The Effects of Pain Intensity on Goal Schemas and Goal Pursuit: A Daily Diary Study

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Abstract

Objective: Although the adverse effects of chronic pain on work productivity and daily life pursuits are clear, the within-person dynamics of pain, goal cognition, and engagement in work-related and lifestyle goals remain uncharted. This study investigated the impact of pain intensity (assessed on three occasions each day) and goal-related schematic thinking (ratings of importance, planning, and goal pursuit opportunities, assessed only in the morning) on afternoon and evening work and lifestyle goal pursuit.

Methods: A community sample of working adults with chronic pain (N =131) were screened and interviewed about their work and lifestyle goals and completed a 21-day telephonic diary. Hierarchical linear modeling was used to estimate within-person and between-person effects.

Results: At the within-person level, morning pain intensity was inversely related to schematic cognition concerning work and lifestyle goals, whereas, at the between-person level, morning pain intensity varied positively with schematic thinking about work goals as well with afternoon life-style goal pursuit. At both the between- and within- analytic levels, morning goal schemas were positively associated with the pursuit of each type of goal in the afternoon and again in the evening. Moreover, positive carry-over effects of morning goal schemas on next day afternoon goal pursuit were observed.

Conclusions: Whereas morning pain intensity exhibited inconsistent effects across analytic levels, morning goal-related schematic thinking consistently predicted goal pursuit across analytic levels, type of goal, and time of day. These findings have implications for treatment and prevention of pain's potentially deleterious effects on workplace and lifestyle goals.

Keywords: goal schemas, chronic pain, multi-level modeling, work goals, lifestyle goals

The psychology of goal-directed action and its vicissitudes has recently come to occupy a central place in our understanding of human adaption and its failures (Austin & Vancouver, 1996; Bandura, 1986; Emmons, 1999; Karoly, 1999; Little, Samela-Aro & Phillips, 2007). From the perspective of both basic and applied research, attention has increasingly focused upon the top-down and bottom-up cognitive control operations that normally modulate ongoing behavior, decision-making, and future-directed thought, but with particular emphasis on the potentially debilitating influence of uncontrollable stress, challenge, novelty, and situational transition on the systemic unfolding of self-regulatory processes (Kross & Mischel, 2010).

Clinical experience and an array of research findings suggest that chronic pain is among the most powerful and insidious disruptors of self-regulated action and day-to-day emotional well-being (DeWitte, Van Lankveld & Crombez, 2011; Karoly & Ruehlman, 2007); and empirical efforts to identify the mechanisms by which persistent pain consumes cognitive resources and undermines the process of goal pursuit have shown a healthy growth rate (Affeck, Tennen, Urrows, Higgins, Abeles, Hall, et al., 1998; Crombez, Eccleston, Van Damme, Vlaeyen & Karoly, 2012; Karoly & Ruehlman, 1996).

With the advent of ecologically sensitive modes of data collection, such as those involving daily electronic diaries, and the emergence of hierarchical linear modeling, the analysis of human goal trajectories along with their psychosocial antecedents and consequences can be explored in greater depth than previously possible with cross-sectional procedures (cf., Bolger, Davis & Rafaeli, 2003; Conner, Tennen, Fleeson & Barrett, 2009; Curran & Bauer 2011). Thus, the present research focused on the within-day dynamics of pain as it relates to a small set of key motivational dimensions: goal type (work and lifestyle), schematic goal cognition, and daily goal pursuit.

Work-Related and Lifestyle Goals

Although persistent pain has been reported to be a major source of functional interference across an array of everyday activities (Karoly & Ruehlman, 2007; Naliboff, Cohen, Swanson, Bonebakker & McArthur, 1985), interest has increasingly focused upon its negative impact in occupational contexts (Byrne & Hochwarter, 2006). It is now widely believed that pain disorders such as headache, low back pain, and musculoskeletal injuries contribute significantly to work disabilities (Robinson, 2011) and to their considerable psychological and economic aftereffects.

Less often studied are pain's deleterious effects on worker's attitudes toward their jobs or their work-related aspirations or goals. However, in a study that sought to link pain and goals, Karoly and Ruehlman (1996) found that, among a sample of managers, those with persistent or episodic pain reported lower levels of goal-related self-efficacy and positive arousal, higher levels of goal-related self-criticism and negative arousal, and greater levels of conflict between work and non-work goals. Interestingly, pain had no apparent effect upon the number of work-related goals reported, nor on the frequency of work goal pursuit. These results, suggesting that pain's influence on work goal construal may be distinct from its effect on vocational performance, support the current investigation wherein the between-person and within-person sources of variation in pain experience and goal pursuit will be systematically parsed.

The pursuit of idiosyncratic and normative personal goals concerning recreation, self-improvement, physical health improvement, social relationships, spirituality, and the like (what we are here calling lifestyle goals), is likewise potentially undermined by persistent pain. Affleck, Tennen, Urrows, Higgins, Abeles, Hall et al. (1998), for example, reported that when pain and fatigue increased over the day, progress on health and social goals tended to decline.

Schematic Goal Cognition

The present study focused specifically upon future event scripting in the form of three questions put to our participants each day in the early morning. The three questions addressed goal planning, goal importance, and the perceived opportunity to pursue goals (the last of which is also called goal attainability; cf., Pomaki, Karoly & Maes, 2009). Each of these can be construed as a dimension of forethought (Bandura, 1986) or what control theorists term feed-forward activation ---widely considered a key functional component of human self-regulation (Ford, 1987; Karoly, 1999, 2010). Moreover, goal-centered anticipatory cognitions, preparatory mindsets, autobiographical planning(what we are here calling goal schemas) can be especially potent in light of recent research demonstrating: (a) that future-oriented simulation encompassing various themes (such as work and play) can impact daily life performance (D'Argembeau, Renaud & Van Der Linden, 2011), (b) that the within-person dynamics of instrumental activity and task engagement at work are influenced by self-relevant thoughts and positive emotions (Binnewies, Sonnentag & Mojza, 2009; Fay & Sonnentag, 2012), (c) that goal schemas, like other modes of schematic cognition, can have durable effects (Fiske & Taylor, 2008), and (d) that pain's effects on goal pursuit can be persistent and modulated by various aspects of goal cognition (Affleck, Tennen, Urrows, Higgins, Abeles, Hall et al., 1998; Fifield, McQuillan, Armeli, Tennen, Reisine, & Affleck, 2004; Karoly & Ruehlman, 1996; Pomaki, Karoly & Maes, 2009).

Thus, in keeping with a process approach to person-context transactions, the current study focused on within-day dynamics, i.e., the relationship between goal cognition and pain that emerges at the start of each day and the individual's self-reported pursuit of lifestyle and work-related goals across the afternoon and evening. This perspective is distinct from those typically

applied to the domain of chronic pain because the study involved community-residing adults with chronic pain who were working full or part-time.

Hypotheses

Daily Pain and Goal Schemas: We examined the level-1 and level-2 effects of morning pain ratings on work and life style goal schemas. At level-1, we hypothesized that on days when persons report greater than usual morning pain intensity, they will be less positive about their morning work and lifestyle goal schemas. Person mean ratings of morning pain intensity averaged over 21 days served as the level-2 predictor. At level-2, we predicted that individuals who reported lower average morning pain intensity would have more positive morning work and lifestyle goal schemas than individuals who reported higher average pain intensity.

Daily Pain, Goal Schemas, and Goal Pursuit: We predict that, at level 1, when persons report more positive than usual morning work and lifestyle goal schemas, they will be more likely in the afternoon and evening to pursue work and lifestyle goals, respectively. At level-2, individuals with more positive average morning work and lifestyle goal schemas are expected to be more likely to pursue afternoon and evening work and lifestyle goals than individuals who reported less positive morning work and lifestyle goal schemas, respectively.

Methods

Participants

Eligible individuals were obtained by a local survey research organization that used computer-based random-digit dialing to generate phone calls to residents in selected zip codes in the Phoenix metropolitan area located within driving distance (approximately 20 miles) of the study research facility. Residents who answered the phone were screened by recruiters using a script. To be eligible, individuals were required to (a) be between 25 and 70 years old, (b) have

experienced physical pain almost every day for the past six months, (c) be able to read English at least a third grade level, (d) not be color blind, (e) work at a paid job during the day either full-time or part-time, (f) not have taken illegal substances in the past 12 months, and (g) be able to complete three diary calls every day for 21 days. In addition, potential participants were administered a 4-item chronic pain severity screen with possible scores ranging from 0 to 30. Based upon a national norming study (Ruehlman, Karoly, Newton, & Aiken, 2005), cut off scores for inclusion in the study were determined separately by age and sex.

Among the 318 adults who met all criteria for inclusion in the study, 155 declined to participate (48.7 percent). All individuals who agreed to participate were telephoned by study researchers and scheduled for a laboratory appointment.

Among the 163 potential participants, 16 did not arrive for their initial appointment or for subsequent scheduled appointments (9.8 percent). Of the 147 potential participants who showed up for their initial appointment, 16 (10.9 percent) 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. Thus, the final sample consisted of 131 adults.

To examine the representativeness of the final sample, we examined differences on age, chronic pain severity, sex, race, ethnicity, and zip code between participants versus refusals, no shows, and disqualifications. The effect of Participant Status on age, $F(3, 314) = 2.58$, $p > .05$, and chronic pain severity, $F(3, 314) = 1.08$, $p > .05$, were not significant. Because of concerns about the small expected cell frequencies, subsequent analyses compared participants with refusals. The association between Participant Status and Gender, $\chi^2(1, 287) = 0.46$, $p > .05$, Race (Hispanic versus Non-Hispanic), $\chi^2(1, 286) = 1.62$, $p > .05$, Ethnicity (White versus Other Single Ethnicities Combined, versus Two or More Ethnicities), $\chi^2(2, 278) = 1.64$, $p > .05$, and

Zip Code (Phoenix versus Mesa versus Tempe), χ^2 (2, 255) = 5.60, p > .05, were not significant.

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 received a hands-on demonstration and practice session regarding the special features of the interactive voice response (IVR) system for collection of diary data. 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 calls (7:00 – 11:00 PM). Because the call-back time windows were broad, the exact time between the morning-, afternoon-, and 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 responses to the evening call employed "since the last diary" as the reference. During the practice session, participants took part in an automated interview answering the questions via the telephone number pad. Staff members also showed the participant the diary interview scripts containing the questions for each time of day. After participants indicated they felt confident with using the procedures, a staff member conducted a goals elicitation interview.

Participants were asked to list important work and lifestyle goals that fit the following criteria: (a) highly valued, (b) realistically obtainable, (c) concrete and measurable, and (d)

expected to be pursued almost every day for the next 21 days. Of the list generated, the single most important work goal and lifestyle goal were identified by the participants. Work goals were defined as "a personally valued outcome toward which effort is consistently directed while you are on the job." Lifestyle goals were defined as "things that make your life better such as goals for physical health, mental health, social relationships, intellectual pursuits, hobbies, recreation, spirituality, or community service." Over the course of the study, participants could only rate the two goals that they selected during the lab visit.

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, and a wallet card with essential information needed to place diary calls (phone number and log-in procedures) and a reminder of the participant's specific work and lifestyle goal, each of which was to be rated over the 21 days of the study.

Interactive Voice Response (IVR) Technology

The present study was conducted using IVR technology hosted by the University of Connecticut Health Center. The IVR technology entailed a system that 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.

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. Across, all occasions and days, participants, on average, completed 89.5% of the interviews.

Chronic Pain Severity Screen

The Chronic Pain Severity Screen was administered twice—once during the telephone recruitment and once on the study questionnaire. It consisted of four questions (Ruehlman et al., 2005): (1) "Over the past 6 months, how often did you have this pain" with response options ranging from 0 (never) to 6 (daily)?" (2) "What was your AVERAGE level of pain on days when you had pain during the past six months, where zero means very little pain and nine means unbearable pain?" (3) "How often during the PAST 6 MONTHS have you had at least one hour's worth of pain that hinders you from accomplishing your daily tasks with response options ranging from 0 (never) to 6 (daily)?" (4) "What was the GREATEST amount of pain you have had over the PAST 6 MONTHS, where zero means very little pain and nine means unbearable pain?" The correlation between Chronic Pain Severity Screen scores assessed during the telephone screening and during the lab visit via the questionnaire was .68. The interval between the two assessments of the Chronic Pain Severity Screen was typically 7 days. At the first and second administrations, the mean Chronic Pain Severity Screen score was 22.33 (SD = 4.28) and 21.98 (SD = 3.89), respectively. Mean scores on the Chronic Pain Severity Screen were consistent over time, $t(131) = 1.19$, $p > .05$. For the questionnaire version of the Chronic Pain Severity Screen, the internal consistency reliability, as estimated by coefficient alpha, was .69.

Demographics

On the questionnaire, participants were asked about their sex, age, ethnicity, race, marital status, employment status, and educational attainment. 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. With respect to employment status, the majority of the participants were working full-time (74%). Participants' occupations were highly variable, ranging in status level from belly dancer and gym attendant to lawyer, chaplain, and scientific advisor. Only 7 percent of the participants had a high school diploma or less education. Almost half of the participants (49%) had some college or had earned an Associate's degree. Another 16 percent of the sample had earned a Bachelor's degree, and the remaining 24 percent of the sample had attended graduate or professional school.

Goal Content

Participants reported an array of work- and lifestyle goal types. Work goals generally fell into either task-oriented or interpersonally oriented pursuits. Examples of task-oriented work goals include: "Cover my costs and make $100 profit per day", "Create 4 new training modules for team members", and "Spend at least one hour per afternoon organizing files and systems". Examples of interpersonally based work goals include: "Increase attentiveness to older patients with special needs", "Improve daily relationships with co-workers", and "Demonstrate respectful tone with dealing with co-workers". The modal work goal dealt with job performance. Lifestyle goals were also quite varied. Examples include "Bike/walk at least one hour per day", "Improve relationship with teenage granddaughter", and "Lose 10 pounds via a healthy diet". The modal lifestyle goal dealt with exercise. In view of the heterogeneity of goal types, we did not attempt

to separate them into discrete categories.

Diary Measures

Pain intensity: To assess morning pain intensity, participants were asked to complete a Numerical rating of their pain level as follows: “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?” (cf., Jensen & Karoly, 2011).For each person, we calculated “person means” which represent the individual’s average morning pain ratings across 21 days. The mean and the standard deviation for these person means were 3.56 and 1.70, respectively.

Work and lifestyle goal schemas: Morning work goal schema and morning lifestyle goal schemas were both assessed with three parallel items pertaining to importance, opportunity, and planning. The items were: (1) How important is it for you to pursue your work [lifestyle] goal today? (2) To what extent do you expect to have an opportunity to pursue your work [lifestyle] goal today? (3) To what extent do you have a plan in place for how and when you will pursue your work [lifestyle] goal today? All items were rated on 10-point scales ranging from 0 to 9. For the important question, the anchor points of the rating scale were not at all and extremely important. For the opportunity question, the anchor points of the rating scale were no expectation and definite expectation. For the planning question, the anchor points of the rating scale were no plan and definite plan. Separate morning work goal schema and lifestyle goal schema scores were calculated by summing the rating of the items and dividing by 3.For the person means of ratings of morning work goal schemas, the mean and standard deviation were 5.17 and 1.81, respectively whereas for the morning lifestyle goal schemas, the mean and standard deviation were 6.37 and 1.98.

We assessed the internal consistency reliability of the diary measures of work goal

schema, and lifestyle goal schema at each day and then computed the mean of these reliability estimates over days. The values of the coefficient alphas assessed in this manner were.90 for the lifestyle goal schema scale, and .94 for the work goal schema scale.

Work and lifestyle goal pursuit: Work and lifestyle goal pursuit were assessed in the afternoon and in the evening. In the afternoon diary, participants were asked: Have you pursued your work [lifestyle] goal today? In the evening diary, participants were asked: Have you pursued your work [lifestyle] goal since the last time we talked with you. For both questions, participants indicated that they had not pursued their goal by pressing a 0 and that they had pursued their goal by pressing a 1. The person mean of afternoon work goal pursuit was 0.55 (SD = 0.24). For evening work goal pursuit, the person mean was 0.50 (SD = 0.27). For afternoon lifestyle goal pursuit, the person mean was 0.56 (SD = 0.33) whereas for evening lifestyle goal pursuit the person mean was 0.57 (SD = 0.31).

Overview of Multilevel Models

To create orthogonal sources of variation in the predictors, we centered the level-1 (i.e., daily) predictors at the person means (i.e., group mean centered; Enders & Tofighi, 2007). For example, each person's daily pain scores were expressed as deviations from his or her overall average pain score. The regression slopes for these level-1 predictors represent pooled within-person associations between the predictor and the outcome (e.g., in Equation 1 below, β_1 represents the average within-person association between daily pain fluctuations and daily goal schema). Our models also include the person averages (e.g., average pain ratings) as level-2 predictors. The regression slopes for these level-2 predictors represent between-person associations between the average predictor and the average outcome score (e.g., in Equation 1 below, β_2 represents the person-level association between average pain ratings and average goal

schema scores). To provide an interpretable intercept coefficient, we centered the pain means at the grand mean. We employed this centering strategy for all models. All analyses were carried out using SPSS. The remainder of this section describes the specific models that we estimated.

For morning goal schemas, we used the multilevel model in Equation 1.

$$Y_{ij} = \beta_0 + \beta_1(\text{Pain}_{ij}) + \beta_2\left(\bar{x}_{\text{Pain}_j}\right) + b_{0_j} + +e_{ij} \quad (1)$$

In this model, Y_{ij} is the outcome score at day i for person j, β_0 is the grand mean, $\beta_1$is the coefficient for the within-person pain predictor, (i.e., daily pain fluctuations), β_2 is the between-person (i.e., average) pain predictor, b_{0_j} is a random intercept that captures between-person variation in the outcome means, and e_{ij} is the level-1 residual.

Turning to goal pursuit (i.e., binary) outcomes, we fit a series of multilevel logistic models separately for afternoon and evening pursuit of the work goal and the lifestyle goal. The level-1 predictors consisted of pain intensity ratings and goal schemas. Consistent with the previous model, the corresponding person means served as level-2 predictors. We entered random slopes one at a time and determined that the goal schema predictor required a random effect, but only in the lifestyle goal pursuit model. For afternoon goal pursuit the final model is given in Equation 2.

$$\text{logit}(\pi_{ij}) = \beta_0 + \beta_1(\text{Pain}_{ij}) + \beta_2(\text{Schema}_{ij}) + \beta_3\left(\bar{x}_{\text{Pain}_j}\right) + \beta_4\left(\bar{x}_{\text{Goal}_j}\right) + b_{0_j} + b_{2_j}(\text{Schema}_{ij}) \quad (2)$$

In this equation, π_{ij} is the probability that person j pursued a goal at day i, and b_{2_j} is a residual that captures between-person differences in the influence of goal schema on goal pursuit. All other regression coefficients and the residuals have the same interpretation as those from Equation 1, except that coefficients 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 because this term is fixed for identification purposes.

Finally, the evening goal pursuit models were identical to Equation 2, except that afternoon goal pursuit served as an additional predictor, as follows.

$$\text{logit}(\pi_{ij}) = \beta_0 + \beta_1(\text{Pain}_{ij}) + \beta_2(\text{Schema}_{ij}) + \beta_3(\text{Pursuit}_{ij}) + \beta_4\left(\bar{x}_{\text{Pain}_j}\right) \quad (3)$$

$$+\beta_5\left(\bar{x}_{\text{Schema}_j}\right) + \beta_6\left(\bar{x}_{\text{Pursuit}_j}\right) + b_{0_j} + b_{2_j}(\text{Pursuit}_{ij})$$

Both the work and lifestyle goal pursuit models required a random slope for the afternoon goal pursuit predictor (i.e., the association between afternoon and evening goal pursuit varied across persons), as denoted by the b_{2_j} residual term in Equation 3.

Results

Preliminary Analyses

For the continuous outcomes (e.g., work and lifestyle goal schemas), we first estimated a series of unconditional models with no predictors that partitioned the score variation into within- and between-person variability. The intraclass correlations from these analyses were .23 and .54 for work and lifestyle goal schema, respectively (i.e., 23% of the variation in work goal schema and 54% of the variance in lifestyle goal schema was attributed to between-person mean differences). For the binary outcomes (work and lifestyle goal pursuit) we applied the intraclass correlation given by Snijders and Bosker (1999, p. 224). The intraclass correlations for afternoon work and lifestyle goal schemas were .23 and .50, and the corresponding evening values were .27 and .43. These statistics established that substantial variation existed at both levels of the data hierarchy to estimate a model with within- and between-person predictors of the work and lifestyle goal schemas.

Goal Schemas

Table 1 gives the parameter estimates and standard errors from the work goal schema analysis. The within-person predictor reduced the level-1 residual variance from 8.50 to 8.48 (less than a 1% reduction), and the between-person predictor reduced the level-2 variance from 2.59 to 2.48 (a 4% reduction). As seen in the Table, the negative level-1 coefficient suggests that, when a participant experienced greater than usual morning pain intensity, he or she reported less positive morning work goal schemas ($p < .05$). In contrast, the positive level-2 coefficient indicates that, as compared to participants with lower average pain intensity ratings, participants with higher pain intensity ratings reported higher work goal schema scores ($p < .05$). To better understand the relative magnitude of the associations at both levels, we performed a contrast to determine whether the regression coefficients differed at level-1 and level-2 (i.e., a contextual effect).This contrast indicated that the influence of pain on work goal schema was significantly stronger at the between- than the within- person levels, $t(193.64) = 2.82$, $p = .005$. In this particular analysis, the pain coefficients differed in direction as well as magnitude, the level-1 regression coefficient was negative, but the level-2 coefficient was positive.

----Insert Table 1 about here----

Table 1 also gives the parameter estimates and standard errors from the lifestyle goal schema analysis. The within-person predictor reduced the level-1 residual variance from 2.93 to 2.91 (less than a 1% reduction), and the between-person predictor reduced the level-2 variance from 3.50 to 3.48 (less than a 1% reduction). At level-1, pain was a significant ($p < .001$) predictor of within-person variation in lifestyle goal schema, albeit with a relatively small effect size. Consistent with the previous analysis, the regression coefficient for pain intensity was negative, meaning that when a person experienced greater than usual morning pain intensity, he

or she reported less positive morning work goal schemas. At level-2, pain was not a significant predictor of the lifestyle goal schema score.

Goal Pursuit

Turning to the goal pursuit analyses, Table 2 gives the multilevel logistic parameter estimates for the afternoon work goal pursuit. As seen in the table, work goal schema was a significant ($p < .001$) positive within-person predictor, meaning that, when a person had a more positive than usual morning work goal schema, he or she was more likely in the afternoon to pursue his or her work goal. The corresponding means were a significant, positive ($p < .001$) between-person predictor, which suggests that, compared to participants with lower average morning work goal schema scores, participants with higher average morning work goal schema scores were more likely to report pursuit of their work goal in the afternoon.

----Insert Table 2 about here----

Table 2 also provides the corresponding parameter estimates for the afternoon lifestyle goal pursuit outcome. Consistent with the previous analysis, level-1 and level-2 lifestyle goal schema variables were significant predictors of afternoon lifestyle goal pursuit. At level-1, this means that when a person had a more positive than usual morning lifestyle goal schema, he or she was more likely in the afternoon to pursue his or her lifestyle goal. The positive coefficient at level-2 indicates that relative to participants with lower average lifestyle goal schema scores, participants with higher average lifestyle goal schema scores were more likely to report pursuit of their lifestyle goal in the afternoon. In addition, the pain intensity means were a significant predictor at the between-person level. Here again, the positive coefficient indicated that, after controlling for the goal schema means, relative to individuals with lower average pain intensity

scores, individuals with higher average pain intensity scores had a higher probability of working on their lifestyle goals in the afternoon.

Turning to the evening goal pursuit analyses, Table 3 gives the multilevel logistic parameter estimates for the evening work goal pursuit outcome. As seen in the Table, controlling for other variables, at level-1, morning work goal schema and afternoon work goal pursuit were significant ($p < .01$) positive predictors of the within-person variance. However, at level-2, only the work goal schema was significant ($p < .001$).

----Insert Table 3 about here----

Finally, Table 3 also gives the parameter estimates from the evening lifestyle goal pursuit model. These results indicate that, controlling for other variables, at level-1, morning work goal schema and afternoon work goal pursuit were significant predictors of the within-person variance, and the goal schema means and goal pursuit means were significant predictors at level-2.Morning pain ratings were not a significant predictor at level-1 or level-2.

Post hoc Analysis

Because the effect of level-1 morning goal schema on goal pursuit was consistent across type of goal and time of day (highest $p = .001$), we examined whether the effect of level-1 morning goal schema carried over from the previous day to the next day. We used a lagged predictor variable (e.g., morning goal schema predicting the following day's outcome). For afternoon goal pursuit, controlling for either level-1 morning pain or level-1 afternoon pain, and same day level-1 morning goal schema, previous day level-1 morning goal schema was a positive predictor of afternoon goal pursuit across both types of goals (regression slopes ranged from .05 to .08 and p values range from .014 to .009). In contrast, carry-over effects for morning level-1 goal schema on evening goal pursuit were not observed (lowest $p = .230$).

Discussion

The present research sought to examine at the within-day and between-person levels how morning pain intensity influences morning schematic goal cognition as well as the impact of these factors upon work-related and lifestyle goal pursuits in the afternoon and evening. Our findings extend previous work on chronic pain with clinical samples to a community sample recruited via random digit dialing.

The Effects of Pain Intensity

At the within-person level, morning pain intensity varied inversely with goal schematic thinking, supporting an expectably disruptive role for pain. Unexpectedly, at the between-person level, morning pain intensity was positively related to our participants' work goal schemas. It is worth noting that this pattern emerged despite the fact that pain level served as a study inclusion criterion. Apparently, there was sufficient variability in morning pain ratings to yield significant effects on goal schemas. Nonetheless, the discrepancy between findings that link pain and goal schema cognition at the within- versus the between-person levels of analysis merits careful consideration.

When considered in light of prior investigations of pain's deleterious effects, the within-person, level-1 findings appear quite consistent---that is, waking up with relatively high levels of pain tends to be an experience that varies inversely with goal importance, the likelihood of finding opportunities to pursue them, and the need to plan for them. Nonetheless, when pain ratings are averaged across 21 days, this level-2 summary measure is positively correlated with work goal importance, planning, and attainability (i.e., work goal schema construal). In other words, participants with more level 2 pain relative to those with less level-2 pain reported more

positive work goal schemas. In addition, as level-2 pain scores increased, participants reported being more likely to pursue their lifestyle goals in the afternoon.

But why do people with more level-2 morning pain have more positive morning work goal schemas and more frequently pursue their afternoon lifestyle goals? We suggest that, in this case, pain may be directing goal-related thinking. That is, level-2 pain as calculated in the current study reflects a construct that, because it is distal or remote from the immediate or proximal determining effects of morning pain on work goal construal, captures a distinct between-person positive motivational process. One interpretation of such a process has been articulated by Rothermund (2011) as the counter-regulation principle. According to this principle, individuals in pursuit of goals must employ flexible, context-dependent affective processing heuristics so as to remain in a state of "balanced sensitivity" to both gain (reward) and loss (pain/punishment). The negative information associated with one's three week average of pain experience should, in the name of balance, foster greater attention to positivity. By so doing, the average level of pain experienced by adults who have elected to work (rather than to withdraw from vocational activities) may come to serve as an incentive to achieve rather than as a disincentive (which is, however, in evidence at the within-person level).

A similar balanced sensitivity analysis has been offered by MacCoon, Wallace, and Newman (2004). Operating from a cognitive processing perspective, these authors suggest that the effective pursuit of goals is dependent upon the context-appropriate allocation of attention to both dominant and non-dominant cues. If too much attention is allocated to the dominant sensory cues associated with pain, individuals will fail to modulate their goal-directed actions. Working adults with chronic pain such as those in our sample may well have developed a mindset that allows them to connect their level-2 pain to the array of non-dominant, but nonetheless context-

appropriate cues associated with the completion of job-related and lifestyle-linked tasks. Thus, level-2 pain may facilitate positive morning work goal schemas and afternoon lifestyle goal pursuit.

Notably, our data show an unexpected "contrast" effect whereby the effect of pain intensity is in a different direction depending on whether it is measured at the within-person or between-person level. To recap, at the between-person level, participants who experienced higher morning pain intensity over the 21 days also reported more positive morning work goal schemas as well as more frequent lifestyle goal pursuit in the afternoon. In contrast, at the within-person level, on days when individuals experienced higher morning pain intensity than usual, they also reported less positive goal schemas.

Therefore, we are enjoined to address the key question of why the effects of morning pain intensity are in different directions depending upon whether pain intensity is assessed at the between-person or within-person level. We conjecture that the differences are due to the momentary versus extended consequences of pain intensity. In the moment (i.e., analyzed at the within person level), the aversive experience of pain has strong demotivating consequences. However, when participants are "off-task" and reflecting on the events of the day, those with the most daily morning pain (i.e., analyzed at the between-person level) may be most likely to invoke a gain (as opposed to loss) mindset in keeping with the counter-regulation principle, and thus are more positively predisposed to work on their goals in the future.

We also note that the difference in the direction of within- and between-person associations has been observed in other studies (Tennen & Affleck, 1996; Tennen, Affleck & Armeli, 2003). Therefore, pain researchers should refrain from interpreting their findings as

having implications for clinically meaningful within-person processes when they have assessed variables exclusively at the between-person level (Conner, Tennen, Fleeson, & Barrett, 2009).

The Pervasive Impact of Goal Schemas

Morning goal schemas assessed at both level-1 and level-2 were positively associated with goal pursuit in the afternoon and with goal-pursuit in the evening (even after controlling for afternoon ratings). Such a pattern, confirmed across analytic levels, suggests that our brief, three-item index of goal cognition captures a meaningful aspect of motivational readiness or prospective thinking among persons with pain. Moreover, that the predictive propensity of goal schemas holds across both vocational and lifestyle goals is a further testament to its motivational relevance.

If goal schemas (at least in the form articulated here) of adults with chronic pain are predictive of goal pursuit over the course of a day, might we not expect explicit schema enhancement training to be clinically beneficial? For example, bolstering goal planning skills would appear to be a relatively straightforward operation, as would the training of individuals to pay special attention to people and places that facilitate goal attainment. Such a goal-centered intervention need not be limited to work- and lifestyle goals, but can be extended to other valued aspirations as well.

Goal Content Matters

Although many of our findings regarding work and lifestyle goals showed consistency, level 2 (i.e., average) pain was a positive predictor only for the work goal schema but not the lifestyle schema, level 2 pain positively influenced only average afternoon lifestyle pursuit, level 2 pain was a positive predictor only for the work goal schema but not the lifestyle schema, and level 2 pain positively influenced only afternoon lifestyle pursuit, but not afternoon work goal

pursuit. Because work goals typically are non-discretionary, individuals with chronic pain who are currently active in the labor force may be especially prone to maintain positive schematic beliefs about their vocational aspirations. By contrast, as lifestyle goals tend to be voluntary and discretionary, pain may not readily compel individuals to sustain positive life style schematic beliefs.

Limitations and Future Directions

Despite the inferential sensitivity afforded by the use of a 21-day diary, the present research relied exclusively upon self-report data, and therefore lacked independent verification of participants' self-ascribed work and lifestyle goal pursuits. Similarly, because the sample was screened telephonically, we did not have access to the sorts of medical information usually available to investigators who employ clinic-derived samples. Acknowledging the logistical difficulties inherent in obtaining significant-other, employer, and/or physician evaluations, future research should nonetheless seek such information in order to bolster confidence in the pattern of findings herein reported. In addition, we chose to focus on a single work goal and a single life style goal that participants rated as important. Clearly, subsequent research could focus on how people with chronic pain juggle multiple, short- and long-term goals. Another limitation is the admittedly small within-person effect sizes obtained in the present study. For example, a 1-point increase in a person's pain intensity on a given day was associated with a decrease of less than one-tenth of a point in the individual's work goal schema on that day. However, small day-to-day effects can accumulate and compound over time. Thus, the vagaries of daily pain and the individual's ongoing attempts to cope with that pain can over months and years diminish the individual's ability to plan, organize, and pursue their work goals. Another limitation stems from our restricted use of goal constructs in the current study. As Austin and Vancouver (1996) noted,

goals vary in their content, structure, and process, and a number of theoretical models have been proposed for articulating the nature of these differences. Future research should focus on the relation between pain and other types of goals, beyond work and life style aspirations, such as social and spiritual pursuits. Similarly, future investigations might explore the relation between pain and structural goal characteristics such as conflict and differentiation (Emmons, 1999). Finally, there are a host of potential self-regulatory processes whose links to pain can be further explored such as goal-setting, executive functioning, self-monitoring, mental contrasting, and goal shielding (Karoly, 2010).

Despite the study's limitations, the findings provide a clear warrant for the continued exploration of pain experience, goal cognition, and daily goal pursuit. As recent motivation-centered research has begun to establish reliable links between indices of chronic pain and diverse aspects of goal cognition, investigators are encouraged to not only enlarge their repertoire of motivational constructs and theories but to focus upon the episodic and inter-episodic coordination of goal pursuit processes for persons in pain across work and non-work (i.e., recreational, educational, family, and spiritual) environments via diary designs and under controlled laboratory conditions. Beyond the current set of findings, additional empirical efforts are needed to further clarify the mechanisms by which pain influences goal-directed action, thought, and emotion via the dynamic interplay of time-dependent processes (level 1) and relatively stable individual factors (level 2). Such efforts should serve to strengthen the foundations of pain science and advance treatment and preventive applications in the future.

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Table 1

MLM Parameter Estimates from the Morning Work and Lifestyle Goals Schema Analysis

	Morning Work Goal Schema				Morning Lifestyle Goal Schema			
Parameter	Est.	SE	T	p	Est.	SE	t	p
Intercept	5.188	0.151	34.457	< .001	6.397	0.167	38.388	< .001
Pain Level-1	-0.094	0.041	-2.329	.020	-0.078	0.024	-3.301	.001
Pain Level-2	0.185	0.090	2.045	.043	0.075	0.099	0.758	.450
Intercept Variance	2.485	0.368			3.477	0.457		
Residual Variance	8.477	0.250			2.915	0.086		

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

Table 2

MLM Parameter Estimates from the Afternoon Work and Lifestyle Goal Pursuit Analysis

	Afternoon Work Goal Pursuit				Afternoon Lifestyle Goal Pursuit			
Parameter	Est.	SE	T	p	Est.	SE	t	p
Intercept	0.179	0.116	1.536	.128	0.401	0.161	2.498	.014
Pain L-1	0.001	0.045	0.018	.985	0.043	0.041	1.063	.288
Goal Schema L-1	0.617	0.035	17.410	< .001	0.420	0.050	8.437	< .001
Pain L-2	-0.010	0.077	-0.124	.902	0.280	0.092	3.034	.003
Goal Schema L-2	0.546	0.069	7.914	< .001	0.483	0.080	6.048	< .001
Intercept Variance	1.374	0.247			2.817	0.456		

Note: L=Level. **Work goal** schema was used to predict afternoon **work goal pursuit**; **lifestyle goal** schema was used to afternoon predict **lifestyle goal pursuit.**Wald tests are invalid for variance estimates and are omitted from the table.

Table 3 MLM Parameter Estimates from the Evening Work and Lifestyle Goal Pursuit Analysis

	Evening Work Goal Pursuit Analysis				Evening Lifestyle Goal Pursuit Analysis			
Parameter	Est.	SE	t	p	Est.	SE	t	p
Intercept	-0.710	0.332	-2.137	.036	-1.108	0.280	-3.954	< .001
Pain L-1	-0.009	0.048	-0.189	.850	-0.043	0.037	-1.158	.247
Goal Schema L-1	0.416	0.041	10.264	< .001	0.303	0.040	7.606	< .001
Goal Pursuit L-1	0.962	0.197	4.880	< .001	0.702	0.204	3.440	.001
Pain L-2	0.049	0.071	0.689	.492	0.109	0.076	1.437	.154
Goal Schema L-2	0.500	0.084	5.954	< .001	0.247	0.076	3.242	.001
Goal Pursuit L-2	1.070	0.590	1.815	.073	2.784	0.448	6.218	< .001
Intercept Variance	1.354	0.258			1.441	0.260		
Goal Pursuit Slope Variance	1.673	0.559			1.764	0.540		
Intercept-Slope Covariance	0.842	0.279			0.081	0.317		

Note: L=Level. **Work goal** schema and afternoon **work goal** pursuit measures were used to predict evening **work goal pursuit**; **lifestyle goal** schema and afternoon **lifestyle goal** pursuit measures were used to predict evening **lifestyle goal pursuit**. Wald tests are invalid for variance estimates and are omitted from the table.