The Effects of Daily Support Transactions During Acute Stress: Results From a Diary Study of Bar Exam Preparation

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Persons who feel supported enjoy a variety of benefits, both psychological and physical (Cohen, 1992; Sarason, Sarason, & Gurung, 1997; Taylor, 2007). These benefits include fewer complications during pregnancy and childbirth (Collins, Dunkel-Schetter, Lobel, & Scrimshaw, 1993), faster recovery following surgery (e.g., Helgeson, 1991) and fewer depressive symptoms (Schwarzer & Leppin, 1992). Benefits such as these are thought to help explain why persons in sustained intimate relationships live longer and in better health (Berkman & Syme, 1979; House, Landis, & Umberson, 1988). Patterns of support are hypothesized to influence perceptions that a partner will be responsive to one's needs and will make efforts to "be there" in times of need (Reis, Clark, & Holmes, 2004), and this psychological perception provides benefits even when support is not evident.

Given the robustness of the findings associated with overall support patterns and perceived responsiveness of partners, one would think that individual instances of daily support provision would be related to immediate health and mental health outcomes. However, a number of studies have reported that specific supportive behaviors either have no positive effect on well-being (Barrera, 1986; Bolger, Foster, Vinokur, & Ng, 1996), or may even have a negative effect on the recipient (Sandler & Barrera, 1984; Bolger, Zuckerman & Kessler, 2000; Vella, Kamarck, & Shiffman, 2008). The contrast of findings on perceived availability of support and those on the effects of reports of specific support behaviors (which we will call *support transactions*) remains one of the important puzzles in the social support literature (Lakey & Drew, 1997).

Our own studies have contributed to the literature on the costs of support events in daily life. Using a daily diary design, Bolger, Zuckerman, and Kessler (2000) reported

that acutely stressed persons who recognized that their partner was emotionally supportive on one day tended to have higher rather than lower anxiety and depressed mood on the next day. However, this study also collected separate data from the partners of the stressed persons, and found different results for the partners' reports of support provision compared to recipients' reports of support receipt. Adjusting for recipients' report of received support, persons whose partners said that they provided emotional support tended to have lower rather than higher depressed mood on the next day. Because of this mixed pattern, it appeared that the most effective pattern of emotional support was "invisible support", in which the recipient received support, but was not aware of the support.

In further analyses of data from the same study, Shrout, Herman and Bolger (2006) extended the analysis of invisible support patterns to a range of daily emotional outcomes, including anger, fatigue and vigor. They also examined daily reports of practical support in addition to emotional support. These analyses revealed that a) visible emotional support on one day was related to increased anger, anxiety, and depressed mood on the next day, b) there was no evidence of benefits of invisible emotional support for anger, fatigue or vigor, and c) practical support patterns were quite different from emotional support patterns. In contrast to findings regarding emotional support, receipt of practical support was not significantly related to increased anxiety, depression, fatigue, anger or diminished vigor. However, partner's report of practical support provision was related to decreased fatigue and increased vigor on days following practical support receipt.

Even though emotional support receipt had mostly negative consequences on mood in our studies, Gleason (2005; Gleason, Iida, Shrout, & Bolger, 2008) found that the same support events could have both positive effects on perceived intimacy and negative effects on mood. Part of the joint effect came from aggregating over persons who had purely positive (intimacy) effects and persons who had purely negative (mood) effects. However, Gleason et al. (2008) also found a number of persons who experienced both the positive intimacy effects and the negative mood effects following support transactions. The analyses leading to these conclusions extended the models of Bolger, Zuckerman and Kessler (2000) and Shrout, Herman and Bolger (2006) by considering support equity (i.e. reciprocated support) in addition to support receipt and provision to a single partner.

Testing claims that support has costs

The conclusions from these studies were based on analyses of associations from longitudinal nonexperimental data, and we are well aware that such studies are susceptible to various biases. An important class of biases arises from model misspecification errors in the statistical analyses. Seidman, Shrout and Bolger (2006) used statistical simulation studies to determine whether we might have spuriously obtained results suggesting that support was costly if the data had actually arisen from one of two alternative processes. One process posited that the causal direction between support and distress was reversed – that distress mobilized support. The other process posited that a third variable, such as an important life event, led to both distress and support. The simulation results were reassuring. The multilevel model used in both sets of diary analyses protected against misinterpreting the reverse causation model as costs of

support. The third variable process was more threatening, but the simulation studies suggested that this competing model was implausible given the large effects found in the two analyses of empirical data.

Our group also checked whether similar patterns of results could be obtained when support was manipulated rather than observed. Bolger and Amarel (2007) conducted laboratory based experiments in which undergraduate participants were randomly assigned to support conditions. In three different studies participants were subjected to stress by being asked to give an impromptu speech that was to be evaluated, and various support messages were designed. In two studies those in the visible support condition were given practical advice on how to prepare by a confederate posing as a student peer. In a third study visible and invisible emotional support were provided by direct or indirect reassuring comments. Over all three studies participants in the visible support conditions experienced increased distress compared to those who were given no advice or who received the advice in a way that led them not to interpret it as support. Analyses of the experimental conditions were revealing of possible mechanisms for the costs and benefits of the support manipulations. Two principal mechanisms were explored: first, that support visibility communicated a sense of inefficacy to the recipient, and second, that visibility led to upward social comparison to the support provider. Considerable evidence was found for the first mechanism, and none was found for the second.

These experimental studies of unacquainted undergraduates were silent about possible mechanisms for costs of support within intimate relationships. These include the possibility that support efforts might be awkwardly administered and constitute a

negative interaction (Rook, 1984), that support may make the recipient feel indebted to the provider (Walster, Berscheid, & Walster, 1973), that it can challenge the recipient's sense of autonomy and agency (Ryan & Solky, 1996), or that it simply fails to match the specific needs of the recipient (Cutrona & Russell, 1990) and therefore constitutes a lost opportunity.

Timing of Support Effects

Depending on which mechanism links support events to emotional outcomes, one might expect immediate or delayed effects of support on positive and negative mood. On one hand, if the support event involves a negative interpersonal component, or activates an immediate sense of inefficacy, then one might expect the mood to change minutes if not seconds after the support is recognized. On the other hand, if the support event creates inequity or imbalance in relationships that are based on norms of exchange, the costs may be more gradual, taking hours or days to be evaluated and appreciated. Similarly, the benefits of support on mood might have varying time courses. A warm exchange or a back rub might have immediate benefits on muscle tension in the recipient, but the full benefit of the support might only be apparent after a good night's sleep that is facilitated by the support event.

Methodologists have long written about the importance of considering causal timing in the analysis of effects, particularly when effects are being studied in non-experimental contexts (Gollob & Reichardt, 1987). Recent studies by Cole and Maxwell (2003; Maxwell & Cole, 2007) have shown how misleading inferences can be if the timing of measurements and the analytic model do not mirror the true causal timing. Researchers' beliefs about the correct causal timing can sometimes conflict with their

concern about showing a credible causal sequence. For example, to argue against the model of reverse causation, Bolger, Zuckerman and Kessler (2000) predicted tomorrow's mood based on today's reported support events, while adjusting for today's mood. A diagram that reflects the assumed causal model is in Panel A of Figure 1. There were two alternative models that Bolger, Zuckerman and Kessler did not consider, however. One was that there were common causes of support and distress that could induce a spurious association between the two (see Panel B of Figure 1). An example of such a variable is time to the stressor, which is related to both increased support and distress. Working in the opposite direction is the variable of weekend versus weekday, where weekends are associated with more support events (because of time spent together) and reduced distress (because of increased leisure). Shrout, Herman and Bolger (2006) adjusted for days to event and weekend and found essentially the same pattern of results as Bolger, Zuckerman and Kessler (2000).

A different model is that support events on one day increase the likelihood of support events on the next day, and that the main increase in distress is due to a same-day causal process. This is illustrated in Panel C of Figure 1. If this model is correct, then the lagged effect of Support (t-1) to Distress (t) might be a fraction of the same-day effect. The theoretical implications of the difference between a lagged effect and a same-day effect are considerable in terms of the dynamics of the daily support process. However, modeling the same-day effect of support raises the possibility that a variety of other common causes of both support and distress need to be considered, as indicated by Figure 1, Panel (D).

In the analyses reported in Gleason et al. (2008) we focused on same-day effects of support on negative mood. In addition to adjusting for elapsed time and weekend vs. weekday, we adjusted for (i) a summary of reported daily stressors and (ii) the possibility that equity was maintained by the simultaneous provision and receipt of support during the same day. Finally, the Gleason et al. analysis had a finer-grained view of the distress process. We had information about negative mood of the recipients when they awoke on a given day, and we used this same-day mood adjustment instead of the previous-day mood adjustment used in Bolger, Zuckerman and Kessler (2000).

Goals of Current Report

The Gleason et al. (2008) report was based on results from a large-scale daily diary study designed to replicate and extend the findings of Bolger, Zuckerman and Kessler (2000). Like the original study, we recruited intimate couples in which one member was facing a highly stressful professional licensing examination. Unlike the original study, the new study had more than three times the number of couples and it involved both members of the couple to complete diary forms twice a day from five weeks prior to the examination to one week afterwards. Other than these improvements, the protocol was very similar to that of the original study. Although we reported one set of analyses of these new data in the Gleason et al. (2008) article, until now we have not revisited the original invisible support question with these new data.

The goal of this chapter is to revisit that question by examining the impact of received (reported by recipient) and provided (reported by partner) support on five different daily moods: Anxiety, Depression, Anger, Fatigue and Vigor. Like Shrout, Herman and Bolger (2006), we will consider both emotional support and practical

support transactions. We will also follow the original papers by focusing on the effect of today's support on tomorrow evening's mood. However, we will also extend the analysis systematically by considering other temporal representations of the support process. The first variation examines support effects on reports of mood made upon awaking the following morning. We reason that if support has either lasting benefits or costs, they will be evident at the start of the new day. The next-day morning measure provides a better realization of the dependent variable in Panel A of Figure 1 than does the next-day evening measure. In particular, we hope to avoid any confounding of the effect of today's support and other events occurring during the subsequent day. The third and final variation builds on the analysis presented in Gleason et al. (2008) which focused on evening mood reports as the outcome while adjusting for morning mood, support equity processes, daily stressors and time to exam. Extending the Gleason analyses, we incorporate a) all five mood outcomes, and b) both practical and emotional support. In our final analysis, we will use

Methods

Design and Participants

For this study of stress, coping and support we sought to recruit persons who were facing a fixed stressful event with a known time course and who were in a long term intimate relationship. State bar examinations provide an excellent opportunity to study a group facing stress. Students in their last year of law school can be recruited in the spring just before they begin to prepare for the July sitting of the bar exam. The examinations are considered to be very challenging, and nearly 30% of the participants fail the exam. The results of the exam are made public in print and on the internet, and many of the examinees depend on passing to secure steady employment in the legal profession.

In the summers of 2001, 2002, and 2003 we contacted more than 100 law schools in the continental United States. In 2001 fourteen schools agreed to allow us to contact their graduating students; in 2002 twenty-seven schools participated; and in 2003 thirty schools participated. Students' marital or cohabitation status was unavailable prior to recruitment and so we asked the school representatives to distribute either a letter or email to their entire graduating class. Across the three years, over 15,000 students were contacted. To be eligible for participation, couples had to be married or cohabiting for at least six months at the time of the recruitment and only one member of the couple could be planning on taking the July exam. Of the 765 eligible couples who contacted us to participate, 552 were assigned to the diary condition. Another group of couples was assigned to a cross-sectional survey condition that will not be considered here. Of those in the diary condition, 472 (77%) couples agreed to participate.

Couples were paid $150 for participation, and each couple was given a chance to win $1,000 upon the completion of the study. They received an initial payment of $10, two consent forms, two background questionnaires, and two return envelopes when they agreed to participate in the study. Background questionnaires were returned an average of three weeks prior to the start of the diary period. The diary period consisted of the five weeks prior to the exam, the two days on which the exam took place, and the week after the exam. Packets of diaries were mailed to each participant on a weekly basis (six packets over the six weeks of the study). Each batch consisted of seven identically structured daily diaries with the exception of the last batch, which consisted of nine daily diaries. The diary form included questions regarding mood, relationship closeness, daily troubles or difficulties, relationship conflicts, and support transactions. Participants were

asked to complete the questionnaires separately and not to share or discuss their answers with their partners. Participants were also asked to complete the diaries on the days assigned and to indicate whether each diary had been completed on the correct day. Only entries that indicated that they had been completed on the correct day were included in the analyses (88% of completed diaries).[1] The analyses were also restricted to diary days prior to the bar examination.

The current analyses were restricted to heterosexual couples for which the examinee completed seven or more days of diaries. The final study group consisted of 312 examinees and 310 partners. The method of recruiting participants and the restriction to those with minimal amounts of data led to a group of participants that is not formally representative of persons in relationships who are preparing for the bar exam.

The average age of the examinee was 29.7 years (*SD* = 6.4), and the average age of the partner was 29.9 (*SD* = 7.7). Fifty-four percent of the examinees were female. Sixty-five percent of the participants were married. The racial/ethnic composition of the examinees was 80.3% White, 7.3% Asian, 1.7% Black, and 5.0% Latino This is a highly educated volunteer sample and is not representative of the population as a whole.

Measures

Mood. Anger, Anxiety, Fatigue, Depression and Vigor were measured on the daily diary using items adapted from the Profile of Mood States (Lorr & McNair, 1971). Upon awakening participants were asked to respond to 16 items with the following instruction, “After you are fully awake, please rate the extent to which you are feeling or experiencing these feelings or emotions, RIGHT NOW, IN THE MORNING”. Response categories ranged from 1 (not at all) to 5 (extremely). Similar instructions were included

on the diary for evening responses, with the substitution, "RIGHT NOW, IN THE EVENING".

The five mood measures were computed as average responses to the moods listed in parentheses: Anger (resentful, angry, annoyed); Anxiety (on edge, uneasy, anxious); Fatigue (fatigued, worn out, exhausted); Depressed mood (sad, discouraged, hopeless, blue); Vigor (cheerful, lively, vigorous). These averages were transformed to range from zero to four. Cranford et al. (2006) described how to estimate the reliability of mood change scores, using the replicate mood items to quantify error. The AM/PM estimates of reliability were Anger (0.79, 0.81), Anxiety (0.78, 0.80), Fatigue (0.91. 0.90), Depressed mood (0.80, 0.82) and Vigor (0.79, 0.76)[2].

Support provision and receipt. In the daily diary participants were asked to record receipt and provision of both emotional and practical support. Each measure consisted of a pair of items, in which participants circled "yes" or "no" to indicate whether they had received emotional or practical support from their partner and, separately, whether they had provided emotional or practical support to their partner "for a worry, problem, or difficulty in the past 24 hours". These reports were initially coded 1 for support and 0 for no support. Within each person we calculated the average support over the diary period, which represented the proportion of days that support was reported. These person-specific averages were subtracted from the (0,1) codes to person-center the daily reports (Enders & Tofighi, 2007). Because we did not obtain replicate measures of support, we were not able to estimate the reliability of these reports.

Time. The week before the examination was higher stress than the weeks before that and represented this fact by including a period variable, which we call *phase*. The

higher stress phase was the final week before the exam was over, including five days before the exam and two exam days. The lower stress phase was comprised of the first four weeks of the diary study. In addition, we represented individual day as an integer variable, centered on the first day of the higher stress phase.

Weekend. We represented weekend with a variable that was coded 1 for Saturday and Sunday and 0 for days falling on Monday through Friday.

Results

We present three analyses of the bar exam data that make different assumptions about the timing of support effects on mood. The first analysis is a strict replication of the one that was reported by Shrout, Herman and Bolger (2006), which followed Bolger, Zuckerman and Kessler (2000) in predicting tomorrow's evening mood on the basis of today's support transactions. The second is an analysis that brings the outcome closer in time to the support events, by predicting tomorrow morning's mood on the basis of today's support transactions. The third brings the outcome even closer still, by predicting today's evening mood on the basis of reports of today's support transactions.

Replication analysis: Tomorrow evening's mood predicted by today's support

The analytic model used by Shrout, Herman and Bolger (2006) was a multilevel model that described the relation of support to mood within each person each day at the first level and between-person variation in that process at the second level. In our replication, we represent an examinee's mood tomorrow evening to be (V_{t+1}), and then model this mood as a function of this evening's mood (V_t), support provision by the partner (P_t), support receipt as perceived by the examinee (R_t), as well as temporal

variables for stress phase (S_{t+1}), day (T_{t+1}) and weekend (W_{t+1}). Equation 1 shows this model explicitly:

$$V_{t+1} = b_0 + b_1V_t + b_2S_{t+1} + b_3T_{t+1} + b_4W_{t+1} + b_5G + b_6R_t + b_7P_t + b_8(S*R)_t + b_9(S*P)_t + e_{t+1}. \quad (1)$$

We center V_t by subtracting the examinee's mean of the mood across all days so that zero represents the examinee's average mood. Stress phase, S_{t+1}, is coded zero for the seven days before the exam, and is coded 1 for days before then. Day indictor T_{t+1} is set to zero for day 31, weekend indicator W_{t+1} is coded 0 for weekdays (1 for weekends) and support indicators (R_t and P_t) are zero for days when no support transactions occur. Gender, G, is effect coded, -.5 for males and +.5 for females. The intercept b_0 is the expected mood when all the explanatory variables are zero. This occurs when mood on Day 31 (a weekday) is average and when no support is reported as received or provided. In Equation 1 there are two parameters of special interest. One is b_6, which is the expected change in tomorrow's mood when the examinee reports receiving support today and the other is b_7, which is the expected change when the partner says support was provided today. Both of these effects are adjusted for each other and describe effects during the high stress week before the exam, which is coded as the reference category for phase.

In the multilevel model, Equation 1 refers to an individual examinee. We could have made that explicit by adding subscript "*i*" to all the explanatory variables and also to all the *b* coefficients, but we opted for a simpler notation. The analysis can yield a distribution of each *b* coefficient across the many examinees. The average coefficient is called the fixed effect, and the variation in the coefficient across examinees is called the random effect. Following the analysis of Shrout, Herman and Bolger (2006) we

considered the intercept (b_0), the effect of today's mood (b_1), and the effect of support receipt (b_6) to vary across persons.

The support transactions coded in Equation 1 could be emotional support, practical support or a combination of the two. Within the typical examinee-partner dyad, there is a tendency for emotional and practical support to be reported on the same day, as illustrated in the correlations shown in Table 1. These are averages of product moment correlations between reports of provision and receipt of both practical and emotional support. For the average partner, practical and emotional support provision were correlated 0.34 over time, and for the average examinee, practical and emotional support receipt were correlated 0.36. The Shrout, Herman and Bolger (2006) analysis focused on each type of support without adjusting for the other type, and we follow that approach in the replication analysis, but we consider the adjusted approach in our subsequent two analyses.

Table 2 presents the results from the application of Equation 1 to emotional support events. The top half of the table presents fixed effect results. For the average examinee, receipt of emotional support is marginally associated with increased anxiety (b_5 = 0.092, z=1.88), increased fatigue (b_5 = 0.104, z=1.85) and increased depressed mood (b_5 = 0.065, z=1.66), and it is significantly associated with increased vigor (b_5 = 0.092, z=2.06). Partner's reported provision of emotional support is significantly associated with increased examinee anxiety (b_6 = 0.097, z=2.06) and fatigue (b_6 = 0.104, z=3.38). The bottom of the table contains the random effect estimates, including one for emotional support receipt. There is little evidence that persons vary systematically in how they respond to emotional support receipt. Table 3 presents comparable results for practical

support. The only significant finding for either provision or receipt is an increase in anxiety on days following practical support receipt. There was no evidence of random variation associated with practical support.

Although the pattern of results in Table 2 confirms the hypothesis that emotional support events can be followed by increased negative mood, the specific findings are not the same as presented in Shrout, Herman and Bolger (2006). In particular, the pattern that was described as "invisible support" for depressed mood was not replicated. This pattern showed a cost associated with emotional support receipt but a benefit associated with emotional support provision. It is possible that this pattern was diluted by the events that occurred between the support events and the moods on the evening of the next day.

Refined lagged analysis: Tomorrow morning's mood predicted by today's support

One way that the current data were designed to extend the data originally reported by Bolger, Zuckerman and Kessler (2000) was the inclusion of interim time points to monitor mood changes. Each morning of the bar study, participants were asked to provide a brief report on their mood. We expected that the costs and benefits of support on the previous day should be more evident in the morning of the new day rather than later on the same day, since there is little that occurs except sleep between the evening report of mood and the morning report. Indeed, one might expect that effective support might be related to a restful night of sleep, and that support that evokes negative social comparisons, inequity and feelings of inefficacy might be related to less restful sleep. Even without considering this mediating process, we hypothesized that the pattern of findings from our previous study should be apparent at the beginning of the new day.

The multilevel model we considered in this analysis is a refinement of Equation 1. We represent an examinee's mood tomorrow morning to be (M_{t+1}), and model this mood as a function of the variables used in Equation 1, as well as two others. The morning mood is expected to vary as a function of today's morning's mood (M_t), stress phase (S_{t+1}), day (T_{t+1}) and weekend (W_{t+1}). We also allow the mood changes to be different in the week before the exam by adding the interaction of day to exam with stress phase, $(S*T)_{t+1}$. Furthermore, we refine the ability to distinguish between-person differences in level of mood by adding as a predictor the participant-specific average morning mood, which we write as $M_{\bullet}$, as well as gender (G) (effect coded with +.5 for females and -0.5 for males). The refined level one equation is,

$$M_{t+1} = b_0 + b_1 M_t + b_2 M_{\bullet} + b_3 S_{t+1} + b_4 T_{t+1} + b_5 (S*T)_{t+1} + b_6 W_{t+1} + b_7 G + b_8 R_{et} + b_9 P_{et}$$
$$+ b_{10}(S*R_e)_t + b_{11}(S*P_e)_t$$
$$+ b_{12} R_{pt} + b_{13} P_{pt} + b_{14} (S*R_p)_t + b_{15}(S*P_p)_t + e_{t+1}. \quad (2)$$

There are a few other changes to our analytic approach. Not surprisingly, for the morning mood report, there are substantially more missing data on the two days of the exam itself, and we found that the partners spend significantly less time together on those two days. Therefore, we restricted our second set of analyses to the days <u>prior</u> to the exam (not the exam days themselves). We shifted the phase variable to correspond to one week prior to the beginning of the exam. The linear day variable was similarly shifted to be centered on day 29 rather than 31. Finally, in the second series of analyses we included both practical and emotional support events in the same model, rather than in separate models like Shrout, Herman and Bolger (2006). Because we included average

morning mood as an explicit predictor, it was not necessary to model the intercept as a random effect.

Table 4 presents the results of our analyses of mood on the morning following support events. We pay special attention to the fixed effects associated with emotional support receipt (b_8), emotional support provision by partner (b_9), practical support receipt (b_{12}) and practical support provision by partner (b_{13}). Emotional support provision by partner was related to increased anger ($b_9 = 0.071$, z = 2.05), anxiety ($b_9 = 0.107$, z = 2.57), fatigue ($b_9 = 0.156$, z = 3.10) and depressed mood ($b_9 = 0.119$, z = 3.79), but there were no significant associations with emotional support receipt. For anxiety, fatigue and vigor, there was evidence of systematic random effects for emotional support receipt, suggesting that some people benefitted from the emotional support while others were affected negatively.

For practical support there were no significant associations with receipt or provision, although there were two trends associated with morning anger. Both practical support receipt and provision were associated with somewhat less anger ($b_{12} = -0.069$, z = -1.87; ($b_{13} = -.060$, z = -1.74). In addition there was evidence of random effect variation for practical support receipt in relation to anger, fatigue and depressed mood.

Analysis of same-day effects: Today's evening mood predicted by today's support

Recognizing the experimental evidence that costly effects of support provision are observed immediately after the support event (e.g., Bolger & Armarel, 2007), we planned an additional analysis of the relation of support transactions to same-day mood. When formulating the analytic model we noted that there was scant evidence that the support process interacted with the stress phase (Table 4). To simplify the analysis we eliminated

these interaction terms in the final model. This simplification was offset by our decision to add terms to reflect the impact of daily stressors and equity processes. As Gleason et al. (2008) argued, these processes could induce correlation among daily support and mood outcomes when they are measured on the same day. With these considerations in mind, we specified the following model:

$$V_t = b_0 + b_1 M_t + b_2 M_\bullet + b_3 S_t + b_4 T_t + b_5 (S*T)_t + b_6 W_t + b_7 G + b_8 X_t + b_9 R_{et} + b_{10} P_{et} + b_{11} E_{et} + b_{12} (E_e * R_e)_t + b_{13} R_{pt} + b_{14} P_{pt} + b_{15} E_{pt} + b_{16} (E_p * R_p)_t + e_t. \quad (3)$$

The outcome in Equation 3 is evening mood of day t, and the explanatory variables have the same t subscript as the outcome. The explanatory variables have the same interpretation as in Equation 2, but we now also include X_t as a count of daily stressors reported on day t, E_{et} as an indicator of whether the examinee provided emotional support to the partner, and E_{pt} as an indicator of whether the examinee provided practical support to the partner on day t.

Table 5 presents the findings from the multilevel analysis of Equation 3. We focus our attention on the receipt and provision of emotional support (b_9 and b_{10}) and on the receipt and provision of practical support (b_{13} and b_{14}), while noting that both types of receipt could be moderated by supportive equity effects (b_{12} and b_{16}). We found that emotional support receipt was associated with reduced anger (b_9 = -0.052, z = -2.43), increased anxiety (b_9 = 0.045, z = 1.85) and increased vigor (b_9 = 0.055, z = 2.60). On support equity days (when examinee both provided and received support), receipt was particularly beneficial for anger (b_{12} = -0.082, z = -2.08) and fatigue (b_{12} = -0.123, z = -2.28). In contrast, we found that reports by the partner of emotional support provision

were associated with increased anxiety (b_{10} = 0.051, z = 2.68), depressed mood (b_{10} = 0.079, z = 5.06), anger (b_{10} = 0.052, z = 3.12), and fatigue (b_{10} = 0.058, z = 2.54). When practical support was received, there were no fixed effects, except for vigor, which was increased on the evening of the receipt (b_{13} = 0.061, z = 3.21). Partner practical support provision, on the other hand, was associated with decreased depressed mood (b_{14} = -0.055, z = -3.44) and there was a trend for it to be associated with decreased anxiety (b_{14} = -0.037, z = -1.89). Table 5 also indicates that there were random effects for emotional support receipt with regard to anger, fatigue and depression, and random effects for practical support receipt for anxiety and vigor.

Discussion

Our goals in this chapter were to replicate and extend the findings on daily transactions of support that we presented in Bolger, Zuckerman and Kessler (2000) and Shrout, Herman and Bolger (2006), and to gain insight into the timing of the effects of provided and received support by considering alternate statistical models of longitudinal effects. We presented three sets of analyses of data that were collected using essentially the same methods as our previous studies, but with a sample size that was more than three times as large. Our findings are noteworthy in how they differed from our initial expectations and in what they revealed about the timing of daily support effects.

We failed to replicate the pattern of findings that we have called "invisible support," whereby recipient reports of support were associated with more depression and partner reports of support (adjusted for recipient reports) were associated with less depression in the final week of an acute stressful event. Instead, we found that across all time lags provider reports of emotional support were often associated with increased

anger, anxiety, depressed mood and fatigue. We also found that instead of being associated with costs, emotional receipt by the bar examinee was associated with increased vigor for two time lags, and with decreased anger on the same day. There were no costs associated with received emotional support, with the exception of statistical trends for anxiety. There were only a few significant findings for practical support; increased anxiety on the next evening was associated with practical support receipt, increased vigor on the same day was associated with practical support receipt, and decreased depression on the same day as practical support provision. These were not the same findings in Shrout, Herman and Bolger (2006), but they were similar in that emotional support events were more often related to subsequent mood than practical support events, and practical support was related to increased vigor. We also note that as we moved from models of practical support that focused on more distal (next day) effects to those focusing on more proximal (same day) effects we found larger associations, more indications of systematic individual differences as measured by random effects, and generally smaller standard errors of effects.

Readers will appreciate that these are not the findings we expected. We have looked at the data many ways, and checked the quality of the responses. We found that the data were generally coherent and without contamination. The systematic nature of the data is apparent from the effects of time to exam, weekend, daily stressors, equity responses and autoregressive correlations. Even after adjusting for previous mood measures, negative moods tend to increase as the exam draws near, weekends are times of less negative mood, days with more stressors are associated with more negative mood, and days with supportive equity are associated with less negative mood.

To highlight the fact that results are different because of the sample and not the statistical model, we chose to present the initial replication analyses using a statistical model that mirrored that presented in Shrout, Herman and Bolger (2006). Had we incorporated refinements in the model such as eliminating the two exam days, adjusting for both practical support and emotional support in the same model, and adjusting for different rates of daily change during the higher and lower stress phases, the basic pattern of weak to null findings for support receipt and provision from the previous day would be the same. To be explicit, we examined variations of the models reported in Table 5 with lagged support variables included for both emotional and practical support as shown in Panel C of Figure 1. Across 20 possible lagged effects (2 support types, 2 reporters, 5 moods), only one effect appeared to be significant: partner's practical support provision was associated with a small reduction of vigor. We conclude that the data rather than the model specification are behind the differences between the current results and those we reported from the earlier study.

We do not believe that the current findings undermine the theoretical perspective that well intended support events can have negative consequences, particularly when they do not match the needs of the recipient (Cutrona & Russell, 1990), but the results for emotional support provision do suggest that these effects are likely to be more proximal than distal. We also do not believe that these results preclude the possibility that skillful support can lead to benefits, and that non-intrusive "invisible support" may be an example of skillful support. Particularly in the analyses of same day mood we found evidence of random effects that suggest that the impact of support transactions can vary from couple to couple. Whereas the statistical pattern that we found in our first bar exam

study suggested that the invisible support pattern was common on the average, our new results suggest that we need to look more carefully at individual couples. This kind of approach has been taken in a recent study that reported that persons high on hostility may be especially reactive to offers of support (Vella, Kamarck, & Shiffman, 2008). It may not be enough to simply adjust statistically for received and provided support to detect skillful support provision, as these adjustments are affected by both measurement error (e.g. forgetting a support event, or recasting a loving event as intentional support) and contrasting visibility of support actions.

Limitations

Although the design of this study was improved relative to our first reports, in that the sample was larger, more attention was paid to the timing of causal effects, and the statistical models were more completely specified, there are a number of remaining limitations that should be noted. One is that the sample is essentially one of convenience, based as it is on volunteers. Participants appear to be more likely to have high relationship satisfaction and more communal investment, and thus the variability of the random effects for the costs and benefits of support is likely to be artificially small. The study is also limited by its use of binary self reports of emotional and practical support, with no objective or qualitative information about the nature of the action that was reported as support. Further work is needed to understand how people code actions as being supportive or merely loving (see Burke, 2009 for further discussion). In addition, we acknowledge that the binary reports mix measurement error with true differences in perspectives that lead to the invisible support pattern – provider thinking that she provided support while the recipient thinking that he did not receive explicit support.

Broader Implications of Results

At the outset of the chapter we noted that generalized perceived support availability is widely recognized to be helpful for both physical and mental health, whereas social support studies involving daily support transactions often show negative consequences of support behaviors. We thought that we would gain insight into the nature of the apparently contradictory results by a) verifying the timing of the causal processes involved in costs and benefits of support, b) obtaining better estimates of the individual differences (i.e. random effects) in the responses to support transactions, c) determining whether the invisible support pattern described by Bolger, Zuckerman and Kessler (2000) would be clearer when examined with a larger sample.

Our new results remind us that daily processes are more intricate and nuanced than general cognitions about support availability. Whereas general beliefs that support is available and that partners are responsive have robust associations with health and well being (Taylor, 2007; Reis, Clark and Holmes, 2004), the daily impact of support provision and receipt seems to vary depending on whether the support is viewed as emotional or practical, and whether it is reported by the provider or the recipient. In addition, the strength of the consequences of support seems to vary over couples. We did find that for practical support the benefits were more apparent when outcomes were recorded near the time of the support experience, but for emotional support there were reliable associations with negative outcomes on the next morning after the support experience and the following evening. However, these more lasting effects are likely to be explained by an indirect path though concurrent mood effects. In our final model of same-day effects (Figure 1 Panel C), we examined lagged support effects in addition to

same day support effects and found no evidence for unique lagged effects. This implies that they rich experiences associated with daily support transactions are mostly transient.

How daily support experiences are recalled and evaluated when persons make judgments about support availability is not a question that we addressed. However, we did consider between-person summary variables of the total number of support transactions (emotional and practical counted separately) in relation to overall level of negative and positive affect, and we failed to find any associations. We did not consider a measure of general perceived availability of support in our study, but it is easily conceivable that the perceived measure of available support would be inversely related to anxiety and depression, even if actual support usage was unrelated. Understanding appraisals of responsiveness of intimate partners is of great interest, even if not resolved here.

In our previous reports on invisible support, we suggested that emotional support that was provided without making the recipient overtly aware of the effort might have special benefits. Our new results lead us to back off from this simple take home message. Emotional support that was reported by the providers was associated with costs on the average for these couples, regardless of whether it was recognized by the recipient. Both quantitative and qualitative work is needed to better explain the fact that these costs are substantial in some couples, but non-existent in others.

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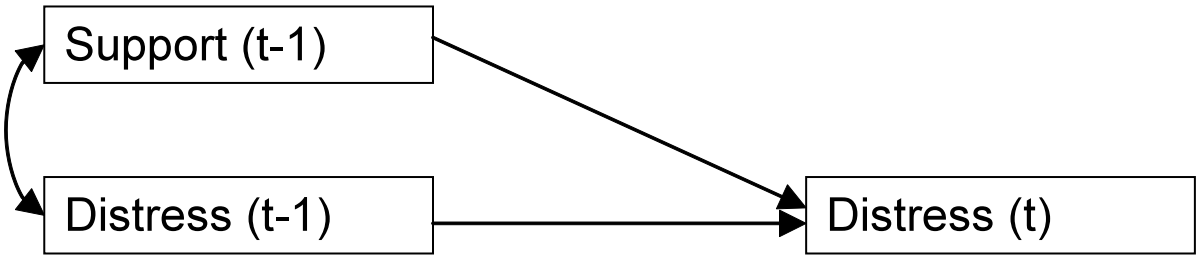
[1] Although one cannot be certain that participants were honest about their reported time of completion, there was no penalty assigned to participants who did not complete the diary on time. Under such conditions, Green, Rafaeli, Bolger, Shrout, & Reis (2006) found that self-reports of completion produced patterns of results similar to those produced with electronically verified completion information.

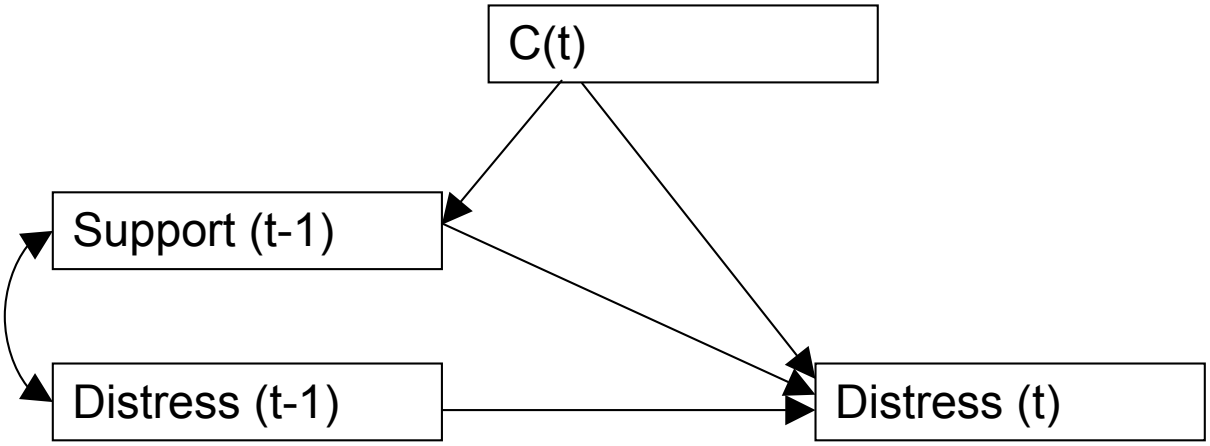
[2] Reliability estimates were based on variance components analysis of diary reports from day 2 through day 37, the last day of the examination. Details of analysis are available from authors.

Figure 1
Alternative Temporal Models for Effects of Support on Distress

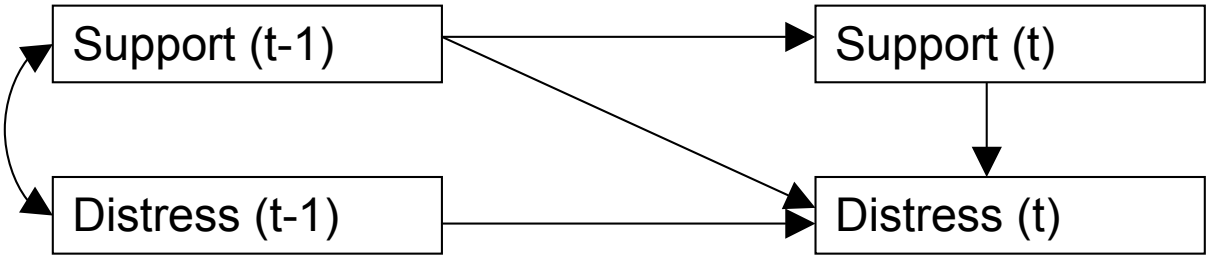
Panel A



Panel B



Panel C



Panel D