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Pain-Contingent Interruption and Resumption of Work Goals: A Within-Day Diary Analysis

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Abstract

Daily pain-related attributions for and negative affective reactions to the non-pursuit of work goals and individual differences in chronic pain severity and stress were used to predict work goal resumption in a sample of 131 adults with chronic pain. Variables were assessed via questionnaires and a 21-day diary. On days when participants reported non-pursuit of work goals in the afternoon, increases in pain-related attributions for goal interruption were positively associated with higher negative affective reactions which, in turn, were associated with an increased likelihood of same-day work goal resumption. Stress amplified the relation between pain-related attributions and negative affective reactions, and chronic pain severity was positively related to work goal resumption.

Keywords

Chronic Pain; Work Goals; Goal Resumption; Affect; Stress

Introduction

Chronic pain is frequently associated with reductions in work productivity and quality[6,32] presumably because pain-induced sensory hypervigilance reduces the cognitive resources available for work goal self-regulation.[9,31] The ability to self-regulate work-related goals becomes particularly salient when workflow is interrupted, necessitating task suspension or task switching and, when feasible, task resumption.[25]

A recent model of pain-contingent activity interruption (PCAI)[11] postulated that the debilitating short-term effects of PCAI may not prevent and may even facilitate later goal resumption. Schrooten, Karsdorp and Vlaeyen[28], for example, found in a laboratory

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experiment that PCAI facilitated completion of the original task as moderated by pain catastrophizing. But do such findings hold in the extra-laboratory world? There are reasons to believe that they would.

Klinger[23] suggested that unforeseen obstacles to goals (or "current concerns") trigger frustration and disappointment, but also increase their incentive value. Indeed, frustration and disappointment tend to engender a more vigorous pursuit of the goal (i.e., an invigoration effect) for some period of time. Likewise, the Gatzounis et al. PCAI model suggests that external cues or task reminders can increase the likelihood of task resumption.[11] Consequently, we hypothesized that, on afternoons when people report non-pursuit of work goals, and when they experience greater than usual frustration and disappointment related to work goal non-pursuit, they will be more likely to resume their work goal later in the day (see Figure 1).

Self-interruptions involve task cessation in the absence of external cues,[1] and persons with chronic pain are likely to occasionally attribute interruptions and work goal non-pursuit to their internal aversive experiences.[30] Because of the undesirability of pain-centered task interference, we reasoned that working adults with chronic pain might adopt a "loss mindset" on afternoons when their pain-related attributions for work-goal non-pursuit were higher than average. Framing incentives in terms of losses rather than gains has been shown to increase work task motivation[13] as well as motivation to self-manage pain.[17] Therefore, on those afternoons when people do not pursue their work goals, and when their pain-related attributions are higher than usual, they should experience greater frustration and disappointment (what we label, in combined form, *negative affective reactions*). Following from our hypotheses concerning frustration and disappointment and goal resumption, we further predicted that the pain-contingent interruption attributions would operate through negative affective reactions so as to exert a *positive* indirect effect[24] on evening work goal resumption.

We further contend that the within-person relationship between pain-related attributions for, and negative affective reactions to, work-goal non-pursuit may be moderated by individual differences in chronic pain severity and stress. When chronic pain severity increases, important activities of daily living tend to decrease.[22] Furthermore, stress is associated with over-reactivity to negative events, tension, irritability and intolerance of goal blockage.[3] Therefore, we hypothesized that the within-person relationship between pain-related attributions for, and negative emotional reactions to, work goal non-pursuit would increase as chronic pain severity and stress increase.

Finally, we expected stress and chronic pain severity to predict the likelihood of evening work goal resumption. On the one hand, stress increases informational demands which, in turn, may narrow a person's attentional focus.[35] Consequently, we predicted that stress would be negatively related to evening work goal resumption. On the other hand, pain intensity ratings averaged over 21 days have been shown to be positively related to work goal schemas which, in turn, tend to promote work goal pursuit.[20] Therefore, we predicted that chronic pain severity would be positively related to evening work goal resumption.

Methods

Participants

Participants were recruited by computer-based random-digit dialing of residents who lived in the Phoenix metropolitan area and who were located within 20 miles of the research facility. Recruiters used a script to screen residents. Eligibility requirements included: (a) being 25 to 70 years old, (b) experiencing physical pain almost every day for the past six months, (c) being able to read English at least a third grade level, (d) not being color blind, (e) working at a paid, day-time job, (f) not taking illegal substances in the past 12 months, and (g) being able to complete three diary calls every day for 21 days. In addition, scores on a chronic pain severity screen were used to determine eligibility for study inclusion.

Among the 318 adults who met all inclusion criteria, 155 declined to participate (48.7 percent). Sixteen of the 163 individuals who agreed to participate were telephoned by study researchers but did not appear for their laboratory appointment (9.8 percent). Fifteen of the 147 potential participants who showed up for their initial appointment were disqualified for various reasons including: not currently working, being unable to articulate a work goal, or being unwilling to complete diaries 3 times a day for 21 days (10.2 percent). Owing to data collection error, the data from one participant was dropped (yielding a final N of 131).

The majority of the study sample was female (61%). The mean age was 49.49 years old with a standard deviation of 11.99. Eighteen percent of the sample identified themselves as being of Hispanic origin. The breakdown of the participants' race was as follows: 80 percent Caucasian, 4 percent African American, 2 percent Native American, 2 percent Asian, 7 percent mixed, and 5 percent other. Slightly over half of the sample was married (53%). Twenty-three percent of the participants were single, 18 percent were divorced, 3 percent were widowed and another 3 percent were not married but living together. Only 7 percent of the participants had a high school diploma or less education. The majority of the participants were working full-time (74%). The status of participants' occupations was coded by the first and second authors. Occupations that involved administration, management, and independent judgment were deemed "high" status and other occupations were classified as "low" status. Examples of high status occupations included lawyer and scientific advisor and examples of low status occupations included gym attendant and belly dancer. Fifty-five percent of the occupations were classified as low status.

Procedure

All procedures employed in this study were approved by the Institutional Review Board at Arizona State University. Participants provided written informed consent. Participants were paid $45 for participating in a 150-minute lab visit; and subsequently could earn up to $155 if almost all diaries were completed. During the lab visit, participants were given a structured interview pertaining to work-related and lifestyle goals, completed a packet of questionnaires, completed a battery of cognitive tasks, and received a hands-on demonstration and practice session regarding the special features of the interactive voice response (IVR) system for the collection of diary data. During the practice session, participants took part in an automated interview answering the questions via the telephone

number pad. Staff members also gave the participant the diary interview scripts containing the questions for each time of day.

At the end of the lab visit, research staff gave participants a take-home packet of information with detailed instructions for completing diary calls, a copy of the diary interview script, a wallet card with essential information needed to place diary calls (phone number and log-in procedures) and a reminder of their most important work goal.

Goal Elicitation

Participants listed important work and lifestyle goals fitting the criteria of being: (a) highly valued, (b) realistically obtainable, (c) concrete and measurable, and (d) expected to be pursued almost every day for the next 21 days. Because the current study focused on analyses of data on negative affective reactions to the non-pursuit of the most important work goal in the afternoon and whether this goal was resumed in the evening, data pertaining to the most important lifestyle goal were excluded. Work goals were defined as "a personally valued outcome toward which effort is consistently directed while you are on the job." From the list of work goals, participants were asked to identify the most important work goal. Participants rated this goal on each day of the diary. Participants' work goals were coded by the first and second authors as either interpersonally-oriented (e.g., improve daily relationships with co-workers) or as task-oriented (e.g., create 4 new training modules for team members). Seventy-three percent of the work goals were classified as task-oriented.

Questionnaires

Chronic pain severity—The Chronic Pain Severity Scale consisted of four questions tapping the frequency, average level, and the greatest amount of pain, and the frequency of severe pain.[27] Scores were calculated by averaging the responses to the four items with a potential range from 1 to 7.5. The Chronic Pain Severity Scale was administered during the telephone recruitment and again during the lab visit (r = .68). At the first and second administrations, the mean Chronic Pain Severity score was 5.58. (SD = 1.07) and 5.50 (SD = 0.97), respectively. Mean scores on the Chronic Pain Severity scale did not change over time, t (131) = 1.19, p = .24. Scores from the lab visit were used in the multi-level regression models. The coefficient alpha for the Chronic Pain Severity scale administered during the lab visit was .69.

Stress—Participants were administered the 7-item Stress subscale of the Depression Anxiety Stress Scales[3] which measures experiences over the past week related to persistent arousal and tension with a low threshold for becoming upset. The response options ranged from 0 (*Did not apply to me*) to 3 (*Applied to me very much or most of the time*). Stress scores were calculated by taking the average of the responses to the seven items. The mean score on the Stress scale was 0.98 (SD = 0.58). The internal consistency reliability estimate of the Stress scale was .84.

Interactive Voice Response (IVR) Technology

The present study was conducted using IVR technology hosted by the University of Connecticut Health Center. The IVR technology system combined telephone service with

computer-administered questionnaires. The system was interfaced with local area network stations for data input, storage, and backup. Participants called a toll-free number and provided their participant identification number. Then, participants answered pre-recorded questions by pressing numbers on the keypad of their touch-tone telephones.

Participants were told that they would be called via the IVR system three times a day for 21 consecutive days, placing a total of 63 diary calls of about 5 minutes each. If they were unavailable at the time of the call, participants were able to complete the diary by calling back during fixed time windows. During face-to-face training, research staff explained the required time windows for placing the morning (6:00 –10:00 AM), afternoon (noon–4:00PM), and evening (7:00 – 11:00 PM) calls. Because the call-back time windows were broad, the exact time between the morning, the afternoon, and the evening diary entries varied among participants. Also, when responding to diary questions in the afternoon, respondents were asked to use the comparative reference “today”, whereas when responding to the evening call, respondents were asked to use the comparative reference “since the last diary.” For example, on a given day, a participant might have answered questions on the afternoon phone call for the period from 8AM to 1PM and on an evening phone call for the period from 1PM to 8PM.

Research staff monitored IVR system activity and identified participants who missed several calls in a row, so that friendly reminder calls could be made when needed. After the first 14 days of the 21-day diary period were completed, a “Thank You” note was mailed acknowledging the participant’s effort in complying with the diary procedure.

Diary data were collected from May 2010 through April 2011. For data from each day to be included in our analyses, participants had to respond to both the afternoon and evening calls and indicate in the afternoon call that they had not pursued their work goal. Across, all 131 participants and 21 days, (a) 45 percent of the days were excluded because participants reported pursuing their work goal in the afternoon, (b) 17 percent of the days were lost due to missing data, and (c) 38 percent of the days were included in the analysis.

Diary Measures

Pain intensity—To assess afternoon pain intensity, participants were asked the following question: “If a zero means no pain, and nine means pain as bad as it could be, on a scale from 0–9, what is your level of pain right now?”[18]

Positive affect—Afternoon positive affect was assessed with the adjectives alert and enthusiastic taken from the PANAS[34] as well as happy and relaxed. Participants were asked to rate the intensity of each positive affect over the past 30 minutes using a scale ranging from 0 (*not at all*) to 9 (*extremely*). An afternoon positive affect score was formed by averaging ratings of the four items.

Negative affect—Afternoon negative affect was assessed with the adjectives nervous and upset from the PANAS[34] as well as angry and fearful because of their relevance to people with chronic pain. Participants were asked to rate the intensity of each negative affect over

the past 30 minutes using a scale ranging from 0 (*not at all*) to 9 (*extremely*). An afternoon negative affect score was formed by averaging ratings of the four items.

The internal consistency reliability of positive and negative affect was assessed each day and then the mean of these reliability estimates was computed over days. The values of the coefficient alphas assessed in this manner were 0.85 for the positive affect scale and 0.88 for the negative affect scale.

Afternoon pain-related attributions for work goal non-pursuit—To assess afternoon pain-related attributions for work goal non-pursuit (hereafter referred to as pain-related attributions), participants were asked to rate how much their pain prevented them from pursuing their work goal today, using a scale ranging from 0 (*not at all*) to 9 (*quite a lot*).

Afternoon negative affective reactions to work goal non-pursuit—When participants reported that they did not pursue their work goal in the afternoon, they were asked: (1) How disappointed are you that you have not pursued your work goal today? (2) How frustrated are you that you have not pursued your work goal today? Both items were rated on scales ranging from 0 (*not at all*) to 9 (*extremely*). Afternoon reports of frustration and disappointment at work goal non-pursuit (hereafter referred to as negative affective reactions) were averaged. To estimate internal consistency reliability, we first calculated the correlation between the ratings of disappointment and frustration each day and then computed the mean of this correlation over days. The value of the correlation assessed in this manner was .79.

Within-day work goal resumption—In the evening, participants were asked: Have you pursued your work goal since the last time we talked with you? Participants pressed 0 on their phone if they had not pursued their work goal and pressed 1 if they had pursued their work goal (hereafter referred to as work goal resumption).

Overview of Multi-Level Modeling

Multi-level modeling (MLM) is used to handle nested (clustered) data. Observations in nested data are not independent and MLM handles this issue by differentiating the within-level and between-level random effects (residuals). The variance of the between-level random effect accounts for the dependency in the data. As participants of the present study completed diary data over 21 days, the data is nested and requires MLM. Two different levels of effect exist in the present nested data. Level-1 effects represent within-person associations across days. For example, in the present study, we examined whether, when pain-related attributions for work goal non-pursuit in the afternoon were higher than usual, did participants reported greater negative affective reactions to work goal non-pursuit in the afternoon? Level-2 effects refer to between-person associations in which individual differences in variables assessed on the pre-dairy questionnaire were used to predict variables assessed in the diary. For example, in the present study, we examined whether participants who reported higher stress scores relative to the mean of all participants were less likely than participants who had lower stress scores to resume their most important

work goal in the evening when they did not pursue it in the afternoon. Cross-level (level-1 by level-2) interaction effects are also available in the MLM framework. Effects of cross-level interactions examine how within-person (level-1) relationships between predictor and outcome variables can be moderated by between-person differences (level-2). For example, in the present study, we examined whether the within-person association between pain-related attributions for work goal non-pursuit in the afternoon and negative affective reactions to work goal non-pursuit in the afternoon increased as individual differences in stress increased.

Centering

First, the within-person predictors were centered at the person means.[10] Each individual's average rating for a variable was subtracted from the daily rating for that variable. Person-mean centering is based on the assumption that daily ratings involve a state-like variation which would depend on the overall mean of the daily ratings for a variable. Second, grand-mean centering was used for the between-person predictors based on the assumption that the rating of a variable involves trait-like variation, and a score does not depend on other scores of the same cluster. For the grand-mean centering, each individual's rating was subtracted from the mean of all the individuals. By centering the within- and between-person predictors in the manner described, the relationship across levels becomes orthogonal. That is, the person-mean-centered within-person predictors are no longer correlated with grand-mean centered between-person predictors.

Multilevel Models in the Current Study

A random intercept multilevel model was estimated for pain-related attributions relating to negative affective reactions (NAR) as the outcome (which represents the *a* path [PAINRELATT → NAR] of a simple mediation model) by including level-1 and level-2 predictors, and two cross-level interaction terms. The variables included in this model were afternoon pain intensity ratings (PAININT), afternoon positive affect (PA), afternoon negative affect (NA), pain-related attributions (PAINRELATT), chronic pain severity scores (PAINSEV), and stress scores (STRESS). The equation for this model is as follows:

$$\begin{aligned} NAR_{ij} = {} & \beta_0 + \beta_1(PAININT_{ij}) + \beta_2(PA_{ij}) + \beta_3(NA_{ij}) + \beta_4(PAINRELATT_{ij}) \\ & + \beta_5(PAINSEV_j) \\ & + \beta_6(STRESS_j) + \beta_7(PAINRELATT_{ij})(PAINSEV_j) \\ & + \beta_8(PAINRELATT_{ij})(STRESS_j) + b_{0_j} + e_{ij} \end{aligned} \quad (1)$$

In this model, NAR_{ij} is the outcome score at day *i* for person *j*, the intercept (β_0) quantifies the expected value (conditional mean) of negative affective reactions for days where persons are at their average of the level-1 variables and at the grand mean of the level-2 variable. β_1 is the regression coefficient for within-person afternoon pain intensity controlling for all other predictors. β_2 is the regression coefficient for within-person afternoon positive affect controlling for all other predictors. β_3 is the regression coefficient for within-person afternoon negative affect after controlling for all other predictors. β_4 is the regression coefficient for within-person pain-related attributions controlling for all other predictors. β_5 is the regression coefficient for between-person pain severity controlling for all other

predictors. β_6 is the regression coefficient for between-person stress controlling for all other predictors. β_7 is the cross-level interaction between within-person pain-related attributions and between-person chronic pain severity. β_8 is the cross-level interaction between within-person pain-related attributions and between-person stress. b_{0_j} is a random intercept that captures between-person variation in the outcome means, and e_{ij} is the level-1 residual. We also investigated whether the influence of the level-1 predictors varied across persons. To do so, we estimated the model in Equation 1 four times, each time adding a random slope for one of the predictors. Likelihood ratio tests from restricted maximum likelihood estimation revealed that none of the within-person measures required a random slope.

Next, turning to work goal resumption (WGR) as the binary outcome which represents the *b* (NAR → WGR) and *c′*(direct effect; PAINRELATT → WGR controlling for the effect of the mediator, NAR) paths in a mediation model, we fit a multilevel logistic model that includes level-1 and level-2 predictors. The model is given in Equation 2.

$$\begin{aligned}\text{logit}(\pi_{ij}) = \beta_0 + \beta_1(NAR_{ij}) + \beta_2(PAININT_{ij}) + \beta_3(PA_{ij}) + \beta_4(NA_{ij}) \\ + \beta_5(PAINRELATT_{ij}) + \beta_6(PAINSEV_j) + \beta_7(STRESS_j) + b_{0_j}\end{aligned} \quad (2)$$

In this model, π_{ij} is the probability that person *j* pursued a goal at day *i*. β_0 is the conditional mean of work goal resumption for days where persons are at their average of the level-1 variables and at the grand mean of the level-2 variable. Coefficients in this model reflect the influence of the predictors on the logit (i.e., log odds) metric. Note that the logistic models do not have a level-1 residual (e_{ij}) because this term is fixed for identification purposes. β_1 is the regression coefficient for within-person negative affective reactions controlling for all other predictors. β_2 is the regression coefficient for within-person afternoon pain intensity controlling for all other predictors. β_3 is the regression coefficient for within-person afternoon positive affect controlling for all other predictors. β_4 is the regression coefficient for within-person afternoon negative affect controlling for all other predictors. β_5 is the regression coefficient for within-person pain-related attributions controlling for all other predictors. β_6 is the coefficient for between-person chronic pain severity controlling for all other predictors. β_7 is the coefficient for the between-person stress predictor controlling for all other predictors. b_{0_j} is a random intercept that captures between-person variation in the outcome means. Likelihood ratio tests from restricted maximum likelihood estimation revealed that none of the within-person measures required a random slope.

Results

Data Analysis

Multilevel Modeling (Hierarchical Linear Modeling) was used to examine the hypothesized model. The analyses were conducted by IBM SPSS Statistics 22[16] using its MIXED (i.e., analyzing models with continuous outcome variables) and GENLINMIXED (i.e., analyzing mixed models with dichotomous or categorical outcomes) commands. Our analyses were based on days when participants reported non-pursuit of work goals in the afternoon.

Preliminary Analysis

Table 1 presents the means and standard deviations for each of the day-level (Level-1) variables throughout the 21-day period and for each of the person-level variables (Level-2). Work goal resumption occurred on approximately 50% of the days when participants indicated in their afternoon reports that they did not pursue their work goals. The intraclass correlation coefficients (ICCs) indicate the proportion of the total variance in each level 1 variable that is due to between-person differences. The ICCs ranged from .20 (i.e., 20% of the variance in work goal resumption is between-person) to .57 (57% of the variance in afternoon pain-related attributions is between-person). The upper-diagonal of Table 1 shows Pearson's correlations among day-level variables that are all person-mean centered. The lower-diagonal of the table shows correlations between person-level variables and day-level variables that are averaged across the 21-days. Among the level 1 variables, afternoon pain-related attributions exhibited a modest but significant correlation with afternoon negative affective reactions (r = .24) and afternoon negative affective reactions were also modestly but significantly correlated with work goal resumption (r = .11).

Negative Affective Reactions

Table 2 gives the parameter estimates, standard errors and t tests from the negative affective reactions model (i.e., alpha path of a mediation model). Compared to the unconditional model which does not include any predictors, the level-1 predictors reduced the within-person variance from 3.10 to 2.74 (approximately a 12% reduction). Among the covariates, there was a significant ($p < .001$) positive coefficient for afternoon negative affect and a significant negative coefficient for afternoon positive affect ($p < .01$). These findings indicate that when a participant experienced greater than usual afternoon negative affect and less than usual afternoon positive affect, he or she reported greater afternoon negative affective reactions (frustration and disappointment). As predicted, on afternoons when participants made greater than usual pain-related attributions about goal interruption, they reported significantly ($p < .001$) greater negative affective reactions over and above afternoon pain intensity, positive affect, and negative affect.

The level-2 predictors reduced the between-person variance from 2.51 to 2.13 (an approximately 15% reduction). As chronic pain severity scores increased ($p < .05$) and as stress scores increased ($p < .01$), participants reported higher daily negative affective reactions. In addition, stress moderated the within-person association between pain-related attributions and negative affective reactions. To facilitate the interpretation of the moderation effect, a simple slope analysis[2] was conducted (see Figure 2). There, it can be seen that as stress increased, pain-related attributions were more strongly associated with the negative affective reactions of frustration and disappointment.

Work Goal Resumption

Table 3 gives the multilevel logistic parameter estimates for work goal resumption. As hypothesized, when controlling for afternoon covariates and afternoon pain-related attributions, afternoon negative affective reactions were a significant ($p < .01$) positive within-person predictor. This means that, when a person's negative affective reactions were higher than usual, he or she was more likely to resume his or her work goal. As for level-2

coefficients, when chronic pain severity scores increased ($p < .05$), participants were more likely to resume their work goal.

Mediation Analyses

In order to calculate mediated effects with a dichotomous outcome variable, we used an Excel macro.[15] The alpha and beta coefficients and standard errors shown in Table 4 are raw values. Using these statistics as input, the macro calculates adjusted coefficients and standard errors for the alpha and beta path, respectively. Thus, the Sobel test statistics presented in Table 4 are based on the adjusted coefficients and the standard errors provided by the macro.

Since between-person stress was a statistically significant moderator of the relationship between pain-related attributions and negative affective reactions, we tested conditional indirect effects in order to determine whether the mediated effects differ across levels of stress. The results indicated that the conditional indirect effect of pain-related attributions on work goal resumption, operating through negative affective reactions, was 0.092 at one standard deviation above the stress mean ($p < .01$), 0.070 at the stress mean ($p < .01$), and 0.042 at one standard deviation below the stress mean ($p < .05$).

Post hoc Analyses

We did not offer any hypotheses regarding moderators of the beta path from negative affective reactions to work goal non-pursuit in the afternoon to work goal resumption in the evening. However, as noted by one of the reviewers of a prior version of this article, this path may be moderated by the extent to which employees have control over resumption of their work goals. Although we did not directly measure perceived control over work goal pursuit, we tested for moderation using four proxy variables: occupational status (low [coded 0] versus high [coded 1]), employment status (part-time [coded 0] versus full-time [coded 1]), work goal (interpersonally-oriented [coded 0] versus task-oriented [coded 1]), and sex (female [coded 0] versus male [coded 1]). The cross-level interaction between each of these variables and negative affective reactions to work goal non-pursuit in the afternoon on evening work goal resumption was tested separately by adding one main effect and one interaction term to the model summarized in Table 3.

None of the four interaction terms attained statistical significance: negative affective reactions to work goal non-pursuit in the afternoon by (a) occupational status ($\boldsymbol{b} = -.028$, $\boldsymbol{SE} = .115$, $p = .806$), (b) employment status ($\boldsymbol{b} = .195$, $\boldsymbol{SE} = .106$, $p = .066$), (c) work goal ($\boldsymbol{b} = .059$, $\boldsymbol{SE} = .144$, $p = .685$), and (d) sex ($\boldsymbol{b} = .024$, $\boldsymbol{SE} = .129$, $p = .856$). However, two significant main effects were observed. Participants with task oriented work goals were more likely than participants with interpersonally oriented work goals to resume their work goals in the evening ($\boldsymbol{b} = 1.015$, $\boldsymbol{SE} = .349$, $p < .01$) and participants working full-time were less likely than participants working part-time to resume their work goals in the evening ($\boldsymbol{b} = -.862$, $\boldsymbol{SE} = .317$, $p < .01$).

Discussion

In recent years, investigators working in the human factors tradition have sought to develop methods for examining the properties of work-related interruptions in an effort to better manage workflow threats. The psychology of interruption and interruption management has introduced useful ideas about how the nature of the interrupted task, time pressure and cognitive demands, and memory decay for focal goals can impact task/goal resumption.[4,7,14,17,25] However, the effects of persistent pain on goal cognition and post-interruption work resumption have yet to be integrated into the extant models. The present study is the first one to examine, in a community sample of adults screened for chronic pain, how pain-related attributions for and negative affective reactions to goal interruption at the within-person level, and how stress and chronic pain severity at the between-person level, contribute to same-day resumption of one's most important work goal.

The Within-Person Relation between Negative Affective Reactions and Work Goal Resumption

On afternoons when individuals experienced higher than usual disappointment and frustration with work goal non-pursuit, the likelihood of work goal resumption increased. This finding is consistent with Klinger's model[23] and Gatzounis et al.'s PCAI formulation.[11] Moreover, from a control-process perspective,[8] negative affect may signal that increased effort should be allocated to goal pursuit in order to return the rate of goal progress to the desired level.

The Within-Person Mediated Effect

Our results suggest that pain-related attributions for work goal non-pursuit exert an indirect effect on work goal resumption through negative affective reactions to work goal non-pursuit. On afternoons when participants attributed work goal non-pursuit to the interruptive effects of pain, they reported greater frustration and disappointment. Perhaps, pain-contingent attributions trigger loss-based mindsets in adults with chronic pain because such attributions are associated with memories of other situations in which pain precluded pursuing daily goals. After accessing memories reflective of motivational disengagement, frustration and disappointment over work goal non-pursuit may well become heightened and, in turn, increase the likelihood of work goal resumption. This interpretation is consistent with the finding that loss-based mindsets may enhance motivation among people with chronic pain.[17]

Conditional Mediated Effect

In the present study, stress amplified the conditional indirect effect of pain-related attributions on work goal resumption operating through negative affective reactions. Because stress is associated with hyper-reactivity,[3] elevated pain-related attributions for work goal non-pursuit may evoke stronger negative affective reactions among participants high in stress. By contrast, the relationship between pain-centered attributions regarding work goal non-pursuit and negative affective reactions to goal non-pursuit did not vary with level of chronic pain severity. Future research should therefore consider other characteristics

of individuals with chronic pain that may condition this within-person relationship, such as the perceived controllability of pain.[30]

Main Effects of Chronic Pain Severity and Stress Symptoms

In the present study, chronic pain severity and stress were positive predictors of negative affective reactions. Because chronic pain can interfere with the performance of daily activities,[12,21] participants with higher levels of chronic pain severity may experience greater disappointment and frustration on a daily basis when they are unable to pursue their important goals. Individual differences in stress symptoms, in part, reflect the extent to which individuals are intolerant of barriers to goal pursuit.[3] Therefore as stress symptoms increase, daily disappointment and frustration regarding work goal non-pursuit increases.

Whereas chronic pain severity was a significant predictor of the likelihood of work goal resumption, stress symptoms were not. In the present study, our sample consisted of adults, who, despite their chronic pain, were nonetheless able to work. Among such individuals, a dynamic may be occurring whereby pain attains positive motivational properties. As the level of chronic pain increases, following a period of work goal non-pursuit, individuals may be more likely to "counter-regulate"[26] by invoking more positive work goal schemas.[20]

Work-Related Variables and Sex as Moderators of the Beta Path

In several exploratory analyses, we found that the relation between negative affective reactions to work goal non-pursuit in the afternoon and evening work goal pursuit did not vary with occupational status, work goal, employment status, and sex. Instead, we found that resumption of the most important work goal in the evening was higher among participants who reported task-oriented as opposed to interpersonally-oriented work goals and participants who were employed part-time rather than full-time. In comparison to participants with task-oriented work goals, participants with interpersonally-oriented work goals may have had less control over resuming their work goals on the same day because pursuit of these goals typically involves interacting with other employees or customers. Why were part-time employees more likely than full-time employees to resume their work goal on the same day? One possibility is because they are less likely than full-time employees to be working on consecutive days, part-time employees may feel a greater obligation to resume their work goal on the same day. In contrast, relative to part-time employees, full-time employees may perceive that they have the latitude to wait until the next work day to resume their work goal activity.

Limitations

Some important limitations serve to constrain the manner in which the current findings should be interpreted. We were not able to pinpoint the exact interval between afternoon and evening reports of work goal pursuit. Our study relied solely on self-report data and therefore lacked objective verification of whether participants pursued their work goals as reported. The alpha path in our mediational model was assessed using variables measured concurrently; and hence causal relationships cannot be inferred. In the present study, our analyses were based on 1,040 days, that is, 69 percent of the days when participants did not pursue their work goal in the afternoon. It is an empirical question as to whether the

parameter estimates for our effects were biased in some way by the days lost to missing data. Another limitation is the admittedly small within-person effect obtained for the alpha path (at the mean level of stress) and the modest within-person effect beta path in our mediational model (see Table 4). More specifically, a 1-point increase in a person's pain-related attribution for work goal non-pursuit in the afternoon if he or she had average stress symptoms was associated with an increase of only.26 of a point in the individual's negative affective reactions to work goal non-pursuit that afternoon. In addition, a 1-point increase in a person's negative affective reactions to work goal non-pursuit in the afternoon increased the likelihood of work goal resumption in that evening by 18 percent. Nonetheless, we contend that small to modest day-to-day effects can accumulate and compound over time. Thus, over months and years, small increases in pain-related attributions and negative affective reactions to work goal non- pursuit can come to meaningfully influence the within-day resumption of work goals and the productivity of employees with chronic pain. Finally, because we did not recruit our sample from clinical settings, our findings may not generalize to typical treatment-seeking persons with chronic pain.

Research Directions and Applied Implications

The adverse effects of chronic pain on work productivity have been well documented.[6,32] Building on previous work on the benefits of pain,[5] our findings provide a warrant for further exploration of the facilitative aspects of pain in the work domain. Additional research should seek also to compare the effects of pain-related attributions with other types of attributions for work goal non-pursuit and examine potential mediators of the association between chronic pain severity and work goal resumption. Furthermore, objective and subjective aspects of the work environment such as actual and perceived control over daily job-related activities should be incorporated into future studies of work goal resumption among employees with chronic pain.[29]

Because chronic pain is a person-centered recurring experience, and is somewhat more predictable than task interruptions emanating from the actions of fellow workers, equipment failures, instant messaging, or unexpected workload changes, it should be possible to design programs to assist workers to anticipate pain-contingent task interruptions and develop plans for timely work resumption. As pain is typically an internally-generated interruptive signal that is not readily ignored, individuals experiencing interruptions may benefit from explicit training that emphasizes the role of pain acceptance. Pain acceptance has been shown to significantly attenuate the capacity of pain intensity to disrupt work goal pursuit (Mun, 2010–2011). Therefore, an intervention such as Acceptance and Commitment Therapy (ACT) that has demonstrated its ability to enhance psychological flexibility in persons with chronic pain[33] might prove useful as a method of interruption management in vocational contexts.

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Perspective

Under certain circumstances, chronic pain and pain-related attributions can have positive motivational effects on work goal resumption. The findings of the present study may contribute to the development of interruption management techniques in vocational settings that leverage the roles of pain-related attributions, goal cognition, and emotionality.

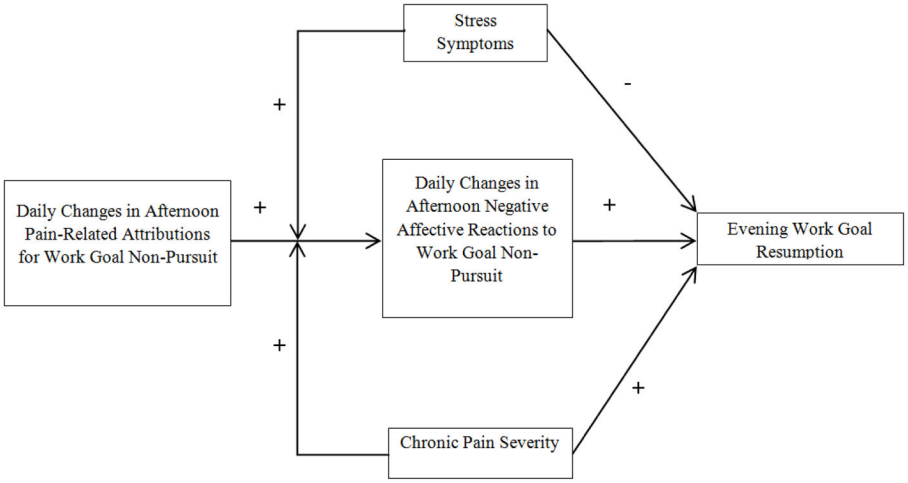

Figure 1.

Model depicting hypothesized relationships among chronic pain severity, stress symptoms, daily changes in afternoon pain-related attributions, afternoon negative affective reactions, and evening work goal resumption. (Covariates not shown for ease of presentation.)

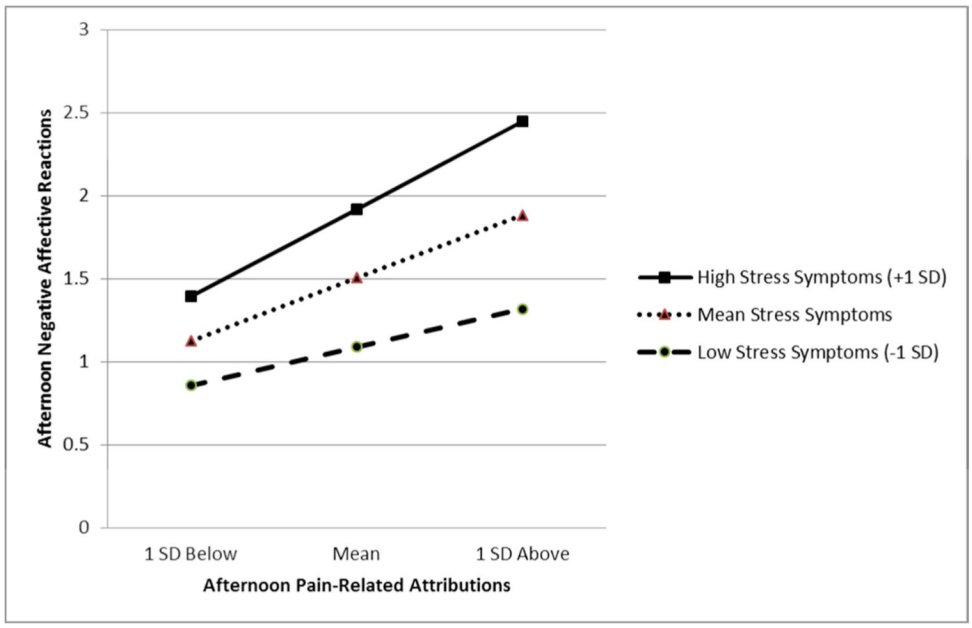

Figure 2.
Interaction effect of afternoon pain-related attributions and stress on afternoon negative affective reactions.

Table 1

Descriptive Statistics, ICC for Within-Person Variables, and Correlations

Variable	M	SD	ICC	1	2	3	4	5	6	7
Level - 1 Variables										
1. Afternoon Pain-Related Attributions for Work Goal Non-Pursuit	1.16	2.26	0.57	—	.04	−.19**	.22**	.24**	.01	—
2. Afternoon Negative Affect	1.37	1.75	0.44	.21*	—	−.41**	.17**	.13**	−.01	—
3. Afternoon Positive Affect	5.45	1.84	0.55	−.27**	−.33**	—	−.20**	−.14**	.00	—
4. Afternoon Pain Intensity	3.66	2.23	0.54	.52**	.20*	−.18*	—	.03	−.01	—
5. Afternoon Negative Affective Reaction to Work Goal Non-Pursuit	1.39	2.32	0.45	.67**	.35**	−.20*	.39**	—	.11**	—
6. Evening Work Goal Resumption	0.50	0.50	0.20	.21*	.05	.20*	.11	.14	—	—
Level – 2 Variables										
7. Chronic Pain Severity	5.50	0.97	—	.40**	.02	−.17*	.55**	.26**	.25**	
8. Stress	0.98	0.59	—	.23*	.57**	−.37**	.33**	.30**	−.04	.19**

Note. Upper-diagonal shows correlations among day-level (level-1) variables that are person-mean centered. Lower-diagonal shows correlations between person-level variables and day-level variables that are averaged across the 21-days.

* $p < .05$,

** $p < .01$

Table 2

Chronic Pain Severity, Stress Symptoms, Changes in Afternoon Pain-Related Attributions for Work Goal Non-Pursuit, and Their Interaction in the Prediction of Afternoon Negative Affective Reactions to Work Goal Non-Pursuit

Parameter	Est.	SE	*t*	*P*
Intercept	1.495	0.142	10.488	< .001
Intercept slope	2.128	0.326		
Residual variance	2.736	0.124		
Level-1				
Afternoon Pain Intensity	−0.034	0.036	−0.949	0.343
Afternoon Negative Affect	0.151	0.044	3.459	< .01
Afternoon Positive Affect	−0.120	0.044	−2.716	< .01
Afternoon Pain-Related Attributions for Work Goal Non-Pursuit	0.257	0.037	6.798	< .001
Level-2				
Chronic Pain Severity	0.327	0.150	2.181	< .05
Stress Symptoms	0.733	0.254	2.884	< .01
Cross-Level Interactions				
Afternoon Pain-Related Attributions for Work Goal Non-Pursuit x Chronic Pain Severity	0.004	0.047	0.091	0.928
Afternoon Pain-Related Attributions for Work Goal Non-Pursuit x Stress Symptoms	0.180	0.064	2.790	< .01

Note. Wald tests are invalid for variance estimates and are omitted from the table.

Table 3

Chronic Pain Severity, Stress Symptoms, Changes in Afternoon Pain-Related Attributions for Work Goal Non-Pursuit and Afternoon Negative Reactions to Work Goal Non-Pursuit in the Prediction of Evening Work Goal Resumption

Parameter	**EST.**	***SE***	***t***	***P***
Intercept	−1.355	0.144	−9.398	< .001
Level-1				
Afternoon Negative Affective Reactions to Work Goal Non-Pursuit	0.180	0.062	2.877	< .01
Afternoon Pain-Related Attributions for Work Goal Non-Pursuit	−0.018	0.055	−0.321	0.748
Afternoon Pain Intensity	−0.055	0.055	−0.997	0.319
Afternoon Negative Affect	−0.018	0.060	−0.305	0.761
Afternoon Positive Affect	−0.009	0.094	−0.093	0.926
Level-2				
Chronic Pain Severity	0.385	0.154	2.497	< .05
Stress Symptoms	−0.426	0.275	−1.546	0.124
Intercept Variance	1.492	0.346		

Note. Wald tests are invalid for variance estimates and are omitted from the table.

Table 4

Indirect Effect of Afternoon Pain-Related Attributions for Work Goal Non-Pursuit on Evening Work Goal Resumption via Afternoon Negative Affective Reactions to Work Goal Non-Pursuit at Three Different Values of Stress Symptoms

Stress Symptoms	Alpha Path Coefficient	Alpha Path S.E.	Beta Path Coefficient	Beta Path S.E.	Sobel Test Statistic	Sobel Test S.E.	Indirect Effect	*p*-value
+1 SD	0.363	0.057			2.642	0.035	0.092	< .01
Mean	0.257	0.037	0.180	0.062	2.679	0.026	0.070	< .01
−1 SD	0.151	0.050			2.093	0.020	0.042	< .05

Note. The alpha and beta coefficients and standard errors are raw values.