Temporal distancing, the act of thinking about events or experiences from a broader time perspective, has been shown to improve well-being through reduced distress and avoidance as well as increased positive affect (Bruehlman-Senecal & Ayduk, 2015). The effect of temporal distancing on reduced avoidance suggests that it may be a useful strategy to adopt for goal pursuit, especially for students at risk for attrition (e.g., women in STEM). Participants were asked to identify a stressor and randomly assigned to detail the impact of it on their lives in either the near or distant future. Thinking about their stressor from the distant future increased major commitment only for women in STEM as revealed by post hoc contrasts. For these participants, the distant future perspective increased a focus on the transience of the stressor/stress reaction (impermanence) and their reasons for pursuing a degree in their major (purpose). However, purpose emerged as a unique mechanism through which temporal distancing affects major commitment for female STEM majors.
THE LIGHT AT THE END OF THE TUNNEL: TEMPORAL DISTANCING AND ACADEMIC ATTITUDES

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by

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The transition into college brings a variety of new stressors for students that lead some to question whether they truly belong. This uncertainty can put students at risk for attrition (Deberard, Scott, Glen, Spielmans, & Julka, 2004), which is often costly to both the institution and the student. For the institution, attrition means less income, the sunk expenditures of valuable resources, and potentially lower national rankings. For the student, attrition represents not only the loss of money and effort put toward an outcome that will not materialize, but the gain of potentially large amounts of debt (i.e., student loans) without a resulting credential. Because of these costs, it is important to ensure that temporary stressors (e.g., transitioning into college) do not cause students to leave too early. Further, disproportionate attrition affects individuals from underrepresented groups (e.g., women, ethnic minorities, and first-generation students) in ways that may reinforce societal inequities. Additionally, academic attitudes (e.g., commitment) in the first year of college are predictive of retention in the second year (Morrow & Ackermann, 2012). Thus, identifying strategies targeted toward improving academic attitudes is crucial.

The current research examines whether temporal distancing, or thinking about present challenges from the perspective of the distant future, may be one such strategy for improving academic attitudes in the face of stress. It further investigated whether temporal distancing facilitates a focus on purpose, or the “why” of goal pursuit, and impermanence of the stressor. Finally, this study examined whether the proposed effects are more pronounced for those who feel that they do not belong in a particular domain.

**Foundational Theory and Evidence**

**Construal Level and Academic Goal Pursuit**

Construals are perceptions of events or objects at different levels of psychological distance (Trope & Liberman, 2003). Temporal construal, for example, is the process of mentally representing information about the past or future, either near or distant. Construal level theory argues that as temporal distance increases, information should be construed at a higher level than when temporal distance decreases. Higher level construal involves abstract mental representations. Lower level construal involves more detailed representations. Varying temporal construal, therefore, changes people’s mental representations of these events and their predictions regarding the impact these events will have.
Goals, too, can be represented at different levels of construal (Vallacher & Wegner, 1987). At a higher level, goal information pertains to the “why” of pursuing a goal. At a lower level, goal information targets the concrete steps, or “how”, of pursuing a goal. Similarly, goals and goal pursuit can vary in temporal distance. For example, a first-year student in college can strive to pass a current class (a proximal goal) and to graduate from college (a more distal goal). Lower level construals can be crucial for attaining a goal because they allow for the creation of actionable steps (e.g., implementation intentions) that mark progress toward that goal (Gollwitzer & Brandstätter, 1997). Higher level construals, though, may be important for long term persistence, especially when a goal is difficult to achieve. College degree attainment, which can take four years or more, is one domain in which high level construal might be particularly helpful. For example, students who used a high level construal to represent their academic goals perceived them to be more meaningful and displayed greater motivation to pursue them (Davis, Kelley, Kim, Tang, & Hicks, 2016). Ultimately, achieving these goals requires flexibility in moving from the demands of the current situation to planning for future experiences – all of which can foster goal attainment (Ledgerwood, Trope, & Liberman, 2015).

**Temporal Distancing Attenuates Negative Emotional Responses**

As a coping strategy, work on temporal distancing has focused on how it affects emotional responses to negative events (Bruehlman-Senecal & Ayduk, 2015). The act of contemplating events or experiences from a broader time perspective reduces the perceived emotional impact through reinterpretation. Experimentally induced temporal distance after a stressor resulted in reduced distress and reduced avoidance of emotions (Bruehlman-Senecal & Ayduk, 2015). Among college students, avoidance goals have been associated with reduced academic interest and performance (Harackiewicz, Barron, Carter, Lehto, & Elliot, 1997). Thus, effects of temporal distancing on reduced avoidance suggest that it may be especially important in the context of goal pursuit.

Additionally, individuals with high tendencies to temporally distance reported greater positive affect, greater optimism, and satisfaction with life (Bruehlman-Senecal, Ayduk, & John, 2016). Each of these constructs has been linked to goal achievement. Greater state satisfaction has been shown to facilitate goal pursuit (Hofmann, Finkel, & Fitzsimmons, 2015). Moreover, situated optimism (i.e., the confidence associated with goal attainment) predicts achievement of weight loss goals (Benyamini & Raz, 2007) and academic optimism predicts academic
achievement (Hoy, Tarter, & Hoy, 2006). Given its effects on avoidance, positive affect, optimism, and life satisfaction, temporal distancing could foster goal pursuit.

**Mechanisms and Moderation of Temporal Distancing**

The present study sought to build on the understanding of processes that underlie the beneficial emotional effects of temporal distancing. As seen in Figure 1, the study attempted to build on the original research by looking at how temporal distancing influences goal pursuit—rather than well-being (Bruehlman-Senecal & Ayduk, 2015; Bruehlman-Senecal et al., 2016). Further, it replicated the original research in testing impermanence of a stressor or of stress reactions as a mediator of the relationship between temporal distancing and major commitment and satisfaction. Importantly, this study also proposed the addition of a novel mediator of this relationship, purpose. Finally, it explored a potential moderator, belonging uncertainty, of the proposed relationships among temporal distancing, purpose, impermanence, and major satisfaction and commitment.

**Mechanisms**

Prior work has examined the importance of impermanence of stressors and reactions as a mechanism through which temporal distancing has beneficial emotional outcomes (Bruehlman-Senecal & Ayduk, 2015). The current research proposed that impermanence remains an important mediator in the realm of goal pursuit but suggested that purpose may be equally or more important.

**Impermanence of stressors and reactions.** Underlying the effects of temporal distancing on well-being is impermanence, or the insight that events and one’s responses or reactions to them are temporary (Bruehlman-Senecal & Ayduk, 2015; Bruehlman-Senecal et al., 2016). In multiple studies, impermanence focus has been established as a key mediator between temporal distancing and well-being because it helps with emotional coping. Within an academic context, this evidence may suggest that focusing on the impermanence of major-related stress will have beneficial outcomes because it highlights that the stressor is transient. Thus, the current research will focus on the role of impermanence in allowing temporal distancing to benefit academic attitudes, rather than general well-being.

**Purpose.** Purpose is the overarching reason for pursuing a task (Trope & Liberman, 2010). In the context of construal level theory, purpose is the “why” of higher level construal (Ledgerwood et al., 2015). Similarly, a sense of purpose has been associated with persistence and
positivity toward longer term goals. For example, students who focused on a self-transcendent purpose for learning persisted longer on a boring task and improved their grade point average (Yeager et al., 2014) and individuals with lower status jobs requiring repetitive tasks were more efficient and more positive toward their work when they focused on the prosocial benefit their job confers (Dutton, Roberts, & Bednar, 2010). Additionally, participants who thought about either the process (how) or the purpose (why) of a science task showed increased self-generated communal content related to the task, and, in turn, increased positivity toward science (Steinberg & Diekman, 2017). Given this evidence, temporal distancing – an abstract mindset – should lead people to think about the purpose of their major.

The present study examined whether a purpose focus is promoted through temporal distancing. Specifically, because temporal distancing requires putting a negative event in a broader temporal context, it may lead to a focus on what will endure (i.e., purpose) that is distinct from a focus on the stressor and reactions as temporary (i.e., impermanence).

**A Moderator: Belonging Uncertainty**

Belonging uncertainty involves concerns with being disconnected or devalued in a particular context (Walton & Brady, 2017). Importantly, these events can accumulate over time to produce chronic group differences in levels of belonging uncertainty within a domain (Smith et al., 2014). Thus, events that signal lack of belonging, such as poor performance on a test, have disproportionately large impacts and can undermine the motivation and achievement of those who are negatively characterized in academic contexts (e.g., people of color, first generation students, and women in STEM; Walton & Cohen, 2007). Thus, it is important to provide those who experience belonging uncertainty with strategies to reframe stressful events so that they do not confirm concerns about belonging.

Temporal distancing in the face of stressors may be especially important for those high in belonging uncertainty because it can lead them to frame the stress as temporary (impermanence) and remind them of their reasons for being in that major (purpose). An impermanence focus facilitates emotional coping through recognizing that things will get better and the event will pass (Bruehlman-Senecal et al., 2016). As such, recognizing the transience of stressors may be motivating and improve academic attitudes, especially for those vulnerable to belonging uncertainty. Further, an abstract focus may reduce perceptions of goal incongruity: Thinking about science more abstractly increased the production of other-oriented goal opportunities.
within it and, in turn, increased positivity, especially among women (Steinberg & Diekman, 2017). Therefore, being reminded of purpose should be particularly helpful in inspiring motivation among those high in belonging uncertainty.

I anticipate that women in STEM will be higher in belonging uncertainty than either their male or non-STEM counterparts. Indeed, phenomena such as perceived incompatibility between gender identity and STEM careers (Ahlqvist, London, & Rosenthal, 2013), masculinity evoking décor (Cheryan, Plaut, Davies, & Steele, 2009), numerical representation (Murphy, Steele, & Gross, 2007), and perceived incongruity between valued goals and goal affordances within a domain (Smith et al., 2014) all signal to women that they may not be valued or fit within the STEM context. As such, temporal distancing, through its resulting impermanence and purpose foci, should be especially beneficial for STEM women’s major commitment and satisfaction.

The Current Research

The benefits of temporal distancing for affect, optimism, and well-being have been well established (Bruehlman-Senecal & Ayduk, 2015; Bruehlman-Senecal et al., 2016); however, temporal distancing has yet to be studied as a way to foster major commitment and satisfaction. This research sought to address this gap by examining whether and how temporal distancing improves major satisfaction and commitment. Additionally, I investigated the implications for these predicted effects for groups more vulnerable to belonging uncertainty (e.g., women in natural and physical sciences, engineering, and computer science). Thus, this research examined differences in belonging uncertainty across gender and major group (i.e., STEM or non-STEM). I hypothesized that women in STEM majors would report the highest levels of belonging uncertainty. Further, I expected that because of group differences in belonging uncertainty, female STEM majors who took a distant future perspective would report higher major commitment and satisfaction than their male and non-STEM counterparts who also took a distant future perspective.

This research further proposed a novel mechanism through which temporal distancing may relate to academic attitudes – purpose. A broader time perspective may remind people why they are pursuing their goals in addition to highlighting the impermanence of a negative event. I hypothesized that focusing on impermanence of the stressor and purpose for pursuing the major would be concurrent but separate mechanisms through which temporal distancing fosters positive academic attitudes. It also examined the role of belonging uncertainty in the proposed
relationships. Here, I hypothesized that as belonging uncertainty increases, impermanence and purpose foci should have larger effects on academic attitudes. Thus, this study proposed and tested the model seen in Figure 1.

Methods

Participants

Two hundred seventy-seven undergraduate students were recruited from the psychology department’s participant pool for partial fulfillment of a course requirement. Eight participants were removed because they did not complete one of the key writing tasks. All analyses were completed on the remaining sample of 269 participants. Sensitivity analyses determine the minimum effect size that can be sufficiently detected given a study’s sample size, \( \alpha = 0.05 \), and power (80%; Faul, Erdfelder, Lang, & Buchner, 2007). I conducted a sensitivity analysis which showed the ability to detect small effects. A three-way ANOVA with 8 groups and 1 dependent variable could detect effects of \( f^2 = 0.17 \) or larger.

Of this sample, 132 were women and the median age was 19. The majority (71.1%) of the sample identified as White/European American, with the remaining proportion of racial identities distributed as follows: 20.1% Asian/Asian American, 2.2% Black/African American, 2.2% Multi-racial, 1.9% Hispanic/Latinx.

Participants were coded as STEM or non-STEM majors using the definition of STEM employed in federal STEM initiatives (Chen & Wako, 2009). As such, STEM fields included natural science, engineering, computing and technology fields, and mathematics. Non-STEM majors included psychology, business, education, and others. Ninety-eight participants (48 women) were STEM majors and 171 participants (83 women) were non-STEM majors.

Procedure

Consistent with the protocol outlined in Bruehlman-Senecal and Ayduk (2015), participants were first asked to describe the most significant stressor related to their major at the present moment. Participants then completed a measure of belonging uncertainty. Next, they were randomly assigned to the temporal distancing manipulation which required reflecting on the implications and feelings about this stressor in either the near future or the distant future. Following this, participants completed a series of questionnaires.

Manipulation.
Temporal distancing. Participants who were randomly assigned to the distant future condition were asked to reflect on their feelings about and the implications of the identified stressor ten years from now. Participants who were randomly assigned to the near future condition were asked to reflect on their feelings about and the implications of the stressor one week from now.¹

The exact text of the prompt for the distant future is as follows: “Please take a few moments to consider how you will feel about the stressor you identified 10 years from now along with the implications, if any, this stressor may have on your life 10 years from now. Please also consider the impact, if any, your major will have on your life 10 years from now.” The prompt for the near future was identical except that the specified time frame was 1 week rather than 10 years from now.

Measures.

Moderator.

Belonging Uncertainty. Participants rated their agreement with two items on a scale from 1 (Strongly Disagree) to 7 (Strongly Agree). Items included: “When something bad happens, I feel that maybe I don’t belong in my major,” and “When something good happens, I feel that I really belong in my major” (reverse scored; Walton & Cohen, 2007). Items were averaged to create an index of belonging uncertainty (α = 0.79).

Mediators.

Impermanence. For each of three items, participants rated their agreement on a scale from 1 (Strongly Disagree) to 7 (Strongly Agree). Items included: “I focused on how my perceptions of this event may change over time,” “I told myself that my feelings about the problem are temporary,” and “I focused on how my perceptions of the problem may change over time” (Bruehlman-Senecal & Ayduk, 2015). Items were averaged to create a composite impermanence focus score (α = 0.64).

Purpose. To examine purpose with an emphasis on focus that is parallel to the existing impermanence measure, participants rated their agreement with each of six items adapted from

¹ In the initial studies in Bruehlman-Senecal and Ayduk (2015), a general future condition was used as a control; however, because no key differences were found between the near future condition and the general future condition this control was dropped in subsequent studies. For the sake of power this study used only the distant future and the near future conditions.
Yeager et al. (2014) using a scale from 1 (Strongly Disagree) to 7 (Strongly Agree). Example items included “I focused on my reasons for pursuing this major” and “I thought about why I like my major” (see Appendix A for all items). Items were averaged to create an index of purpose focus ($\alpha = 0.83$).

To assess the validity of this new measure, participants also completed the original Yeager et al. (2014) measure of broader major purpose. The two measures were moderately correlated, suggesting that they are related but distinct constructs; $r(267) = 0.365, p < .001$. All analyses of interest were conducted using the purpose focus measure.\(^2\)

**Outcomes.**

**Major Commitment.** Participants rated their agreement with two items on a scale from 1 (Strongly Disagree) to 7 (Strongly Agree). Items included: “I am motivated to graduate with a degree in my major” and “I am very committed to my major” (Davis et al., 2016). Items were averaged to create an index of major commitment ($\alpha = 0.86$).

**Major Satisfaction.** Participants rated their agreement with each of six items on a scale from 1 (Strongly Disagree) to 7 (Strongly Agree). Example items include “I often wish I hadn’t gotten into this major” and “I feel good about the major I’ve selected” (reverse scored; Nauta, 2007). Items were averaged to create a composite major satisfaction score ($\alpha = 0.90$).

**Results**

First, I examine whether women and men in STEM and non-STEM majors differ in belonging uncertainty. Then, I discuss the effects of temporal distancing on commitment, purpose, and impermanence. Next, I investigate whether belonging uncertainty moderates the effects of temporal distancing. I then examine whether belonging uncertainty moderates the relationships between impermanence and purpose and commitment. Finally, I test whether purpose and impermanence foci uniquely mediate the relationships between temporal distancing and major commitment. Although I originally hypothesized that major satisfaction would be an important outcome variable, no main effect of temporal distancing nor Gender × Major interaction emerged, $ps > 0.20$. Therefore, I focus on commitment as the variable of interest for

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\(^2\) Analyses were also conducted using the broader major purpose measure from Yeager et al. (2014). Results were similar, except that it did not mediate the relationship between the contrast variable and major commitment (95% CI = [-0.08, 0.15]).
the remainder of the results, but explore the potential reasons for this unexpected null result in the discussion.

**Gender, Major, and Belonging Uncertainty**

I predicted that STEM women would be higher in belonging uncertainty than their male or non-STEM counterparts. A 2 (gender: male, female) × 2 (major: STEM, non-STEM) between-subjects analysis of variance (ANOVA) was conducted to examine differences in belonging uncertainty. A main effect of gender emerged such that women reported higher levels of belonging uncertainty ($M = 4.68, SD = 1.52$) than men ($M = 4.09, SD = 1.47$), $F(1,265) = 10.95, p = 0.001, \eta^2_p = 0.04$. Although the main effect of major and the gender by major interactions were both nonsignificant, $p$s > 0.20, the means were in the predicted direction: Women in STEM majors reported the highest levels of belonging uncertainty (see Table 1).

**Temporal Distancing, Impermanence, and Purpose**

**Impermanence.** I predicted that thinking about a stressor from a distant future perspective would lead to higher levels of impermanence focus than thinking about it in the near future. Data were submitted to a 2 (future condition: near, distant) × 2 (gender: male, female) × 2 (major: STEM, non-STEM) between-subjects ANOVA. Main effects of condition and gender emerged. As predicted, participants who thought about the distant future focused on impermanence more ($M = 5.22, SD = 0.97$) than those who thought about the near future ($M = 4.95, SD = 1.00$), $F(1, 261) = 4.79, p = 0.03, \eta^2_p = 0.018$. Additionally, women considered impermanence more ($M = 5.22, SD = 0.97$) than men ($M = 4.96, SD = 1.00$), $F(1,261) = 4.35, p = 0.04, \eta^2_p = 0.016$.

These main effects were qualified by a marginal future condition by gender by major interaction, $F(1,261) = 2.76, p = 0.09, \eta^2_p = 0.010$ (see Figure 2). Despite a nonsignificant interaction, I decomposed this effect within each future condition to test the hypothesis that female STEM majors who took a distant future perspective reported higher consideration of impermanence than their male and non-STEM counterparts who also took a distant future perspective. In the near future condition, the Gender × Major interaction did not emerge, $F(1,129) = 0.49, p = 0.48$. In the distant future condition, the Gender × Major interaction showed the predicted pattern of means but did not reach significance, $F(1,132) = 2.71, p = 0.10, \eta^2_p = 0.020$. Among STEM majors, STEM women reported marginally higher consideration of impermanence than STEM men, $F(1,43) = 3.11, p = 0.08, d = 0.53$. Among non-STEM majors,
men and women did not differ in their consideration of impermanence, $F(1,89) = 0.003$, $p = 0.95$, $d = 0.01$. Although the two-way interaction was not significant, based on visual inspection of the means, I did a post hoc 3 versus 1 contrast. Analyses using Scheffe’s test suggested that, compared to their male and non-STEM counterparts who thought about their stressor from the distant future, STEM women reported marginally higher consideration of impermanence, $p = 0.09$ for the 3 versus 1 contrast.

**Purpose.** I predicted that thinking about a stressor from a distant future perspective would lead to higher levels of purpose focus than thinking about it in the near future. Data were submitted to a 2 (future condition: near, distant) x 2 (gender: male, female) x 2 (major: STEM, non-STEM) between-subjects ANOVA. Although the predicted main effect of temporal distancing did not emerge, $F(1,261) = 0.40$, $p = 0.53$, $\eta_p^2 = 0.002$, a main effect of major and a marginal main effect of gender did. STEM majors focused on purpose more ($M = 6.03$, $SD = 0.76$) than non-STEM majors ($M = 5.67$, $SD = 0.85$), $F(1,261) = 10.74$, $p = 0.001$, $\eta_p^2 = 0.040$, and women focused on purpose more ($M = 5.96$, $SD = 0.75$) than men ($M = 5.74$, $SD = 0.91$), $F(1,261) = 3.62$, $p = 0.06$, $\eta_p^2 = 0.014$.

The hypothesized future condition by gender by major interaction was nonsignificant, $F(1,261) = 1.94$, $p = 0.16$, $\eta_p^2 = 0.007$ (see Figure 3). Despite a nonsignificant interaction, I decomposed this effect within each future condition to test the hypothesis that female STEM majors who took a distant future perspective reported higher consideration of purpose than their male and non-STEM counterparts who also took a distant future perspective. In the near future condition, the Gender × Major interaction did not emerge, $F(1,129) = 1.88$, $p = 0.17$. In the distant future condition, the Gender × Major interaction showed the predicted pattern of means but did not reach significance, $F(1,132) = 0.33$, $p = 0.57$, $\eta_p^2 = 0.002$. Among STEM majors, the pattern of means showed that STEM women considered purpose more than STEM men, $F(1,43) = 2.19$, $p = 0.15$, $d = 0.46$. Among non-STEM majors, men and women did not differ in their consideration of purpose, $F(1,89) = 0.76$, $p = 0.39$, $d = 0.19$. Although the two-way interaction was not significant, based on visual inspection of the means, I did a post hoc 3 versus 1 contrast. Analyses using Scheffe’s test suggested that, compared to their male and non-STEM counterparts who thought about their stressor from the distant future, STEM women reported higher consideration of purpose, $p = 0.04$ for the 3 versus 1 contrast.

**Temporal Distancing and Commitment**
I predicted that women in STEM would show higher levels of major commitment when they thought about their stress from the distant future than when they thought about it from the near future. A 2 (future type: near, distant) × 2 (gender: male, female) × 2 (major: STEM, non-STEM) between-subjects ANOVA was conducted to investigate differences in commitment. The three-way interaction was marginal, \( F(1,261) = 3.23, p = 0.07, \eta^2_p = 0.012 \) (see Figure 4). I decomposed this effect within future condition. In the near future condition, the Gender × Major interaction was nonsignificant, all \( p > 0.20 \). In the distant future condition, the Gender × Major interaction showed the predicted pattern of means but did not reach significance, \( F(1, 132) = 2.17, p = 0.14, \eta^2_p = 0.016 \). Among STEM majors, the pattern of means showed that STEM women reported higher major commitment more than STEM men, \( F(1,43) = 2.53, p = 0.11, d = 0.47 \). Among non-STEM majors, men and women did not differ in their major commitment, \( F(1,89) = 0.64, p = 0.80, d = 0.05 \). Although the two-way interaction was not significant, based on visual inspection of the means, I did a post hoc 3 versus 1 contrast. Analyses using Scheffe’s test suggested that, compared to their male and non-STEM counterparts who thought about their stressor from the distant future, STEM women were more committed to their majors, \( p = 0.027 \) for the 3 versus 1 contrast.

**Temporal Distancing and Belonging Uncertainty**

I hypothesized that belonging uncertainty would moderate the relationship between temporal distancing and impermanence focus. I entered dummy coded future condition (0 = near future, 1 = distant future), mean centered belonging uncertainty, and their interaction into a regression predicting impermanence focus. The interaction term was not significant, \( \beta_{\text{Future Condition} \times \text{Belonging Uncertainty}} = 0.029, p = 0.73 \). I also predicted that belonging uncertainty would moderate the relationship between temporal distancing and purpose focus. I entered dummy coded future condition, mean centered belonging uncertainty, and their interaction into a regression predicting purpose focus. The interaction term was not significant, \( \beta_{\text{Future Condition} \times \text{Belonging Uncertainty}} = -0.003, p = 0.97 \). Finally, I anticipated that belonging uncertainty would moderate the relationship between temporal distancing and major commitment. I entered dummy coded future condition, mean centered belonging uncertainty, and their interaction into a regression predicting major commitment. The interaction term was not significant, \( \beta_{\text{Future Condition} \times \text{Belonging Uncertainty}} = 0.029, p = 0.72 \). Thus, belonging uncertainty did not moderate these relationships.
Impermanence, Purpose, and Commitment

I hypothesized that belonging uncertainty would moderate the relationship between purpose and commitment. I entered mean centered purpose focus, mean centered belonging uncertainty, and their interaction into a regression predicting commitment. Purpose significantly predicted commitment, $\beta = 0.42$, $p < 0.001$, but was moderated by belonging uncertainty, $\beta_{\text{Purpose} \times \text{Belonging Uncertainty}} = 0.19$, $p = 0.002$. As shown in Figure 5, simple slopes revealed that the relationship between purpose and commitment was strongest for those who were high in belonging uncertainty ($\beta = 0.52$, $p < 0.001$) and weakest, albeit still significant, for those who were low in belonging uncertainty ($\beta = 0.32$, $p < 0.001$).

I also predicted that belonging uncertainty would moderate the relationship between impermanence and commitment. I entered mean centered impermanence focus, mean centered belonging uncertainty, and their interaction into a regression predicting commitment. Impermanence significantly predicted commitment, $\beta = 0.20$, $p < 0.001$, and was not moderated by belonging uncertainty, $\beta_{\text{Impermanence} \times \text{Belonging Uncertainty}} = 0.06$, $p = 0.325$. Thus, belonging uncertainty significantly moderated the relationship between purpose and commitment, but did not moderate the relationship between impermanence and commitment.

Mediational Analyses

I predicted that purpose and impermanence foci would operate as parallel mediators of the relationship between temporal distancing and commitment. Because the women in STEM who took a distant future perspective showed higher levels of purpose, impermanence, and major commitment, I tested the model by comparing this group to their male and non-STEM counterparts who also thought about the distant future. I created a contrast variable where female STEM majors in the distant future condition were coded as 1 and the other three groups were coded as 0. Using Hayes PROCESS macro model 4 and 10,000 bootstrapped samples, I entered this contrast variable as the predictor variable, purpose focus and impermanence focus as the mediators, and commitment as the outcome variable. As depicted in Figure 6, purpose focus emerged as a significant mediator (0.09, 95% CI = [0.02, 0.19]), whereas impermanence focus did not (0.01, 95% CI = [-0.009, 0.07]).

3 Models with purpose and impermanence focus as single mediators were also tested. Impermanence remained a nonsignificant mediator (0.02, 95% CI = [-0.02, 0.09]). Purpose remained a significant mediator (0.10, 95% CI = [0.02, 0.20]).
I also hypothesized that belonging uncertainty would moderate the benefits of purpose and impermanence focus on major commitment. I again created a contrast variable where female STEM majors in the distant future condition were coded as 1 and their male and non-STEM counterparts who also thought about the distant future were coded together as 0. Using Hayes PROCESS macro model 14 with 10,000 bootstrapped samples, I entered this contrast variable as the predictor variable, purpose focus as the mediator\(^4\), belonging uncertainty as the moderator, and commitment as the outcome variable. The index of moderated mediation did not cross zero, \([0.01, 0.06]\), indicating successful moderation of the indirect effect. As shown in Figure 6, purpose mediated the relationship across levels of belonging uncertainty; however, the indirect effect was strongest for those high in belonging uncertainty.

**Discussion**

This research investigated the effects of temporal distancing on major commitment and satisfaction, examined impermanence and purpose as mediators for this effect, and investigated belonging uncertainty as a moderator. The results provided partial support for the benefits of temporal distancing on goal pursuit: Women in STEM thinking about their stressors from the distant future had higher major commitment than their male counterparts or non-STEM counterparts. Satisfaction, however, did not change. These findings build upon existing research (Bruehlman-Senecal & Ayduk, 2015; Bruehlman-Senecal et al., 2016) by showing that, among women in STEM, thinking about a negative event or stressor in the distant future is beneficial for some aspects of academic goal pursuit rather than just well-being.

Further, the current research found evidence that purpose is a stronger mechanism through which temporal distancing improves major commitment than impermanence. Because temporal distancing is an abstraction process (Trope & Liberman, 2003), it shifted the focus to other types of higher level construals (e.g., purpose) for women in STEM. Whereas the link between purpose and major commitment has been well documented (Yeager et al., 2014), this research is some of the first to empirically examine the link between temporal distancing, purpose, and commitment.

**Theoretical and Practical Contributions**

\(^4\) Belonging uncertainty did not moderate the relationship between impermanence and major commitment. Because of this, moderated mediation analyses were only conducted using purpose as a mediator.
For women in STEM, the present findings are compatible with and build on previous work in temporal distancing; at the same time, the null effects for men in STEM are surprising and suggest a boundary condition. Consistent with past work is the finding that women in STEM who thought about their stressor from the distant future focused on the importance of persisting through temporary stressors (particularly those related to exams/work load and difficult classes) in order to achieve their future goals (Bruehlman-Senecal & Ayduk, 2015). New to this research is the finding that women in STEM also readily identified the reasons (e.g., purpose) for needing to persist. Thus, asking female STEM majors to think about their stressor from the distant future reminded them that their immediate stressors are both temporary and necessary for growth toward their hoped-for distant futures.

For women in STEM, these results suggest that leveraging temporal distancing, especially as it relates to purpose, to encourage goal pursuit could facilitate the creation of interventions. In line with a movement toward interventions that are “wise to”, or tailored to, addressing specific psychological processes (Walton, 2014), these findings could be especially helpful for improving college and major retention among groups who have historically been underrepresented (e.g., people of color, women in STEM, first generation students). Specifically, having identified purpose as a stronger mechanism than impermanence in the realm of goal pursuit suggests that temporal distancing interventions would benefit from targeting those processes.

It was surprising to find a null effect of temporal distancing among all other groups, given that previous research did not find moderation by gender (Bruehlman-Senecal & Ayduk, 2015; Bruehlman-Senecal et al., 2016): To understand further, I examined the content of essays written for the stressor description and the temporal distancing manipulation. Although women and men in STEM majors did not seem to differ drastically in the acute stressors they identified, the content of their temporal distance essays did seem quite different. Compared to STEM women, the men in STEM who thought about their stressor from the distant future were much more likely to focus on the emergence of other future stressors. For example, many participants talked about concern for obtaining an enjoyable job in their chosen field. Men’s career focus in the distant future is consistent with past work showing that thinking about possible selves leads to gender role-congruent content (Brown & Diekman, 2010). Men in STEM who thought about their distant futures may have focused on the stressors involved in men’s traditional roles as
breadwinners (Croft, Schmader, & Block, 2015). Indeed, being reminded of the distant future seemed to cause men to tie future stress back to money. For example, men in STEM majors expressed increased concerns about being able to find financially stable careers (i.e., monetary concerns).

Taken together, these patterns may suggest an important boundary condition for the effects of temporal distancing on emotion regulation and goal attainment: Male STEM majors asked to consider their stressor from the distant future generated content related to new stressors. Temporal distancing should only reduce stress if psychological distance from the stressor is actually achieved. Thus, care should be taken to find interventions for men that allow them to increase their psychological distance from the current stressor without focusing on new stressors. Such interventions might leverage other methods of increasing psychological distance (e.g., power) prior to or coupled with temporal distancing manipulations. Because power reduces the influence of the situation (Galinsky, Magee, Gruenfeld, Whitson, & Liljenquist, 2008) and increases optimism (Anderson & Galinsky, 2006), priming men with power before temporal distancing may allow psychological distance from the current stressor.

The current research also adds to the literature examining the role of purpose in goal pursuit (Smith et al., 2014; Yeager et al., 2014): Focusing on the reasons for major pursuit was especially helpful in increasing major commitment for those high in belonging uncertainty. These results suggest that the purpose focus that emerges from temporal distancing may benefit a variety of student groups vulnerable to belonging uncertainty (e.g., Native Americans, people of color). Thus, temporal distancing may ultimately improve retention outcomes for these students.

Contrary to my initial predictions, belonging uncertainty on its own did not moderate the effects of temporal distancing on impermanence, purpose, or major commitment, in part because there were no effects of temporal distancing to moderate. Importantly, though, temporal distancing did not appear to benefit even those who were vulnerable to belonging uncertainty. One explanation for this null effect may be that the stressor prime itself, having reminded everyone of major related stressors, could have overridden any effects experienced by those vulnerable to belonging uncertainty.

This finding also suggests that there are factors beyond belonging uncertainty that allowed the benefits of taking a distant future perspective to emerge for women in STEM but not other students. For example, women are more likely to attribute difficulties to a lack of ability
(Koch, Müller, & Sieverding, 2008) and STEM majors in particular are associated with fixed beliefs about aptitude (Meyer, Cimpian, & Leslie, 2015). One possibility, therefore, is that temporal distancing reduced these concerns by allowing STEM women to reframe their difficulties as emerging from their current situation (i.e., college) rather than a lack of ability and reminded them that growth is possible. Further research is needed to understand what other factors may contribute to the benefits temporal distancing conferred to women in STEM majors.

**Limitations and Future Directions**

In the current research, the onus of focusing on impermanence and purpose lie predominantly on the individual. Although examining these purpose and impermanence foci as emanating from the person is a good first step, future research would do well to investigate ways in which the context can trigger these purpose and impermanence foci in the face of negative events. One way may be through organizational policies directed at communicating purpose. Organizations (e.g., businesses or university departments) have the power to shape endorsed beliefs and mindsets (Murphy & Dweck, 2010). Therefore, a university department may be able to create slogans or programs (e.g., guest speakers) that directly communicate purpose to individuals. Similarly, the focus on growth within the female STEM major essays suggests that a broader temporal perspective may also cue a growth mindset, the belief that intelligence or skills can be grown over time (Murphy & Dweck, 2016). Moving forward, it will be important to examine this link directly, because it could indicate that growth mindset interventions are especially beneficial when they incorporate an element of temporal distancing, and that temporal distancing interventions are particularly helpful when they incorporate elements of growth. Consolidating aspects of each of these processes into one intervention may provide long lasting benefits with low levels of effort and cost.

A crucial future research direction will be in identifying why major satisfaction showed null effects within temporal distancing. Previous work has shown that temporal distancing positively predicted life satisfaction (Bruehlman-Senecal et al., 2016). In contrast, the current work showed differences in major commitment and no differences in major satisfaction across future condition. One potential reason for these null effects may be the use of manipulated temporal distance rather than individual differences in tendency to temporal distance. Differing effects across the two paradigms indicate that the benefits of temporal distancing for satisfaction in particular may only occur through practice and over time. Moving forward it will be important
to determine whether repeated exposure to manipulated temporal distancing yields the same benefit for satisfaction that chronic tendencies to engage in this strategy does.

**Conclusion**

Identifying strategies, such as temporal distancing, that can remind students why their goals are important (purpose) and that the difficulties they are experiencing are temporary (impermanence) could ensure that students are not derailed from valued goals because of momentary stressors. Thus, such strategies can help improve persistence when such difficulties arise. Temporal distancing seems to be especially useful for those who are likely to experience belonging uncertainty in particular domains and, indeed, did not show benefits except among women in STEM. Future research will need to empirically investigate why no one else benefitted from temporal distancing. For women in STEM, however, the message seems clear: When times are hard, then, focusing on the light at the end of the tunnel may be a needed reminder that the darkness will end.
References


https://doi.org/10.1007/s11031-015-9522-x


https://doi.org/10.1037/a0012633

https://doi.org/10.1037/0022-3514.73.1.186


https://doi.org/10.1037/0022-3514.73.6.1284


https://doi.org/10.3102/00028312043003425


https://doi.org/10.1016/j.compedu.2008.05.007


https://doi.org/10.1002/9781118900772.etrds0052


https://doi.org/10.3389/fpsyg.2015.00235


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Figure 1. The proposed model.
Table 1

*Belonging Uncertainty by Major and Gender*

<table>
<thead>
<tr>
<th>Major Type</th>
<th>Male</th>
<th>Female</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>$M$ (SD)</td>
<td>n</td>
</tr>
<tr>
<td>Non-STEM</td>
<td>88</td>
<td>4.07 (1.42)</td>
<td>83</td>
</tr>
<tr>
<td>STEM</td>
<td>50</td>
<td>4.13 (1.79)</td>
<td>48</td>
</tr>
<tr>
<td>Overall</td>
<td>138</td>
<td>4.09 (1.47)</td>
<td>131</td>
</tr>
</tbody>
</table>
Figure 2. Effects of temporal distancing and group membership on impermanence focus. Error bars represent +/-1 standard error. Pairwise comparison for STEM men and STEM women in the distant future condition, $F (1, 43) = 3.11, p = 0.08, d = 0.53$. Pairwise comparison for Non-STEM men and Non-STEM women in the distant future condition, $F (1, 89) = 0.003, p = 0.95, d = 0.01$. † = marginal significance.
Figure 3. Effects of temporal distancing and group membership on purpose focus. Error bars represent +/-1 standard error. Pairwise comparison for STEM men and STEM women in the distant future condition, $F (1, 43) = 2.19, p = 0.15, d = 0.46$. Pairwise comparison for Non-STEM men and Non-STEM women in the distant future condition, $F (1, 89) = 0.76, p = 0.39, d = 0.19$. 
Figure 4. Effects of temporal distancing and group membership on major commitment. Error bars represent +/- 1 standard error. Pairwise comparison for STEM men and STEM women in the distant future condition, $F(1, 43) = 2.53, p = 0.11, d = 0.47$. Pairwise comparison for Non-STEM men and non-STEM women in the distant future condition, $F(1, 89) = 0.64, p = 0.80, d = 0.05$. 
Figure 5. Belonging uncertainty moderates relationship between purpose focus and commitment.
Figure 6. Model with both purpose and impermanence focus as mediators. In the above model, the 3 versus 1 contrast discussed on page 17 is the predictor. * $p < 0.05$, ** $p < 0.01$
Figure 7. Mediation model with belonging uncertainty moderating the path from purpose focus to commitment.
Appendix A – Measures

Purpose Focus Measure
Please rate your agreement with each item below.
1. I focused on my reasons for pursuing this major.
2. I thought about why I am interested in my major.
3. I focused on my desire to contribute to society and make a positive impact on the world through my future career.
4. I thought about my reasons for wanting a career associated with this major.
5. I focused on why I like my major.
6. I thought about why I chose my major.

Purpose Measure (adapted from Yeager et al., 2014)
How true for you personally are each of the following reasons for going to college?
1. I want to learn things that will help me make a positive impact on the world.
2. I want to gain skills that I can use in a job that helps others.
3. I want to become an educated citizen that can contribute to society.
4. I want to expand my knowledge of the world.
5. I want to become an independent thinker.
6. I want to learn more about my interests.
7. I want to get a good job.
8. I want to leave my parents’ house.
9. I want to have fun and make new friends.