Abstract

Negative emotions may be an outcome of goal progress. Importantly, negative emotions may also serve as guideposts for subsequent goal regulation by flagging which goals to pursue and which goals to let go. The authors examined this hypothesis using 10-day time-sampling information from 186 adults aged 20-81 years. In line with past work, young adults progressed less on their goals and experienced more negative emotions (anger, sadness) than older adults. Importantly, daily sadness and anger seem to serve different regulatory functions. Specifically, daily sadness was associated with subsequent increases in goal contemplation and end-of-study goal disengagement and goal reengagement whereas anger was not. Findings extend previous research by pointing to the adaptive potential of negative emotions for goal regulation across the adult lifespan.
Preface

This project was a collaborative effort between Dr. Fredda Blanchard-Fields, Dr. Christiane Hoppmann, and me. The research topic was conceived by Dr. Hoppmann and me, and made possible by the National Institutes of Health AG11715 grant awarded to Dr. Blanchard-Fields for the larger, independently conducted study project entitled Everyday Problem Solving and Emotion Regulation via Time Sampling from which my data is drawn. My project thus entails testing research questions under the novel conceptual framework that I developed with the use of secondary non-identifying data. My master’s thesis work was supported by a Pacific Century Graduate Scholarship, a Dofasco Inc. First Nations Fellowship, and a Special UBC Graduate Scholarship - Aboriginal Graduate Fellowship.

Time-Sampling methodology has been utilized for this project, on which I have published a methodological overview paper in European Health Psychologist, an empirical psychological journal. In consultation with Dr. Hoppmann, and I was responsible for completing the first draft. Dr. Hoppmann and I reviewed and edited subsequent drafts of the manuscript. Sections from the published work can be found in section 2.1, an overview of time-sampling research. The full published article can be found at:


This project was conducted under the approval of the Georgia Institute of Technology Institutional Review Board, Protocol Number H07153, and the University of British Columbia Behavioural Research Ethics Board, Certificate Number H12-01703.
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Dr. Fredda Blanchard-Fields and the entire research team at the Georgia Institute of Technology deserve thanks as well for providing me with a fantastic dataset for use for my master’s work.

Finally, my family members and friends deserve special thanks for providing me with support in all forms imaginable throughout my life and along this journey through graduate school. I am entirely appreciative of having such wonderful people in my life.
Dedication

To learning, in all of its forms
1 Introduction

Personal goals act as a developmental compass and can contribute to a sense of meaning, direction, and well-being (Baltes, Staudinger, & Lindenberger, 1999; Emmons, 1996; Hooker, Hoppmann, & Siegler, 2010; Klinger, 1975; Little, 1989). Indeed, goals are intrinsically tied to emotional experiences, and previous research demonstrates that goal progress is associated with a variety of positive outcomes including increased well-being and positive affect (Brunstein, 1993; Carver & Scheier, 1990; Diener, 1984; Omodei & Wearing, 1990; Orehek, Bessarabova, Chen, & Kruglanski, 2011). True, attaining one’s goals has been found to be related to positive emotions (Fleeson & Cantor, 1995; Harris, Daniels, & Briner, 2003), and persistence toward reaching one’s goals has also been linked with self-reported enhanced abilities to deal with experiences of stress (Carver & Scheier, 1998). Similarly, modifying one’s goals may be difficult in that it requires the acknowledgement of holding potentially unachievable goals (König, van Eerde, & Burch, 2010), perhaps making persistence a favourable choice. At the same time, difficulties with making progress on goals can lead to stress and negative emotions (Brown, Cron, & Slocum, 1997; Carver & Scheier, 1990, 1998; Hoppmann & Klumb, 2006; Oishi, Diener, Suh, & Lucas, 1999; Pomerantz, Saxon, & Oishi, 2000), and may therefore be undesirable under certain circumstances. Importantly, negative emotions may not only be an outcome of problems or difficulty with goal progress but they may also help flag which goals need to be adjusted, ultimately guiding goal-regulation (Austin & Vancouver, 1996; Ilies & Judge, 2005; Ilies, Judge, & Wagner, 2010). To date, the role that negative emotions might play in shaping processes pertaining to goal-regulation is not well understood. The present study extends and compliments previous work by examining the potential of negative emotions as experienced in daily life in guiding goal regulation. Specifically, we use repeated daily life assessments from 186 adults aged 20 to 81 years to examine time-ordered associations between
goal progress, negative emotions, thinking about goals, and goal adjustment in the forms of goal disengagement and reengagement across the adult lifespan as individual engage in their typical daily life routines.

1.1 What are goals and why are they worth investigating?

Our experiences, both daily and long-term, are shaped by the endeavours we deem important. The desired experiences, actions, or outcomes that we each continually work toward have been more specifically conceptualized as individualized goals (Emmons, 1986). The concept of possessing goals that guide our development has attracted attention within and outside of the realm of psychology. Goals represent a broad and relatively stable map of subjectively desired behavioural or situational experiences (Emmons, 1991). Goals and their pursuit are important for mental and physical well-being (Emmons, 1986; Emmons & King, 1988; King & Emmons, 1990; Emmons, 1991), quite possibly across cultures (e.g., Massey, Gebhardt, & Garnefski, 2008). Personal goals indicate current or future desires, often possessing subjectively meaningful qualities (Brunstein, Dangelmayer, & Schultheiss, 1996), and a sense of identity is often derived from subjective goal pursuits (Cross & Markus, 1991). Of particular interest to the present study are goals that reflect reasonably concrete desired experiences for the near future. Hence, the ultimate significance of goals is revealed by acknowledging their role in shaping our current endeavours thereby contributing to our overall well-being and development.

1.2 Goals and negative emotions across the adult lifespan

While striving to attain a goal there is ample opportunity for problems to arise, the specifics of which may differ across various life phases. For example, young adults tend to set
different types of goals that are often more conflicting and loftier than those of older adults (e.g., Conway & Holmes, 2004; Erikson, 1968; Kroger, 2003; Nurmi, 1992; Riediger, Freund, & Baltes, 2005; Wrosch, Heckhausen, & Lachman, 2000). Furthermore, young adults may also not be able to draw upon the same problem solving and coping skills as older adults (Blanchard-Fields, 2009; Folkman, Lazarus, Pimley, & Novacek, 1987; Heckhausen & Schulz, 1995; Lazarus, R. S., 1996; Schulz & Heckhausen, 1998; Carstensen, Issacowitz, & Charles, 1999; Charles & Carstensen, 2007). Hence, there is greater potential for goal progress to be difficult in young adulthood explaining at least in part explaining previously observed age differences in emotional experiences, control, and regulation (Carstensen, Pasupathi, Mayr, & Nesselroade, 2000; Gross, Carstensen, Pasupathi, Tsai, Gotestam, & Hsu, 1997; Riediger, Schmiedek, Wagner, & Lindenberger, 2009). That is, improvements in both emotional control (Lawton, Kleban, Rajagopal, & Dean, 1992) and understanding (Labouvie-Vief, DeVoe, & Bulka, 1989) occur as individuals progress in age, and older adults also display fewer hard negative emotions, such as anger and disgust, than younger adults (Gross et al., 1997). Perhaps curious, but quite interesting, the way in which we regulate our emotions also does not appear to be static over the course of our lives. Motivation sometimes exists for individuals to maintain or enhance negative emotional experience, or even to reduce positive emotional experience, and such contra-hedonic tendencies are most prevalent during adolescence (Riedeger et al., 2009). Related, pro-hedonic propensities, or the motivation to maintain positive emotional experience while decreasing negative emotional experience, seem most prevalent in later adulthood (Riedeger et al., 2009). Overall, the literature seems to suggest that there are evident differences in goals and goal attainment across the lifespan which may be related to detected differences in processes pertaining to emotional experiences. In line with previous research we therefore expect that
young adults report less goal progress than older adults, and that problems with goal progress elicit more negative emotional experiences in the former than in the latter.

Emotions have been touted in the scientific literature as important response tendencies encompassing multiple elements (Frederickson, 2000), connecting aspects of our biological, cognitive, and motivational systems (Salovey, DiPaolo, & Mayer, 1990). Theorists have long suggested that emotions exert functional capacities (e.g., Darwin, 1872) in that they enable adaptive responses to environmental occurrences (Izard, 1992), so it seems reasonable that our emotional experiences often allow us to decidedly persist or to switch gears and revisit the goals we expend energy on. Notably, there is accumulating evidence that negative emotions in particular may not only be an outcome of unsuccessful goal progress but that they also strongly predict subsequent behaviours (Carver & Scheier, 1998; Frijda, 1986; Larsen, Hemenover, Norris, & Cacioppo, 2003). For example, negative emotions may be an important signal that flags situations that require alterations in current activities and that calls for adjustments to personal goals (Carver & Scheier, 1998; Larsen, et al., 2003). As such, negative emotions may play a key role in goal regulation and ultimately adjustment. While evident that emotions may hold goal-functional properties, the vast variety of emotional experiences augments the complexity in identifying how specific emotions might serve independent purposes for our personal daily goal progress. Past research linking goal progress problems with emotional experiences typically focuses on broad categories of negative emotions without taking into account that different negative emotions may have different regulatory functions (e.g., Hoppmann & Klumb, 2006; Lavallee & Campbell, 1995; Watkins & Moberly, 2009). This study thus extends past research by examining the specific role of different negative emotions, namely sadness and anger, in shaping goal regulation. Sadness and anger have been chosen for
exploration in how they may influence goal regulation since both are quite commonly
experienced in healthy individuals and each possesses rather distinct characteristics. Sadness is a
soft negative emotion in that it is commonly accompanied by a low level of physiological
arousal, and it has been implicated in many facets of health and well-being (e.g., Miller &
Blackwell, 2006; Parker, Schatzberg, & Lyons, 2003; Rivers, Brackett, Katulak, & Salovey,
2007; Wrosch & Miller, 2009). Sadness appears to relate to cognitive efforts that promote active,
deliberative thinking that may enhance problem-solving (Alloy & Abramson, 1979; Ambady &
Gray, 2002; Schwarz, 1990; Sinclair & Mark, 1992). As such, sadness may lead to increased
thinking about goals, or goal contemplation (as it will henceforth be referred to as). Findings on
the experience of anger are also widespread and often highlight its relation to physical health
(e.g., Burns, Quartana, & Bruehl, 2008; Bruehl, Chung, & Burns, 2006; Chida and Steptoe,
2009; Eysenck, 1994; Iyer, Korin, Higginbotham & Davidson, 2010; Scheier & Bridges, 1995;
Smith, 1992), mental health (e.g., Fava, Anderson, & Rosenbaum, 1990; Newman, Gray, &
Fuqua, 1999) and social functioning (e.g., Dodge, Price, Bachorowski, & Newman, 1990;
Bosworth, Espelage, & Simon, 1999; Iyer et al., 2010; Sprague, Verona, Kalkhoff, & Kilmer,
2011), thereby demonstrating its significant influence in regular life. Interestingly, anger is often
defined in terms of its relation with experiences of goal-blockage and seems to arise when one
encounters difficulties in reaching an important goal (Lewis, Alessandri, & Sullivan, 1990).
Anger, in stark contrast to sadness, is a hard negative emotion accompanied by a higher level of
physiological arousal. It has been associated with reliance on simple heuristic cues for decision
making, and contrary to sadness, anger is not well-aligned with systematically thinking things
through (Bodenhausen, Sheppard, & Kramer, 1994; Lerner, Goldberg, & Tetlock, 1998; Tiedens,
2001). It is therefore expected that sadness and anger may lead to different outcomes in the
context of goal regulation. Specifically, we expect that individuals who experience sadness will show continued or increased thinking about their goals, whereas anger is expected to be associated with less goal contemplation, at the subsequent assessment point. To capture the dynamic nature of these processes including time-ordered associations, the present study employs a time-sampling design involving repeated daily life assessments of emotional experiences, goal progress, and thinking about goals as individuals engage in their typical daily life routines. An elaboration of time-sampling methods is presented in the second research chapter.

1.3 Goal progress, negative emotions, and goal adjustment

In addition to influencing daily life processes, anger and sadness may also impact longer term outcomes in terms of goal adjustment. Goals are not static, and their adjustment can be adaptive when goals become unattainable (Wrosch, Scheier, Miller, Schulz, & Carver, 2003). In some instances, such as when one is persistent toward attaining an improbable goal, individuals may experience negative outcomes that are detrimental to their health and wellbeing (Lavallee & Campbell, 1995). For example, being unable to disengage from goals that are unlikely to be attained has been implicated in the adverse physiological consequence of increased systemic inflammation (Miller & Wrosch, 2007). Researchers have asserted that it may be most adaptive for both mental and physical health to modify goals that seem unrealistic or unattainable (Brunstein, 1993; Miller & Wrosch, 2007), and typically, individuals’ goal pursuits are in fact subject to modification (Nurmi & Salmela-Aro, 1992). Such general modification of goal pursuits tends to be related to improved overall subjective well-being (Brunstein, 1993). Making changes to our goals typically encompasses two general processes, namely goal disengagement
and reengagement. Disengaging from goals is an active process of letting go of goal pursuits that are no longer in one’s interests (Wrosch et al., 2003). There may be many explanations for why certain goals are abandoned (e.g., they seem too difficult to attain, they are no longer relevant to the individual), but largely, one’s ability to disengage from goals has been identified as an important process (e.g., Wrosch & Miller, 2009). Goal disengagement is characterized by a reduction of efforts and commitment to a particular goal, thereby protecting an individual from energy depletion (Wrosch, Miller, Scheier, & de Pontet, 2007). As such, goal disengagement can be an adaptive process that has been linked with improved health and well-being in previous studies (Brandstädter & Renner, 1990; Carver & Scheier, 1990; Klinger, 1975; Nesse, 2000; Wrosch & Miller, 2009; Wrosch et al., 2003). The other side of the goal modification coin involves goal reengagement, or the adoption of novel or alternative goals to replace goals that are no longer feasible or of interest (Wrosch et al., 2003). Previous research has shown that like disengagement, goal reengagement is also linked with positive outcomes (e.g., Kraaij, Van der Veek, Garnefski, Schroeters, Witlox, & Maes, 2008; Neely, Schallert, Mohammed, Roberts, & Chen, 2009; Wrosch et al., 2003). Particularly, engaging in activities that are directed towards a new goal helps the individual to recover from failure experiences associated with a previous goal, and offers the potential for increased well-being (Gollwitzer, Heckhausen, & Steller, 1990; Wrosch et al., 2007). Overall, however, goal-regulation in this sense appears to promote beneficial outcomes in that perhaps even small changes or adjustments to our goals may be worthwhile. While we want to attain success, sometimes regrouping or rerouting our efforts may be what is necessary for successful outcomes, though such change is quite likely a dynamic process that encompasses a multitude of factors, such as emotional experiences, and accordingly, takes time to unfold.
Specifically, repeated experiences of sadness in daily life coupled with increased goal contemplation may help individuals realize that some of their goals are unattainable or unrealistic, ultimately leading to goal disengagement and reengagement in novel goals that are deemed worthwhile (Carver & Scheier, 1990; Brunstein, 1993; Pomerantz, Saxon, & Oishi, 2000; Miller & Wrosch, 2007). So far, little is known about the daily life processes underlying goal disengagement and reengagement. Following the previously described reasoning we propose that one pathway associated with goal disengagement and reengagement may be the accumulation of sadness-elicited goal contemplation. Hence, we assume that individuals who experience sadness might be more likely to disengage from goals and adopt novel ones. Specifically, we expect that overall daily sadness is positively associated with end-of-study goal disengagement and reengagement. Hence, although counterintuitive at first glance, sadness may actually lead to a regrouping of efforts ultimately leading to improved well-being and health.

Anger in contrast, has been linked to increasing effort in the face of problems (e.g., Fischer & Roseman, 2007; Frijda, 1986) and persistence (e.g., Fessler, 2010; Parrott, 1993; Litvak, Lerner, Tiedens, & Shonk, 2010; Snyder, Schrepferman, McEachern, & DeLeeuw, 2010), and it has been shown to be associated with less directed thinking about a problem (Bodenhausen, et al., 1994; Lerner, et al., 1998; Tiedens, 2001). We therefore expect overall daily anger to be negatively associated with goal disengagement and reengagement.

1.4 Tying it all together

To examine the role of negative emotions for goal regulation, we used a 10-day time-sampling design involving repeated daily life assessments of goal progress, emotional experiences, goal contemplation, as well as end-of-study goal disengagement and reengagement
ratings. This approach allows for an in-depth investigation of a) age differences in daily goal progress and negative emotional experience; b) the degree to which daily sadness and anger may be associated with subsequent goal contemplation; and c) whether daily sadness and anger may have different functions in shaping goal adjustment in the forms of goal disengagement and reengagement as assessed at the end of the study. Specifically, we expected that young adults would report less goal progress in daily life, higher levels of sadness and anger, and also display more pronounced negative emotional reactions to low goal progress as compared to older adults. Furthermore, we predicted that individuals experiencing sadness would subsequently increase their goal contemplation, whereas anger experiences would be associated with reduced goal contemplation at the next assessment. Finally, we expected that overall daily sadness would ultimately lead to increased goal disengagement and goal reengagement over time, whereas anger would be negatively associated with goal adjustment.
2 The Present Research

2.1 Overview of the data

To investigate my research questions on the relationships between emotions and goal regulation across the lifespan I conducted secondary analyses on non-identifying data independently collected in the Everyday Problem Solving and Emotion Regulation via Time-Sampling project at the Georgia Institute of Technology. Since the project data that I had been given access to had already been completed, I developed a novel conceptual framework which permitted me to ask a new set of research questions with use of the existing data. While the present study includes the utilization of standard self-report measures during baseline and study exit assessments, the most significant and innovative portion of data collection is perhaps the time-sampling phase. Time-sampling, or ecological momentary assessment, is characterized by repeatedly assessing current experiences as individuals carry out their typical daily life routines in their natural environment (Bolger, Davis, & Rafaeli, 2003; Shiffman & Stone, 1998). Time-sampling is complementary to the in-lab questionnaire portion of our research since it directly places our scope on individuals’ experiences in their real world environments, thereby optimizing the ecological validity of our assessment of the variables under investigation (Feldman-Barrett & Barrett, 2001). Individuals adapt their behaviours to the changing characteristics of momentary circumstances resulting in substantial intra-individual variability. Much work has been done to highlight great intra-individual variability in key psychological constructs and behaviours wherein the powerful influence of one’s situation has been clearly demonstrated (Scholz, Keller, & Perren, 2009; DeLongis & Holtzman, 2005; Hoppmann & Blanchard-Fields, 2011), and we expect experiences such as sadness, anger, and goal progress to be much the same. Our use of time-sampling allows the intra-individual variability in the
variables of research interest to become a key part of the phenomenon under study, instead of being regarded simply as noise in the data (Almeida, 2005; DeLongis & Holzman, 2005). Such investigation is extremely valuable since exploring inter-individual differences in intra-individual variability may shed light on the complex interplay between the person and the situation in the context of emotional experience and goal regulation. Such methods also allow for the statistical modeling of temporal order of events of interest (Bolger et al., 2003), which is of particular importance to the present study since time-ordered relationships between emotions and goal regulation are of key focus. Furthermore, the use of time-sampling methods helps to alleviate many common concerns associated with one time assessments, such as retrospective self-report biases and memory distortions (Almeida, 2005; Bolger et al., 2003; Feldman-Barrett & Barrett, 2001; Schwarz, 1999; Shiffman & Stone, 1998) and hence enhances data quality. Being asked to think back and report on experiences (e.g., emotions) in retrospect involves complicated reconstructions of the past, and is cognitively demanding and may be prone to systematic biases (Almeida, 2005; Schwarz, 1999). To minimize such retrospective biases, time-sampling research assesses thoughts, behaviours, and feelings as they occur within one’s natural environment. It therefore does not place the same cognitive demands on an individual, and it incorporates and capitalizes on current situational influence. Finally, the use of time-sampling is believed to be beneficial for the present study since it allows us to capture momentary, often fleeting, experiences that may be undetected if we were to use retrospective self-reports (Shiffman & Stone, 1998). Overall, time-sampling methods permit addressing research questions that uniquely capture between and within person differences in study variables of interest far beyond what can be captured with retrospective self-report measures. The present study utilized
time-sampling data so as to optimize the quality of the data and investigation of the relationships between emotional experiences and goal regulation.

2.2 Participants

The sample was composed of 186 individuals ranging in age from 20 to 81 years ($M = 49.13, SD = 19.34$) from the Atlanta metropolitan area who volunteered to participate in a time-sampling study on everyday problem solving across the adult lifespan. Recruitment for the study was conducted in such a way as to obtain a representative sample of the city of Atlanta. The number of students enrolled in the study was limited to a representative number, and representative employment/unemployment rates were met based on United States of America Department of Labor statistics for Atlanta, Sandy Springs, and Marietta. The sample consisted of an almost equal number of women (51%) and men (49%) and was ethnically diverse (74.1% Caucasian, 16.9% African-American, 7.4% other ethnicities). There was a range in levels of education (less than 12 years of schooling – master’s degree) with the majority (75.2%) having completed some college. About a third of the sample was married (38.1%) and another third was single (36%). Of the remaining participants, 13.4% were divorced, 2.7% were in a domestic partnership, 5.4% were widowed, and 2.2% were other. We find typical age-differences in cognitive abilities in our sample. For example, older adults had higher scores on the Advanced Vocabulary Test (Ekstrom, French, Harman, & Derman, 1976) than middle-aged and younger adults ($F(2, 181) = 5.39, p = .005$), and younger adults outperformed middle-aged and older adults on the Letter Sets Test (Ekstrom et al., 1976; $F(2, 181) = 23.72, p < .001$). To meet study eligibility criteria, participants could not have any conditions or be taking medications that impact the hypothalamus-pituitary-adrenal system since part of the data collection involved
assessing biomarkers for other research questions in the broader study project. Volunteers were reimbursed $100 for complete participation (i.e. at least 80% of questionnaires and saliva samples). An additional 5 participants were excluded due to missing data on the central study variables.

2.3 Procedure

Eligible participants completed baseline questionnaires including information on sociodemographic characteristics and personal goals. Next, participants kept daily diaries, administered on a pocket computer, including six daily ratings of emotional experiences, goal contemplation, and goal progress over a period of 10 consecutive days. The first questionnaire was completed upon waking, and was followed by 5 beep-prompted questionnaires at approximately three hour intervals until going to bed. Daily questionnaires took 5 minutes and 56 seconds on average for completion. Soon after the study began recruiting participants the protocol was modified such that baseline sessions were held on a Monday, Tuesday, or Saturday so as to standardize the number of regular and weekend days of involvement across participants. Participants were thus prevented from participating in the study over two full weekends for the time-sampling phase. Following the time-sampling phase, participants returned to the lab for an exit session where they provided ratings on goal disengagement and goal reengagement.

2.4 Measures

2.4.1 Personal goals. At baseline, participants were asked to complete a personal goals questionnaire (Hoppmann & Klumb, 2006) which involved reporting three salient goals for
which active pursuit was expected over the upcoming weeks, thus capturing goals that would be relevant to participants for the duration of the study. Open-ended goals pertained to many life domains and included things such as a plan to work out three times per week, to call parents once a day, and to remove weeds from four garden areas, for example. Participants also provided goal-specific attainability ratings on a 5-point Likert-type scale (1 = not at all to 5 = very much) which were aggregated and used as a control variable in our models ($M = 4.37$, $SD = 0.56$).

2.4.2 Daily emotional experiences. At each daily assessment, participants rated their current emotional experiences. The respective questions read “To what extent are you ____ at the moment? (happy, sad, calm, sleepy, nervous, alert, quiet, irritated, & excited)” (Magai, Condesine, Krivoshekova, Kudadjie-Gyamfie, & McPherson, 2006; Tsai, J. L., Knutson, B., & Fung, H. H., 2006). For the present study, we specifically focused on the ‘sad’ and ‘irritated’ responses with the extent of sadness endorsed providing a measure of momentary sadness ($M = 1.46$, $SD = 0.54$) and the extent of irritation endorsed providing a proxy for momentary anger ($M = 1.70$, $SD = 0.59$).

2.4.3 Daily goal contemplation. At each assessment, participants were also asked if they had encountered problems in the pursuit of their goals since their last daily assessment and if not, they were further asked if they had stopped thinking about their goals. If they had stopped thinking about their goals was assessed in a dichotomous fashion for each of the three goals, producing a total of 3 ratings which were then summed per assessment to provide a proxy for goal contemplation in daily life, with lower values indicating higher goal contemplation ($M =$
1.25, \(SD = 1.18\). Due to this study design, goal contemplation ratings are available for 81.3\% of all measurement points (i.e., those daily assessments without a manifest problem).

2.4.4 **Daily goal progress.** At each assessment, participants were also asked to rate their goal progress by answering the question of "Since the last beep: To what extent did the activities you engaged in further or hinder achievement of your goal?" on a Likert-scale ranging from -2 (hindered) to +2 (furthered) for each of their three goals. An average was taken for such reports across the three goals to provide a measure of overall goal progress since the last assessment (\(M = -0.10, SD = 0.87\)).

2.4.5 **Overall goal adjustment.** During the exit session, participants’ goal disengagement and reengagement were investigated through the use of a modified version of the Goal Adjustment Scale (Wrosch et al., 2003) which has been used successfully in previous studies to assess goal disengagement and reengagement (e.g., Wrosch et al., 2007). Typically, goal adjustment focuses on one’s general abilities whereas our modified version of this scale specifically targeted the three goals under study, using a subset of variables from the scale, with the duration of the time-sampling phase as a reference period (for disengagement: \(M = 1.95, SD = 0.76\), Cronbach’s \(\alpha = .73\), for reengagement: \(M = 2.72, SD = 1.00\), Cronbach’s \(\alpha = .88\)).

2.5 **Analytic strategy**

Hierarchical linear modeling (HLM; Raudenbush & Bryk, 2002) was used to account for the hierarchically nested data structure. The present study provided data with two-levels; the first level concerned days, e.g. daily sadness and irritation, goal progress, and goal contemplation,
and the second level referred to individual characteristics such as age, goal attainability, and goal disengagement and reengagement.

2.6 Results

*Table 1* shows the means and intercorrelations of the central study variables. We first report our findings regarding daily negative emotion-goal-regulation links and then proceed to an examination of the relationship between negative emotions and goal adjustment.
<table>
<thead>
<tr>
<th></th>
<th>Mean (SD)</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Age</td>
<td>49.13 (19.34)</td>
<td>-.25**</td>
<td>-.30**</td>
<td>.19**</td>
<td>.10</td>
<td>-.12</td>
<td>-.16*</td>
</tr>
<tr>
<td>2. Daily sadness</td>
<td>1.46 (0.54)</td>
<td>-</td>
<td>.63**</td>
<td>-.14</td>
<td>-.13</td>
<td>.23**</td>
<td>.16*</td>
</tr>
<tr>
<td>3. Daily irritation</td>
<td>1.70 (0.59)</td>
<td>-</td>
<td>-</td>
<td>-.13</td>
<td>-.16*</td>
<td>.06</td>
<td>.11</td>
</tr>
<tr>
<td>4. Daily goal progress</td>
<td>-.10 (0.59)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-.28**</td>
<td>-.09</td>
<td>.16*</td>
</tr>
<tr>
<td>5. Daily goal contemplation</td>
<td>1.26 (0.78)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>.24**</td>
<td>-.11</td>
</tr>
<tr>
<td>6. Overall goal disengagement</td>
<td>1.95 (0.76)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>.10</td>
</tr>
<tr>
<td>7. Overall goal reengagement</td>
<td>2.72 (1.00)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Note. * p < .05; ** p < .01

Note. Goal contemplation was assessed by the item of “to what extent did you stop thinking about your goals” thus higher values indicate lower levels of contemplation.
### 2.6.1 Daily-life associations between goal progress, negative emotions, and goal contemplation

We first wanted to replicate previously reported age differences in daily goal progress and negative emotional experiences by examining if young adults would report less goal progress in daily life, experience more sadness and anger, and display stronger associations between low goal progress and sadness and anger than older adults. Intraclass correlations from unconditional models indicated that most of the variability in goal progress, sadness, and irritation originated at the situation level (55%, 60%, and 71% respectively) whereas less variability originated at the individual level (45% for goal progress; 40% for sadness; 29% for irritation). This demonstrated that modeling goal progress, sadness, and anger as a function of time-varying situational variables as well as person characteristics is conceptually sound.

Using restricted maximum-likelihood procedures in HLM (Raudenbush & Bryk, 2002), we then proceeded to model level 1 goal progress \((s)\) for a given individual \((i)\) in a given situation \((j)\) as a function of an overall mean across all participants \((\gamma_{00})\), age \((\gamma_{01})\), goal attainability \((\gamma_{02})\), and a random effect \((u_{0i})\) leading to the following level 2 model: 
\[
\beta_{0i} = \gamma_{00} + \gamma_{01} (\text{age}) + \gamma_{02} (\text{goal attainability}) + u_{0i}.
\]

As expected, young adults reported significantly less daily goal progress than older adults, \(\beta = .01, t(183) = 2.58, p = .01\). The conditional two-level model significantly reduced the variance in comparison to the empty model (3%). Results are illustrated in *Figure 1*. 
Figure 1. Age Differences in Goal Progress.
Sadness ($s$) was modeled for a given individual ($i$) in a given situation ($j$) as a function of an individual’s mean sadness ($\beta_{0j}$), goal progress ($\beta_{1j}$), and a residual ($r_{ij}$): Sadness $s_{ij} = \beta_{0j} + \beta_{1j}$ (goal progress) $+ r_{ij}$. At level 2, an individual’s mean sadness ($\beta_{0j}$) was modeled as a function of an overall mean across all participants ($\gamma_{00}$), age ($\gamma_{01}$), goal attainability ($\gamma_{02}$), and a random effect ($u_{0i}$): $\beta_{0i} = \gamma_{00} + \gamma_{01}$ (age) $+ \gamma_{02}$ (goal attainability) $+ u_{0i}$. Age by goal progress interactions were modeled by estimating the level 1 slope for goal progress ($\beta_{1j}$) as a function of age ($\gamma_{11}$), and a random effect ($u_{1i}$): $b_{1i} = \gamma_{10} + \gamma_{11}$ (age) $+ u_{1i}$. Identical modeling was conducted for irritation as the outcome measure as well. The results are displayed in Table 2.
Table 2. Hierarchical Linear Regressions Predicting Daily Negative Emotional Experience by Assessment- and Person-Characteristics using Restricted Maximum Likelihood Estimation in HLM (N = 186).

<table>
<thead>
<tr>
<th></th>
<th>Model 1: Sadness Mean (SD)</th>
<th>Model 2: Irritation Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fixed effects</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>1.46** (.04)</td>
<td>1.69** (.04)</td>
</tr>
<tr>
<td>Age</td>
<td>-.01** (.002)</td>
<td>-.01** (.002)</td>
</tr>
<tr>
<td>Goal Attainability</td>
<td>-.18* (.08)</td>
<td>-.27** (.08)</td>
</tr>
<tr>
<td>Goal Progress</td>
<td>-.07** (.02)</td>
<td>-.11** (.02)</td>
</tr>
<tr>
<td>Goal Progress X Age</td>
<td>.002** (.001)</td>
<td>.003** (.001)</td>
</tr>
<tr>
<td><strong>Random effects</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept variance lv 1 (SD)</td>
<td>.26** (.51)</td>
<td>.28** (.53)</td>
</tr>
<tr>
<td>Residual variance (SD)</td>
<td>.42 (.65)</td>
<td>.81 (.90)</td>
</tr>
<tr>
<td>Explained variance (Pseudo Δ R²)</td>
<td>.014**</td>
<td>.04**</td>
</tr>
</tbody>
</table>

Note. * p < .05, ** p < .01. Unstandardized coefficients
In line with our hypotheses, young adults experienced more sadness and irritation than older adults. Furthermore, analyses examining age differences in goal progress-negative emotion associations indicate that younger age was associated with steeper goal progress- sadness and goal progress- irritation slopes. These findings for sadness and irritation are depicted graphically in *Figure 2*. 
Figure 2. Goal Progress- and Age-Specific Variability in Daily Sadness and Irritation.
The conditional two-level models from Table 2 significantly reduced the variance compared to the empty models (sadness 1.4%; irritation 4%).

As a next step, and particularly central to our hypotheses, we were interested in the extent to which daily goal contemplation varied depending on previously experienced sadness and anger. Intraclass correlations demonstrate that a large part of the variability in goal contemplation originated at the situation level (57%) and a smaller part at the individual level (43%). We then specified a two-level hierarchical linear model including lagged effects. Specifically, level 1 daily goal contemplation \((s)\) for a given individual \((i)\) in a given situation \((j)\) was modeled as a function of an individual’s mean goal contemplation \((\beta_{0j})\), current sadness \((\beta_{1j})\), previous beep sadness \((\beta_{2j})\), previous beep contemplation \((\beta_{4j})\), and a residual \((r_{ij})\): Sadness \(s_{ij} = \beta_{0j} + \beta_{1j} \) (sadness) + \(\beta_{2j}\) (previous beep sadness) + \(\beta_{4j}\) (previous beep contemplation) + \(r_{ij}\).

Previous beep sadness and contemplation ratings from the night prior to the first morning beep were not used to predict morning contemplation, as we wanted to exclude overnight effects, thus previous beep sadness and contemplation assessments were taken from a given day. At level 2, an individual’s mean goal contemplation \((\beta_{0j})\) was modeled as a function of an overall mean across all participants \((\gamma_{00})\), age \((\gamma_{01})\), goal attainability \((\gamma_{02})\), and a random effect \((u_{0i})\): \(\beta_{0i} = \gamma_{00} + \gamma_{01}\) (age) + \(\gamma_{02}\) (goal attainability) + \(u_{0i}\). A model including age by emotion interactions did not show a significant interaction and thus we present the more parsimonious model without such interactions. Findings are shown in Table 3.
Table 3. Hierarchical Linear Regressions Predicting Daily Contemplation by Assessment- and Person-Characteristics using Restricted Maximum Likelihood Estimation in HLM (N =186).

<table>
<thead>
<tr>
<th></th>
<th>Contemplation</th>
<th>( \beta )</th>
<th>(SE)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fixed effects</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td></td>
<td>1.26**</td>
<td>(.06)</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td>.005</td>
<td>(.003)</td>
</tr>
<tr>
<td>Goal attainability</td>
<td></td>
<td>-.04</td>
<td>(.10)</td>
</tr>
<tr>
<td>Sadness</td>
<td></td>
<td>-.001</td>
<td>(.02)</td>
</tr>
<tr>
<td>Sadness at previous beep</td>
<td></td>
<td>-.05*</td>
<td>(.02)</td>
</tr>
<tr>
<td>Contemplation at previous beep</td>
<td></td>
<td>.02</td>
<td>(.01)</td>
</tr>
<tr>
<td><strong>Random effects</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept variance lv 1 (SD)</td>
<td></td>
<td>.71**</td>
<td>(.84)</td>
</tr>
<tr>
<td>Residual variance (SD)</td>
<td></td>
<td>.61</td>
<td>(.78)</td>
</tr>
<tr>
<td>Explained variance (Pseudo ( \Delta R^2 ))</td>
<td></td>
<td>.02**</td>
<td></td>
</tr>
</tbody>
</table>

Note. * \( p < .05 \), ** \( p < .01 \). Unstandardized coefficients; Due to question format, higher values indicate lower goal contemplation.
In line with our hypotheses, sadness emerged as a significant predictor of subsequent goal contemplation\(^1\). Irritation, in contrast, was unrelated to subsequent goal contemplation and was thus excluded from the final model for reasons of parsimony. The sadness-goal contemplation results are illustrated in *Figure 3*. 
Figure 3. Associations between Sadness and Subsequent Goal Contemplation

Note. Due to question format, higher values on the contemplation variable (Y-axis) indicate lower goal contemplation.
The respective model resulted in a significant 4% reduction in the variance in daily goal contemplation as compared to the empty model.

2.6.2 Associations between goal progress, negative emotions, and goal adjustment

Finally, we examined associations between overall goal progress during the time-sampling phase, negative emotions, and end-of-study goal adjustment reports. Specifically, we were interested in whether mean sadness and anger experiences from the time-sampling phase would be associated with goal disengagement and reengagement at the end of study. The model with sadness, age, and goal attainability entered as predictors accounted for a significant portion of the explained variance in goal disengagement, \( R_{adj}^2 = 0.04, F(3, 181) = 3.64, p < .001 \). There was a significant relationship between mean daily sadness and end-of-study goal disengagement with higher levels of sadness predicting greater goal disengagement, \( b = .30, t(184) = 2.84, p < .005 \). Similarly, the model with sadness, age, and goal attainability entered as predictors accounted for a significant portion of the explained variance in goal reengagement, \( R_{adj}^2 = 0.051, F(3, 181) = 4.31, p = .006 \). There was a significant relationship between mean daily sadness and goal reengagement with higher levels of daily sadness predicting greater end-of-study goal reengagement, \( b = .29, t(184) = 2.05, p = .04 \). Results are displayed in Table 4 and depicted graphically in Figure 4.
Table 4. *Regression Predicting Goal Adjustment by Assessment- and Person-Characteristics (N = 186)*.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Goal Disengagement</th>
<th>Goal Reengagement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( b )</td>
<td>( b )</td>
</tr>
<tr>
<td>Constant</td>
<td>1.47**</td>
<td>1.39*</td>
</tr>
<tr>
<td>Age</td>
<td>-.003</td>
<td>-.01</td>
</tr>
<tr>
<td>Attainability</td>
<td>.04</td>
<td>.29*</td>
</tr>
<tr>
<td>Sadness</td>
<td>.30**</td>
<td>.29*</td>
</tr>
<tr>
<td>( R^2 )</td>
<td>.06</td>
<td>.07</td>
</tr>
<tr>
<td>( R^2_{adj} )</td>
<td>.04</td>
<td>.05</td>
</tr>
<tr>
<td>( F )</td>
<td>3.64*</td>
<td>4.31*</td>
</tr>
</tbody>
</table>

*Note. * \( p < .05 \), ** \( p < .01 \). Unstandardized coefficients.*
Figure 4. Associations between Sadness and Goal Adjustment.
Additional analyses including irritation as a predictor were also conducted. Irritation did not predict goal disengagement or reengagement and was therefore excluded from the model for reasons of parsimony.
3 Conclusion

3.1 Discussion

Our study examined the adaptive potential of negative emotions for goal regulation across the adult lifespan. Using time-sampling information from a lifespan sample, we first replicated well-documented age differences in goal progress and the experience of negative emotions. In addition, we demonstrate that young adults reported more sadness and more irritation when goal progress was low as compared to older adults. Furthermore, and particularly central for our study, we demonstrated that daily sadness was related to subsequent increases in goal contemplation. In contrast, daily irritation was not associated with subsequent goal contemplation. Finally, our hypotheses on the distinct functions of daily sadness and anger for overall goal adjustment were partially supported in that daily sadness was positively associated with both goal disengagement and reengagement at the end of the time-sampling phase whereas daily irritation was unrelated to goal adjustment.

We first replicated well-known age differences in goal progress and emotional experiences across the adult lifespan to be able to link our findings to previous research. Specifically, age differences were observed in levels of goal progress in daily life. We found that young adults experienced lower levels of goal progress compared to older adults, even when controlling for subjective goal attainability ratings. Such differences make conceptual sense given that young adults tend to hold less integrated, perhaps loftier goals than their older counterparts (e.g., Riediger et al., 2005), and they also may not yet have developed strong skills that would facilitate goal progress, such as those that aid with problem solving (Blanchard-Fields, 2009).
In line with the extant literature (e.g., Carstensen et al., 2000; Gross et al., 1997), young adults were also found to experience more intense negative emotions in daily life than older adults. Furthermore, the link between low goal progress and negative emotions was more pronounced in young adults indicating that young adults experienced higher levels of negative emotions when their goal progress was low as compared to older adults. These results anchor our findings in the existing literature on emotional experiences across the adult lifespan (e.g., Carstensen et al., 2000; Carstensen, Turan, Scheibe, Ram, Ersner-Hershfield, Samanez-Larkin, et al., 2011; Gross et al., 1997), and further complement existing studies by providing detailed insights obtained using time-sampling information.

Importantly, increases in daily sadness and anger were not only associated with low concurrent goal progress. In fact, in line with our hypothesis, daily sadness was also associated with subsequent goal contemplation, and this association was emotion-specific. Higher levels of sadness were associated with higher goal contemplation at the subsequent assessment point. Increases in sadness were followed by changes in goal contemplation in the same direction above and beyond previous beep contemplation. Sadness is thus predictive of levels of, and changes in, goal contemplation. In line with literature suggesting that emotion states such as sadness have developed to aid with less than desirable circumstances (e.g., Nesse, 2000), we too find that sadness can be adaptive. Recognizing that sadness does not have a good reputation, and that most people do not have a particularly strong desire to experience it, sadness seems to hold at least one potentially positive outcome in that it appears to promote thinking things through. Our expectation that anger would be associated with decreased subsequent goal contemplation, however, was not supported. There are several potential reasons why irritation-goal contemplation associations were not found. It has been posited that anger experiences fade quite
rapidly, typically within 10 to 20 minutes of their advent (Frindhandler & Averill, 1982; Tyson, 1998). In the present study, participants were assessed six times per day and it is possible that better capturing any effects of anger, an apparently rapid-changing negative emotion, would have required an even denser assessment schedule. Arguably, there is always a fine line between ideal sampling schedules and feasibility. We believe that for a time-sampling study, more than six measurement points per day would have been overly taxing. Borrowing from experimental studies that involve the evocation of an anger response (e.g., Engebretson, Sirota, Niaura, Edwards, & Brown, 1999; Siegman, Anderson, Herbst, Boyle, & Wilkinson, 1992; Martin & Dahlen, 2011; Small, Lerner, & Fischhoff, 2006), further exploration of how anger may relate to goals could be undertaken in a lab setting. Participants could be given specific goals or tasks to work toward and anger could be induced, perhaps through discussions involving conflict (e.g., Suarez & Williams, 1989; Smith & Allred, 1989) between the participant and the experimenter or a confederate that center on the assigned goals. Subsequent goal contemplation, progress, and adjustment could then be assessed, and comparisons could be made to a group of participants who were exposed to neutral or even positive emotion evoking discussions. Such experimental approaches may complement the reported findings in important ways. Going back and forth between lab and life ensures that findings have high ecological validity while at the same time subjecting them to thorough testing under highly controlled experimental conditions.

Additionally, the current study used daily irritation as a proxy for anger. There are several pros and cons attached to this approach. On one hand, we were hoping to capture the phenomenon of interest while avoiding the use of ‘angry’ which is a socially undesirable emotion that people do not like to report. At the same time we have to recognize that irritation does not cover the entire conceptual space of anger. Hence, while focusing on daily irritation
may have the desired variability in our measure, we cannot assume that irritation leads to
the same outcomes as plain anger. Our expectations surrounding anger and goal regulation
therefore need to be subjected to further empirical testing using a broader representation of
anger, perhaps by combining ratings of daily irritation, frustration, annoyance, or other emotions
that are conceptually close to anger but not as prone to social censoring (e.g., Russell & Fehr,
1994), and/or by employing experimental methods.

Our hypotheses regarding associations between daily negative emotions and longer-term
outcomes were partially supported. Specifically, we demonstrated that higher levels of daily
sadness were associated with greater goal disengagement and goal reengagement at the end of
the study. Hence, this finding is in line with theoretical notions suggesting that experiencing
higher levels of sadness in daily life may contribute to one’s ability to let go of goals after some
time, as well as one’s ability to adopt novel pursuits, which seems plausible given that sadness
was also associated with greater contemplation of one’s goals. Such relationships between
sadness and goal disengagement and reengagement are important given that goal adjustment has
been linked to a broad spectrum of positive outcomes including various health and well-being
measures (e.g., Brandtstädter & Renner, 1990; Carver & Scheier, 1990; Klinger, 1975; Nesse,
2000; Wrosch, et al., 2007; Wrosch & Miller, 2009; Wrosch et al., 2003).

How can we conceptually connect our daily life findings with these longer-term
processes of goal adjustment? As mentioned, increased thinking about one’s goals could be an
adaptive process that fosters problem solving which may in turn ultimately promote the ability to
let go of a goal that has a low likelihood of success (Blanchard-Fields, 2009; Rasmussen,
Wrosch, Scheier, & Carver, 2006). Such a relationship between sadness and overall goal
disengagement may be particularly important if individuals hold goals that are potentially
unrealistic (Miller & Wrosch, 2007; Street, Sheeran, & Orbell, 2000; Wrosch et al., 2007; Wrosch et al., 2003). Further, exploring and committing to novel/alternative goals may help counteract stress that might go along with disengaging from unrealistic goals thereby protecting or enhancing wellbeing (Wrosch et al., 2007). Of note, our study was based on a relatively healthy community-dwelling sample (e.g., participants were screened for mental illnesses such as depression and had no co-morbidities that are associated with hypothalamus-pituitary adrenal function). While our findings provide initial evidence for the adaptive role of negative emotions for goal regulation we also recognize that this association may only emerge if sadness stays within “healthy” bounds. Hence, findings may not translate to particularly vulnerable and/or clinical populations.

Our expectation regarding the potential effects of anger on decreased goal adjustment was not supported. Akin to our above discussion of potential reasons for why anger did not significantly predict reduced subsequent goal contemplation, perhaps our assessment of ‘irritation’ did not fully capture the experience of outright anger or its subsequent goal-regulation properties. Additionally, perhaps anger does not limit goal adjustment as might have been expected. Anger has been linked with persistence and motivation (e.g., Fessler, 2010; Parrott, 1993; Litvak, et al., 2010; Snyder, et al., 2010), and under certain circumstances (e.g., if goal importance was taken into account), anger may facilitate goal attainment thus potentially obviating the need for goal adjustment.

3.2 Strengths and limitations

The present study examined the association between negative emotions and goal regulation while participants engaged in their typical daily life routines. To capture meaningful
fluctuations in emotional experiences and to examine the predicted time-ordered effects, we employed time-sampling methods. While our study methodology has many strengths, our results should be interpreted with cognizance of the following study limitations. First and foremost, the study was not designed with our specific research questions in mind. While we believe that the dataset was well suited to test our empirical questions, there are at least two potential issues with the way that goal contemplation was assessed. Namely, the question “since the last beep, did you stop thinking about your goals?” is meant to capture goal contemplation, but ideally it would have been worded in the reverse to ask if participants had “kept thinking of”, “thought more about”, or even “contemplated” their goals. There may be ambiguity associated with our assessment of contemplation and while we believe to be capturing whether participants had thought things through, there is the potential that they may have been caught up in a loop of unconstructive repetitive or ruminative thought. Whereas rumination has been conceptualized as a stable, negative fixation on achieving a specific desired event, goal, or status (Smith & Alloy, 2009) involving feelings of anxiety, anger, and sadness (Rusting & Nolen-Hoeksema, 1998), and is often discussed in terms of its ties with depression and other mental disorders (e.g., Ciesla, Felton, & Roberts, 2011; Cowdry & Park, 2012; Gruber, Eidelman, Johnson, Smith, & Harvey, 2011), merely increased thought about one’s goals could allow for effective problem solving (e.g., Schwarz, 1990; Bodenhausen et al., 1994). We aimed to capture such contemplation since our question was directed at thinking about goals in our sample of mentally healthy adults and had no emphasis on negative emotions or feelings entrenched in such thoughts, as is characteristic of depressive rumination (Nolen-Hoeksema, 1991). The possibility of capturing rumination could be ruled out if our study included a more detailed assessment of the nature of such thinking, or if follow up studies could identify and compare subgroups of thought type. It
may have been useful to measure and control for trait rumination through use of the Global Rumination Scale (McIntosh & Martin, 1992; For an overview of adaptive and maladaptive repetitive thought see Segerstrom, Stanton, Alden, & Shortridge, 2003 and Watkins, 2008).

Thus, while we perceive the findings as positive, we cannot be certain that we have tapped into a constructive form contemplation or repetitive thought involving problem solving.

Additionally, when participants indicated that they had experienced a specific obstacle or other problem, the questionnaire branched off and they were asked different follow-up questions excluding if they had stopped thinking about goals. Thus, we only have data from 81% of all measurement points. If anything, we believe that this led to underestimating the actual effect because we do not capture contemplation following full-blown problems, which would be expected to be particularly powerful at evoking negative emotions. Additionally, our goal adjustment measure was a modified version of the published scale (Wrosch et al., 2003). We did this to allow participants to provide goal-specific disengagement and reengagement ratings. While this specificity of goal adjustment within our study is believed to be novel and useful, it also makes it difficult to draw comparisons between our study and others that investigate goal adjustment abilities as a more stable personality characteristic. Finally, our sample had been screened for health conditions. Hence, our sample included fewer participants with illnesses and/or comorbidities than the general population (since an aim of the larger study was to assess biomarkers), which resulted in a particularly high functioning older adult sub-sample. This may, at least in part, explain why some of our findings did not provide evidence for age effects (e.g. explaining the lack of age differences in the link between sadness and goal contemplation).
3.3 Future directions

While the findings of this study provide insight on how goals and emotional experiences interrelate and contribute to goal regulation, there is much potential for future studies to better investigate the underlying mechanisms. For example, in follow-up studies we could use a broader representation of anger associated adjectives that more fully captures the underlying conceptual space of anger. Additionally, we could directly use “contemplation” endorsements in daily life to see if findings are similar to those of this study. It might further be interesting to look at rumination tendency as well (e.g., Nolen-Hoeke, 1991; Nolen-Hoeke, McBride, & Larson, 1997) as a variable to control for so as to better tease apart how sadness may contribute to beneficial or detrimental outcomes that both involve thinking about problems. Additionally, it may be interesting to explore specific goals or goal domains (e.g., Sheldon, Ryan, Deci, & Kasser, 2004) of a particular population from this framework to assess which emotions are elicited by goal problems within a given domain, e.g. physical activity or social relationships, and what subsequent goal-regulation strategies are employed. For example, the constructs of autonomy and generativity are commonly explored in the literature on lifespan development. Autonomy has been conceptualized as an individual’s subjective perception of having independence from others, especially family members (e.g., Elder, 1963), and an increase in one’s perceived self-governance efficacy (Greenberger, 1984). Generativity, quite differently, has been defined as a desire to positively and productively contribute to future generations through social endeavours (such as teaching and parenting) so as to pass along knowledge, ideas, and life skills (Cox, Wilt, Olson, & McAdams, 2010). Generative goals are often expected to result in an end-product of one imparting a positive self-legacy for individuals of the future (de St. Aubin, McAdams, & Kim, 2004). Future investigations on how differing emotional
experiences may hold beneficial or detrimental functions for goals pertaining to autonomy (e.g., anger may help one isolate from others and thus foster the ability to be independent) versus generativity (e.g., anger may hinder one’s ability to be generativity which involves a significant social component). We have explored a rich spectrum of goal types but domain differences could have impacted the relationships we were interested in and are thus open for interesting future exploration. Finally, it may be interesting to consider the possibility that individuals purposefully up-regulate sadness or anger (e.g., Riediger et al., 2009) because of their goal regulatory functions. Developing worthwhile and attainable goals is a challenging process, perhaps especially in young adulthood when there are so many major life decisions to be made (e.g., with regard to employment, planning a family, deciding where to live). Thus, one interpretation that would connect our findings with those of Riediger et al. (2009) is that younger adults get into trouble with their goals more easily because, from a developmental standpoint, there is still much that they need to figure out and there are so many coping strategies that require further cultivation. Since sadness appears to help us to consider our goals then perhaps this increased sadness during young adulthood may come about due to differences from their older counterparts who have been shown to demonstrate more inter-goal facilitation (Riediger et al., 2005) and thus potentially more realistic goals. Thus, exploring pro- and contra-hedonic propensities as they relate to goal regulation across the lifespan may provide very interesting insight on how and why our emotions are important for the goals that shape our lives.

Taken together, the present study demonstrates that young adults progress less on their goals, experience more negative emotions, and display greater levels of negative emotions when goal progress is low than older adults. Sadness appears to play a particularly important role for goal regulation in that it increases subsequent goal contemplation, which could have an
important function for goal adjustment down the line. Indeed, sadness was linked with increased goal disengagement and reengagement at the end of our time-sampling period suggesting that it is an important emotional experience for adjusting one’s goals. Hence, the findings of this study provide initial evidence that negative emotions may impact goal regulation in a beneficial way. While interesting, further studies are necessary to investigate what happens after goal disengagement and reengagement, and whether such negative emotional experiences are consciously regulated (e.g., whether they are intentionally up- or down-regulated). Overall, we hope to have contributed initial evidence to the larger picture of how daily negative emotional experiences, in a healthy dose, could play a positive role in development.
Footnotes

1Follow-up analyses were conducted to examine if the relationship between sadness and goal contemplation was unidirectional, and if one’s level of arousal influenced goal contemplation. Firstly, since sadness predicted goal contemplation we wanted to explore if goal contemplation would predict sadness. Goal contemplation did not significantly predict sadness at the subsequent assessment point ($\beta = .00, p = 0.74$), suggesting the importance of temporal order in the relationship between these two variables. Secondly, we further examined the predictive effects of current and previous beep calmness and excitement on goal contemplation to examine the role of arousal. Findings support our assumption that the results are indeed specific to anger and sadness. Specifically, neither current nor previous beep excitement predicted goal contemplation. Previous beep calmness also did not significantly predict goal contemplation. Furthermore, previous beep sadness significantly predicted goal contemplation ($\beta = .02, p = .006$) above and beyond current calmness ($\beta = .01, p = .01$) lending support to the notion that it is sadness itself, and not simply the arousal level associated with it, that is important for subsequent goal contemplation.
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