcomes of support can be explained by understanding the cognitive appraisals made by support recipients. These evaluations can include implications of the support in terms of its personal and interpersonal meanings. Receiving support can



communicate both negative information about the self and positive relational information. More specifically, it can be seen as an indication of one's inefficacy or shortcomings or it can be viewed as a sign of the presence of good-quality social relationships. For this reason, the appraisal of support is critical in contributing to the outcomes as a result of whichever interpretation dominates the recipient's understanding of the supportive interaction. According to the ESI model, both self- and relational-evaluations can occur simultaneously, but the net appraisal of the event will depend upon the recipient's mindset. If the individual is mainly focused on self-relevant concerns, such as issues of competence or efficacy, they will primarily interpret the event with regards to its implications about the self. When support events are construed in this regard, they are likely to draw attention to the individual's inability to effectively handle the stressor independently. Therefore, support in the context of self-relevant concerns can underscore the individual's shortcomings, leading to negative self-evaluations and increased distress. On the other hand, when support provision occurs in the absence of self-relevant concerns, the individual is likely to interpret the event with regard to the relationship itself. Because supportive behaviors are a valued characteristic of relationships, construal of the support experience from this perspective should have positive relational implications. For example, support may contribute to feelings that one is loved and cared for and/or draw attention to the fact that they are part of a reliable social network that is willing and able to provide assistance in times of need (Cobb, 1976). Overall, it is important to remember that although both self- and relational-evaluations are plausible outcomes of the support experience, the relative extent of either evaluation should depend on the concerns activated by the present context.

Because the ESI model is relatively new, there are few studies to-date that have been explicitly designed to test it. Nonetheless, support for its premises is apparent in work that highlights the importance of cognitive construal processes and their role in influencing the tendency to interpret support in a specific manner. This includes evidence that the detrimental effects of enacted support are attributable to its psychological costs to views of the self (Bolger and Amarel, 2007; Fisher, Nadler, & Whitcher-Alagna, 1982; Nadler et al., 1983).

The best support for this model is derived from work that has been purposefully designed to test its premises. Burke (2009) provided evidence for the ESI model in a sample of couples in which one member of the dyad was a law student preparing for the upcoming bar examination, a highly self-relevant stressor for which efficacy is a central concern. Using diary methods to record daily experiences of stress and support, he found that, amongst those preparing for the upcoming exam, support receipt was simultaneously associated with feeling loved and supported as well increases in distress. Furthermore, the relationship between support and increased distress varied as a function of the salience of the self-relevant stressor, with both the proximity to the upcoming test and the presence of exam-related stress strengthening the relationship between support receipt and distress. This work highlights the importance of the self-relevance of a stressor in shaping the cognitive processes that determine reactions to enacted support.

In another study carried out by our research group (Burke & Goren, unpublished data), a lab-based experimental design was used to examine the outcomes of support as a function of the self-relevance of the task. This work used a challenging math and logic problem set that was introduced in one of two ways, differing with respect to whether the

task was described as relevant to an important domain or not. For some, practical support was provided via the offer of a calculator while others received no support. Consistent with the ESI model, the consequences of support depended on the self-relevance of the task. When it was not depicted as self-relevant, support receipt was associated with significantly lower increases in negative affect compared to no support in the same context. Conversely, when the task was framed as being self-relevant, receiving support had a detrimental impact on the recipient's mood. Further analyses revealed that changes in affect were mediated by changes in negative self-evaluations. The experimental nature of this study adds to the work of Burke (2009) in providing more direct evidence for the causal relationships implicated by the ESI model.

### **Limitations of Existing Evidence**

Together, these two studies highlight the dual nature of information communicated through supportive experiences and the importance of mindset in shaping the subsequent appraisal of an event. Although these studies provide support for the ESI model, more research is necessary to address the limitations of the previous work.

*Limitations of Reliance on Self-Report Measures.* One limitation that is seen in some past research is the sole use of self-report measures to assess changes in affect. This leaves open the question of the reliability of such measures in detecting reactions to support receipt. Because they rely on both the ability and willingness to accurately report feelings, it is possible that self-reports may sometimes be unable to detect reactions that do, in fact, exist. In fact, a number of past studies provide evidence that self-report measures often fail to uncover emotional reactivity that is evident via physiological indices (Christenfeld et al., 1997; Gerin, Pieper, Levy, & Pickering, 1992; Glynn et al.,

1999; Kamarck, Manuck, & Jennings, 1990; Lepore, Allen, & Evans, 1993). Along these lines, the reliability of self-reports can also be questioned to the extent that awareness of dependent measures may influence responses. Specifically, the likely possibility that participants in these previous studies recognized that the experimenters were measuring changes in the relevant variables, a reasonable conclusion based on the presence of repeated self-report measures, may have impacted their responses in either direction.

Another limitation of self-report measures is the fact that they might miss temporal dynamics that could otherwise further clarify the nature of reactions to support. To date, much of the research on enacted support is comprised of measures that assess its effects at some endpoint following the interaction(s). It is unclear whether these reactions occur as a direct effect of the supportive behavior (e.g., getting upset in the support interaction) or whether they change the way that support recipients respond in subsequently dealing with the stressor (e.g., reacting more strongly to later difficulties). The literature has also yet to elucidate the temporal dynamics of reactions to support and whether they aggregate, dissipate, or rise and fall over the course of time. Therefore, more information is necessary to clarify the nature of responses to supportive interactions.

A good alternative (or addition) to self-report measures is to utilize indices of physiological reactivity. Physiological arousal is controlled by the nervous system and can be used as an index of emotional arousal (McEwen, 2005; Stern, Ray, & Quigley, 2001; Taylor, 2007). Much research shows that the perception of stress is reliably associated with physiological changes, such as increases in heart rate and perspiration, which prepare the body to combat the stressor (Christenfeld et al., 1997; Glynn et al., 1999; McEwen, 2005; Stern et al., 2001; Taylor, 2007). Somewhat stable levels of

activity within the nervous system can be contrasted with the transient responses represented by changes in physiological arousal that result from a given stimulus in order to examine specific reactions to stimuli. Through the detection of the responses that occur in reaction to a known stressor, physiological indices allow researchers to examine changes in emotional arousal. To the extent that the perception of stress induces the associated responses in the nervous system, physiological measures are a useful way of assessing emotional arousal.

*Limitations of Stranger-Provided Support.* In addition to the above limitations, the use of a stranger as the support provider in the latter study leaves open the question of the generalizability of such effects to interactions between close others. Although this is a common approach used to control the nature of supportive interactions that take place within experimental paradigms (Bolger & Amarel, 2007; Glynn et al., 1999), it is important to consider the extent to which reactions to support may depend on the nature of the provider-recipient relationship. Certainly, interactions between strangers tend to have different dynamics than those between people who know each other well. It is possible that people may make different conclusions about the intentions of those they know versus those they do not when they interact with them. Likewise, they may feel better able to make conclusions about the meaning of interactions with close others. Alternatively, they may be more concerned about the opinions of close others, may be more trusting of them, or assume certain intentions based on their knowledge from a history of past interactions. These possibilities all merit further investigation that will not be included in the present work. Regardless of the exact differences, evidence that reactions to support can vary as a function of the relationship to the support provider

(Christenfeld et al., 1997; Nadler et al., 1983) underscore the importance of experimental work that examines the ESI model using interactions between individuals in intact relationships.

### **The Present Research**

This study takes the next step in examining the ESI model (Burke et al., in preparation). While past research has provided support for the model both in a naturalistic setting (using a diary design) and an experimental study (using the experimenter as a support provider), this project is the first to test this model using individuals in intact relationships within an experimental setting and to examine physiological reactions to support receipt. The goal of the present work was to further extend prior research examining the ESI model by combining the strengths of experimental lab-based research with a design intended to increase the generalizability of results obtained within the lab to real-world interactions. To this avail, this study examined support as it generally occurs, between individuals in intact relationships. As mentioned above, this is important both because it has been found that supportive interactions between close others tend to have a greater impact on the recipient compared to support provided by a stranger (Christenfeld et al., 1997; Nadler et al., 1983) and because these dynamics represent a more realistic representation of typical real-world supportive interactions. Through the strategic combination of experimental and naturalistic elements, the intention of the present research design was to enable stronger inferences about the relationships illustrated in the ESI model while, at the same time, maximizing the extent to which these conclusions are applicable to real-world contexts.

## Overview and Hypotheses

The present work is an experimental lab-based paradigm in which intact dyads interact as the support recipient and provider. In some conditions, one member of the dyad works on challenging math/logic problems while the other seemingly provides (scripted) feedback from the next room through messages sent via computer (either supportive or not). Another comparison group receives feedback via the computer without any social interaction or communication. The instructions describing the purpose of the task differ depending on the condition to which the participant is randomly assigned in order to implicitly activate either a self- or other-focused mindset by varying the degree of self-relevance associated with the problem-solving task. We examine reactions to support using self-report measures of emotion, self-evaluation, and relational evaluations as well as physiological measures to assess emotional arousal.

Based on the ESI model, we expect to find that the consequences of enacted support depend on the context and resulting construal of the support event. Therefore we expect that:

- 1) When the task is framed in a self-relevant context, it will activate self-focused cognition, and support will tend to result in negative self-evaluations and, thus, increased distress. These negative consequences of support are also expected to exacerbate physiological reactivity in those who receive support relative to those who do not.
- 2) In the absence of self-relevant concerns, support will be associated with positive relational evaluations and, thus, decreased distress. (It is not expected to impose costs to self-evaluations since the relationally-focused mindset should not activate appraisals of support in relation to the self). These positive consequences of support are expected to be

paralleled by moderated physiological reactivity in those who receive support relative to those who do not.

Although we expect positive relational evaluations to be evident with respect to current ratings of partner responsiveness (such as being loved, supported, and cared for), it is less clear whether a single support experience will impact overall evaluations of relationship satisfaction (Beach, Fincham, Katz, & Bradbury, 1996; Lakey & Drew, 1997). It seems unlikely that a single support experience will have a lasting impact on relationship satisfaction, but it is nonetheless possible that minor or transient changes may even occur without the recipient being aware that such changes are present. Therefore, we attempt to gain a better understanding of the relational consequences of support by examining changes in relationship satisfaction that result from enacted support.

## **Method**

### **Participants**

One hundred and twenty-five Lehigh undergraduates (71 women and 54 men,  $M_{\text{age}} = 19.0$  years,  $SD_{\text{age}} = 1.1$ ) enrolled in an introductory psychology course participated in this study in exchange for research credit towards a class requirement. Participants in the partner conditions (randomly assigned from those who were assigned to the study) were asked to bring a close friend with them to the lab<sup>2</sup>. After excluding those who expressed suspicion about whether their partner was providing the support and those for whom there were computer or equipment issues, analyses were run on 108 participants (60 women and 48 men) with a mean age of 19.0 years ( $SD_{\text{age}} = 1.1$ ).

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<sup>2</sup> All participants indicated in the prescreen survey that they could bring a friend.



## Design

The study had a 2 (Task instructions: self-relevant, not self-relevant) x 3 (Feedback: computer-generated performance feedback, friend-provided performance feedback (without support), friend-provided supportive performance feedback) experimental design. The task instructions manipulated self-relevance by describing the purpose of the task as relevant to an important domain (intelligence and academic potential) or not. Feedback varied with regards to the alleged source of the response and the content. Specifically, the support was either ostensibly from the participant's friend or computerized. The no-support conditions include computerized or (ostensibly) friend-provided responses simply indicating whether the given answer to each problem was correct or incorrect. The support condition appeared to be provided by the friend and included three emotionally supportive comments amongst the responses of correctness<sup>3</sup>. The supportive phrases were provided in response to the first, third, and seventh instances of incorrectness. The purpose of the three different feedback conditions was to enable us to look at the effect of support or no support while controlling for the possibility that participants may experience the friend-provided feedback as evaluative. Therefore, comparisons of the friend-provided feedback conditions to the computer-provided feedback were intended to inform whether responses may be a result of processes related to social evaluation as opposed to the lack of support without any social components.

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<sup>3</sup> The support statements used in the present study included: 1) "Wrong, but don't worry, you can get the next one!" 2) "Nope, sorry, but you still have a way to go, you can totally make a comeback!" and 3) "Wrong. You can do it! Keep going!" These statements were chosen from a number of supportive statements that were included in a pilot test in which they were rated along a number of dimensions. These supportive responses were those that were ranked most highly in terms of the desired characteristics for a support statement (e.g., supportiveness, helpfulness, not diminishing the importance of the task, sounding believable).

The primary outcomes of interest include physiological reactivity as well as changes in self-reported distress, measures of self-evaluation, and measures of relational evaluation.

## **Measures**

**Physiological Arousal.** Physiological arousal was assessed using a BIOPAC MP150 data acquisition system in conjunction with BIOPAC *AcqKnowledge* Software (BIOPAC Systems, Inc., Goleta, CA) to measure and analyze physiological responses in terms of cardiovascular and electrodermal activity. Cardiovascular activity was assessed via electrocardiography (ECG) using electrodes placed on the surface of the skin, one just below the collarbone on the right side of the body and another on the lower abdomen above the hip on the left side of the body. Electrodermal activity was assessed via skin conductance levels using electrodes placed on two adjacent fingers of the subject's nondominant hand. These indices of physiological arousal were measured continuously throughout the entirety of the laboratory session.

**Negative Affect.** (See Appendix A.) The negative affective measures consisted of a compilation of items from the Positive and Negative Affect Schedule- Expanded Form (PANAS-X; Watson & Clark, 1994) and the Profile of Mood States (POMS; McNair, Lorr, & Droppleman, 1971). Participants were presented with emotion adjectives (e.g. distressed, ashamed) and asked to rate the extent to which they were currently experiencing each. Items were rated on a 20-point visual analog scale (implemented via computer) ranging from “very slightly or not at all” to “extremely.” Ratings for relevant emotions were used to form subscales for distress (pre-task Cronbach's  $\alpha = .89$ , post-task Cronbach's  $\alpha = .90$ ) and negative self-evaluation (pre-task Cronbach's  $\alpha = .87$ , post-task Cronbach's  $\alpha = .86$ ). The distress subscale included the

following items: anxious, on edge, uneasy, blue, discouraged, hopeless, and sad. The negative self-evaluation subscale included the following items: angry at self, ashamed, disgusted with self, and dissatisfied with self. These measures were completed both before and after the task to assess changes in affect.<sup>4</sup>

**Academic self-efficacy.** (See Appendix B.) Academic self-efficacy (as opposed to general self-efficacy) was examined because of the relevance of this domain to the task at hand. Participants completed the 4-item intellectual/ academic ability subscale of the Self-Attributes Questionnaire (SAQ; Pelham & Swann, 1989). These questions asked participants to rate their intellectual and academic ability as compared with other college students their own age, their certainty on their standing (referring to the prior rating), the personal importance of intellectual and academic ability, and their ability level relative to their “ideal self.” Responses were recorded via computer to rate abilities along a 20-point visual analog scale. The item that asked individuals to estimate the degree to which they felt like their “ideal self” with regard to their intellectual/academic abilities was used as the focal indicator of academic self-efficacy. This measure was presented both preceding and following the task in order to gauge the effect of the task on perceptions of academic self-efficacy.

**Relational Evaluations.** (See Appendix C.) A modified version of the Relationship Assessment Scale (RAS; Hendrick, 1988) was used to measure participants’ thoughts and feelings about the quality of the relationship that they have with the close other accompanying them to the present study. This questionnaire consists of 7 items

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<sup>4</sup> Data was collected for a variety of emotion subscales. However, upon analyzing the data, the patterns were highly consistent across the different subscales. Therefore, the work presented here focuses on those that were most relevant to the processes of interest.

that assess the degree to which individuals are satisfied with their relationship. Ratings were made using a 20-point visual analog scale via computer. Items were combined to form an overall measure of relationship satisfaction (pre-task Cronbach's  $\alpha = .69$ , post-task Cronbach's  $\alpha = .79$ ). Changes in relationship satisfaction were measured by including this measure both before and after the task.

Perceived emotional responsiveness was measured following the task using 10 items from the perceived responsiveness measure utilized by Fekete, Stephens, Mickelson, and Druley (2007) and Khan et al. (2009). Each item was rated along a 20-point visual analog scale ranging from "not at all" to "very much." Items were averaged (with negative items reverse-scored) to form a single overall score for perceived responsiveness (Cronbach's  $\alpha = .78$ ).

**Task Performance.** Two additional questions were administered directly after the problem-solving task in order to assess perceptions about the task. These questions included "How important did you feel it was to perform well on the tasks involved in this experiment?" and "How did your performance on the math and logic problems compare to your expectations regarding how you thought you would perform?" Both questions were rated along a 20-point visual analog scale. The former was rated from "not at all important to me" to "extremely important to me" and the latter was rated from "I performed much worse than expected" to "I performed much better than expected."

## **Procedure**

Participants in both friend conditions were asked to come to the experiment with a close other while those in the computer feedback condition arrived alone. Upon arrival, participants were informed that the purpose of the study was to investigate different study

methods. It was then explained that they had been randomly assigned to the flashcard study technique. Those in the friend conditions were told that one person would be completing math/logic problems while being hooked up to equipment to measure physiological activity and the other person would be able to see their responses from the other room and would then provide feedback (ostensibly based on an answer key they had received from the experimenter) on whether each question was answered correctly or not via an online messenger. Those in the alone/control conditions were informed that they would be completing math/logic questions while being attached to equipment to assess their physiological activity and that the computer would provide feedback on whether each question was answered correctly or not.

After providing informed consent, the experimenter ensured that the participant assigned to complete the math/logic problems did not have any skin allergies that might be affected by the adhesive or gels used as a part of physiological assessment in conjunction with electrodes. (No participants indicated any concerns about potential skin reactions.) Participants then prepared to be connected to the physiological equipment under the direction of the experimenter. Preparation involved washing hands with soap and water and, if needed, putting prep gel on areas where small electrodes were to be attached. Next, the experimenter instructed the participant in attaching the electrodes to the appropriate areas. The experimenter then connected the wire leads from the BIOPAC MP150 data acquisition system (BIOPAC Systems, Inc., Goleta, CA) to the electrodes attached to the participant and helped the participant to attach medical tape to the electrode wires in order to secure them and minimize noise in the data. Physiological

recording was then commenced using *AcqKnowledge* Software (BIOPAC Systems, Inc., Goleta, CA).

Once the physiological recording was started, participants in the problem-solving role began a five-minute rest period to gauge baseline levels of physiological activity. For those in conditions involving a second participant assigned to the feedback role, the partner was taken to another room where they worked on a separate task. Following the baseline period, the problem-solver was prompted to complete a number of self-report measures including measures of affect, self-evaluations, and relational evaluations<sup>5</sup>. Upon completion of these measures, individuals were given instructions about completing a set of fifteen challenging math and logic questions (see Appendix D for sample questions). Instructions for those in the self-relevant condition explained that the problems assess intelligence and academic potential while others were told that the purpose of the problems was to gauge their difficulty. Participants were then given twelve minutes to work on the problems, during which time they received feedback that appeared to come from their partner or the computer, depending on their condition. Those in the no-support condition received simple feedback involving the appropriate ‘correct’ or ‘wrong’ responses. Those in the support condition, in addition to feedback regarding the correctness of their answer, were also given periodic emotional support/encouragement (totaling 3 times) alongside the feedback. Directly after the problem set, participants completed post-task measures including two questions asking them to rate how important it was to perform well on the task and how their performance compared to their expectations. They also responded to repeated measures of affect, self-evaluation,

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<sup>5</sup> Relational evaluations were only assessed amongst those participating with a friend.

and relational evaluation (in friend-provided feedback conditions only) in order to assess changes in the relevant variables as a result of the experimental task. The perceived partner responsiveness measure was also included amongst the post-task measures for those who participated in either of the friend-provided feedback conditions. At the end of the study, following the discontinuation of physiological recording, sensors were removed by the participant and he/she was given the opportunity to wash the areas where the electrodes were attached in a nearby restroom. Finally, the experimenter debriefed the participants and thanked them for participating.

## **Results**

### **Overview**

The goal of the analyses was to investigate how the self-relevance of a stressor shapes the experience of enacted support. It was expected that support would be beneficial in the context of a stressor that was not self-relevant, but that it would be detrimental when the stressor was self-relevant. Specifically, we predicted that support would attenuate heart rate and skin conductance reactions when it was related to a stressor that was not self-relevant, but that it would heighten such responses when the stressor was self-relevant. Mixed model analyses were performed to examine physiological reactions as a function of the experimental manipulations using SAS statistical software (SAS Institute Inc, 2010) using the MIXED procedure with a significance level of 0.05. For self-report measures, analyses of variance (ANOVAs) were performed using SAS statistical software (SAS Institute Inc, 2010) using the GLM procedure with a significance level of 0.05. Post hoc analyses were completed to provide additional insight when needed.

Each analysis was rerun including participant ratings of the degree to which they felt that it was important to them to perform well on the problem-solving task and ratings of how well they thought their performance compared to their expectations regarding how they thought they would perform on the task. Including these ratings was important because the manipulations used in this research assume that participants value performing well and are not performing up to their expectations. For this reason, these further analyses were performed by centering the data around those who are one standard deviation above the mean on their rating of importance of performing well and one standard deviation below the mean on their rating of performance relative to their expectations. Conducting the analyses this way focuses the interpretation of the main effects of self-relevance and feedback and their interactions on those individuals for whom it was highly important to perform well and whose performance was low compared to their expectations. For this reason, the results will report the interactions with these variables and then simply interpret the effects of self-relevance and feedback with regard to these target individuals. Additional post hoc analyses were performed when appropriate. These additional analyses are reported where informative with regard to the processes of interest.

### **Physiological Data**

There are several different ways to assess the effects of the predictor variables on physiological outcomes. The following analyses examine both specific responses to feedback, as well as analyses at the aggregate level to investigate differences in physiological reactivity over the course of the experiment. Specific reactions in response to receiving feedback were quantified as the difference between the peak value of heart



rate or skin conductance level occurring between 1 and 4 seconds after receiving feedback and the mean value in the time spanning from 1 second before to 1 second after stimulus presentation<sup>6</sup>. Other analyses investigated reactivity over the course of the problem-solving task relative to the baseline resting period. Baseline measures for the problem-solving period as a whole were calculated using the last minute of the baseline rest period (Mendes, 2009).

**Preprocessing of data.** Physiological data was collected at a rate of 1000 samples per second. Preprocessing was necessary in order to prepare the data for analysis. *AcqKnowledge* software was used to detect and classify heartbeats and calculate heart rate for the entire length of the session to provide information regarding continuous moment-by-moment changes. Following this, the data was resampled down to 125 samples/second. Finally, event markers from the DirectRT program, used for the self-report and flashcard task, were detected in order to locate the occurrence of specific components of the task in the physiological data. These markers were used to calculate several different physiological reactions in the subjects. This included calculations of average levels of electrodermal activity/skin conductance and heart rate for the problem-solving period as a whole as well as specific responses to feedback.

#### **Specific responses to feedback.**

**Heart rate.** Analyses were performed to examine changes in heart rate in response to receiving feedback that a question was answered incorrectly as a function of the self-relevance of the task and supportive feedback adjusted for average heart rate. The results indicated only a main effect of feedback ( $F(2, 98) = 53.02, p < .0001$ ) such

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<sup>6</sup> In general, reactions that occur prior to 1 second after a stimulus are not considered to be a reaction to that stimulus (Martin & Venables, 1980, p.18).

that heart rate increases in response to feedback that a question was wrong were greater when a friend was providing feedback (either supportive or not) relative to when computer feedback was provided ( $t(98) = -8.80, p < .0001, t(98) = -8.68, p < .0001$ , respectively). There was not a significant main effect of self-relevance nor was the hypothesized interaction between self-relevance and support significant. Nevertheless, the pattern of means is consistent with the hypothesized reactions to support. Specifically, the trends suggest that support is slightly helpful in attenuating physiological reactions when the support occurs in the context of a stressor that is not self-relevant but is associated with somewhat exacerbated physiological reactions when the stressor was self-relevant. (See Figure 2.)

After incorporating ratings of importance to perform well and performance compared to expectations, the analyses revealed a marginally significant 4-way interaction between performance compared to expectations, importance to perform well, feedback, and self-relevance ( $F(2, 83) = 2.45, p = .0927$ ) as well as a significant 3-way interaction between performance compared to expectations, importance to perform well, and self-relevance ( $F(1, 83) = 4.59, p = .0350$ ), and a significant 2-way interaction between performance compared to expectations and self-relevance ( $F(1, 83) = 4.19, p = .0438$ ). For individuals high in importance to perform well and low in performance compared to expectations, there was a significant 2-way interaction between feedback and self-relevance ( $F(2, 83) = 4.64, p = .0123$ ). Post hoc simple effects tests examining the interactions between the friend-provided feedback in the support and no support conditions revealed that the difference between support and no support was significant when the context was not self-relevant ( $F(1, 83) = 5.48, p = .0217$ ) such that support led

to significantly lower heart rate in this context. The statistical analyses reported here suggest that pattern of results for how people respond to different feedback as a function of context varies as a function of ratings on scales of importance to perform well and performance compared to expectations. These analyses revealed a pattern of results that was consistent with the hypothesized outcomes for those high in importance to perform well and low in performance compared to expectations. (See Figure 3.)

***Skin conductance.*** We next examined whether skin conductance responses to receiving feedback that a response was incorrect varied as a function of the self-relevance of the task and feedback. The results indicated only a main effect of feedback ( $F(2, 98) = 4.56, p = .0127$ ) such that the magnitude of skin conductance responses to being informed that a question was wrong were larger than when that feedback came from a friend as opposed to the computer. As with heart rate, participating with a friend led to greater physiological reactions relative to participating alone. There was not a significant main effect of self-relevance nor was the hypothesized interaction between self-relevance and support significant. (See Figure 4.) Follow up analyses centering the data around those who placed high importance on performing well but rated their performance low compared to their expectations revealed that none of the interactions with importance to perform well and performance compared to expectations were significant.

**Aggregate measures of physiological reactivity.**

***Heart rate.*** As an indicator of broader physiological changes as a function of condition, we examined the time course of stress responses during the problem-solving task. A mixed model analysis was done to test the relationship between time, feedback, and self-relevance and their interactions in predicting heart rate over the course of the

problem-solving task. This analysis revealed a significant main effect of time ( $F(1, 101) = 6.81, p = .0104$ ) indicating that heart rate tended to decrease over the course of the task. There was also a marginal main effect of feedback ( $F(2, 101) = 2.32, p = .1031$ ) such that, on average, heart rate was higher amongst those who participated with and, ostensibly, received feedback from, a friend as opposed to receiving computer feedback. There was not a significant main effect of self-relevance or any significant interactions.

***Skin conductance.*** The same analysis was performed to examine the time course of reactions as indicated by skin conductance levels. The analysis yielded a marginal main effect of time ( $F(1, 101) = 3.03, p = .0850$ ), consistent with that above, indicating a general decrease in arousal over time course of the problem-solving task. There were no other main effects or interactions revealed by this analysis including no interactions with importance to perform well or performance compared to expectations.

### **Self-Report Data**

**Changes in distress.** We next examined the interactions between support and feedback in predicting changes in ratings of distress. The results revealed significant main effects of both self-relevance ( $F(6, 98) = 4.32, p = .0404$ ) and feedback ( $F(6, 98) = 3.41, p = .0369$ ) such that those in the non-relevant condition tended to report greater increases in distress compared to those in the self-relevant condition and those in either condition involving a friend tended to report greater increases in distress as a result of the task than those in the computer feedback condition ( $t(98) = 7.75, p = .0269$  and  $t(98) = 7.16, p = .0331$  for friend- no support and friend- support conditions, respectively). There was not a significant interaction between self-relevance and feedback. (See Figure 5.)

When the analysis was repeated including importance to perform well and performance compared to expectations, it revealed that there was a significant 2-way interactions between feedback and self-relevance ( $F(24, 80) = 8.64, p = .0004$ ) for individuals high in importance to perform well and low in performance compared to expectations. Post hoc simple effects tests revealed that there were significant differences between the supportive and nonsupportive friend-provided feedback in both the non-relevant ( $F(16, 46) = 5.59, p = .0223$ ) and self-relevant contexts ( $F(16, 46) = 8.03, p = .0068$ ), but in the opposite direction to that predicted. (See Figure 6.)

**Changes in negative self-evaluations.** Analyses were performed to examine the interaction between self-relevance and support in predicting changes in negative self-evaluations. The results indicate only a significant main effect of self relevance ( $F(6, 98) = 7.42, p = .0077$ ) such that, on average, those in the non-relevant contexts reported greater increases in negative self-evaluations than those in the self-relevant conditions. (See Figure 7.)

Rerunning the analysis including importance to perform well and performance compared to expectations revealed that, amongst those for whom it was important to perform well but did not perform well compared to their expectations, there was a significant interaction between feedback and self-relevance ( $F(24, 80) = 5.10, p = .0082$ ) such that support was linked to smaller increases in negative self-evaluations in the self-relevant condition relative to nonsupportive feedback from a friend while it was linked to increased negative self-evaluations in the non-relevant context. (See Figure 8.) Post hoc simple effects tests provided evidence for significant differences between the supportive

and nonsupportive friend-provided feedback in the self-relevant context ( $F(16, 46) = 7.32, p = .0095$ ) only, but, as described above, in the opposite direction to that predicted.

**Changes in academic self-efficacy.** In order to further examine how support receipt impacts self-evaluations, analyses were done to look at changes in academic self-efficacy using the specific item that asked individuals to estimate the degree to which they felt like their “ideal self” with regard to their intellectual/academic abilities as the focal indicator. The analysis revealed that there was a significant main effect of self-relevance ( $F(6, 98) = 5.29, p = .0236$ ) such that ratings of likeness to ideal self tended to decrease more when the task was framed in a non-self-relevant way compared to when it was self-relevant. There was no significant effect of feedback. However, the interaction between self-relevance and feedback was significant ( $F(6, 98) = 3.57, p = .0318$ ). The pattern of this interaction suggests that, in the self-relevant context, feedback from a friend is associated with somewhat better ratings of likeness to ideal self than computer feedback while, in the non-relevant context, feedback from a friend exacerbated costs, with support in the self-relevant context imposing the greatest costs to ratings of likeness to ideal self. These results are in the opposite direction to that predicted. (See Figure 9.) Follow up analyses centering the data around those who placed high importance on performing well but rated their performance low compared to their expectations revealed that none of the interactions with importance to perform well or performance compared to expectations were significant.

### **Changes in Relational-Evaluations**

***Relationship Assessment Scale.*** Changes in ratings on the Relationship Assessment Scale were examined as a function of self-relevance and feedback. The

results indicated that there was a main effect of self-relevance ( $F(4, 56) = 4.77, p = .0331$ ) such that ratings of relationship satisfaction using the RAS tended to decrease over the course of the experiment when the stressor was not self-relevant but increased when it was self-relevant. Neither the main effect of feedback nor the interaction between self-relevance and feedback were significant in predicting changes on the RAS. (See Figure 10.)

Repeating the analysis including importance to perform well and performance compared to expectations revealed a significant 3-way interaction between performance compared to expectations, importance to perform well, and self-relevance ( $F(16, 44) = 5.48, p = .0238$ ), significant 2-way interactions between performance compared to expectations and self-relevance ( $F(16, 44) = 4.27, p = .0447$ ) and importance to perform well and self-relevance ( $F(16, 44) = 5.59, p = .0225$ ). Taking these interactions into account, for individuals high in importance to perform well and low in performance compared to expectations, there was a significant main effect of self-relevance ( $F(16, 44) = 6.62, p = .0135$ ) such that costs to relationship satisfaction were greatest when the task was not framed as self-relevant. However, post hoc simple effects tests did not reveal significant differences between the supportive and nonsupportive friend-provided feedback in either context. (See Figure 11.) Taken together, these two analyses suggest that, compared to the sample as a whole, those individuals who indicated that it was highly important to perform well and who performed below their expectations experienced greater costs to relationship satisfaction (in response to both support and nonsupport) in the non-relevant situation as well as greater benefits of a friend who did not provide support in the self-relevant context.

***Perceived Emotional Responsiveness.*** Neither of the main effects of self-relevance or feedback were significant. The interaction between self-relevance and feedback in predicting ratings for perceived emotional responsiveness was also not significant. (See Figure 12.) Follow up analysis centering the data around those for whom it was important to perform well but rated their performance low compared to their expectations revealed that none of the interactions with importance to perform well and performance compared to expectations were significant.

### **Additional Analyses**

***Gender effects.*** The data were further analyzed to test for gender effects. The results indicated that the independent variables interacted significantly with gender for only two outcomes. For change in self-reported distress, there was a marginally significant two-way interaction between gender and self-relevance ( $F(12, 92) = 3.72, p = .0569$ ), which was qualified, by a significant three-way interaction between gender, feedback, and self-relevance ( $F(12, 92) = 3.70, p = .0285$ ).<sup>7</sup> For change in self-reported negative self-evaluations, there was a significant main effect of self-relevance ( $F(12, 92) = 4.62, p = .0341$ ) and a significant three-way interaction between gender, feedback, and self-relevance ( $F(12, 92) = 4.51, p = .0136$ ).<sup>8</sup> The patterns of results for both distress and negative self-evaluations suggest that, for men, support from a friend was associated with

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<sup>7</sup> Post hoc simple effects tests examining the interactions between the friend-provided feedback in the support and no support conditions revealed that the difference between support and no support was significant for women when the context was not self-relevant ( $F(8, 54) = 4.30, p = .0430$ ) and marginally significant in the self-relevant context ( $F(8, 54) = 3.77, p = .0573$ ) but not significant in either context for men.

<sup>8</sup> Post hoc simple effects tests investigating the interactions between the friend-provided feedback in the support and no support conditions revealed that the difference between support and no support was marginally significant for women in both the non-relevant ( $F(8, 54) = 3.85, p = .0550$ ) and self-relevant contexts ( $F(8, 54) = 3.28, p = .0755$ ) and significant in only the non-relevant context for men ( $F(8, 54) = 5.37, p = .0244$ ).



lower increases in both distress and negative self-evaluations than was nonsupportive feedback from a friend in the non-relevant context, while no such benefits of support were reported when the task was framed as self-relevant. On the contrary, when the task was framed as non-relevant, women reported greater increases in both distress and negative self-evaluations in response to support from a friend compared to nonsupport from a friend whereas, in the self-relevant context, they reported lower increases in both of these constructs when they received supportive relative to nonsupportive feedback from a friend.

In light of the unanticipated gender effects, additional analyses were performed to determine whether they could be accounted for by the importance of performing well and performance compared to expectations. These analyses revealed that women were more likely to fall into the category of people with high importance of performing well and low performance compared to expectations. Once importance to perform well and performance compared to expectations were adjusted for, no gender effects remained significant. It seems that the apparent gender effect was driven by an overrepresentation of women who reported being high on importance to perform well and low on performance compared to expectations.

## **Discussion**

The purpose of this study was to examine a basic principle of the Experiences in Supportive Interactions model, namely, that the link between support receipt and its outcomes depends on the context of the stressor and its role in shaping construal of the supportive experience. The present work adds to current evidence supporting the ESI model by extending evidence for such processes to the physiological level. Consistent

with the hypotheses, the analyses on cardiovascular reactivity suggest that reactions to feedback that one has answered a question incorrectly depend both on the self-relevance of the stressor and the presence of a supportive partner, particularly amongst those who value the task and simultaneously underperform compared to their expectations.<sup>9</sup>

Although this interaction was not evident in terms of skin conductance, greater reactivity when the feedback came from a partner instead of the computer may be considered as partial support for the ESI model to the extent that it provides evidence for the importance of contextual factors such as this to impact reactions to the information provided in a given situation. While there is not conclusive information about why these physiological indices did not show the same pattern, one possible explanation is that the combination of baseline individual differences in skin conductance levels as well as in the magnitude of responses may have made any meaningful between-group differences relatively difficult to detect.

The analysis predicting change in heart rate taking into account the importance of performing well and performance compared to expectations provides evidence to suggest that the most negative experience occurs in the non-relevant situation when the individual does not receive support. This is consistent with the results of Burke (2009), which revealed that days when support was desired but not received were associated with particularly strong emotional costs. It is also in line with research by Burke and Goren (unpublished data) that found that the absence of support in a non-relevant context led to the greatest increase in negative self-evaluations. If this represents a case where support is desired but absent, the fact that a lack of support is particularly costly is not

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<sup>9</sup> Due to the divergence between self-report and physiological measures, we did not test the mediated moderation hypothesis.

unsurprising. To the extent that support benefits the recipient emotionally in non-relevant contexts, it might be both desirable and expected in those circumstances. When support does not appear, it may be upsetting in so far as the individual did not get the support he/she wanted.

In contrast to the physiological findings, self-report measures provided a completely different picture. They largely suggested that support was beneficial primarily in self-relevant contexts and detrimental otherwise. This is not only inconsistent with the hypotheses, but also with previous research examining the same role of self-relevance in shaping the experience of support (Burke, 2009; Burke & Goren, unpublished data), and the relationships suggested by cardiovascular outcomes in the present research. Nevertheless, the fact that physiological and self-report measures do not parallel one another in this work is consistent with a number of other studies that have found evidence of emotional reactivity in physiological but not self-report measures (Christenfeld et al., 1997; Gerin et al., 1992; Glynn et al., 1999; Kamarck et al., 1990; Lepore et al., 1993).

### **Explanations for Divergence of Physiological and Self-Report Measures**

There are several potential explanations for the lack of correspondence between physiological and self-report measures. One potential reason for such findings is the possibility that the observed physiological changes represent something other than emotional reactivity. For example, physiological reactivity may also be influenced by factors such as cognitive load or attentional processes (Haapalainen, Kim, Forlizzi, & Dey, 2010; Shi, Ruiz, Taib, Choi, & Chen, 2007). If such processes do vary as a function of condition, it seems likely that such differences in load or attention could be accounted

for by the perceived stressfulness of that situation. Even if such processes are not related to perceived stressfulness, they should be reflected in ratings of importance to perform well, since this measure should be closely related to the effort afforded to working on the task. In this way, being high on importance to perform well should be a proxy for engagement with the task and, thus, would imply similar amounts of attention and cognitive load. To this avail, the fact that the hypothesized results are evident in analyses focused specifically on individuals for whom it was highly important to perform well would suggest that this explanation is not a likely alternative for the observed results. Even so, future research should assess these processes in order to eliminate alternative explanations for the effects observed in physiological measures.

A different possible reason for the divergence of self-reported emotion is that, at the point when participants make the second set of self-reported emotion ratings, the stressful task is over. This may cause a sense of relief (due to the completion of the problem-solving task), which may skew the reports of current mood. In other words, the more stressful the experience during the problem-solving task, the more one is likely to contrast the current relieved state against the previous mood. Therefore, individuals may report more positive affect after completing a task that was experienced as highly negative. If it is the case that such effects may have shaped the pattern of results in the current study, a more effective way to assess emotion through self-report may have been to measure it throughout the problem-solving task. This might be done either by asking people to rate their emotions at multiple time points throughout the task or by making use of equipment that allows participants to continuously monitor their subjective experience during the task.

Another possible explanation for the pattern of findings found in the self-report data is that these measures may be related to interpretations of one's arousal (Dutton & Aron, 1974; Schachter & Singer, 1962). To the extent that individuals are unable to attribute their arousal to a readily available explanation, they may be more likely to misattribute that arousal in their self-reports. For this reason, participants may have been more likely to interpret arousal in the non-relevant situation as negative feelings, whereas it may have been ascribed to the nature of the situation in the self-relevant context, where the task was arousing for more obvious reasons.

Finally, it is also reasonable to reconcile the divergent findings by recognizing the shortcomings of self-report measures as described in the introduction. Due to the fact that self-report measures require the ability and willingness to accurately report emotion while physiological measures do not tend to be under such conscious control, it seems reasonable to believe that physiological measures are a more accurate representation of participants' emotional experience. Whether the results described herein may have been the product of an inability to recognize or report emotion accurately and the extent to which this might be caused by factors such as defense mechanisms, contrast effects, or attempts to respond in line with demand characteristics of the design is unclear. It is important to note, however, that self-report measures have successfully detected the hypothesized pattern of results in other work we have conducted (Burke & Goren, unpublished data). Procedural differences between the present and former work might explain why the former, but not the present, research was able to effectively detect the predicted changes in affect. One important difference was that, in the former work, we went to great lengths to convince participants that they were participating in two separate

studies (e.g., the participant changed rooms, the appearance of the computer programs were altered to look different from one another) in order to reduce their awareness that we were measuring changes in affect. In contrast, the constraints of being physically attached to physiological equipment in the current study made it difficult to conceal our focus on change in affect and relevant evaluations. Other notable differences in methodology between this and the former study include the use of practical rather than emotional support and the provision of face-to-face support by the experimenter instead of over an instant messenger ostensibly sent by a close other from the next room.

Although the exact cause of the differential outcomes suggested by the self-report measures in these studies can only be speculated, what is important to note is that self-report measures involve complex psychological processes. Responses can be influenced by cognitive factors such as participants' interpretation of what is being measured and their thoughts about the purpose and hypotheses of the given study. Therefore, self-reports are imperfect to the extent that the outcomes they suggest can be manipulated by factors that should not affect the actual processes they are intended to detect. For example, there is evidence to suggest that subtle (but equivalent) differences in question wording can serve as cues to participants for disambiguating the meaning of the questions and can, therefore, impact the ratings made using such self-report measures (Schwarz, 1999; Schwarz, Knauper, Hippler, Noelle-Neumann, & Clark, 1991). In general, it is likely that self-reports may be more effective in some cases than others and determining their merit in any given project is something that should be afforded careful attention in both study design and the interpretation of results. One important caveat that can be drawn from the common mismatch between results suggested by physiological versus

self-report data is that such decisions can make a critical difference in the conclusions that might be drawn from a study. Therefore, using multiple measures may be vital to ensuring that the conclusions derived from a given experiment represent true processes rather than representing an artifact of the shortcomings of any specific measures.

### **Effects of the Mere Presence of a Friend**

One of the most consistent results in the present work is the impact of the source of feedback on both physiological and self-report measures. The data suggest that, on average, the presence of a friend, supportive or not, is associated with both greater physiological activity (both in terms of heart rate and skin conductance) and increased self-reports of distress. The fact that this difference exists between the computer feedback condition and the friend no support condition, where the content of the response is equivalent, but differs only in respect to the apparent source of the feedback, suggests that there is something about receiving feedback from a friend that qualitatively changes the interpretation of the situation. One reason for this observed effect may be that the presence of a friend introduces an evaluative element to the situation. This evaluative component may contribute to stressfulness of the task in general.

This interpretation is consistent with literature suggesting that the presence of friend can have costs when the individual has the potential to be evaluative. For example, some research has found that the presence of a supportive friend may exacerbate physiological reactivity, while the presence of a nonevaluative companion (pet) attenuated responses (Allen, Blascovich, Tomaka, & Kelsey, 1991). In a separate study by Kamarck et al. (1990), the authors found that the presence of a friend attenuated physiological reactivity, but their design ensured that the friend was unable to act

evaluatively by both distracting them with questionnaires and having them wear headphones so that they could not hear responses of the participant. Taken together, these studies suggest that the evaluative potential of a supportive other may influence the impact of social support on reactivity. Considering the present study in terms of the potential for partners to act in an evaluative manner, the role of the friend in providing feedback to let the problem-solver know if he/she was correct or not clearly possesses an evaluative element.

The fact that enacted support often involves evaluation or can, at the very least, often appear to stem from another's evaluation that the recipient is in need of help means that evaluation may be inherently tied to support in most instances of visible support. Some potential factors that might determine the degree to which the evaluative component of support is salient are the self-relevance of a task, the nature of past experiences with the provider, and characteristics of the provider-recipient relationship. The nature of the task in this study may have created a situation in which the presence of the friend posed a self-evaluative threat as a result of the evaluative potential of the friend's role.

At present, it is not clear whether costs to self-evaluation occur primarily as a result of one's feelings of inefficacy due to receiving support, or whether such feelings are a result of the perception of being evaluated negatively by the support provider. To the extent that the emotional costs of support result from the salience of one's own inefficacy or shortcomings that are made salient as a result of receiving support and not primarily from being judged or evaluated by another, receiving support that one deems unnecessary (i.e., the individual holds the belief that she could have achieved her



intended goal without help had she been given the chance to do so) should not be associated with self-evaluative costs. In fact, this perception might allow an individual to transfer the costs to self to her relational-evaluations by providing an outlet through which she can assign responsibility for her lack of performance to the other person rather than her own shortcomings. However, if costs exist even when the individual believes she would have been fine without support, then this would suggest that at least some of the costs of support are a consequence of the negative reactions to feeling that one was viewed negatively by another. This is an area that should be further explored in future research on reactions to social support.

One way to investigate the source of self-evaluative costs would be to vary the evaluative potential of supportive statements. For instance, a paradigm similar to that used in this study could vary whether support is provided before or after beginning the problem set. To the extent that the costs of support remain when it occurs before performance (and therefore cannot be perceived as the result of negative evaluations by the provider), this would suggest that the evaluative component of support exists primarily in beliefs about one's own ability as opposed to perceptions of the other's thoughts. Disentangling these sources of evaluative costs might inform how support could be tailored to reduce its costs.

### **Effects of Self-Relevance Manipulation**

An unexpected finding of this work is that, across several of the measures, overall levels of reactivity were greater in the context where the stressor was not framed as self-relevant compared to when it was self-relevant. Although the exact reasons for this cannot be determined using the present data, there are a number of potential reasons why

this may have been the case. It is possible that both the presence and absence of support in the non-relevant situation might be aversive, each for their own reasons.

As mentioned earlier, it is not surprising that there would be a particularly negative reaction to the absence of support where it might be expected and/or desired and this finding is consistent with past work (Burke, 2009; Burke & Goren, unpublished data). The importance of receiving support in the non-relevant situation may be strengthened by the nature of the present experiment. The fact that the individual providing the feedback has done something supportive in agreeing to accompany their friend to the experiment may make their presence and, consequently, relational concerns especially salient.

However, it is more surprising that support in the non-relevant condition tended to be associated with greater reactivity for several of the dependent outcomes. It is especially unexpected that, in the case of cardiovascular reactivity, support is associated with similar levels of reactivity regardless of self-relevance. The reasons why distress would be expected to result from enacted support in the self-relevant condition have been explained in depth; however, support in the non-relevant situation was not expected to elicit such distress. Nonetheless, one potential explanation for the findings is that receiving support in this condition may be interpreted as somewhat stressful to the extent that it suggests that the friend is out of synchrony with the support recipient. In other words, support provision might indicate that the provider is ascribing greater value to the task than the individual solving the problems, and this lack of coherence could be disconcerting. Further investigation in future work could help to illuminate what other factors might play a role in the cognitive appraisal of the non-relevant situation.

## **Limitations & Future Directions**

One limitation of the present work is that it does not account for the exact nature of the relationship between the ostensible support provider and the recipient. Inherent in the study of close relationships is the assumption that such relationships make a difference in the nature of interactions. While some research draws attention to the fact that stranger- versus friend-provided support can lead to different outcomes (Christenfeld et al., 1997; Nadler et al., 1983), we cannot distinguish between the qualitative differences between the dyads in the present work that may have influenced reactions to support or nonsupport. These differences might include permanent or transient features of the relationship at that point in time. For example, factors such as whether the dyad includes same-gender versus mixed-gender individuals, whether they are a romantically-involved couple as opposed to close friends, the length and quality of the relationship, and any salient or recent relevant events (i.e., arguments, supportive or quality-strengthening events, etc.) may influence the construal of supportive comments and subsequent reactions. Additional work that identifies which relationship dynamics serve as important predictors of reactions to support may prove to be informative.

One interesting area to explore would be the influence of relatively transient relational events on subsequent judgments of ambiguous supportive interactions. For instance, intact couples could participate in a lab-based paradigm in which they first discuss either a point of contention, a neutral event, or a favorite memory they share. Following this discussion, the dyad would engage in a task that included an ambiguous supportive behavior. Responses to support could then be analyzed as a function of the discussion topic. I would expect that the positivity or negativity of the conversation topic

would foster interpretations of the ambiguous support events in line with the valence of the subject matter. For example, the disagreement fostered by discussing a point of contention might be expected to contribute to increasingly negative interpretations of support events as a result of how such experiences might influence expectations about the likelihood of supportive behaviors relative to other types of behaviors from the partner.

In addition to relationship-specific qualities, individual-level characteristics may also influence the interpretation and reactions to the interactions involved in the present study. One example is the individual's attachment style. The ESI model asserts that the views of self and other captured by attachment style have important implications for the construal of supportive interactions (Burke et al., in preparation). Collins and Feeney (2004) provide evidence for the critical role of attachment style in shaping the interpretation of a close other's actions within an experimental paradigm. Along these lines, we are currently working on research examining the influence of attachment style on perceptions of the supportiveness and helpfulness of ambiguous support events as well as satisfaction (with both self and others) derived from such interactions.

Another factor that may influence reactions to enacted support is the personal importance of independence as opposed to interdependence (Martire, Stephens, Druley, & Wojno, 2002; Martire, Stephens, & Schulz, 2011). In the present experiment, to the extent that interdependence is central to an individual and maintaining harmony in his/her relationships represents something that is highly self-relevant, support on the self-relevant task may simultaneously have positive and negative implications for the self (in other words, negative personal implications regarding efficacy on the task and positive personal implications regarding the quality of one's relationships). In the non-relevant

condition, these outcomes would not conflict with one another, as the lack of support would reflect negatively on one's relationship regardless. Likewise, the support condition would be expected to be a positive experience whether the positive implications about one's relationships represent something self-relevant or not.

These characteristics may also vary, on average, as a function of culture or gender. For instance, the relative values placed on independence and interdependence tend to be manifest as a result of cultural differences and are central to the collectivist/individualist distinction (Markus & Kitayama, 1991). Similarly, women tend to have a greater focus on interdependence relative to independence (Cross & Madson, 1997). As suggested by the pattern of results for gender effects that was presented earlier, this was the case in the present study to the extent that women were overrepresented amongst those who highly valued the task and perceived themselves as underperforming relative to their expectations. When examining gender differences before taking into account individual differences in importance to perform well and performance compared to expectations, women tended to report benefits of support in the self-relevant context and costs in the non-relevant one while men appeared to exhibit the opposite (and predicted) pattern. Perhaps this pattern could also have been explained by gender differences in the value assigned to independence versus interdependence. Regardless of the source of such variation across individuals, the ways in which these characteristics can influence the construal of support merits further investigation.

Another potential limitation of the present work is that the support manipulation may have violated expectations in some respects. First, with regard to study design, we chose to use scripted support to ensure the qualitative equivalence of the supportiveness

of statements across dyads. However, it is possible that, if such statements varied in meaningful ways from what might be expected from the close other who was ostensibly providing the feedback, violations of expectations may have, in some cases, contributed to emotional reactions that would not have been present in more naturalistic interactions. Likewise, it is possible that some aspects of the task or the quality of the relationship fostered expectations that one would receive support. For instance, the fact that the partner was their closest friend may have meant that expectations of support were violated in the nonsupportive friend condition, leading to emotional reactions resulting from the lack of support. To the extent that nonsupport might violate norms, it could be upsetting for that reason alone. It is plausible that some of the results may be partially accounted for by such reactions to a lack of support. This possibility might be assessed in future work by asking more specific questions about expectations for and interpretations of the partner's behavior. Alternatively, the match between expectations for support and actual provision could be manipulated by having dyads participate in an interaction in which they are given explicit directions in the presence of both members of the dyad addressing whether the partner should (or should not) provide support as the other completes a task. Following this, the person in the supportive or nonsupportive partner role could be secretly instructed to provide support or not depending on condition. In this 2 x 2 design, two of the conditions would involve matches of behavior and expectations while the other two would represent mismatches. Using emotional indices to gauge reactions, the study would be able to examine the degree to which certain types of matches or mismatches are experienced as more or less emotionally upsetting. This would link back to optimal matching (Cutrona & Russell, 1990), but with a greater

emphasis on subjective construal rather than need matching per se.

## **Conclusions**

In sum, the present work provides partial support for the hypothesized influence of self-relevance in shaping the experience of support receipt. The interaction between self-relevance and feedback that was evident in terms of cardiovascular reactivity supports the Experiences in Supportive Interactions model and suggests that the link between support receipt and its outcomes depends on the context of the stressor and its role in shaping construal of the supportive experience. Furthermore, it demonstrates that the effects predicted by this model are apparent in concrete ways that may have implications for physical health via physiological reactivity. To date, the accumulating evidence for the premises set forth by the ESI model attest to the strengths of this theoretical approach and reinforce the value of this model in providing an integrative understanding of the mechanisms through which enacted support gives rise to both positive and negative consequences. Future work should continue to test this and other assertions set forth by the model.

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## Appendix A

### Modified Measure of Positive and Negative Affect

Instructions: This scale consists of a number of words and phrases that describe different feelings and emotions. Please rate the extent to which you are feeling or experiencing each feeling or emotion right now (at the present moment).

[Item]

\_\_\_\_\_

very slightly or not at all extremely

Items from the Positive and Negative Affect Schedule- Expanded Form (PANAS-X; Watson & Clark, 1994):

Cheerful	Angry at self	Enthusiastic	Attentive
Nervous	Distressed	Happy	Determined
Proud	Alert	Interested	Dissatisfied with self
Irritable	Upset	Ashamed	Disgusted with self
Confident			

Items from the Profile of Mood States (POMS; McNair, Lorr, & Droppleman, 1971):

On Edge	Discouraged	Annoyed	Uneasy
Blue	Angry	Sad	Anxious
Hopeless	Resentful		

Appendix B

**Modified Measure of Academic Self-Efficacy**

**The Self-Attributes Questionnaire** (Pelham & Swann, 1989)

This questionnaire has to do with your attitudes about some of your activities and abilities. For the questions below, you should rate yourself relative to *other college students* your own age by using the following scale:

---

bottom 5% top 5%

An example of the way the scale works is as follows: if one of the traits that follows were "height", a woman who is just below average in height would choose \*E" for this question, whereas a woman who is taller than 80% (but not taller than 90%) of her female classmates would mark "H", indicating that she is in the top 20% on this dimension.

Rate how *certain* you are of your standing on intellectual/academic ability:

---

not at all certain extremely certain

Now rate how personally *important* intellectual/academic ability is to you:

---

not at all important to me extremely important to me

Now rate your intellectual/academic ability relative to your "ideal" self -- the person you would be if you were exactly the way you would *like* to be:

---

very short of my ideal self very much like my ideal self

Appendix C

**Relational Evaluations**

**Modified Relationship Assessment Scale** (Hendrick, 1988)

Instructions: Please answer each question in relation to the friend with whom you are participating in today's study:

1. How well does your friend meet your needs?

\_\_\_\_\_

not well at all very well

2. In general, how satisfied are you with your relationship?

\_\_\_\_\_

not at all very much

3. How good is your relationship compared to most?

\_\_\_\_\_

worse than most better than most

4. How often do you wish you hadn't gotten into this relationship?

\_\_\_\_\_

never very often

5. To what extent has your relationship met your original expectations?

\_\_\_\_\_

not at all very much

6. How much do you love your friend?

\_\_\_\_\_

not at all very much

7. How many problems are there in your relationship?

\_\_\_\_\_

none at all a large amount



**Modified Perceived Responsiveness Measure** (Fekete, Stephens, Mickelson, & Druley, 2007; Khan et al., 2009)

As a result of your experiences during the task, to what extent did you feel:

[Item]

not at all

very much

Worse

Supported

Put down

Accepted

Better

Judged or evaluated

Close to your partner

Undermined

Loved or cared for

To what extent did you find the feedback you received to be helpful?

not helpful at all

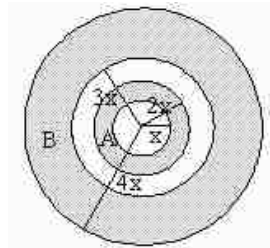
extremely helpful

Appendix D

Sample Questions for Math and Logic Problem Sets

---

Four concentric (having the same center) circles with radii,  $x$ ,  $2x$ ,  $3x$  and  $4x$  are drawn to form two rings A and B as shown in the figure.



Ratio of the area of inner ring A to the area of outer ring B is

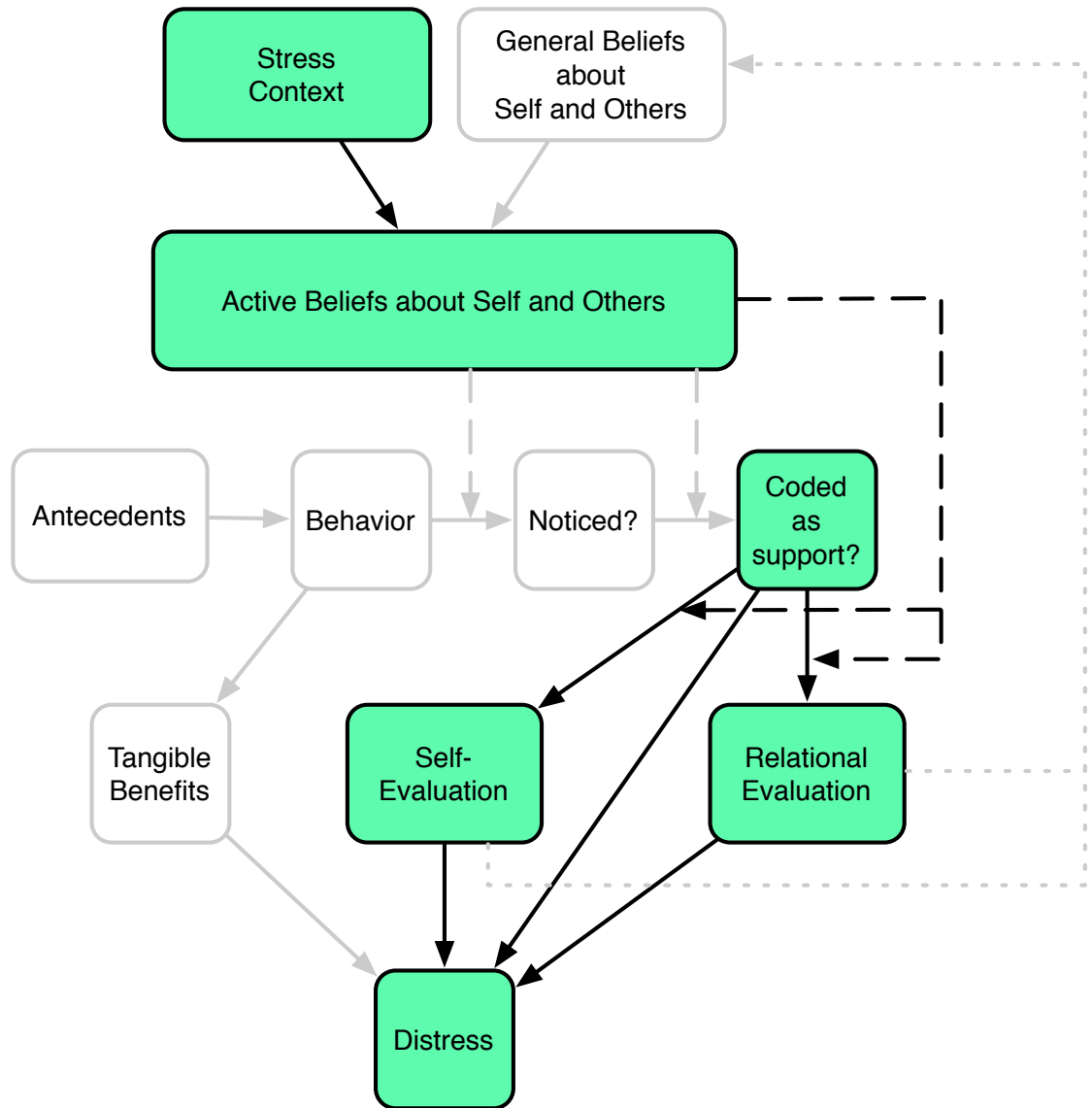
- A. 1 : 2
  - B. 1 : 4
  - C. 2 : 3
  - D. 3 : 7
- 

At 10 a.m. two trains started traveling toward each other from stations 287 miles apart. They passed each other at 1:30 p.m. the same day. If the average speed of the faster train exceeded the average speed of the slower train by 6 miles per hour, which of the following represents the speed of the faster train, in miles per hour?

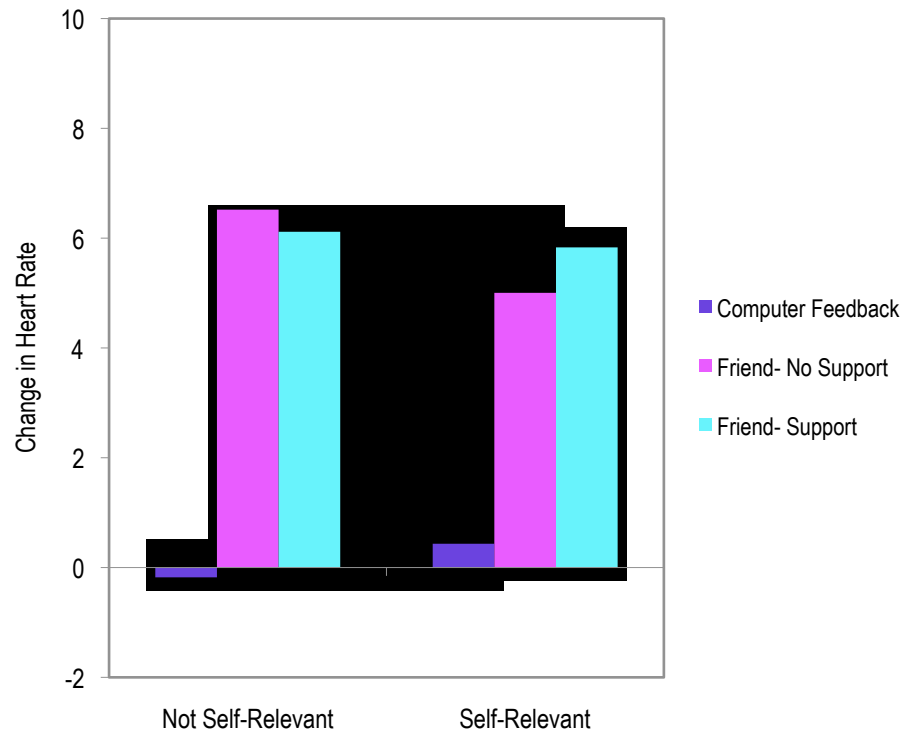
- A. 38
  - B. 40
  - C. 44
  - D. 48
- 

Every student of a certain school must take one and only one elective course. In last year,  $\frac{1}{2}$  of the students took biology as an elective,  $\frac{1}{3}$  of the students took chemistry as an elective, and all of the other students took physics. In this year,  $\frac{1}{3}$  of the students who took biology and  $\frac{1}{4}$  of the students who took chemistry left school, other students did not leave, and no fresh student come in. What fraction of all students took biology and took chemistry?

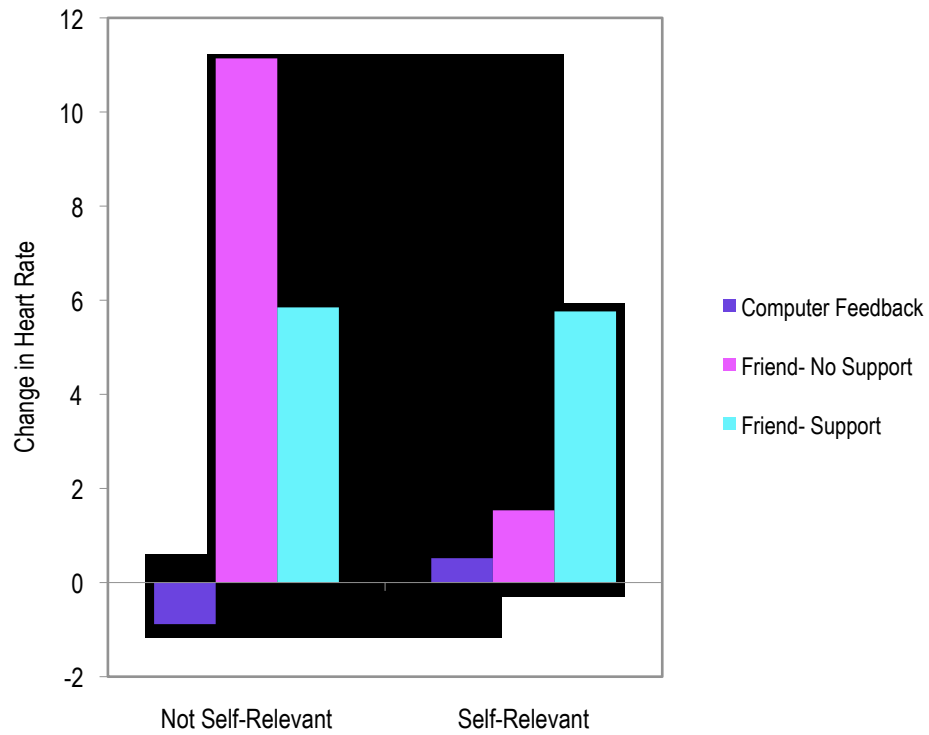
- A.  $\frac{7}{9}$
- B.  $\frac{6}{7}$
- C.  $\frac{5}{7}$
- D.  $\frac{4}{9}$



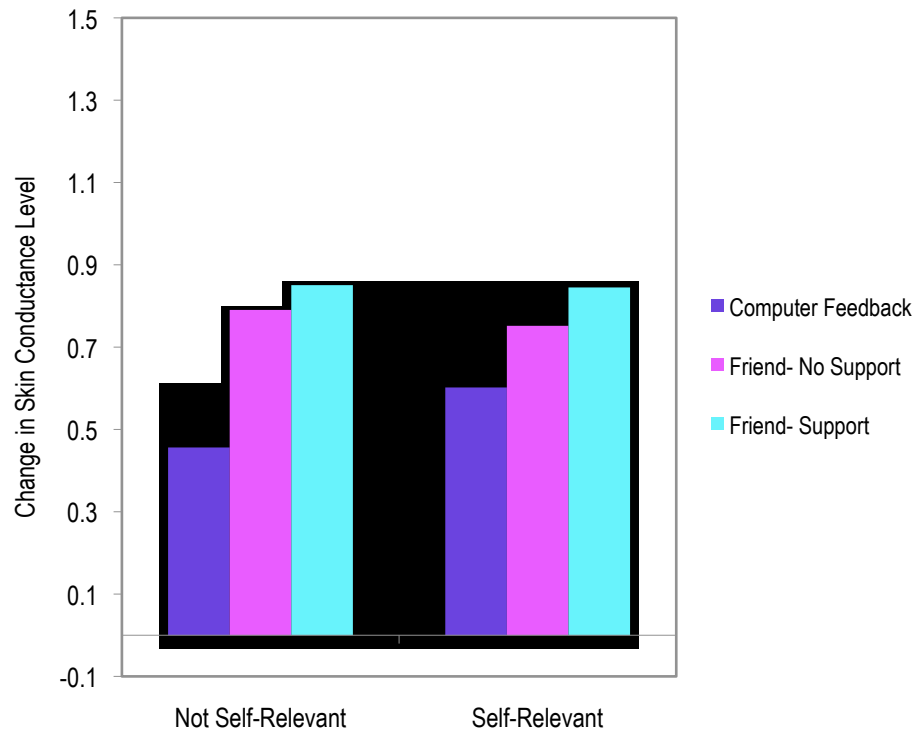
*Figure 1.* Experiences in Supportive Interactions (ESI) Model. The highlighted path represents the portion of the model that is examined within the present work.



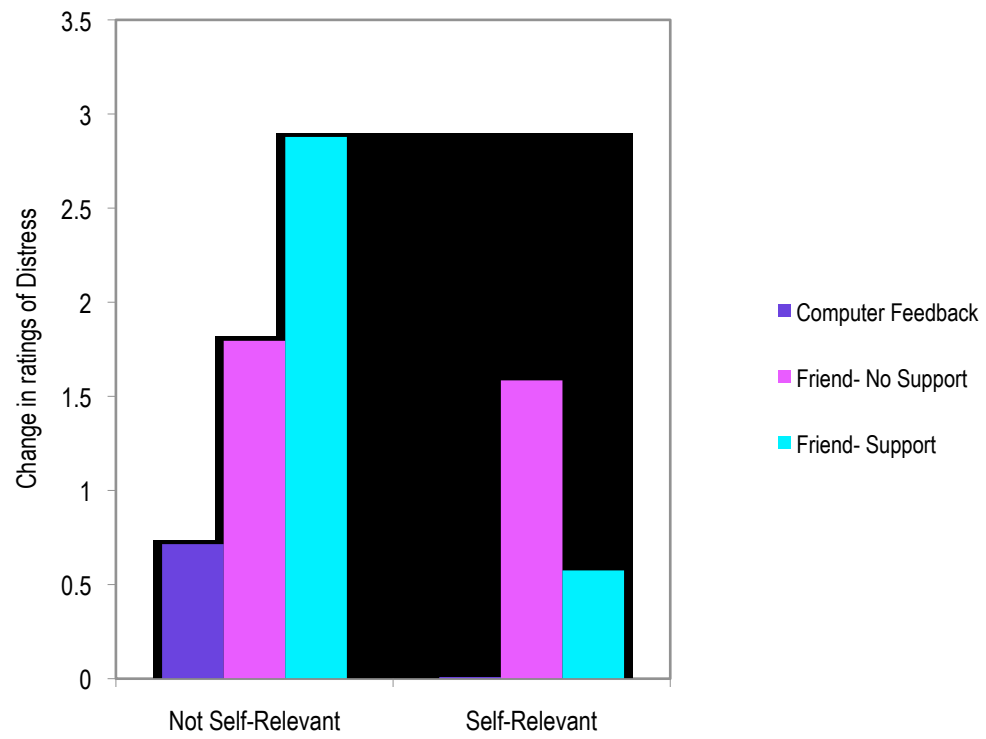
*Figure 2.* Change in heart rate in response to incorrect feedback as a function of support receipt and self-relevance of the stressor.



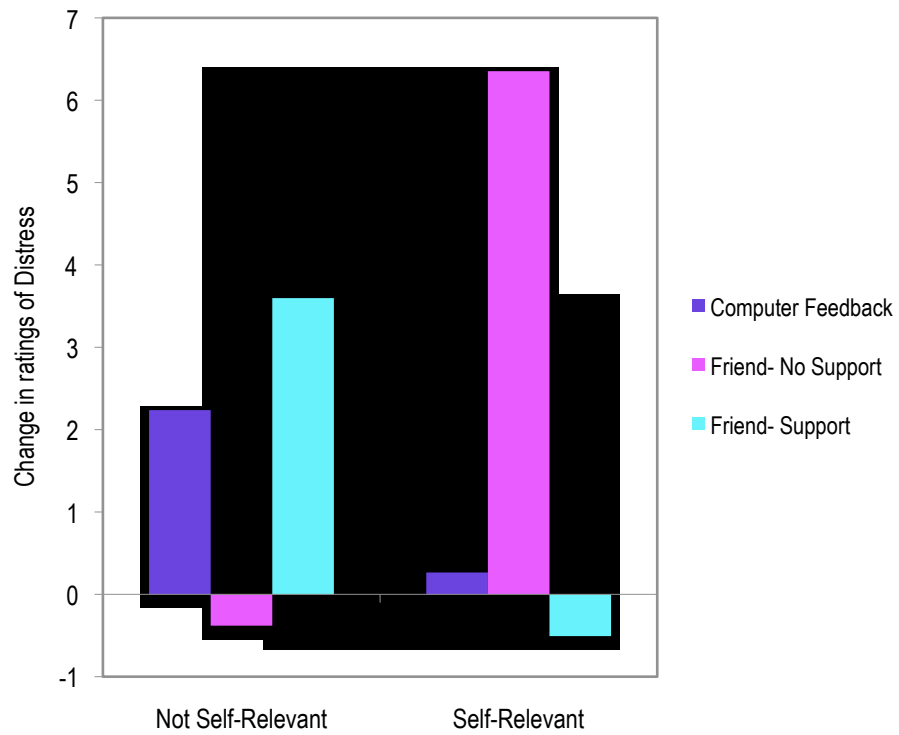
*Figure 3.* Change in heart rate in response to incorrect feedback as a function of support receipt and self-relevance of the stressor for individuals high (+1 SD) on importance to perform well and low (-1 SD) on performance compared to expectations.



*Figure 4.* Magnitude of skin conductance reactions in response to incorrect feedback as a function of support receipt and self-relevance of the stressor.

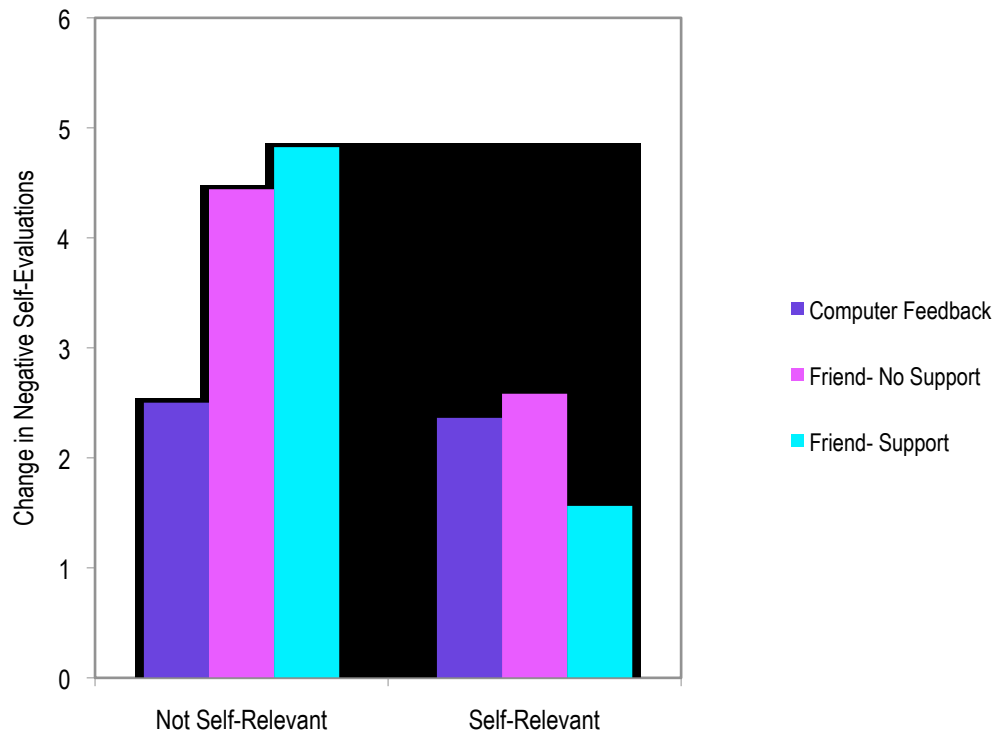


*Figure 5.* Change in distress as a function of support receipt and self-relevance of the stressor.

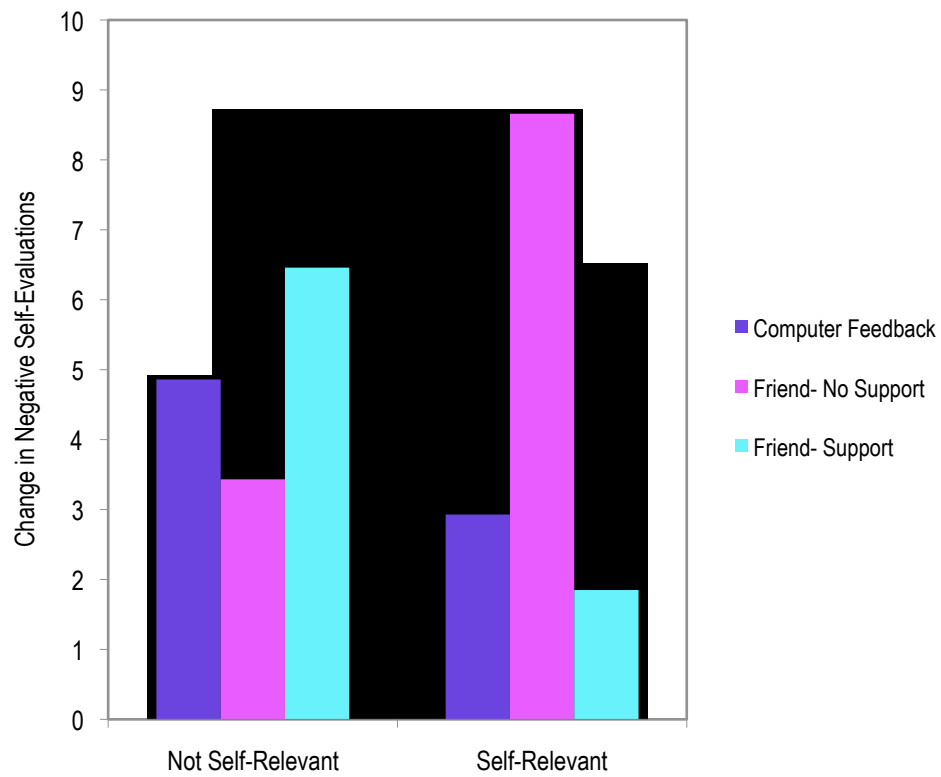


*Figure 6.* Change in distress as a function of support receipt and self-relevance of the stressor for individuals high (+1 SD) on importance to perform well and low (-1 SD) on performance compared to expectations.





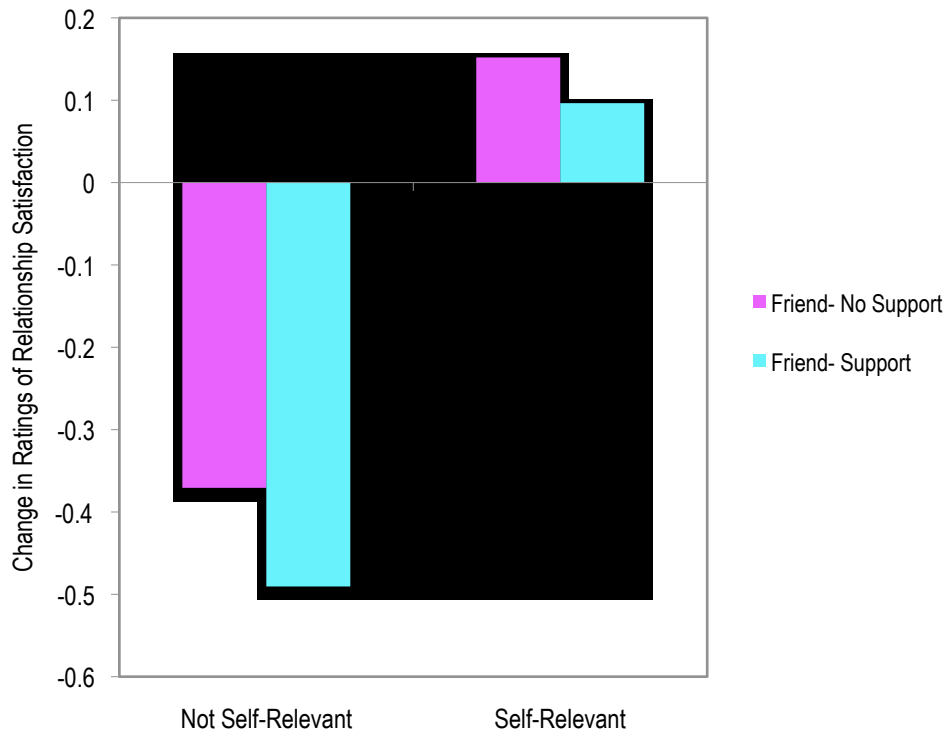
*Figure 7.* Change in negative self-evaluations as a function of support receipt and self-relevance of the stressor.



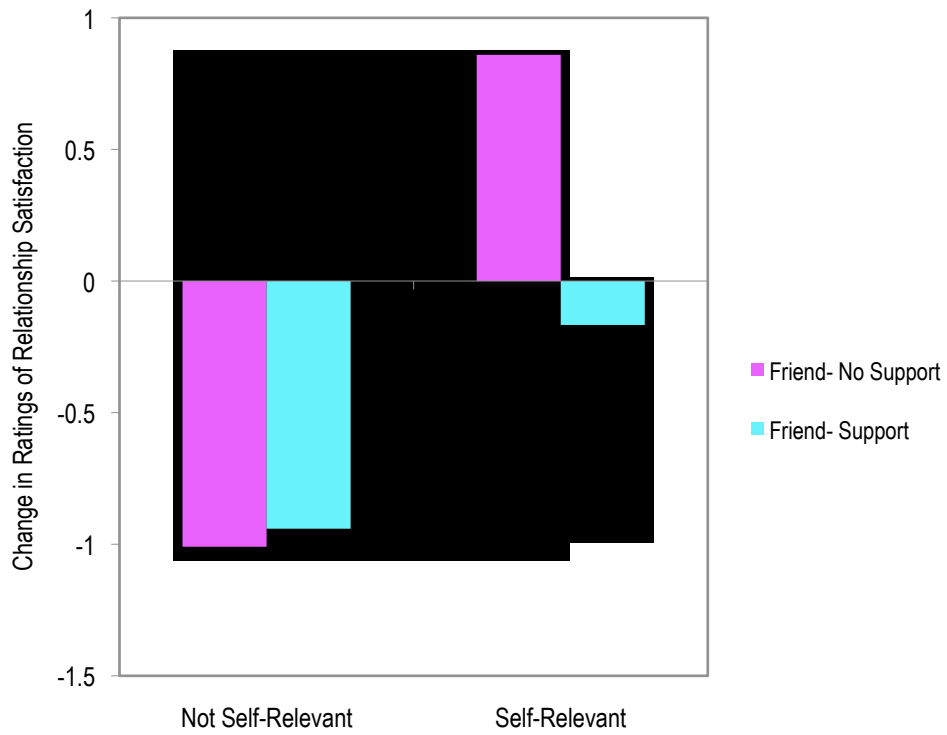
*Figure 8.* Change in negative self-evaluations as a function of support receipt and self-relevance of the stressor for individuals high (+1 SD) on importance to perform well and low (-1 SD) on performance compared to expectations.



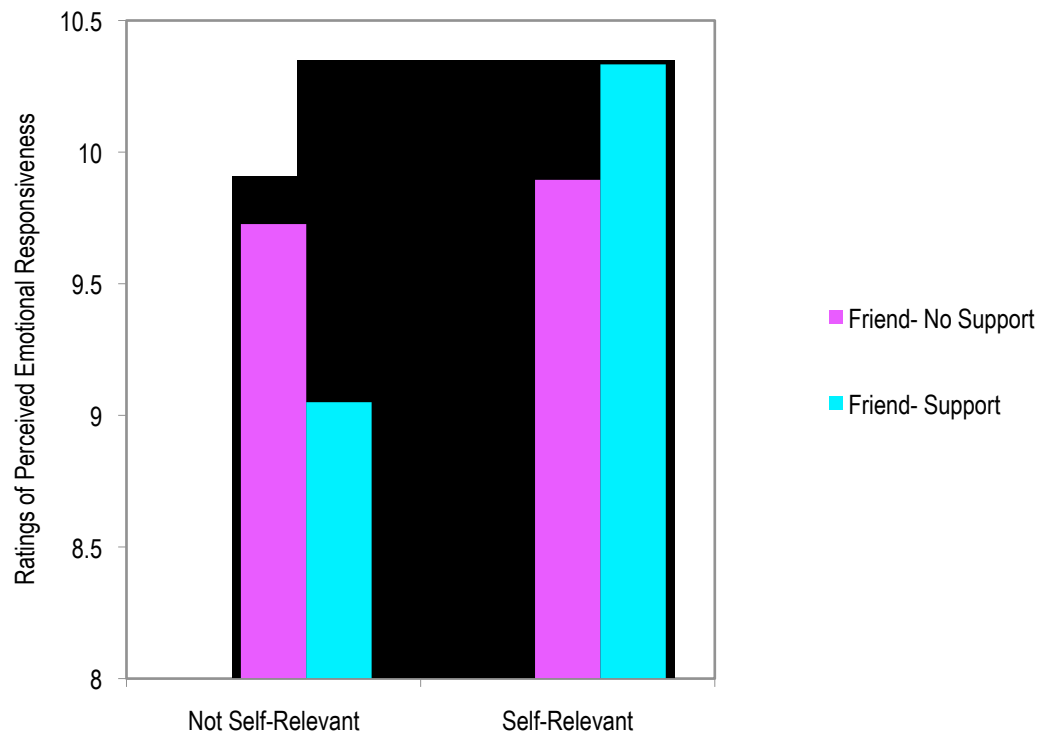
*Figure 9.* Change in ratings of academic self-efficacy as a function of support receipt and self-relevance of the stressor.



*Figure 10.* Change in ratings on the Relationship Assessment Scale as a function of support receipt and self-relevance of the stressor.



*Figure 11.* Change in ratings on the Relationship Assessment Scale as a function of support receipt and self-relevance of the stressor for individuals high (+1 SD) on importance to perform well and low (-1 SD) on performance compared to expectations.



*Figure 12.* Ratings on the Perceived Emotional Responsiveness scale as a function of support receipt and self-relevance of the stressor.

## Curriculum Vitæ

### EDUCATION

**Lehigh University**, Bethlehem, PA **Present**  
Concentration: Social Psychology  
Advisor: Christopher T. Burke, Ph.D.

**University of Melbourne**, Australia **2007**  
Postgraduate Degree (Honors Equivalent) in Psychology  
Advisor: Lisa Phillips, Ph.D.

**Cornell University**, Ithaca, NY **2006**  
BSc in Human Development  
Concentration: Social and Personality Development

### CONFERENCE PRESENTATIONS

Goren, J., & Burke, C.T. (January 2012). The Contextual Dependence of Social Support: Self-Relevant Concerns Shape the Experience of Enacted Support. Poster presented at the 13th annual meeting of the Society for Personality and Social Psychology, San Diego, CA.

### PUBLICATIONS

Goren, J., Phillips, L., Chapman, M., & Salo, R. (in press). Dissociative and psychotic experiences of adolescents admitted to a psychiatric inpatient unit. *Journal of Trauma & Dissociation*.

### RESEARCH INTERESTS

Social support, close interpersonal relationships, social-cognition, attachment

### RESEARCH EXPERIENCE

**Developmental Psychology Lab, Lehigh University** **2009 – 2010**  
Research Assistant, Bethlehem, PA

**Honors Thesis, University of Melbourne** **2007**  
Research Assistant, Bethlehem, PA

**Social Cognition Lab, Cornell University** **2005 – 2006**  
Research Assistant, Ithaca, NY

### TEACHING ASSISTANT EXPERIENCE

**Teaching Assistant for Introduction to Psychology** **Spring 2011**  
**Lehigh University, Bethlehem, PA**  
Professor: Dominic Packer, Ph.D.

**Teaching Assistant for Health Psychology** **Fall 2010**  
**Lehigh University, Bethlehem, PA**  
Professor: Timothy Lomauro, Ph.D.

### OTHER EXPERIENCE

**Graduate Assistant for Technology** **2011-2012**  
**Lehigh University, Bethlehem, PA**

### HONORS AND ACCOMPLISHMENTS

Golden Key Honor Society, Psi Chi, Dean's List (Cornell), NYS Merit Scholarship for Academic Excellence, Lehigh College of Arts and Sciences Summer Research Fellowship (2012)