Connected to a Better Me and Ignoring You: The Role of Future Self-Connectedness in Social Comparison and Temporal Self-Comparison Processes

by

Robert Mark Adelman

A Dissertation Presented in Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy

Approved April 2018 by the
Graduate Supervisory Committee:

Virginia S. Y. Kwan, Chair
C. Athena Aktipis
Kevin J. Grimm
Steven L. Neuberg

ARIZONA STATE UNIVERSITY

May 2018

ABSTRACT

Individuals differ in the extent to which they feel connected to their future selves, which predicts time preference (i.e., preference for immediate versus delayed utility), financial decision-making, delinquency, and academic performance. Future self-connectedness may also predict how individuals compare themselves with their past selves, future selves, and other people. Greater connectedness may lead to more self-affirming types of temporal self-comparison, less self-deflating types of temporal self-comparison, and less social comparison. Two studies examined the relation between future self-connectedness and comparison processes, as well as effects on emotion, psychological adjustment, and motivation. In the first study, as expected, future self-connectedness positively predicted self-affirming temporal self-comparison and negatively predicted self-deflating temporal self-comparison and social comparison. In addition, future self-connectedness had beneficial direct and indirect effects on adjustment, emotion regulation, and motivation. Unlike previous research, this study examined all three components of future self-connectedness, as opposed to only one. Exploratory analyses examined the items comprising the similarity-connectedness component and found that the relation of these items to the other variables in the model did not differ, though some of the relations in the model were moderated by college generation status. The second study tested whether increasing future self-connectedness would have similar effects on comparison, adjustment, emotion, and motivation. It implemented a pilot future self-connectedness manipulation, an established identity-stability manipulation, and a control condition. The

pilot manipulation and identity-stability manipulation failed to affect future self-connectedness relative to control, and did not affect comparison, motivation, adjustment, or emotion. Future research should ascertain whether there is a causal link between connectedness and social comparison or temporal self-comparison processes. Overall, this research links future self-connectedness to social comparison and temporal self-comparison processes, as well as well-being, emotion, and motivation, which demonstrates the importance of connectedness in new, important areas.

TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

Connected to a Better Me and Ignoring You: The Role of Future Self-Connectedness in Social Comparison and Temporal Self-Comparison Processes

We look to others all the time, especially in the goal-oriented parts of our lives, as they provide important information about our abilities and competencies. Consider a high school junior who has just received feedback on a recent test. He may think about his performance relative to other kids in the class, in contrast to his past scores, or compared to how well he wants to perform in the course (i.e., how well his future self will do). That is, he may compare himself to others, to his past self, or to his future self. This comparison may be with an individual who is doing better or doing worse than he is (i.e., upward or downward comparison, respectively), and the consequences of this comparison may differ based on the reference point. For instance, thinking about how he has done better in the past may be demotivating and discouraging, whereas comparing his current performance to how well he anticipates his future self will do may affirm his belief in his own abilities and help direct his behavior toward long-term goal pursuit. These social comparisons and temporal self-comparisons are pervasive social psychological phenomena and occur in many domains; the example could have just as easily invoked a runner and his half-marathon time, a Dilbert-type business drone and her year-end bonus, or a musician and his record sales.

In order to gain insight into these comparison processes and to build on an emerging body of literature, I investigate how psychological connectedness to the future self (i.e., the extent to which individuals perceive overlap between current and future

selves, the extent to which they perceive the future self to be the same person as their present self) affects the selection of comparison target, which has implications for intrapsychic adjustment, emotion, and motivation (see Collins, 1996 for a review). I contend that when individuals are more connected to their future selves they compare themselves less to others and also engage in temporal self-comparisons that are more self-affirming and less self-deflating. Because research has not yet addressed the link between future self-connectedness and social comparison or temporal self-comparison processes, this work has the potential to make contributions to these literatures by establishing that future self-connectedness affects novel outcomes via these comparison processes.

In this dissertation, I first review the literature on future self-connectedness and detail the logic for why I propose a link between future self-connectedness and comparison processes. Second, I consider the social comparison and temporal self-comparison literatures, leverage those insights in order to make predictions about the effects of future self-connectedness via comparison processes, and describe potential contributions of this research to the future self-connectedness and social comparison literatures. Third, I describe the two empirical studies in this investigation and report their findings. These studies address three primary aims – establish the relations among future self-connectedness, social comparison, and temporal self-comparison; investigate whether future self-connectedness affects intrapsychic adjustment, emotion, and motivation via these comparison processes; and test whether experimentally increasing

future self-connectedness has corresponding effects on these comparison processes and downstream outcomes.

Conceptualization of Connectedness to the Future Self

The philosopher Derek Parfit conceptualizes the self as a collection of distinct identities over time and defines connectedness to the future self as the extent to which individuals possess strong psychological connections, such as in the form of memories, beliefs, or goals – that overlap between present and future selves (Parfit, 1971; 1984; 1986). Parfit's theories suggest that individuals value the utility experienced by their future self less, holding timing constant, when they are less connected to that future self. That is, subjective valuation of future outcomes decreases as connectedness to future selves decreases. The psychological research on connectedness with the future self, much of it under the banner of future self-continuity (e.g., Ersner-Hershfield, Garton, Ballard, Samanez-Larkin, & Knutson, 2009; Hershfield, 2011), draws heavily from these ideas and conception of the self over time.

The future self-continuity perspective proposes a triadic conceptualization of psychological connectedness to future selves, consisting of (1) positivity of the future self, (2) vividness of the future self, and (3) similarity to the future self (Hershfield, 2011). Positivity facilitates continuity with future selves because if the attitude individuals hold toward future selves is positive (as opposed to negative), it should be easier to feel continuity to those future selves (e.g., Hershfield, 2011). If the future self is vividly imagined, individuals should feel a greater sense of connection to it (e.g.,

Hershfield, Goldstein, Sharpe, Fox, Yeykelis, Carstensen, & Bailenson, 2011; van Gelder, Hershfield, & Nordgren, 2013; van Gelder, Luciano, Kranenbarg, & Hershfield, 2015). Individuals feel more connected to people who are similar to themselves, so feeling more similar to future selves should promote continuity with those future selves (e.g., Ersner-Hershfield, Garton, Ballard, Samanez-Larkin, & Knutson, 2009; Bartels & Rips, 2010; Bartels & Urminsky, 2011; Hershfield, Cohen, & Thompson, 2012).

Relations among components. The future self-continuity perspective theorizes that these three components are positively related, though there is very limited evidence in support of this because most of the research from this perspective focuses on only one of the three proposed components, and no published research to date has tested all three components together within a single framework. As for the supporting evidence there is, an experimental manipulation designed to increase future self-vividness by showing participants computer-aged images of themselves led to perceptions of greater similarity to the future self (Hershfield et al., 2011), and one study found positive associations among measures of liking the future self, measures of feeling connected to the future self, and measures of feeling similar to the future self (Ersner-Hershfield et al., 2009). The former suggests that manipulating one component positively affects another, and the latter suggests two of the components are positively related. Though these findings support positive relations among the three components, other research found no effect of connectedness manipulations on liking the future self or on focusing on positive outcomes (Bartels & Urminsky, 2013). Future research is warranted in order to more

clearly establish how these three components are interrelated. Another aim of this dissertation is to fill that gap in the literature by examining the interrelations among these components as well as their convergent and divergent validity.

Terminology. Not all research on this topic uses the term future self-continuity as Hershfield does. Another group of researchers refers to this construct as psychological connectedness to the future self and focuses on the perceived (in)stability of the individual's personal identity and the traits that comprise it, with greater perceived stability and similarity corresponding to greater connectedness (e.g., Bartels & Rips, 2010; Bartels & Urminsky, 2011; Bartels, Kvaran, & Nichols, 2011; Urminsky, 2017). Because this research takes a more integrative approach to connectedness to the future self and because connectedness reflects Parfit's original meaning more than continuity does (Parfit, 1984, p. 206), I use the term **future self-connectedness**. To add clarity when referring to a specific component of future self-connectedness, I substitute connectedness with the name of that component (e.g., future self-similarity, future self-positivity, and future self-vividness).

Correlates and Consequences of Future Self-Connectedness

Much of psychological research on future self-connectedness examines the link between future self-similarity and temporal discounting, demonstrating that greater connectedness predicts lower devaluation of future outcomes in monetary time preference tasks (Ersner-Hershfield et al., 2009), and subsequent research has replicated this finding (Bartels & Rips, 2010; Bartels & Urminsky, 2011). This relation to temporal discounting

tendencies extends beyond financial decisions; future self-similarity also predicts less myopic intertemporal decision making on discounting tasks involving good days and bad days on the job, extra workdays, and extra vacation days, as opposed to money (Bartels & Rips, 2010). Research utilizing fMRI techniques has yielded parallel findings: making decisions about a future self does not elicit the same activation in the medial prefrontal cortex and rostral anterior cingulate as does making decisions about the current self, and the difference in activation between these brain regions for current-self-related and future-self-related decisions predicts subsequent measures of temporal discounting (Ersner-Hershfield, Wimmer, & Knutson, 2009). Beyond its relation to discounting, future self-similarity predicts greater financial assets (Ersner-Hershfield et al., 2009), and having vivid mental imagery of the future self is associated with greater retirement preparation (Ellen, Wiener, & Fitzgerald, 2012). In addition, future self-similarity is positively associated with ethical business decision making and negatively associated with actual cheating behavior and making false promises (Hershfield et al., 2012). In the academic domain, future self-similarity confers positive downstream benefits in objective academic performance via self-control and the consideration of immediate/future consequences (Adelman et al., 2017) and is negatively associated with self-reported academic procrastination (Blouin-Hudon & Pychyl, 2015).

In addition to the predictive validity of future self-connectedness, research has found evidence that it is malleable, and several studies have utilized experimental manipulations to affect connectedness and its correlates. Taken together, these

connectedness manipulations have led to increased future self-similarity (Bartels & Urminsky, 2011; Joshi & Fast, 2013; Hershfield et al., 2012; Sheldon & Fishbach, 2015), more-patient (i.e., less-myopic) discounting behavior (Hershfield et al., 2011; Hershfield, 2011; Bartels & Urminsky, 2011), increased investment and saving on money allocation tasks (Hershfield et al., 2011; Bartels & Urminsky, 2015), and reduced adolescent delinquency (van Gelder et al., 2013; Van Gelder et al., 2015). Overall, research on future self-connectedness has largely focused on judgment and decision-making, temporal valuation, delinquency, and academic performance. It has not, however, examined outcomes related to well-being, emotion regulation, or comparison processes.

Social Comparison

One reason to examine the link between future self-connectedness and social comparison is because it would connect future self-connectedness to outcomes related to intrapsychic adjustment and emotion. The comparison target individuals use to gauge their own standing – whether it's a hypothetical other, close friend, or one's past or future self – has powerful consequences for both mental health and social behaviors (Kwan et al., 2004; Kwan et al., 2008; Tesser, 1988; Tesser, 2000; Wilson & Ross, 2001; Collins, 1996). Given emerging evidence that future self-connectedness functions to direct temporal attention (Hershfield, Cohen, & Thompson, 2012; Adelman et al., 2017), connectedness may affect comparison processes by directing attention away from or toward particular comparison targets. In general, much of the literature finds that downward social comparison serves self-enhancement motives, decreases anxiety, and

increases self-esteem as well as positive emotion, whereas upward social comparison serves self-improvement motives, decreases self-evaluations, and elicits negative affect (e.g., Morse & Gergen, 1970; Wills, 1981; Brickman & Bulman, 1977; Diener, 1984; Nosanchuk & Erickson, 1985; Gibbons, 1986; Major, Testa, & Bylsma, 1991; Wheeler & Miyake, 1992). Linking future self-connectedness to these types of outcomes would represent an original contribution to this literature.

Individuals often employ social comparison as an information gathering strategy, such as to accurately assess their own ability and form competence beliefs (Festinger, 1954; Mussweiler, 2003). Researchers describe social comparison as a "pervasive social phenomenon" (Suls, Martin, & Wheeler, 2002, p. 159), and its functional nature as an information gathering strategy has implications for when individuals use social comparison and temporal self-comparison. In general, but especially for those high in connectedness, the future self provides an important, salient, and powerful reference point against which to evaluate the current self. As such, those high in connectedness with their future selves may rely less on information about proximal others. Using temporal self-comparison with a future self instead of social comparison with another individual in the proximal environment should occur when information about the future self is relevant and useful. The future self provides especially useful, relevant information about long-term future goals and one's capacity to attain such goals. These conditions make the future self a good comparison target for self-evaluation on attributes germane to those goals. Much of the time, however, individuals need to gather information about

their current self and the immediate environment. Thus, contextual and situational factors can make certain comparison targets more or less useful or relevant to the individual.

Findings from the social comparison literature lend credence to the notion that individuals high in connectedness may favor comparisons with their temporal selves. Individuals may use another person as a proxy from which to infer beliefs about their own abilities or gather other information and tend to use a comparison target that is similar to themselves (Festinger, 1954; Goethals & Darley, 1977; Suls et al., 2002). Individuals can expect to perform similar to a proxy if they have a similar performance history as that proxy, which makes that proxy a more suitable target for social comparison (Suls et al., 2002; Suls et al., 2000; Suls, Lemos, & Stewart, 2002; Wheeler, Martin, Suls, 1997). Similar comparison targets provide information that tends to be more relevant and useful; when assessing his own athletic ability, an eighth-grade boy would find it more useful and informative to compare himself to other middle school boys as opposed to comparing himself to olympians. Individuals who are high in connectedness to future selves view those future selves as similar to their current selves, and that similarity may increase the likelihood that future selves are used as comparison targets.

When More of Me Means Less of You

Further, future self-connectedness may decrease the extent to which individuals engage in social comparison with other people because individuals engaging in social comparison tend to focus on a single comparison target (Mussweiler, 2003; Sanbonmatsu, Posavac, Kardes, & Mantel, 1998), so more comparison to future selves (or past selves)

would mean less comparison to others. To clarify, this means that when making a particular judgment, individuals tend to use a single comparison target, not that individuals tend to restrict themselves to a single comparison target for all social comparison. Also, *single comparison target* is not necessarily restricted to a single individual but could also include classes or categories of individuals. A student who is attempting to gauge her ability in a certain subject may compare herself to a similar classmate or she may compare herself to a holistic representation of students in her grade. As another example, a teenage boy may infer his athletic prowess via comparison with another boy his age, or he may instead compare himself to boys his own age. The two examples provide different cases of a single comparison target, even if that target is a group comprised of multiple individuals. To be clear, I do not suggest that high connectedness individuals entirely eschew comparison with others around them, but rather a hydraulic mechanism by which they are more likely to favor comparison with future selves over comparison with others under certain circumstances.

This hydraulic mechanism by which high-connectedness individuals compare themselves more to future selves and less to others may be most pronounced when both comparison targets could plausibly provide relevant, useful information. When individuals get performance feedback, for example, they can interpret this information relative to others or relative to future selves/goals; it is in cases like this where future self-connectedness may lead individuals to look to their future selves and goals rather than to others. Consistent with this, I found that future self-connectedness buffered the effect of

early exam grades on subsequent grade expectations for students who performed poorly; low performers lowered their expectations less if they were high in future self-connectedness (Adelman et al., manuscript submitted for publication). Part of this effect may have been due to high connectedness students comparing themselves less to their peers – they gain motivation not to give up because they focus on their positive future self rather than dwell on their standing relative to their peers. For those who are not performing well, it makes strategic sense to look less at their relative standing and instead focus on a more motivating reference point, such as a possible future self or goal. Future self-connectedness may facilitate this process and help individuals utilize social comparison targets that facilitate the pursuit of long-term goals.

Temporal Self-Comparison

To understand the way future self-connectedness may affect how individuals compare themselves to their past and future selves, we must first consider **temporal self-appraisal theory** (Ross & Wilson, 2000; Wilson & Ross, 2001), which addresses the frequency of different types of temporal self-comparisons and the role of subjective temporal distance. This theory contends that individuals tend to engage in temporal self-comparison in a manner that affirms positive self-regard for the present self and that this can be accomplished by thinking about how the past self used to be worse than it is now, by making downward comparisons to past selves. Wilson and Ross (2001) speculate that upward comparisons with future selves would similarly be self-enhancing, especially if those future selves are viewed as attainable. In contrast, upward comparisons with past

selves and downward comparisons with future selves could be considered threatening or self-deflating because they connote that the self has gotten worse over time or is going to get worse. Early work on temporal self-appraisal found that past-upward and future-downward temporal self-comparisons were among the most infrequent types of temporal self-comparisons (Wilson & Ross, 2000), and as such, most of that research has focused on the frequent and self-enhancing past-downward type of temporal self-comparison. Table 1 briefly summarizes the different types of temporal self-comparison and whether they are self-affirming or self-deflating.

Future self-connectedness may direct attention to comparison targets in such a way that facilitates long-term goal pursuit, specifically by leading individuals to engage in more self-affirming temporal self-comparisons and less self-deflating temporal self-comparisons. It may also have positive consequences for well-being and emotional outcomes, given that this pattern of temporal self-comparison maximizes positive self-views and minimizes negative self-views.

Temporal self-appraisal theory also considers the role of subjective temporal distance in these processes and conceptualizes "past selves to be akin to an interconnected chain of different individuals who vary in closeness to the current self" (Wilson & Ross, 2001, p.573; Ross & Wilson, 2002). Of note, this conceptual approach shares similar theoretical underpinnings and assumptions as future self-connectedness. Wilson and Ross suggest that individuals are more likely to derogate a distant-past self, which reflects less on the current self, and are more likely to enhance a

near-past self, which reflects more on the current self. Similarly, past events that reflect well on the current self feel subjectively closer, whereas past events that reflect poorly on the current self feel subjectively further away. Empirical evidence supports this notion – individuals view future selves more positively when they feel subjectively closer in time, and subjectively close future selves affect current identity more than distant future selves do (Wilson, Buehler, Lawford, Schmidt, Yong, 2012). This parallels, and is perhaps consistent with, our emerging findings that greater future self-connectedness is associated with reduced perceived temporal distance (Adelman et al., manuscript under review). This could carry important implications, especially in the academic domain, given recent findings that reduced psychological distance to future selves increases motivation (Strahan & Wilson, 2006) and performance (Peetz, Wilson, & Strahan, 2009).

Temporal self-comparisons affect motivation to improve (Corcoran & Peetz, 2014), current self-evaluation (Hanko, Crusius, & Mussweiler, 2010), and subjective temporal distance (Ross & Wilson, 2002). They can also predict changes in depression (Mehlsen, Thomsen, Viidik, Olesen, & Zachariae, 2005). Some of the phenomena predicted by temporal self-appraisal theory, however, have been shown to be moderated by theories of intelligence – incremental but not entity theorists judged subjectively distant (but not recent) past selves more harshly (Ward & Wilson, 2015) – and by self-esteem – distancing themselves from unfavorable past selves had a greater effect on self-views for individuals high in self-esteem (Ross & Wilson, 2002). These findings suggest that the tendency to denigrate past selves in order to perceive growth and view the current

self more favorably is more pronounced among individuals who consider personal growth to be possible and those who are adept at employing strategies to maintain positive self-regard.

It could be the case that high-connectedness individuals invoke the future self a "routine standard" in comparison processes. Routine standards are comparison targets that have been used in the past for self-evaluation and become the default reference point (Mussweiler & Rüter, 2003). Evidence from the social comparison literature suggests that individuals do not necessarily engage in a complex, deliberative process to select a comparison target and instead may use an automatic, efficient process of utilizing such routine standards. High connectedness individuals may habitually compare themselves to where they want to be and their goals (upward future selves) or to how much they have grown and progressed (downward past selves). Following this, I expect that connectedness predicts stable individual differences in engaging in temporal self-comparison.

Assumptions, Hypotheses, and Research Overview

Assumptions. I make two important assumptions in this research. First, I assume a relatively stable environment in which individuals generally have a predictable future. Future self-connectedness may only have these predicted effects on comparison, emotion, adjustment, and motivation – or its effects documented in the literature – in relatively stable environments in which focusing on the future provides adaptive benefits. It remains an empirical question what the boundary conditions of the effects of future self-

connectedness are, though it is reasonable to assert (low) predictability of the future and (low) usefulness of valuing future outcomes would contribute to such boundary conditions.

Second, I assume that individuals possess a self-concept, representations and beliefs about themselves, including self-schemas and conceptions of their past, present, and possible future selves (Markus, 1977; Markus & Nurius, 1986; Markus & Wurf, 1987). That is, individuals have cognitive conceptions of their future selves and differ in their perceptions and attitudes toward those future selves. This research makes no explicit assumptions or claims about what "The Self" is. Rather, this research focuses on how individuals feel and perceive connection to their future selves.

Hypothesis 1. Future self-connectedness is negatively related to self-deflating temporal self-comparisons (i.e., upward comparisons with the past self and downward comparisons with the future self) and positively related to self-affirming temporal self-comparisons (i.e., downward comparisons to the past self and upward comparisons with the future self), and negatively associated with overall social comparison tendencies.

Hypothesis 2. Future self-connectedness has positive downstream consequences for motivation, emotion regulation, and psychological adjustment through its relations to social comparison and temporal self-comparison processes.

Hypothesis 3. There is a causal relation between connectedness and comparison processes. I anticipate that experimentally manipulating future self-connectedness also

affects social comparison and temporal self-comparison as well as affective, adjustment, and motivational outcomes in a manner corresponding to the correlational findings.

Overview. For this dissertation, I test these hypotheses in two studies. I separate Study 1 into two parts, Study 1A and 1B. Study 1A tests and establishes the relations among individual differences in future self-connectedness, social comparison, and temporal self-comparison. Study 1B examines the downstream consequences of future self-connectedness via social comparison and temporal self-comparison. Studies 1A and 1B come from the same longitudinal study, which was part of a larger study for our IES research (IES, 2016). Specifically, I test the indirect effects of future self-connectedness on well-being and emotion regulation via temporal self-comparison and social comparison tendencies. Study 2 tests Hypothesis 3 by manipulating future self-connectedness and then assessing effects on social comparison, temporal self-comparison, emotion, well-being, and motivation.

Study 1 Method

Design

This study piggybacked on a larger multi-wave longitudinal study, which was part of an ongoing IES research project (IES, 2016). I included measures as part of that study which would allow testing of hypotheses for this investigation. The measures used in this investigation were administered during the first week of the study (Time 1), the 28th week of the study (Time 2), and the 52nd week of the study (Time 3).

Participants

This larger research study targeted first-year students enrolled in introductory chemistry or psychology courses, so the sample is restricted to first-year students who were recruited for return waves; non first-year students were not present for the waves which included the comparison measures. The study included 890 ASU first-year undergraduate students. Of these 890 students, 499 (56.1%) were female, and 391 (43.9%) were male. Of the 879 students who reported their parents' educational attainment, 273 (30.7%) were first-generation college students, and 606 (68.1%) were continuing-generation college students. The three largest ethnic groups were White (56.2%, $n = 500$), Asian (10.3%, $n = 92$), and Latino or Latina (19.7%, $n = 175$). The mean age of the sample was 18.14 years old (90.4% of the sample was 18 years old), based on age during participants' first wave participated in.

Breakdown by time. At Time 1, 307 (55.9%) of participants were female and 242 (44.1%) were male; 166 (30.2%) were first-generation and 375 (68.3%) were continuing-generation college students; 313 (57.0%) were White, 56 (10.2%) were Asian, and 116 (21.1%) were Latino or Latina; and 511 (93.1%) were 18 years old, 27 (4.9%) were 19 years old, and the mean age was 18.12 years old. At Time 2, 320 (60.7%) of participants were female and 207 (39.3%) were male; 162 (30.7%) were first-generation and 359 (68.1%) were continuing-generation college students; 294 (55.8%) were White, 63 (12.0%) were Asian, and 95 (18.0%) were Latino or Latina; and 490 (93.0%) were 18 years old, 31 (5.9%) were 19 years old, and the mean age was 18.10 years old. At Time 3, 306 (61.8%) of participants were female and 189 (38.2%) were male; 144 (29.1%) were

first-generation and 343 (69.3%) were continuing-generation college students; 273 (55.2%) were White, 59 (11.9%) were Asian, and 92 (18.6%) were Latino or Latina; and 452 (91.3%) were 18 years old, 36 (7.3%) were 19 years old, and the mean age was 18.13 years old. Of the participants who were in Time 1, 351 (63.9%) returned for Time 2, and 327 (59.5%) returned for Time 3.

Measures

First, Study 1 included measures of all three components of future self-connectedness, as well as measures of social comparison and temporal self-comparison. This allowed the test of the hypotheses concerning the relation between connectedness and comparison processes. Second, a major goal of this investigation is to examine whether future self-connectedness predicts well-being and affective outcomes. To be able to test this, Study 1 included measures of emotion regulation (Gross & John, 2003), meaning in life (Steger, Frazier, Oishi, & Kaler, 2006), satisfaction with life (Diener, Emmons, Larsen, & Griffin, 1985), and self-esteem (Rosenberg, 1965; Robins, Hendin, Trzesniewski, 2001). In addition, there were measures of academic self-efficacy (Chemers et al., 2001), academic valuing and disengagement (Martin, 2007; Martin, 2009), and various items related to academics such as performance expectations and likelihood of graduation. As part of the larger study, Study 1 included other measures which are not discussed here; I only mention and describe measures relevant to this investigation. Table 2 details which measures for this research appear in which waves.

Future Self-Connectedness. Study 1 included two-item measures of the three components of future self-connectedness. To assess similarity-connectedness, included an adapted version of an existing measure of future self-connectedness (Ersner-Hershfield et al., 2009) based on the *inclusion of other in the self* scale (Aron, Aron, & Smollan, 1992). Participants responded to two items on a 7-point scale to indicate how similar (1 = *not at all similar to my future self*, 7 = *very similar to my future self)* and how connected (1 = *not at all connected to my future self*, 7 = *very connected to my future self)* they felt to their future selves ten years from now. Following previous research (e.g., Bryan & Hershfield, 2013), I averaged the two items, r (547) = .40, forming an aggregate measure of connectedness.

The two vividness items, also on a 7-point scale, asked participants *When you imagine your future self, how vividly do you picture it?* (1 = *not at all vividly; I do not have a clear image in my head of my future self*, 7 = *very vividly; I have a very clear image in my head of my future self)* and *How easy is it for you to visualize a mental picture of your future self?* (1 = *Very difficult*, 7 = *Very easy)*. I averaged the two items, r (547) = .80, to form an aggregate measure of future self-vividness.

For the first positivity item, participants responded to the prompt *When I think about the future, my future self feels…* by dragging a 0-100 slider; 0-20 was labeled very negative, 20-40 was labeled negative, 40-60 was labeled neutral, 60-80 labeled positive, and 80-100 was labeled very positive. The second positivity item was adapted from one used in previous research (Ersner-Hershfield et al., 2009) and asked participants *How*

much do you like your future self five years after graduating from college? (1 = *don't like at all*, 7 = *like as much as possible*). These two items were standardized and averaged, r (546) = .48, to form the future self-positivity measure for this study.

Social Comparison and Temporal Self-Comparison. In order to understand social and temporal-self comparison processes, and to be able to test the hypotheses this dissertation puts forth, we must understand how these processes differ by comparison direction and by target. For this dissertation, I developed an original measure of social and temporal self-comparison because existing measures of social comparison do not adequately vary direction of comparison (e.g., Gibbons & Buunk, 1999) and existing measures of temporal self-comparison involve content coding open-ended responses (e.g., Wilson & Ross, 2000).

To create this measure, I identified the major comparison targets of interest – other people, the past self, and the future self – and the different possible directions of comparison – upward, downward, and unspecified. This resulted in nine possible permutations, such as downward past self-comparison, upward future self-comparison, and upward social comparison. For each of the nine permutations, I drafted 3-5 items to assess the extent to which individuals compare themselves (their present selves) to these targets. These items included both general items and academic-specific items for each category. Table 3 details for each subscale the number of items, reliability at Time 2, and a sample item. With one exception, all reliabilities were above Cronbach's $\alpha = .70$. For the downward future self-comparison subscale, Cronbach's $\alpha = .62$. When the item

sometimes I think things may go downhill from here was deleted, however, Cronbach's α increased to .71.

Emotion regulation. To assess emotion regulation, Study 1 included the reappraisal subscale of the Emotion Regulation Questionnaire (Gross & John, 2003), which taps into the extent to which individuals control their emotions by interpreting an emotion-eliciting stimulus in such a way that changes its affective consequences. On this six-item measure, Cronbach's α = .81, participants responded to such items as *I control my emotions by changing the way I think about the situation I'm in* on a 1 (*strongly disagree*) to 5 (*strongly agree*) scale. Reappraisal was associated with better interpersonal functioning, the experience of more positive emotion, and the expression of more positive emotion.

Well-being. To assess well-being, Study 1 included the Satisfaction with Life Scale (Diener, Emmons, Larsen, & Griffin, 1985), which measures the extent to which individuals are satisfied with their life. Participants respond to five items such as *in most ways my life is close to my ideal* on 1 (*strongly disagree*) to 7 (*strongly agree*) scale, Cronbach's α = .86.

Self-esteem. Study 1 included the single-item measure of self-esteem (Robins, Hendin, Trzesniewski, 2001). Participants respond to *I have high self-esteem* on a 1 (*not very true of me*) to 5 (*very true of me*) scale. In addition, Study 1 included the classic Rosenberg self-esteem scale (Rosenberg, 1965), in which participants indicate their

agreement to 10 items such as *I feel that I'm a person of worth* on a 1 (*strongly disagree*) to 7 (*strongly agree*) scale, Cronbach's α = .90.

Academic motivation. To measure the extent to which students believed in their own competence, Study 1 included an established measure of academic self-efficacy (Chemers et al., 2001), Cronbach's α = .87. On this measure, participants responded to eight items such as *I usually do very well in school and at academic tasks* on a 1 (*very untrue*) to 7 (*very true*) scale. In addition, Study 1 included two subscales from the Motivation and Engagement Scale for University/College (Martin, 2007; Martin, 2009). The academic valuing subscale assessed the extent to which students value what they are learning in college and contains four items, Cronbach's α = .83. Participants indicated their agreement with statements such as *it's important to understand what I'm taught at college* on a 1 (*strongly disagree*) to 7 (*strongly agree*) scale. The academic disengagement subscale, in contrast, measured the extent to which students have given up and don't exert effort anymore in school. Participants responded to four items such as *I don't really care about college anymore* on a 1 (*strongly disagree*) to 7 (*strongly agree*) scale, Cronbach's α = .87. Students also reported their expected GPA for that semester as well their perceptions of the likelihood they would graduate from college.

Study 1 Analytic Approach and Results

Data Analytic Approach

Study 1A tests the hypothesis that future self-connectedness predicts social comparison and temporal self-comparison, such that greater connectedness is associated

with less social comparison, less self-deflating temporal self-comparison, more self-affirming temporal self-comparison. To examine the relations among future self-connectedness, social comparison, and temporal self-comparison, the primary analyses for this study are the zero-order correlations among these constructs. To gain temporal precedence, these analyses use the three measures of future self-connectedness at Time 1 and measures of comparison at Time 2, 28 weeks later. In addition, Time 2 occurred right after most students received feedback on their first round of midterms during their second semester, a time in the semester when social comparison and temporal self-comparison would be especially salient and meaningful. The connectedness, vividness, and positivity components of future self-connectedness are analyzed and described separately, as are the individual subscales of the comparison measures (e.g., past-downward temporal self-comparison).

Study 1B builds a structural equation model to test whether future self-connectedness has downstream effects on emotion, adjustment, and motivation and whether there were indirect effects via social comparison and temporal self-comparison. Figure 1 depicts a simplified version of the structural model for this SEM, emphasizing the primary hypotheses being tested. Analysis of this SEM is conducted in MPlus, Version 8, implementing full information maximum likelihood (FIML) to handle any missing data. The model fit indices include the chi-square test, the root-mean-square error of approximation (RMSEA), the standardized root-mean-square residual (SRMR), and the comparative fit index (CFI). Based on conventions from the literature, model fit is

considered acceptable when RMSEA < .08 (Browne & Cudeck, 1993), CFI > .95, and SRMR < .08 (Hu & Bentler, 1999).

Paths in the SEM. In the structural equation model, the two measures of future self-connectedness predict the three comparison measures and the three outcome measures, and the three comparison measures predict the three outcome variables of adjustment, emotion regulation, and motivation. In addition, this SEM models the relations among the future self-connectedness measures, among the comparison measures, and among the three outcome variables. To test the effects of future self-connectedness on adjustment, emotion, and motivation, I examine both the direct links between future self-connectedness and these measures as well as the indirect effects via social comparison, self-deflating temporal self-comparison, and self-affirming temporal self-comparison. Figure 2 illustrates the variables and paths in this structural equation model.

Comparison measures in the SEM. The SEM for Study 1B includes the aggregate measure of the 11 social comparison items at Time 2, Cronbach's $\alpha = .91$; an aggregate measure of the nine self-affirming temporal self-comparison items at Time 2, Cronbach's $\alpha = .87$; and an aggregate measure of the seven self-deflating temporal self-comparison items at Time 2, Cronbach's $\alpha = .82$.

Primary outcome measures in the SEM. The SEM for Study 1B includes three primary outcomes measures of interest – emotion regulation, psychological adjustment, and academic motivation. The emotion regulation measure is the observed scale score at

Time 3. To assess psychological adjustment, the SEM includes a latent variable consisting of Time 3 satisfaction with life, Time 3 Rosenberg self-esteem, and Time 3 single-item self-esteem. To assess academic motivation, the SEM includes a latent variable consisting of Time 2 academic self-efficacy, Time 2 academic valuing, Time 2 academic disengagement, Time 2 expected GPA, and Time 2 graduation likely. I examine the measurement model for this latent variable before proceeding with further analyses to confirm these measures adequately hang together. There is reason to expect they may not; academic self-efficacy, academic valuing, and academic disengagement represent more psychological constructs, whereas expected GPA and likelihood of graduations represent goals and likelihood judgments.

Study 1A Results

Connectedness and social comparison with peers. As expected, most of the future self-connectedness measures were negatively related to social comparison. The aggregate vividness measure predicted the social comparison aggregate, $r(334) = -.21$, $p < .001$, as well as all three subscales, $|r|$s ranged from .14 to .22, ps < .009. The aggregate positivity measure also predicted social comparison, $r(334) = -.20$, $p < .001$, and all three of its subscales, $|r|$s ranged from .11 to .24, ps < .04. The similarity-connectedness aggregate measure did not predict the aggregate measure of social comparison, $r(334) = -.04$, $p = .52$, nor the three subscales of social comparison (upward, downward, direction unspecified), $|r|$s ranged from .002 to .07, ps > .23.

Connectedness and temporal self-comparison. With the exception of one relation, all measures of future self-connectedness were significantly related to the four temporal self-comparison subscales of interest – past-downward, past-upward, future downward, and future-upward – in the predicted direction. Whereas I had specific predictions for the directional subscales, I did not have strong predictions for the non-directional subscales. The similarity-connectedness measure predicted past-downward temporal self-comparison, $r(334) = .13$, $p = .02$; past-upward temporal self-comparison, $r(334) = -.15$, $p = .006$; and future-downward temporal self-comparison, $r(333) = -.14$, $p = .008$. It did not predict future-upward temporal self-comparison, $r(333) = .07$, $p = .21$; direction-unspecified past temporal self-comparison, $r(333) = .01$, $p = .83$; and direction-unspecified future temporal self-comparison, $r(334) = .01$, $p = .80$. The vividness aggregate predicted the four temporal self-comparison measures of interest, $|r|$s ranged from .18 to .23, ps $\leq .001$, and also direction-unspecified future temporal self-comparison, $r(334) = .29$, $p < .001$. It did not predict direction-unspecified past temporal self-comparison, $r(333) = .01$, $p = .85$. Similarly, the positivity aggregate predicted the four temporal self-comparison measures of interest, $|r|$s ranged from .17 to .36, ps $\leq .002$, and direction-unspecified future temporal self-comparison, $r(334) = .14$, $p = .009$, but did not predict direction-unspecified past temporal self-comparison, $r(333) < .001$, $p = .998$.

Social comparison and temporal self-comparison. The social comparison aggregate measure was positively related to most of the measures of temporal self-comparison (see Table 4). It was related to past-upward temporal self-comparison, $r(501)$

= .18, $p < .001$; future-downward temporal self-comparison, $r(501) = .30$, $p < .001$; and direction-unspecified past temporal self-comparison, $r(501) = .30$, $p < .001$; but not to past-downward temporal self-comparison, $r(502) = .08$, $p = .06$, future-upward temporal self-comparison, $r(501) = .07$, $p = .11$; or to direction-unspecified future temporal self-comparison, $r(502) = -.04$, $p = .40$. The three subscales of social comparison exhibited a similar pattern in their relations to temporal self-comparison, except that direction-unspecified social comparison was not related to past-downward temporal self-comparison, $r(502) = .05$, $p = .30$.

Study 1B Results

As a preliminary test of whether connectedness and comparison matter to the primary outcomes of interest, I first examined the zero-order correlations of future self-connectedness, temporal self-comparison, and social comparison with emotion regulation, adjustment, and academic motivation, testing the same measures as in the SEM.

Future self-connectedness. Overall, the measures of future self-connectedness were related to emotion regulation, well-being, and motivation as expected. The similarity-connectedness aggregate measure predicted emotion regulation $r(319) = .20$, $p < .001$; single-item self-esteem, $r(318) = .27$, $p < .001$; Rosenberg self-esteem, $r(316) = .29$, $p < .001$; satisfaction with life, $r(317) = .24$, $p < .001$; academic self-efficacy, $r(342) = .19$, $p < .001$; academic disengagement , $r(340) = -.24$, $p < .001$; and expected GPA,

$r(337) = .15$, $p = .006$. It was not related to academic valuing, $r(340) = .06$, $p = .24$, or graduation likelihood, $r(336) = .07$, $p = .19$.

The vividness aggregate measure predicted emotion regulation, $r(319) = .13$, $p = .024$; single-item self-esteem, $r(318) = .17$, $p < .001$; Rosenberg self-esteem, $r(316) = .22$, $p < .001$; satisfaction with life, $r(317) = .10$, $p < .001$; academic self-efficacy, $r(342) = .25$, $p < .001$; academic disengagement , $r(340) = -.24$, $p < .001$; and graduation likelihood, $r(336) = .12$, $p = .001$, though it was not related to academic valuing, $r(340) = .08$, $p = .13$, or to expected GPA, $r(337) = .08$, $p = .16$.

The positivity aggregate measure predicted emotion regulation, $r(319) = .25$, $p < .001$; single-item self-esteem, $r(318) = .30$, $p < .001$; Rosenberg self-esteem, $r(316) = .36$, $p < .001$; satisfaction with life, $r(317) = .28$, $p < .001$; academic self-efficacy, $r(342) = .25$, $p < .001$; academic disengagement , $r(340) = -.29$, $p < .001$; academic valuing, $r(340) = .43$, $p = .006$; graduation likelihood, $r(336) = .18$, $p = .001$; and expected GPA, $r(337) = .17$, $p = .001$.

All three measures of future self-connectedness predicted the measures of emotion regulation and psychological adjustment, as well as academic self-efficacy and academic disengagement. In addition, positivity predicted academic valuing, positivity and vividness predicted likelihood of graduation, and positivity and similarity-connectedness predicted expected GPA. The measures motivation were administered 28 weeks after the measures of connectedness, and the measures of emotion regulation and

well-being were administered 52 weeks after connectedness. This underscores the predictive value of future self-connectedness and its relation to these outcomes.

Temporal self-comparison. Across the board, self-affirming and self-deflating temporal self-comparison were related to emotion regulation, motivation, and well-being as predicted. Self-affirming temporal self-comparison was correlated with emotion regulation, $r(388) = .22$, $p < .001$; single-item self-esteem, $r(387) = .15$, $p = .002$; Rosenberg self-esteem, $r(387) = .18$, $p < .001$; satisfaction with life, $r(387) = .12$, $p = .02$; academic self-efficacy, $r(502) = .34$, $p < .001$; academic disengagement , $r(502) = -.33$, $p < .001$; academic valuing, $r(502) = .43$, $p < .001$; graduation likelihood, $r(500) = .25$, $p < .001$; and expected GPA, $r(502) = .14$, $p = .003$. Similarly, though in the opposite direction, self-deflating temporal self-comparison was related to emotion regulation, $r(388) = -.19$, $p < .001$; single-item self-esteem, $r(387) = -.19$, $p < .001$; Rosenberg self-esteem, $r(387) = -.39$, $p < .001$; satisfaction with life, $r(387) = -.28$ $p < .001$; academic self-efficacy, $r(502) = -.41$, $p < .001$; academic disengagement , $r(502) = .49$, $p < .001$; academic valuing, $r(502) = -.30$, $p < .001$; graduation likelihood, $r(500) = -.24$, $p < .001$; and expected GPA, $r(502) = -.32$, $p < .001$.

Social comparison. The aggregate measure of social comparison with peers was correlated with emotion regulation, $r(388) = -.15$, $p = .004$; Rosenberg self-esteem, $r(387) = -.21$, $p < .001$; academic disengagement , $r(502) = .11$, $p = .01$; and expected GPA, $r(502) = .11$, $p = .02$. Social comparison was not, however, related to single-item self-esteem, $r(387) = -.09$, $p = .08$; graduation likelihood, $r(500) = .08$, $p = .06$;

satisfaction with life, $r(387) = -.03$, $p = .55$; academic self-efficacy, $r(502) = .02$, $p = .74$; or academic valuing, $r(502) = .03$, $p = .57$. Social comparison was not as strongly or consistently related to these outcomes as were future self-connectedness and temporal self-comparison, though still associated with some of them (see Table 5).

Academic Motivation Measurement Model

In order to validate the academic motivation latent variable, I examined its measurement model. The measurement model with five indicators – academic self-efficacy, academic valuing, academic disengagement, expected GPA, and likelihood of graduation – exhibited poor fit[3], $\chi^2(5) = 58.44$, $p < .001$, RMSEA = .144, CFI = .912, SRMR = .051. The lowest factor loadings were expected GPA, b* = .49, and graduation likely, b* = .55, compared to self-efficacy, b* = .76, disengagement, b* = -.70, and valuing, b* = .60 (NB: standardized coefficients are denoted with a *). These two indicators showing the lowest loadings are conceptually different from the other three, as expected GPA and graduation likelihood represent goals and judgments, whereas self-efficacy, valuing, and disengagement are more psychological in nature. Because of this, I opted to use academic self-efficacy, valuing, and disengagement as the indicators for this latent variable there are no fit indices because this measurement model is saturated.

Primary Structural Equation Model

I tested the primary structural equation model as described in the analytic approach, with the exception of the change to the academic motivation latent variable

described in the preceding paragraph. This model showed good fit to these data (see Figure 2), $\chi^2(36) = 113.49$, $p < .001$, RMSEA = .053, CFI = .948, SRMR = .04,

Paths from future self-connectedness[4]. The three measures of future self-connectedness were all related to one another. The similarity-connectedness measure was correlated with vividness, $\Psi = .53$, $\Psi^* = .30$, $p < .001$, and with positivity, $\Psi = .28$, $\Psi^* = .28$, $p < .001$. The vividness and positivity measures were also related to each other, $\Psi = .59$, $\Psi^* = .46$, $p < .001$.

Similarity-connectedness. Similarity-connectedness was not related to social or temporal-self comparison, but it predicted the three outcomes of interest. The similarity-connectedness measure predicted academic motivation, $\gamma = .06$, $\gamma^* = .11$, $p = .05$; emotion regulation, $\gamma = .08$, $\gamma^* = .13$, $p = .02$; and psychological adjustment, $\gamma = .12$, $\gamma^* = .20$, $p < .001$. It did not, however, predict social comparison, $\gamma = .06$, $\gamma^* = .06$, $p = .26$; self-affirming temporal self-comparison, $\gamma = .005$, $\gamma^* = .007$, $p = .91$; or self-deflating temporal self-comparison, $\gamma = -.04$, $\gamma^* = -.04$, $p = .44$.

Vividness. Vividness predicted social comparison and self-affirming temporal self-comparison, but not self-deflating temporal self-comparison or any of the outcomes. Future self-vividness predicted social comparison, $\gamma = -.12$, $\gamma^* = -.16$, $p = .007$, and self-affirming temporal self-comparison, $\gamma = .08$, $\gamma^* = .13$, $p = .03$, but it did not predict self-deflating temporal self-comparison, $\gamma = -.08$, $\gamma^* = -.11$, $p = .051$; and psychological adjustment, $\gamma = -.02$, $\gamma^* = -.04$, $p = .56$; academic motivation, $\gamma = .01$, $\gamma^* = .03$, $p = .65$, or emotion regulation $\gamma = -.03$, $\gamma^* = -.07$, $p = .28$.

Positivity. Positivity predicted all three comparison measures, psychological adjustment, and emotion regulation, but not academic motivation. Future self-positivity predicted social comparison, ɣ = -.19, ɣ* = -.15, p = .01; self-affirming temporal self-comparison, ɣ = .22, ɣ* = .20, p < .001; self-deflating temporal self-comparison, ɣ = - .30, ɣ* = -.24, p < .001; emotion regulation ɣ = .12, ɣ* =.15, p = .02; and psychological adjustment, ɣ = .21, ɣ* = .26, p < .001, but it did not predict academic motivation, ɣ = .03, ɣ* =.05, p = .45.

Paths among comparison measures and outcomes. The three comparison measures were all related to each other in the predicted directions, and the three outcomes were all positively related. Social comparison was positively related to both self-affirming temporal self-comparison, Ψ = .17, Ψ* = .18, p < .001, and self-deflating temporal self-comparison, Ψ = .23, Ψ* = .20, p < .001. Self-deflating and self-affirming temporal self-comparison were negatively related to one another, Ψ = -.19, Ψ* = -.20, p < .001. Academic motivation was related to adjustment, Ψ = .11, Ψ* = .40, p < .001, and emotion regulation, Ψ = .11, Ψ* = .17, p = .02, and emotion regulation was related to adjustment, Ψ = .16, Ψ* = .42, p < .001.

Comparison and outcomes. There were differences among which outcomes each type of comparison predicted. Of the main outcomes of interest, social comparison only predicted worse emotion regulation, β = -.07, β* = -.12, p = .03, and was not related to academic motivation, β = .04, β* = .07, p = .16, or adjustment, β = -.05, β* = -.08, p = .14. Self-deflating temporal self-comparison predicted academic motivation, β = -.27, β*

= -.47, $p < .001$, and adjustment, β = -.16, β* = -.26, $p < .001$, but not emotion regulation, β = -.04, β* = -.06, $p = .26$. Self-affirming temporal self-comparison predicted emotion regulation, β = .12, β* = .16, $p = .002$, and academic motivation, β = .23, β* = .34, $p < .001$, but not adjustment, β = .03, β* = .03, $p = .52$. To describe it from the outcomes side, psychological adjustment was predicted by self-deflating temporal self-comparison, emotion regulation was predicted by social comparison and by self-affirming temporal self-comparison, and academic motivation was related to both types of temporal self-comparison.

Indirect Effects. Positivity had downstream effects on emotion regulation via self-affirming temporal self-comparison, on adjustment via self-deflating temporal self-comparison, and on academic motivation via both types of temporal self-comparison, whereas vividness only had downstream effects on academic motivation through self-affirming temporal self-comparison, and similarity-connectedness was not related to social comparison and had no indirect effects on the outcomes of interest via social comparison. Future self-vividness had an indirect effect on academic motivation via self-affirming temporal self-comparison, estimate = .02, $SE_{est.}$ = .009, est.* = .04, $SE*_{est.}$ = .02, $p = .04$. Future self-positivity had indirect effects on academic motivation via self-affirming temporal self-comparison, estimate = .05, $SE_{est.}$ = .02, est.* = .07, $SE*_{est.}$ = .02, $p = .001$, and via self-deflating temporal self-comparison, estimate = .08, $SE_{est.}$ = .02, est.* = .11, $SE*_{est.}$ = .03, $p < .001$. Positivity also had an indirect effect on emotion regulation via self-affirming temporal self-comparison, estimate = .03, $SE_{est.}$ = .01, est.* =

.03, $SE^*_{est.}$ = .01, p = .02, and on psychological adjustment via self-deflating temporal self-comparison,; estimate = .04, SE = .02, est.* = .06, $SE^*_{est.}$ = .02, p = .001.

Exploratory Analyses

Similarity vs. connectedness. One potential issue with this investigation is the grouping of two similarity-connectedness items. Not all research using this measure has taken the average of the two items (e.g., Ersner-Hershfield et al., 2009). Similarity to the future self and connectedness to the future self may represent distinct psychological constructs. In addition, similarity to the future self may have a less-positive meaning or less-positive connotation for certain individuals, such as low-SES individuals who are aiming for upward mobility and a future self who is different from who they have been, at least on certain dimensions.

To explore these issues, I examined the relations of single-item similarity and connectedness to the measures of comparison and to the outcomes of interest. In addition to testing the bivariate correlations (see Table 6), I constructed a SEM similar to the primary model, except that it replaced the future self-connectedness measures with single-item future self-similarity and single-item future self-connectedness (see Figure 3). This model showed good fit to these data, $\chi^2(32) = 106.76$, $p < .001$, RMSEA = .056, CFI = .947, SRMR = .042. As expected, similarity and connectedness were related, $\Psi = .79$, $\Psi^* = .40$, $p < .001$. Similarity predicted psychological adjustment $\gamma = .08$, $\gamma^* = .15$, $p = .02$, but was not related to the other outcomes or to the comparison measures. Connectedness also predicted adjustment, $\gamma = .07$, $\gamma^* = .15$, $p = .01$. In addition, it

predicted self-affirming temporal self-comparison, ɣ = .09, ɣ* = .15, p = .009 , and self-deflating temporal self-comparison, ɣ = -.12, ɣ* = -.17, p = .002. To test whether connectedness and similarity differed in their relations to the other variables in the model, I tested a series of models in which the path from similarity and connectedness to each of the other variables in the model was constrained to be equal. None of these constrained models led to worse fit (see Table 7), suggesting that, at least within this model, similarity and connectedness did not differ in the extent to which they predicted social comparison, temporal self-comparison, adjustment, motivation, or emotion regulation. This supports the using the average of these two items for the similarity-connectedness aggregate measure.

College generation status. In addition, I ran a version of this model stacked by college generation status (see Figure 4), which showed acceptable fit by most indices, $\chi^2(32) = 181.04$, $p < .001$, RMSEA = .064, CFI = .921, SRMR = .079. To test whether college generation status moderated any of the paths in the model, I ran a model which constrained all paths to be equal between the two groups (e.g., the path between future self-similarity and self-affirming for first-generation college students was constrained to equal the same path for continuing-generation college students), and then ran a series of models which removed this constraint for each path in the model, one at a time (see Table 8). These analyses revealed that college generation status moderated five paths in the model: the relation between similarity and connectedness, self-affirming temporal self-comparison predicted from future self-similarity, social comparison predicted from future

self-connectedness, emotion regulation predicted from future self-connectedness, psychological adjustment predicted from self-affirming temporal self-comparison, and psychological adjustment predicted from self-deflating temporal self-comparison.

Moderated paths[5]. In the model, five paths were moderated by college generation status; some of these relations were stronger for first-generation college students, and some were stronger for continuing-generation college students (see paths in black in Figure 4). The relation between similarity and connectedness was stronger for first-generation students $\Psi = 1.06$, $\Psi^* = .50$, $p < .001$, than for continuing-generation college students, $\Psi = .58$, $\Psi^* = .32$, $p < .001$. The path between similarity and self-affirming temporal self-comparison was nonsignificant for both groups but was more positive for first-generation college students, $\gamma = .13$, $\gamma^* = .19$, $p = .11$, and more negative for continuing-generation college students, $\gamma = -.07$, $\gamma^* = -.09$, $p = .42$. The path from connectedness to emotion regulation was moderated by college generation status such that it was stronger for first-generation college students, $\gamma = .15$, $\gamma^* = .33$, $p = .003$, and weaker and nonsignificant for continuing-generation college students, $\gamma = -.004$, $\gamma^* = -.009$, $p = .89$. Similarly, both moderated paths predicting psychological adjustment were stronger for first-generation students. The path from self-deflating temporal self-comparison to psychological adjustment was stronger for first-generation, $\beta = -.20$, $\beta^* = -.30$, $p = .002$, than for continuing-generation college students, $\beta = -.16$, $\beta^* = -.28$, $p < .001$. The path from self-affirming temporal self-comparison to psychological adjustment was

also stronger for first-generation college students, β = .18, β* = .22, p = .02, and weaker and nonsignificant for continuing-generation college students, β = .01, β* = .02, p = .81.

Interactive effects. Though the structural equation model in Study 1B addressed the effects of each component of future self-connectedness when controlling for the other two, it did not examine whether the components of future self-connectedness interact with each other to predict comparison processes, adjustment, motivation, or emotion regulation. As discussed previously, the relations among the components of future self-connectedness are not well established in the literature, and no published work has tested whether the effects of these components are redundant, additive, or interactive. I ran a series of analyses in multiple regression to test whether each possible pairing of the components of connectedness (i.e., positivity*vividness, vividness*similarity-connectedness, similarity-connectedness*positivity) interacted to affect comparison processes or the outcomes of interest, and each analysis also included the appropriate lower-order terms. These analyses examined the following criteria: social comparison, past-downward temporal self-comparison, past-upward temporal self-comparison, future-downward temporal self-comparison, future-upward temporal self-comparison, emotion regulation, satisfaction with life, Rosenberg self-esteem, single-item self-esteem, academic self-efficacy, academic valuing, academic disengagement, expected GPA, and graduation likelihood. All but two of these analyses revealed nonsignificant effects of the interactions between the components of connectedness on comparison processes and the outcomes of interest. This lends support to treating the components of connectedness and

separate though interrelated in the analyses. The only significant effects were the interaction of positivity and similarity-connectedness predicting past-downward temporal self-comparison and the interaction of vividness and similarity-connectedness also predicting past-downward temporal self-comparison.

*Vividness*similarity-connectedness***.** Vividness and similarity interacted to predict past-downward temporal self-comparison, $F(3, 332) = 7.60$, $p < .001$, RSQ = .06; $\beta_0 = 5.35$; $\beta_{VIV} = .11$, $\beta^*_{VIV} = .11$, $t(332) = 2.45$, $p = .01$; $\beta_{FSC} = .08$, $\beta^*_{FSC} = .08$, $t(332) = 1.42$, $p = .16$; $\beta_{FSC*VIV} = -.10$, $\beta^*_{FSC*VIV} = -.15$, $t(332) = -2.76$, $p = .006$. At low levels of similarity-connectedness, the relation between vividness and past-downward temporal self-comparison was stronger and significant, $\beta_0 = 5.25$; $\beta_{VIV} = .23$, $\beta^*_{VIV} = .29$, $t(332) = 4.09$, $p < .001$, whereas this relation was weaker and nonsignificant at high levels of similarity-connectedness, $\beta_0 = 5.45$; $\beta_{VIV} = .001$, $\beta^*_{VIV} = .001$, $t(332) = .017$, $p = .99$ (see Figure 5). At low levels of vividness, the relation between similarity-connectedness and past-downward temporal self-comparison was stronger and significant, $\beta_0 = 5.18$; $\beta_{FSC} = .22$, $\beta^*_{FSC} = .22$, $t(332) = 2.74$, $p = .007$, whereas this relation was weaker and nonsignificant at high levels of similarity-connectedness, $\beta_0 = 5.52$; $\beta_{FSC} = -.06$, $\beta^*_{FSC} = -.06$, $t(332) = -.766$, $p = .44$ (see Figure 6).

*Positivity*similarity-connectedness***.** Positivity and similarity-connectedness interacted to predict past-downward temporal self-comparison, $F(3, 332) = 10.21$, $p < .001$, RSQ = .08; $\beta_0 = 5.35$; $\beta_{POS} = .29$, $\beta^*_{POS} = .22$, $t(332) = 3.73$, $p < .001$; $\beta_{FSC} = .06$, $\beta^*_{FSC} = .06$, $t(332) = 1.75$, $p = .30$; $\beta_{FSC*POS} = -.13$, $\beta^*_{FSC*POS} = -.12$, $t(332) = -2.09$, $p = .$

04, such that as one aspect of future self-connectedness increased, the relation of the other to past-downward temporal self-comparison became weaker. At low levels (-1 *SD*) of similarity-connectedness, the relation between positivity and past-downward temporal self-comparison was stronger and significant, $\beta_0 = 5.28$; $\beta_{POS} = .44$, $\beta^*_{POS} = .331$, $t(332) = 4.90$, $p < .001$, whereas this relation was weaker and nonsignificant at high levels (+1 SD) of similarity-connectedness, $\beta_0 = 5.42$; $\beta_{POS} = .14$, $\beta^*_{POS} = .11$, $t(332) = 1.17$, $p = .24$ (see Figure 7). Similarly, at low levels of positivity, the relation between similarity-connectedness and past-downward temporal self-comparison was stronger and significant, $\beta_0 = 5.10$; $\beta_{FSC} = .17$, $\beta^*_{FSC} = .16$, $t(332) = 2.00$, $p = .05$, whereas this relation was weaker and nonsignificant at high levels of positivity, $\beta_0 = 5.60$; $\beta_{FSC} = -.05$, $\beta^*_{FSC} = -.05$, $t(332) = -.67$, $p = .51$ (see Figure 8). This interaction exhibited a similar pattern as the interaction between vividness and similarity-connectedness.

Interactions in the SEM. When the positivity*similarity-connectedness and vividness*similarity-connectedness interaction terms were added to the primary SEM, however, the interaction effects on self-affirming temporal self-comparison were nonsignificant for both positivity*similarity, $\gamma = -.06$, $\gamma^* = -.07$, $p = .26$, and vividness*similarity, $\gamma = -.006$, $\gamma^* = .01$, $p = .83$. The model with these interaction terms did not differ in terms of fit from the primary model, $\chi^2(54) = 132$, $p < .001$, RMSEA = .044, CFI = .948, SRMR = .038, $\Delta\chi^2(18) = 18.52$, $\Delta\chi^2$ $p = .42$.

Study 1 Discussion

Study 1 provided consistent support for my first two hypotheses: (1) future self-connectedness predicted social comparison and temporal self-comparison, and (2) future self-connectedness predicted later emotion regulation, academic motivation, and psychological adjustment. Overall, as expected, greater connectedness predicted less social comparison, less self-deflating (i.e., past-upward and future-downward) temporal self-comparison, more self-affirming (i.e., past-downward and future-upward) temporal self-comparison, better emotion regulation, greater academic motivation, and higher well-being.

The three components of future self-connectedness differed in how they related to the three outcomes of interest. It is best to keep in mind that the zero order correlations between the individual components and the individual indicators of these three outcomes were almost all significant. That is, the nonsignificance of the paths in the model is most likely due to a portion the variance predicting the outcomes being shared by the components of future self-connectedness. Similarity-connectedness directly predicted academic motivation, emotion regulation and adjustment. Positivity directly predicted adjustment and emotion regulation and also had positive indirect effects emotion regulation via self-affirming temporal self-comparison, on academic motivation via both self-affirming and self-deflating temporal self-comparison, and adjustment via self-deflating temporal self-comparison. Vividness had a positive indirect effect on academic motivation via self-affirming temporal self-comparison. Overall, all measures of future

self-connectedness predicted the three outcomes of interest as expected, but the processes differed somewhat from one another.

The exploratory analyses revealed some interesting findings. First, I tested whether the individual components of future self-connectedness interacted with each other to affect comparison and the outcomes of interest. Overall and across many analyses, they did not interact. There were only two such instances when the components of future self-connectedness interacted, and these interactions did not hold when added to the SEM. In light of this, we should conclude that the different components are somewhat redundant in their relations to comparison processes and the outcomes of interest, given that these relations were significant as bivariate correlations but some were nonsignificant in the SEM, but generally do not interact to affect these processes.

The two interactions that did emerge, however, may still be meaningful. Past-downward temporal self-comparison, the type of self-enhancing temporal self-comparison given the greatest focus by temporal self-appraisal researchers (e.g., Wilson & Ross, 2000; Wilson & Ross, 2001; Ross & Wilson, 2002; Ross & Wilson, 2003), was predicted but the interaction of positivity and similarity-connectedness and by the interaction of vividness and similarity-connectedness. When participants were low in vividness or low in positivity, similarity-connectedness was more strongly associated with this self-enhancing type of temporal self-comparison. That is, low-positivity high-connectedness individuals were engaging more in a self-affirming type of temporal self-comparison involving the past self. In a sense, similarity-connectedness may have helped

participants who were low in positivity (or vividness) about their future self employ a strategy that would affirm the current self without drawing focus to the future self. Individuals lower in positivity about their future self may avoid focusing on that future self, and individuals lower in future self-vividness may get less of a boon thinking about a future self that is hard to see, making past-downward temporal self-comparison a more viable means of self-enhancement. Another interpretation of these findings could be that one does not need all three components of connectedness, just one. Those who were high in positivity or vividness or similarity-connectedness were all showing greater past-downward temporal self-comparison, and those who were high in two components showed similar engagement in this self-affirming type of temporal self-comparison as those who were high in just one component. Still, this interactive effect was not observed for any of the other criteria, and these analyses were exploratory, so these findings should be interpreted with caution.

Second, I examined whether there were differences between the similarity and connectedness in predicting comparison, adjustment, emotion regulation, and motivation. Though these two items have been averaged into a single measure in past research (e.g., Bryan & Hershfield, 2013; Adelman et al., 2017), they may be both conceptually and psychologically distinct constructs. Constraining single-item similarity and connectedness to be equal did not worsen model fit, which suggests that they were not having independent predictive power in the model. This finding alleviates concerns about combining the two items into a single measure and implies that these two constructs –

similarity to the future self and connectedness to the future self – closely resemble each other in terms of how people think about them.

Third, I tested whether similarity and connectedness were functioning in this model the same for first-generation and continuing-generation college students, given that they may have different meaning or connotations for these two groups. Several paths in the model differed for these two groups. The relation between similarity and connectedness, the path from connectedness to emotion regulation, and the paths from both types of temporal self-comparison to psychological adjustment were stronger for first-generation students, whereas the relation between connectedness and social comparison was stronger for continuing-generation students. Given the lack of a consistent pattern – for instance, connectedness was not simply a better predictor for first-generation college students – future research should seek to replicate and verify these findings. The most important finding here may be that temporal self-comparison seems to play a bigger role in well-being for first-generation college students. This may have implications for developing strategies to both bolster and avoid harming first-generation college students' well-being.

Study 2

Building on Study 1, which found that future self-connectedness predicted comparison processes and had positive downstream effects, Study 2 tests the hypothesis that experimentally increasing future self-connectedness has similar effects on comparison processes and on outcomes related to emotion, intrapsychic adjustment, and

motivation. First, I consider the existing future self-connectedness manipulations, their efficacy, and their issues. Despite the effectiveness of these manipulations in terms of affecting future self-connectedness and decision-making, there may be reasonable cause for the development of new, easy-to-implement, scalable future self-connectedness manipulations. I draw on the existing future self-connectedness manipulations as I develop a new pilot future self-connectedness manipulation to implement in Study 2.

Previous Future Self-Connectedness Manipulations

Vividness. In research that has manipulated the vividness of the future self, these experiments typically induce vividness by showing participants older, computer-aged versions of themselves or a control (e.g., a picture of their current self). In one typical study from this literature, participants wear a headset that puts them in an immersive virtual reality environment which allows them to see their older selves when looking at a virtual mirror (Hershfield et al., 2011). Compared to a control group, these participants exhibit less-myopic discounting temporal tendencies and invest more in a retirement spending task. Such future self-vividness manipulations have been employed as interventions intended to reduce adolescent delinquency. One such study utilizes the same immersive virtual reality procedure as described above, gives participants an opportunity to cheat that would earn them €7, and finds that participants who have seen their older self are less likely to cheat relative to participants in the control condition (van Gelder et al., 2013). Another study implements an intervention that embeds static computed aged-images in a Facebook page for each participant's future self, tracks self-reported

delinquency, and finds that participants linked to their future selves report less delinquency relative to participants in a control condition (Van Gelder et al., 2015). The main issue with these types of experimental manipulations is that they are time/labor intensive and most likely not easy to scale up to a larger sample.

Similarity. Several studies have developed experimental manipulations to increase perceptions of similarity to the future self, and most of these manipulations do so by highlighting the stability of the person over time. One study gave participants, high school seniors near graduation, information claiming that a person's core identity and the characteristics that make up a person either stay relatively stable and are already fixed for people their age (high similarity) or are likely to fluctuate and change radically around graduation and during college (low similarity). Participants in the high similarity condition made more patient intertemporal decisions on a later task (Bartels & Urminsky, 2011). Subsequent studies have replicated this finding using a young adult population and modifying the manipulation to be more general (i.e., removing references to graduation). This manipulation has also been found to increase measures of future self-similarity (Sheldon & Fishbach, 2015). Although this manipulation is brief, effective, and easy to implement, it may be harmful in certain domains outside of financial decision-making (e.g., performance, motivation). In a preliminary study, this manipulation promoted a more entity theory of intelligence relative to control (Pilot Study; IES, 2016). This is noteworthy because of the well-documented benefits to academic motivation and performance of having a more incremental theory of intelligence, suggesting that this

manipulation could have unintended harmful effects on academic motivation and performance.

Other studies have manipulated perceptions of similarity to the future self through experiences of cognitive accessibility; participants judged how easily they could generate two reasons (high-similarity) or 10 reasons (low-similarity) why their personal identity would remain highly stable over the next year, and participants in the high-similarity condition exhibited less-myopic temporal discounting behaviors (Bartels & Urminsky, 2011). One study employed both the identity-stability manipulation and the cognitive-accessibility manipulation in a 2 x 2 design, and participants who were in the high stability/high similarity condition scored higher on a future self-continuity measure and were less likely to advocate inappropriate negotiation strategies (Hershfield et al., 2012). Finally, another study found that a personal power manipulation increased future self-similarity, led to less-myopic temporal discounting, and that the effect on discounting was mediated by future self-similarity (Joshi & Fast, 2013).

Positivity. Research examining the positivity component of future self-connectedness has used attitudes toward the elderly as a proxy for holding a positive attitude toward the future self, and the experimental manipulations of positivity have utilized a similar approach (Hershfield & Galinsky, 2011 as reported in Hershfield, 2011). A series of studies found that when participants took the perspective of an elderly person, remembered a time they respected an elderly person, or were primed with words related to the elderly and respect, they placed greater value on the future, as evidenced by

decisions on discounting and saving tasks. Though these effects mirror the effects of future self-connectedness and future self-connectedness manipulations, it is unclear the psychological processes at work, whether these manipulations are increasing positivity of the future self or directly affecting temporal valuation.

Study 2 Method

Design

Study 2 tested the hypothesis that increasing future self-connectedness has corresponding effects on social comparison, temporal self-comparison, intrapsychic adjustment, emotion, and motivation. To do so, I implemented a randomized experiment with three conditions: (1) a no-manipulation control condition, (2) the established identity-stability future self-connectedness manipulation, and (3) a pilot future self-connectedness manipulation developed for this study based on connectedness manipulations developed for a different research project. This study aimed to establish whether future self-connectedness had a causal relation to comparison processes, adjustment, emotion, and motivation.

New pilot future self-connectedness manipulation. This future self-connectedness manipulation attempted to increase all three components of connectedness together. It consisted of two parts, the first of which attempted to enhance vividness and connectedness and the second of which targeted positivity and connectedness. In the first part, participants read the following passage and then drafted a written response: "*Take a moment and imagine yourself ten years from now. Build an image in your mind's eye and*

visualize your current self becoming your future self. How will the person you are now shape the person you will be in ten years?" The second part of the manipulation continued to build positivity and connectedness with the following prompt: "*Continue thinking about your future self. What will you be doing in the future? Consider how you could make a significant, meaningful difference in your life, in the lives of your family members, and in the wider world. What are you doing now that will help you achieve those goals and become that future self*?" Again, participants in this condition drafted a written response after the prompt.

There were several new and noteworthy aspects of this pilot future self-connectedness manipulation. First, it attempted to affect all three components of future self-connectedness, unlike previous future self-connectedness manipulations[6], which only attempt to affect one component at a time. Second, the order in which this manipulation targeted each component was designed to maximize its effect. There may be something about creating a vivid image of your future self and then imbuing it with positivity, all the while connecting that future self to who you are now, which could deliver an especially effective boost of future self-connectedness. Third, this manipulation refined connectedness manipulations we had previously piloted while also remaining brief, easy to implement, and scalable to large samples, unlike prior labor-intensive future self-connectedness manipulations. It represented a synthesis of a guided visualization procedure pilot tested in the PSY 101 questionnaire, which increased connectedness

(single item), and connectedness-based interventions developed for the IES project, which also increased various future self-connectedness measures (IES, 2016).

Identity-stability manipulation. Study 2 included an established future self-connectedness manipulation, which has been shown to increase future self-connectedness (single item) and decrease discounting. This provided a point of comparison for the pilot connectedness manipulation and allowed a test of whether the pilot manipulation performed better than an existing one. Participants read the following paragraph and then wrote a brief summary (adapted from Bartels & Urminsky, 2011): *Day-to-day life events change appreciably after high school graduation as students transition to college life, but what changes the least between graduation and life after high school is the person's core identity. The characteristics that make you the person you are… are established early in life and fixed by the end of adolescence. Several studies conducted with young adults before and after high school graduation have shown that the traits that make your personal identity remain remarkably stable*.

Participants

This study was offered as an extra credit opportunity in an undergraduate introductory psychology course, and the final sample consisted of 443 participants, though 24 participants did not complete the entire study and did not provide demographic information (the percentages reported here include those 24 participants). Of the 443 participants, 147 (33.2%) were in the control condition, 141 (31.8%) received the pilot future self-connectedness manipulation, and 148 (33.4%) received B&U manipulation.

The breakdown in terms of subjective socioeconomic class was 33 working class (7.4%), 41 lower middle class (9.3%), 161 middle class (36.3%), 157 upper middle class (35.4%), and 27 upper class (6.1%). The sample contained 136 (30.7%) first-generation college students and 282 (63.7%) continuing-generation college students. The breakdown in terms of ethnicity was 216 (48.8%) White/Caucasian/European American, 43 (9.7%) East Asian/Asian American/Southeast Asian/Pacific Islander, 69 (15.6%) Hispanic/Latino(a)/ Chicano(a)/Latin American, 27 (6.1%) South Asian/Indian, 15 (3.4%) Middle Eastern/ Arab/Arab American, 4 (.9%) Native American/Alaska Native, 23 (5.2%) Black/African American/African/West Indian, 20 (4.5%) participants who identified as "other," and two participants who did not provide this information. In terms of sex, 210 (47.4%) participants were female, and 209 (47.2%) participants were male. The sample contained 292 (66%) first-year students, 82 (18.5%) second-year students, 30 (6.8%) third-year students, nine fourth-year students (2.0%), one fifth-year student (.2%), and five students (1.1%) who indicted "other."

Measures

To address the causal relation of future self-connectedness with social comparison and temporal self-comparison, Study 2 included the same measures of future self-connectedness, social comparison, and temporal self-comparison as in Study 1 directly following the experimental condition. In addition, Study 2 included measures of emotion regulation (Gross & John, 2003), well-being (Diener, Emmons, Larsen, & Griffin, 1985; Steger, Frazier, Oishi, & Kaler, 2006), self-esteem (Rosenberg, 1965; Robins, Hendin,

Trzesniewski, 2001), mood (Watson, Clark, & Tellegen, 1988) to test the hypotheses concerning the relation of future self-connectedness with affect and intrapsychic adjustment. These were the same measures of emotion regulation, well-being, and self-esteem used in Study 1.

Given the established link between social comparison and mood in the literature (Collins, 1996), Study 2 assessed mood via the PANAS (*positive and negative affect schedule*), a 20-item measure of positive and negative affect. Participants report how much they are experiencing various feelings or emotions from on a 1 (very slightly or not at all) to 5 (extremely). The negative affect items included *distressed, upset, ashamed, guilty, scared, hostile, nervous, afraid, irritable, disgusted, threatened, helpless, angry,* and *aggressive*. The positive affect items include *alert, excited, inspired, strong, determined, attentive, enthusiastic, proud, active,* and *in control.*

Prospective Power Analysis

I assumed a small-to-medium effect size for effects of the future self-connectedness manipulations. To achieve .80 power with $f = .18$ and three groups, it would require a total sample size of 303 (i.e., 101 participants per each of the three conditions).

Data Cleaning

There were several steps of data cleaning to ensure that the final sample consisted of participants who were paying attention and processed whichever manipulation they received. The raw data file provided 488 cases, but there were many instances of

participants completing the study more than once. In the case of repeaters, if both cases provided complete data, the first completion of the study was kept. Otherwise, the most complete response was kept. Once repeaters were processed, the working data file contained 443 cases, though 24 participants did not complete the entire study. The study included a manipulation check question, which asked participants about which condition they were in at the beginning of the study. The 40 participants who failed this manipulation check were not included in the final sample. There were also an attention check question which prompted participants to response "agree" if they were paying attention. The 30 participants who failed the attention check were not included in the final sample. Fifty-five participants failed either of these two checks. I conducted data analysis with the entire working sample of 443 cases and then again with the sample of 388 participants who passed both the attention check and manipulation check.

In the control condition, 14 failed the manipulation check, five failed the attention check, and 17 failed either check. In the connectedness condition, nine failed the manipulation check, seven failed the attention check, and 13 failed either check. In the identity-stability condition, 10 failed the manipulation check, 11 failed the attention check, and 18 failed either. The cleaned sample contained 130 in the control condition, 128 in the connectedness condition, and 130 in the identity-stability condition, which was sufficient to test the effect of experimental condition given the prospective power analysis.

Study 2 Results

Manipulation Check

I first examined whether the experimental manipulations affected future self-connectedness (see Table 9). Unfortunately, omnibus ANOVA tests did not find effects of experimental condition on the primary measures of future self-connectedness, including the similarity-connectedness aggregate, $F(2, 425) = .307$, $p = .74$; the vividness aggregate, $F(2, 425) = .807$, $p = .45$; and the positivity aggregate, $F(2, 423) = 526$, $p = .59$. These findings held when I examined the individual items which composed the aggregate measures (see Table 9), Fs < 1.54, ps > .23. I tested each manipulation condition relative to control as independent-samples t-tests, which yielded the same null effects.

I conducted these same analyses again only including those participants who passed both the manipulation check and the attention check. This yielded similar findings of no significant effects of the manipulations. I also conducted these analyses with only first-year students; again, this yielded similar findings of no effects of experimental condition.

Because the experimental manipulations failed the manipulation check (i.e., did not affect future self-connectedness), it limits the interpretation of this study. That is, this study should probably not be viewed as testing the effect of increasing future self-connectedness on social comparison and temporal self-comparison if the manipulations were not able to successfully increase connectedness.

Experimental Effects on Comparison Processes

A series of one-way ANOVAs tested whether experimental condition affected social comparison or temporal self-comparison (see Table 10). There was no effect of condition on social comparison with peers, $F(2, 426) = 1.67$, $p = .19$, self-affirming temporal self-comparison, $F(2, 426) = .23$, $p = .78$, or self-deflating temporal self-comparison, $F(2,426) = 2.50$, $p = .08$. In addition to testing the effect of condition on the composite measures of temporal self-comparison and social comparison with peers, I tested the effect of condition on the individual comparison subscales. Experimental condition did not effect the individual subscales of upward, downward, or direction-unspecified social comparison (see Table 10). These null findings held when the sample was filtered to only those participants who passed the attention and manipulation checks.

Experimental Effects on Emotion, Well-Being, Motivation

As Study 1 found downstream effects of connectedness on emotion, well-being, and motivation, Study 2 tested whether experimental condition affected any of these outcomes of interest (see Table 10). Condition did not affect emotion regulation, $F(2, 421) = .40$, $p = .67$. In terms of well-being, condition did not affect satisfaction with life, $F(2, 423) = .36$, $p = .70$; single-item self-esteem, $F(2, 421) = .18$, $p = .83$; or scores on the Rosenberg self-esteem measure, $F(2, 420) = .92$, $p = .40$. In terms of academic motivation, experimental condition had no effect on academic self, efficacy, $F(2, 414) = 1.54$, $p = .22$; academic valuing, $F(2, 420) = .35$, $p = .71$; academic disengagement, $F(2, 420) = .85$; self-rated likelihood of graduating from college, $F(2, 420) = .39$, $p = .68$; or

expected GPA, $F(2, 420) = 2.89$, $p = .06$. This pattern of null results was replicated when analyses were conducted with the cleaned sample.

Experimental Effects on Mood

Finally, I examined the effect of experimental condition on mood using the PANAS (see Table 11). Condition did not affect the positive affect aggregate, $F(2, 414) = .33$, $p = .72$, or the negative affect aggregate, $F(2, 414) = .15$, $p = .86$. The only individual item of the PANAS which experimental condition affected was the *helpless* item (see Table 12), $F(2, 414) = 4.18$, $p = .02$, $M_{control} = 1.96$ ($SD = 1.28$), $M_{connectedness} = 1.58$ ($SD = .98$), $M_{identitystability} = 1.88$ ($SD = 1.13$). This measure failed the homogeneity of variances test, $F(2, 414) = 5.49$, $p = .004$. Contrast tests indicated significant or marginally significant differences between the following pairings: control vs. manipulations, $t(230.95) = -1.83$, $p = .069$; control vs. identity-stability, $t(257.52) = -2.73$, $p = .007$; connectedness vs. identity-stability, $t(275.47) = 2.36$, $p = .02$; connectedness vs. control and identity-stability, $t(311.42) = -3.03$, $p = .003$. This analyses indicated that the connectedness manipulation decreased feelings of helplessness. These findings held when analyses were conducted with the cleaned sample.

Examination of Pre-Manipulation Measures

Because the sample consisted of PSY 101 students, I was able to merge a subset of the Study 2 sample with students' responses on the PSY 101 questionnaire; 75 participants provided responses on both the PSY 101 questionnaire and the Study 2 survey, $n_{control} = 25$, $n_{connectedness} = 22$-24, $n_{identitystability} = 28$. Though the sample size per

condition was quite small, this allowed for a cursory examination of the means and, albeit underpowered, tests of pre- post-manipulation effects on the future self-connectedness measures.

A series of 2x3 (pre-post x condition) mixed model ANOVAs tested the effects of experimental condition by pre- post- manipulation on the three aggregate connectedness measures and the seven individual items (see Table 13): similarity-connectedness aggregate, $F(2, 72) = .44$, $p = .65$; positivity aggregate, $F(2, 72) = .70$, $p = .50$; vividness aggregate, $F(2, 72) = 2.51$, $p = .09$; future self-similarity, $F(2, 72) = .15$, $p = .86$; single-item future self-connectedness, $F(2, 72) = .73$, $p = .48$; future self-liking, $F(2, 72) = 1.54$, $p = .22$; 100-point positivity item, $F(2, 72) = .94$, $p = .40$; 7-point positivity item, $F(2, 72) = .64$, $p = .53$; vividness, $F(2, 72) = 1.44$, $p = .24$; and ease of mental imagery, $F(2, 72) = 3.12$, $p = .051$. There were no significant effects. Similar ANCOVA analyses, testing the effect of condition on each of the post-manipulation connectedness measures while controlling for its pre-manipulation counterpart, also revealed no significant effects of condition.

Importantly, an examination of the pre-manipulation means suggests that there may have been baseline differences in connectedness among the experimental conditions (see Table 14). Because of the small sample size (22-28 per condition, varying slightly by measure), I examined the effect size differences among the conditions on the pre-manipulation future self-connectedness measures. Of the possible pairwise comparisons, 17 out of 30 reflected mean differences of $d = .2$ or greater. For instance, participants in

the control condition were $d = .48$ higher on single-item vividness than participants in the identity-stability condition and $d = .21$ higher than those in the pilot manipulation condition. One reason for the ineffectiveness of the manipulations may have been that participants in the control condition were already higher in aspects of connectedness before the manipulations. Given the small sample size, testing these differences would be underpowered, but these differences may account, at least in part, for the null effects of the experimental manipulations on connectedness.

Brief Discussion

Study 2 did not provide support for the hypothesis of a causal link between future self-connectedness and comparison processes (Hypothesis 3). Given that the primary manipulation check for this study failed – the manipulations did not affect future self-connectedness – this study did not constitute a valid test of the causal relation between future self-connectedness and comparison processes. Similarly, there were no conventionally significant effects of the manipulations on comparison processes, academic motivation, emotion regulation, or psychological adjustment. Random baseline differences could have contributed to the ineffectiveness of the manipulations, there may have been some aspects of the manipulations which were themselves actually ineffective at affecting future self-connectedness, or perhaps the filler task nullified any effects of the manipulations. Future research should utilize other designs in order to test the causal relation between future self-connectedness and comparison processes.

General Discussion

This investigation tested how future self-connectedness relates to comparison processes (both social comparison with others and temporal self-comparison), emotion, psychological adjustment, and motivation. In addition, this research attempted to examine the causal relation between connectedness and comparison processes and outcomes. First, I expected that future self-connectedness would predict more self-affirming types of temporal self-comparison (i.e., comparisons with past or future selves which reflect well on the current self, such as comparisons with worse past selves or better future selves), less social comparison with others and less self-deflating temporal self comparison (i.e., comparisons with past or future selves which reflect poorly on the self, such as comparisons with better past selves or worse future selves). Second, I hypothesized future self-connectedness would predict better emotion regulation, better psychological adjustment, and greater motivation, and that connectedness would affect these outcomes via comparison processes. Third, I predicted a causal relation between future self-connectedness and comparison processes.

Overall, this investigation found support for the first two hypotheses but not for the third hypothesis. As expected, future self-connectedness predicted more past-downward and future-upward temporal self-comparison (both types of self-affirming temporal self-comparison), less past-upward and future-downward temporal self-comparison (both types of self-deflating temporal self-comparison), and less social comparison. These relations were more pronounced among the positivity and vividness components and less so for the similarity-connectedness component. It makes sense that

the positivity component would show more robust relations to such types of temporal self-comparison given its very nature; holding a positive view of the future self may reflect a generally positive self-concept, which would lead to temporal self-comparisons that function to preserve this positive self-image. Also as expected, future self-connectedness predicted emotion regulation, psychological adjustment, and academic motivation. The similarity-connectedness component directly predicted these outcomes, whereas future self-vividness and future self-positivity had indirect effects on these outcomes via temporal self-comparison processes, though positivity also had direct positive effects on psychological adjustment and emotion regulation. Contrary to expectations, the experimental manipulations intended to increase future self-connectedness and have corresponding effects on comparison processes did not succeed in increasing future self-connectedness. This limits the ability to make inferences about the causal nature between connectedness and comparison processes.

Importance and Contributions

Novel psychological processes and outcomes. This research builds on the future self-connectedness literature by linking connectedness to social comparison and temporal self-comparison, psychological processes which have not been previously considered in this literature. It is the first research, to my knowledge at least, demonstrating that perceptions of the future self influence how individuals compare themselves to other people and to their past and future selves. This represents a significant departure from the mechanisms this literature has primarily focused on, such as temporal discounting,

temporal attention, and self-control. In this longitudinal research, future self-connectedness predicted comparison tendencies assessed 28 weeks later, suggesting the enduring nature of this relation.

In addition, this investigation linked future self-connectedness to a new set of important outcomes, particularly to emotion regulation, psychological adjustment, and academic motivation. Prior research on future self-connectedness has primary focused on its relation to time preference, financial decision-making, ethical decision-making, delinquency, and academic performance. These findings extend the importance of future self-connectedness beyond decision-making to psychological well-being and emotion regulation. Importantly, the longitudinal nature of this research demonstrates that future self-connectedness predicts these outcomes related to emotion and adjustment a year later

Why promote future self-connectedness? It may be possible to leverage findings from the literature on future self-connectedness, including this investigation, in order to do social good through the development of brief, evidence-based interventions. In addition to the empirical findings demonstrating future self-connectedness can be increased via experimental paradigms with corresponding effects on intertemporal decision-making (e.g., Bartels & Urminsky, 2011; Hershfield et al., 2011; Hershfield, 2011; Hershfield et al., 2012; van Gelder et al., 2013; Joshi & Fast, 2013; Sheldon & Fishbach, 2015; Bartels & Urminsky, 2015), an intervention based on the future self-connectedness literature reduced adolescent delinquency (van Gelder et al., 2015). Our research team is currently developing a future self connectedness-based intervention

intended to increase retention and performance in academic settings (IES, 2016). These types of interventions may have to potential to also enhance motivation, well-being, and emotion regulation. Connectedness to the future self may also have clinical implications through its relation to temporal self-comparison and psychological adjustment. That is, clinical populations may be more likely to make self-deflating types of temporal self-comparison, promoting depressive symptoms, and enhancing connectedness may attenuate that harmful cycle.

Contributions to other literatures. This research also represents a contribution to the social comparison and temporal self-comparison literatures. The measure developed for this research provides a more sensitive, nuanced assessment of social and temporal self-comparison tendencies than other measures and methods used in the literature (e.g., Gibbons & Buunk, 1999; Wilson & Ross, 2000). This research also suggests that self-deflating types of temporal self-comparison may be more common than prior research has implied (cf., Wilson & Ross, 2000). This may be in part because past research has employed a trait-listing methodology or has asked participants about temporal self-comparisons in a particular domain, such as social skills. The prevalence, frequency, and impact of temporal self-comparisons may be domain specific, an issue which future research should seek to clarify.

Limitations and Future Directions

Ineffective manipulations. The most problematic limitation of this research was the ineffectiveness of the experimental manipulations in Study 2. The ineffectiveness of

the experimental manipulations was made all the more unusual given that the identity-stability manipulation has been used in several published studies, which found effects on measures of connectedness (Bartels & Urminsky, 2011; Bartels, Kvaran, & Nichols, 2013; Bartels & Urminsky, 2015). In addition, research using manipulations similar to the pilot future self-connectedness manipulation also found those manipulations increased measures of future self-connectedness (IES, 2016).

Why did the manipulations not work? One plausible reason for why the pilot manipulation did not have its intended effect concerns aspects of the manipulation itself. Unlike other manipulations of connectedness, the pilot future self-connectedness manipulation attempted to target all three components of connectedness; instead of being a positive, this may have had the unintended effect of rendering the manipulation less effective. This design of the manipulation – creating a vivid image of the future self, connecting it to the current self, thinking about positive aspects of the future self, and connecting it back to the current self again – may have spread participants' attention and effort across the three components of connectedness and made it more difficult for them to complete each part. Instead of focusing on all three components resulted in reinforcing each other, it may have detracted from all of them. The manipulations this pilot manipulation is based on were much longer, and participants completed multiple tasks in order, for example, to increase the vividness of their future self (e.g., writing about their future self, selecting photos to represent their future self, reading about a possible role model, more writing about their future self). Spreading out the manipulation in that way

may have been more effective because it allowed participants more time to put together thoughts about their future in a way that was easy to recall and describe. If participants found it difficult to create this imagery or think of such positive things, the manipulation could have even backfired in some instances and decreased future self-connectedness (Schwarz et al., 1991).

Additionally, Study 2 took place in the spring semester, whereas previous the manipulations this pilot was based on took place during the fall semester. It may be the case that college students' future self-connectedness is more malleable right at the beginning of college. as opposed to a semester later after they have had time to form their future self-concept. This could account for why both manipulations did not have effects on connectedness.

Another plausible explanation for the null results is "unhappy randomization." An examination of a subset of the sample who reported their future self-connectedness on the PSY 101 Questionnaire, which was administered roughly four weeks before Study 2, suggests that these null findings may be due, in part, to random differences in pre-existing levels of future self-connectedness across the three conditions. These baseline differences may have diluted or nullified the effects of both the manipulations. As described in Table 14, over half of the possible pairwise differences among the means of the different experimental conditions on the future self-connectedness measures are on the magnitude of small to medium effects.

In addition, there may have been something different about the study design which could account for the ineffectiveness of the manipulations. Study 2 included a filler task, which was not used in other research. It may be possible that the filler task drew attention away from the thoughts and mental imagery created by the experimental manipulations, perhaps enough to dilute the effects. This filler task consisted of making subjective judgments about pairs of similar photographs taken by the author. Two pairs of the photos were of brightly colored flowers, red and yellow, and two pairs of photos were of animals, a bear and a goose. There may have been something about these vivid, striking visual stimuli which drew participants into the moment and diverted their attention away from thoughts and imagery of the future self. Similarly, the subjective preference judgments required some amount of attention to compare the two photos in each pair. It may have been more effort and attention than intended, and possibly enough to detract from the manipulations.

Inattentiveness or lack of engagement does not seem to be a viable explanation for why the manipulations did not have the predicted effects. These null effects held when restricting the sample to only those who passed the manipulation check. In a follow-up analysis, participants who spent less than a minute on any page of the manipulations were filtered out; the null effects remained null.

*Alternative design***.** If there issues were responsible for the ineffectiveness of the experimental manipulations, an alternative study design could address or control for some of these issues. First, the experimental manipulations would be changed. Instead of

attempting to manipulate all there components of future self-connectedness at once, there would be separate conditions for similarity-connectedness, vividness, and positivity. The pilot manipulation may have been ineffective because it tried to do too much in too short of a span of time, so these manipulations would be longer, less intense, and participants would be prompted to think about their future selves with related tasks before doing any writing about their future selves. For instance, the vividness manipulation could include a section where participants select photos to represent their future self and future life, a couple multiple-choice questions about participants' futures, and then a writing section similar to the first part of the pilot manipulation in Study 2, without the connectedness part.

Second, a full pre- post- study design would allow for a full examination of baseline scores before the manipulation and whether there were pre-existing differences among the groups before implementation of the manipulations. Third, counterbalancing the measures of interest (comparison, well-being, motivation, emotion) with the future self-connectedness measures would rule out the possibility that the manipulation check measures themselves were diluting the effects of the manipulation. Fourth, the filler task would be removed. Fifth, another major limitation of this research was that it did not manipulate social comparison or temporal self-comparison. Pilot manipulations that would attempt to increase self-affirming temporal self-comparison, upward social comparison, and downward social comparison would also be added. Because of potential harmful effects, a self-deflating temporal self-comparison manipulation would not be

included. Taken together, these design changes could rectify the issues with Study 2 and allow for a true test of the causal relation between future self-connectedness and comparison processes.

Coda

This investigation found preliminary evidence for a link between psychological connectedness to the future self and how individuals compare themselves to their past and future selves and to others. As expected, individuals who were greater in connectedness to the future self showed a greater tendency to make self-enhancing comparisons with their past and future selves, less of a tendency to compare themselves to their past and future selves in a way that reflected poorly on themselves, and less of a tendency to compare themselves to other people. Further, greater connectedness predicted higher well-being a year later, better emotion regulation a year later, and greater academic motivation 28 weeks later. This research, however, does not adequately address the causal relation between future self-connectedness and temporal self-comparison or social comparison, nor does it rule out alternative processes models (e.g., self-efficacy and emotion regulation affecting comparison processes and future self-connectedness). Future research should seek to clarify these issues. Still, this research extends the literature on future self-connectedness to new psychological processes – social comparison and temporal self-comparison – and to important, new outcomes – emotion regulation and psychological adjustment. As such, this research contributes to the existing literature and shows promise for future investigation.

Footnotes

1 The original guided visualization procedure gave participants the following: *Think of who you are today. Focus on your good qualities, your best qualities — project them and who you are into the future. Imagine yourself a week from now. You are the best you can be. Imagine yourself a month from now. You are the best you can be. Imagine yourself a year from now. You are the best you can be. Now take a moment. Take a moment with your future self. In your mind's eye, sit next to the you ten years from now. See who you become, and who you have always been. Feel that person emerging inside you. Visualize yourself ten years from now – hold that image and let it grow organically. Use the space below to write about your future self.*

2 In the pilot test of the IES manipulation, participants created a social media profile for their future self, which included them writing a blurb about their self in 10 years, selecting photos to depict their future life, writing about how they will make a meaningful difference in the future, reading a letter from a potential role model, and writing a letter of advice to their current self from their future self. Relative to a no-manipulation control condition, this manipulation increased future self-connectedness (single item), and positivity, and also led to a marginally signifiant increase in future self-esteem and vividness in its pilot testing. This version of this intervention included four pre- and post- measures for participants in the experimental condition, and all four measures – future self-connectedness,

future self-similarity, future self-esteem, and ease of picturing the future – showed increases after the manipulation. A pared-down version of the pilot, which removed two of the three writing prompts (the "meaningful difference" and "letter of advice" prompts), increased positivity of the future self, future self-esteem, and future vividness.

3 To verify the superiority of the three-indicator academic motivation latent variable over the five-indicator academic motivation latent variable, I took the primary model and substituted the five-indicator latent variable. That is, I tested a model similar to the SEM from Figure 3, except it used five indicators for the academic motivation latent variable. This model showed worse fit with these data than when the original three-indicator version of the academic motivation latent variable was used, $\chi^2(69) = 362.59$, $p < .001$, RMSEA = .062, CFI = .851, SRMR = .086, $\Delta\chi^2(37) = 256.65$, $\Delta\chi^2$ $p < .001$.

4 I also examined SEMs with one-factor versions of future self-connectedness, which modified the primary models by substituting the three factors of connectedness with one single future self-connectedness variable. I tested two one-factor future self-connectedness models. When future self-connectedness was treated as a latent variable – the six items were its indicators – the model showed poor fit, $\chi^2(109) = 375.44$, $p < .001$, RMSEA = .066, CFI = .886, SRMR = .086. When future self-connectedness was treated as an observed variable – the six

items were standardized and averaged – the model showed acceptable fit, $\chi^2(28) = 70.70$, $p < .001$, RMSEA = .062, CFI = .958, SRMR = .042.

5 The path coefficients reported are from the unconstrained stacked model.

6 No published study has attempted to manipulate more than one component of future self-connectedness. The only study to my knowledge that has is the Fall 2016 pilot study for the IES project we used to develop the manipulation implemented in IES Study 2. The effects of that manipulation are discussed in Footnote 2.

References

Adelman, R. M., Herrmann, S. D., Bodford, J. E., Barbour, J. E., Graudejus, O., Okun, M. A., & Kwan, V. S. Y. (2017). Feeling closer to the future self and doing better: Temporal psychological mechanisms underlying academic performance. *Journal of Personality, 85*(3), 398-408.

Adelman, R. M., Okun, M. A., Graudejus, O., Herrmann, S. D., & Kwan, V. S. Y. (unpublished manuscript). Adaptive Functions of Future Self-Connectedness: Promoting Competence Beliefs and Buffering Setbacks. Manuscript submitted for publication.

Albert, S., (1977). Temporal comparison theory. *Psychological Review, 84*, 485-503.

Bartels, D. M., Kvaran, T., & Nichols, S. (2013). Selfless giving. *Cognition, 129*(2), 392-403.

Bartels, D. M., & Rips, L. J. (2010). Psychological connectedness and intertemporal choice. *Journal of Experimental Psychology: General, 139*(1)*,* 49-69.

Bartels, D. M., & Urminsky, O. (2011). On intertemporal selfishness: How the perceived instability of identity underlies impatient consumption. *Journal of Consumer Research, 38,* 182-198.

Bartels, D. M., & Urminsky, O. (2015). To know and to care: How awareness and valuation of the future jointly shape consumer spending. *Journal of Consumer Research, 41*(6), 1469-1485.

Blouin-Hudon, E., & Pychyl, T. A. (2015). Experiencing the temporally extended self: Initial support for the role of affective states, vivid mental imagery, and future self-continuity in the prediction of academic procrastination. *Personality and Individual Differences, 86*, 50-56.

Brickman, P., & Bulman, R. (1977). Pleasure and pain in social comparison. In J. Suls & R. L. Miller (Eds.), *Social comparison processes: Theoretical and empirical perspectives* (pp. 149-186). New York: Hemisphere.

Buunk, B. P., Collins, R. L., Taylor, S. E., VanYperen, N. W., & Dakof, G. A. (1990). The affective consequences of social comparison: Either direction has its ups and downs. *Journal of Personality and Social Psychology, 59*(6), 1238-1249.

Chemers, M. M., Hu, L., & Garcia, B. F. (2001). Academic self-efficacy and first year college student performance and adjustment. *Journal of Educational Psychology, 93*, 55–64.

Collins, R. L. (1996). For better or worse: The impact of upward social comparison on self-evaluations. *Psychological Bulletin, 119*(1), 51-69.

Corcoran, K., & Peetz, J. (2014). Looking towards the past or the future self: How regulatory focus affects temporal comparisons and subsequent motivation. *Self and Identity, 13*(1), 81-99.

Diener, E. (1984). Subjective well-being. *Psychological Bulletin, 95*(3), 542-575.

Diener, E., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The satisfaction with life scale. *Journal of Personality Assessment, 49*(1), 71-75.

Ellen, P. S., Wiener, J. L., & Fitzgerald, M. P. (2012). Encouraging people to save for their future: Augmenting current efforts with positive visions of the future. *Journal of Public Policy & Marketing, 31*(1), 58-72.

Ersner-Hershfield, H., Garton, M. T., Ballard, K., Samanez-Larkin, G. R., & Knutson, B., (2009). Don't stop thinking about tomorrow: Individual differences in future self-continuity account for saving. *Judgment and Decision Making, 4*(4), 280-286.

Ersner-Hershfield, H., Wimmer, G. E., & Knutson, B. (2009). Saving for the future self: Neural measures of future self-continuity predict temporal discounting. *Social Cognitive and Affective Neuroscience, 4*(1), 85-92.

Festinger, L. (1954). A Theory of Social Comparison Processes. *Human Relations*, *7*, 117-140.

Gibbons, F. X. (1986). Social comparison and depression: Company's effect on misery. *Journal of Personality and Social Psychology, 51,* 140-148.

Gibbons, F. X., & Buunk, B. P. (1999). Individual differences in social comparison: Development of a scale of social comparison orientation. *Journal of Personality and Social Psychology, 76*(1), 129-142.

Goethals, G. R., & Darley, J. M. (1977). Social comparison theory: An attributional approach. In J. M. Suls & R. L. Miller (Eds.), *Social comparison processes: Theoretical and empirical perspectives* (pp. 259-278). Washington, DC: Hemisphere.

Gross, J. J., & John, O. P. (2003). Individual differences in two emotion regulation processes: Implications for affect, relationships, and well-being. *Journal of Personality and Social Psychology, 85*(2), 348-362.

Hanko, K., Crusius, J., & Mussweiler, T. (2010). When I and me are different: Assimilation and contrast in temporal self-comparisons. *European Journal of Social Psychology, 40*(1), 160-168.

Hershfield, H. E. (2011). Future self-continuity: How conceptions of the future self transform intertemporal choice. *Annals of the New York Academy of Sciences, 1235,* 30-43.

Hershfield, H. E., Cohen, T. R., & Thompson, L. (2012). Short horizons and tempting situations: Lack of continuity to our future selves leads to unethical decision making and behavior. *Organizational Behavior and Human Decision Processes, 117,* 298-310.

Hershfield, H. E., & Galinsky, A. D. (2011). Respect for the Elderly Predicts National Savings and Individual Saving Decisions. Northwestern University. Evanston, IL.

Hershfield, H. E., Goldstein, D. G., Sharpe, W. F., Fox, J., Yeykelis, L. Carstensen, L. L., & Bailenson, J. N. (2011). Increasing saving behavior through age-progressed renderings of the future self. *Journal of Marketing Research, 48,* 23-37.

IES R305A160023 (2016). Institute of Educational Science: Strengthening Present-Future Self-Continuity Improves College persistence.

Joshi, P. D., & Fast, N. J. (2013). Power and reduced temporal discounting. *Psychological Science, 24*(4), 432-438.

Kwan, V. S. Y., John, O. P., Kenny, D. A., Bond, M. H., & Robins, R. W. (2004). Reconceptualizing individual differences in self-enhancement bias: An interpersonal approach. *Psychological Review, 111*, 94-111.

Kwan, V. S. Y., John, O. P., Robins, R. W., & Kuang, L. L. (2008). Conceptualizing and assessing self-enhancement bias: A componential approach. *Journal of Personality and Social Psychology, 94,* 1062-1077.

Major, B., Testa, M., & Bylsma, W. (1991). Responses to upward and downward social comparisons: The impact of esteem-relevance and perceived control. In J. Suls & T. A. Wills (Eds.), *Social comparison: Contemporary theory and research* (pp. 237-260). Hillsdale, NJ: Erlbaum.

Markus, H. (1977). Self-schemata and processing information about the self. *Journal of Personality and Social Psychology, 35*(2), 63-78.

Markus, H., & Nurius, P. (1986). Possible selves. *American Psychologist, 41*(9), 954-969.

Markus, H., & Wurf, E. (1987). The dynamic self-concept: A social psychological perspective. In M. R. Rosenzweig, & L. W. Porter (Eds.), *Annual review of psychology, vol. 38; annual review of psychology, vol. 38* (pp. 299-337, Chapter xi, 776 Pages) Annual Reviews, Palo Alto, CA.

Martin, A. J. (2007). *The Motivation and Engagement Scale*. Sydney, Australia. Lifelong Achievement Group. Retrieved from http://www.lifelongachievement.com.

Martin, A. J. (2009). Motivation and engagement across the academic lifespan. *Educational and Psychological Measurement*, *69*, 794-824.

Mehlsen, M., Kirkegaard Thomsen, D., Viidik, A., Olesen, F., & Zachariae, R. (2005). Cognitive processes involved in the evaluation of life satisfaction: Implications for well-being. *Aging & Mental Health, 9*(3), 281-290.

Morse, S., & Gergen, K. J. (1970). Social comparison, self-consistency, and the concept of self. *Journal of Personality and Social Psychology, 16*(1), 148-156.

Mussweiler, T. (2003). Comparison processes in social judgment: Mechanisms and consequences. *Psychological Review, 110*(3), 472-489.

Mussweiler, T., & Rüter, K. (2003). What friends are for! the use of routine standards in social comparison. *Journal of Personality and Social Psychology, 85*(3), 467-481.

Mussweiler, T., Rüter, K., & Epstude, K. (2004). The ups and downs of social comparison: Mechanisms of assimilation and contrast. *Journal of Personality and Social Psychology, 87*(6), 832-844.

Nosanchuk, T. A., & Erickson, B. H. (1985). How high is up? Calibrating social comparison in the real world. *Journal of Personality and Social Psychology, 48,* 624-634.

Parfit, D. (1971). Personal identity. *The Philosophical Review*, *80*, 3-27.

Parfit, D. (1984). *Reasons and persons*. Oxford, UK: Clarendon Press.

Parfit, D. (1986). Comments. *Ethics, 96*, 854–862.

Peetz, J., Wilson, A. E., & Strahan, E. J. (2009). So far away: The role of subjective temporal distance to future goals in motivation and behavior. *Social Cognition, 27*(4), 475-495.

Robins, R. W., Hendin, H. M., & Trzesniewski, K. H. (2001). Measuring global self-esteem: Construct validation of a single-item measure and the rosenberg self-esteem scale. *Personality and Social Psychology Bulletin, 27*(2), 151-161.

Rosenberg, M. (1965). Society and the adolescent self-image. Princeton, NJ: Princeton University Press.

Ross, M., & Wilson, A. E. (2000). Constructing and apprasing past selves. In D. L. Schacter, & E. Scarry (Eds.), *Memory, brain, and belief; memory, brain, and belief* (pp. 231-258, Chapter viii, 349 Pages) Harvard University Press, Cambridge, MA.

Ross, M. & Wilson, A.E. (2002). It feels like yesterday: Self-esteem, valence of personal past experiences, and judgments of subjective distance. *Journal of Personality and Social Psychology, 82,* 792-803.

Ross, M., & Wilson, A. E. (2003). Autobiographical memory and conceptions of self: Getting better all the time. *Current Directions in Psychological Science, 12*(2), 66-69.

Sanbonmatsu, D. M., Posavac, S. S., Kardes, F. R., & Mantel, S. P. (1998). Selective hypothesis testing. *Psychonomic Bulletin & Review, 5*(2), 197-220.

Sheldon, O. J., & Fishbach, A. (2015). Anticipating and resisting the temptation to behave unethically. *Personality and Social Psychology Bulletin, 41*(7), 962-975.

Strahan, E. J., Wilson, A. E., Cressman, K. E., & Buote, V. M. (2006). Comparing to perfection: How cultural norms for appearance affect social comparisons and self-image. *Body Image, 3*(3), 211-227.

Steger, M. F., Frazier, P., Oishi, S., & Kaler, M. (2006). The meaning in life questionnaire: Assessing the presence of and search for meaning in life. *Journal of Counseling Psychology, 53*(1), 80-93.

Suls, J., Lemos, K., & Stewart, H. L. (2002). Self-esteem, construal, and comparisons with the self, friends, and peers. *Journal of Personality and Social Psychology, 82*(2), 252-261.

Suls, J., Martin, R., & Wheeler, L. (2000). Three kinds of opinion comparison: The triadic model. *Personality and Social Psychology Review, 4*(3), 219-237.

Suls, J., Martin, R., & Wheeler, L. (2002). Social comparison: Why, with whom, and with what effect? *Current Directions in Psychological Science, 11*(5), 159-163.

Tangney, J. P., Baumeister, R. F., & Boone, A. L. (2004). High self-control predicts good adjustment, less pathology, better grades, and interpersonal success. *Journal of Personality, 72*(2), 271- 322.

Tesser, A. (1988). Toward a self-evaluation maintenance model of social behavior. In L. Berkowitz (Ed.), Advances in experimental social psychology, vol. 21: Social psychological studies of the self: Perspectives and programs; advances in experimental social psychology, vol. 21: Social psychological studies of the self: Perspectives and programs (pp. 181-227, Chapter x, 361 Pages) Academic Press, San Diego, CA.

Tesser, A. (2000). On the confluence of self-esteem maintenance mechanisms. *Personality and Social Psychology Review, 4*(4), 290-299.

Urminsky, O. (2017). The role of psychological connectedness to the future self in decisions over time. *Current Directions in Psychological Science, 26*(1), 34-39

van Gelder, J., Hershfield, H. E., & Nordgren, L. F. (2013). Vividness of the future self predicts delinquency. *Psychological Science, 24*(6), 974-980.

Van Gelder, J., Luciano, E. C., Kranenbarg, M. W., & Hershfield, H. E. (2015). Friends with my future self: Longitudinal vividness intervention reduces delinquency. *Criminology: An Interdisciplinary Journal, 53*(2), 158-179.

Ward, C. L. P., & Wilson, A. E. (2015). Implicit theories of change and stability moderate effects of subjective distance on the remembered self. *Personality and Social Psychology Bulletin, 41*(9), 1167-1179.

Wheeler, L., Martin, R., & Suls, J. (1997). The proxy model of social comparison for self-assessment of ability. *Personality and Social Psychology Review, 1*(1), 54-61.

Wheeler, L., & Miyake, K. (1992). Social comparison in everyday life. *Journal of Personality and Social Psychology,* 62, 760-773.

Wills, T. A. (1986). Discussion remarks on social comparison theory. *Personality and Social Psychology Bulletin*, 12, 282-288.

Wilson, A. E., Buehler, R., Lawford, H., Schmidt, C., & Yong, A. G. (2012). Basking in projected glory: The role of subjective temporal distance in future self−appraisal. *European Journal of Social Psychology, 42*(3), 342-353.

Wilson, A. E., & Ross, M. (2000). The frequency of temporal-self and social comparisons in people's personal appraisals. *Journal of Personality and Social Psychology, 78*, 928-942.

Wilson, A.E. & Ross, M. (2001). From chump to champ: People's appraisals of their earlier and current selves. *Journal of Personality and Social Psychology, 80*, 572-584.

APPENDIX I
TABLES

Table 1. Types of temporal self-comparison

Self-Affirming Temporal Self-Comparison		Self-Deflating Temporal Self-Comparison	
Past Downward: Your current self is better than your past self. You have gotten better.	Future Upward: Your future self is better than your current self. You will get better.	Past Upward: Your current self is worse than your past self. You used to be better.	Future Downward: Your future self will be worse than your current self. You will be worse.

Note: The description under each type of temporal self-comparison is provided to give a sense of what each of these comparisons would mean and what they might look like. There are multiple ways to express each, and keep in mind that these are comparisons, oftentimes in a specific domain.

Table 2. Summary of Waves and Measures Used in Study 1.

Time 1 Fall 2016 Week 1	Time 2 Spring 2017 Week 28	Time 3 Fall 2017 Week 52
Future Self-Connectedness	*Future Self-Connectedness*	*Future Self-Connectedness*
Future Self-Vividness	*Future Self-Vividness*	*Future Self-Vividness*
Future Self-Positivity	*Future Self-Positivity*	*Future Self-Positivity*
	Social Comparison	*Social Comparison*
	Temporal Self-Comparison	*Temporal Self-Comparison*
		Emotion Regulation
		Satisfaction with Life
		Self-Esteem
		Rosenberg Self-Esteem
Academic Self-Efficacy	**Academic Self-Efficacy**	*Academic Self-Efficacy*
	Academic Valuing	
	Academic Disengagement	*Academic Disengagement*
	Expected GPA	*Expected GPA*
	Likelihood of Graduation	*Likelihood of Graduation*

Note: This table includes the measures used in Study 1. Measures in bold will be used in analyses.

Table 3. Social comparison and temporal self-comparison measures

Comparison Target	Comparison Direction		
	Downward	Upward	Direction Unspecified
Past Self	Downward Past Self-Comparison N_{items} = 5 Cronbach's α_{T4} = .885 e.g., *I am better than I used to be*	Upward Past Self-Comparison N_{items} = 4 Cronbach's α_{T4} = .856 e.g., *I was a better student in the past*	Past Self-Comparison Direction Unspecified N_{items} = 3 Cronbach's α_{T4} = .786 e.g., *I compare who I am now to who I was when I was in high school*
Future Self	Downward Future Self-Comparison N_{items} = 3 Cronbach's α_{T4} = .615 e.g., *I am a better student now than I will be in the future*	Upward Future Self-Comparison N_{items} = 4 Cronbach's α_{T4} = .823 e.g., *I think about how my future self will be better at things than I am right now*	Future Self-Comparison Direction Unspecified N_{items} = 4 Cronbach's α_{T4} =.820 e.g., *I measure myself against the person I will be in the future*
Others	Downward Social Comparison N_{items} = 4 Cronbach's α_{T4} = .841 e.g., *I tend to compare myself to students who are not doing as well as I am in school*	Upward Social Comparison N_{items} = 3 Cronbach's α_{T4} = .889 e.g., *I compare myself to students who are better than I am in school*	Social Comparison Direction Unspecified N_{items} = 4 Cronbach's α_{T4} = .861 e.g., *I think about how I am doing in school relative to my friends in school*

Table 4. Correlations among future self-connectedness, social comparison, and temporal self-comparison.

Measure	1	2	3	4	5	6	7	*M*	*SD*	*N*
1. S-C	-							4.16	1.19	549
2. Vivid	.30***	-						4.66	1.48	549
3. Pos	.28***	.46***	-					0.00	0.86	549
4. SCom	-.04	-.21***	-.20***	-				4.58	1.12	504
5. PastDo	.13*	.20***	.27***	.08 †	-			5.31	1.14	504
6. PastUp	-.15**	-.21***	-.23***	.18***	-.35***	-		4.01	1.37	504
7. FutDo	-.14**	-.23***	-.38***	.30***	-.25***	.45***	-	3.26	1.15	503
8. FutUp	.07	.19***	.17**	.07	.44***	-.02	-.12**	5.21	1.03	503

Note: S-C = similarity-connectedness at Time 1; Vivid = future self-vividness aggregate at Time 1; Pos = future self-positivity aggregate at Time 1; SCom = social comparison at Time 2; PastDo = past-downward temporal self-comparison at Time 2; PastUp = past-upward temporal self-comparison at Time 2; FutDo = future-downward temporal self-comparison at Time 2; FutUp = future-upward temporal self-comparison at Time 2.

† $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 5. Correlations of connectedness and comparison with primary outcome measures.

Measure	1. S-C	2. Viv	3. Pos	4. SA TSC	5. SD TSC	6. SCom	*M*	*SD*	*N*
ERQ	.20**	.13*	.25***	.22**	-.19**	-.15**	3.82	.69	484
Esteem	.27**	.17**	.30***	.15**	-.19**	-.09 †	3.47	.98	483
RSE	.29**	.22***	.36***	.18**	-.39**	-.21**	5.13	1.09	480
SWLS	.24**	.10 †	.28***	.12*	-.28**	-.03	4.90	1.23	482
ASE	.19**	.25**	.25***	.34**	-.41**	.02	5.37	.89	516
Disengage	-.24**	-.24**	-.29***	-.33**	.49**	.11*	2.28	1.19	514
Value	.06	.08	.18**	.43**	-.30**	.03	5.84	.89	514
Grad	.07	.12*	.18**	.25**	-.24**	.08 †	6.68	.82	508
Expect	.15**	.08	.17**	.14**	-.32**	.11*	3.56	.37	510

Note: S-C = similarity-connectedness at Time 1; Viv = Vividness aggregate at Time 1; Pos = positivity aggregate at Time 1; SA TSC = self-affirming temporal self-comparison at Time 2; SD TSC = self-deflating temporal self-comparison at Time 2; SCom = social comparison at Time 2; ERQ = emotion regulation at Time 3; Esteem = single-item self-esteem at Time 3; RSE = Rosenberg self-esteem scale at Time 3; SWLS = satisfaction with life scale at Time 3; ASE = academic self-efficacy at Time 2; Disengage = academic disengagement at Time 2; value = academic valuing at Time 2; Grad = graduation likelihood at Time 2; Expect = expected GPA for that semester at Time 2. † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 6. Study 1 exploratory analyses. Relation of single-item similarity and connectedness to comparison processes and outcomes of interest, for working sample and split by college generation status.

Group	Working Sample		First-Generation		Continuing-Generation	
Measure	Similar	Connected	Similar	Connected	Similar	Connected
Social Comp	.02	-.07	.17 †	.08	-.04	-.13 †
Past Down	.03	.16 **	.22 *	.28 **	-.07	.10
Past Upward	-.05	-.18 ***	.03	-.21 *	-.07	-.15 *
Future Down	-.10 †	-.14 *	-.06	-.21 *	-.12 †	-.10
Future Upward	.04	.07	.17 †	.10	-.03	.04
Emotion Reg	.15 **	.18 ***	.24 *	.38 ***	.08	.07
Self-Esteem	.19 **	.25 ***	.08	.21 †	.20 **	.23 ***
RSE	.22 ***	.27 ***	.23 *	.32 **	.18 **	.22 ***
Life Satisfaction	.22 ***	.19 ***	.20 †	.33 ***	.22 ***	.11 †
ASE	.11 *	.20 ***	.14	.28 **	.07	.15 *
Disengagement	-.18 ***	-.21 ***	-.26 **	-.34 ***	-.13 *	-.14 *
Valuing	.06	.05	.08	.21 *	.06	-.005
Grad Likely	.05	.07	.14	.25 *	-.02	-.04
Expected GPA	.07	.17 **	.05	.29 **	.07	.09

Note: S-C = similarity-connectedness at Time 1; Viv = Vividness aggregate at Time 1; Pos = positivity aggregate at Time 1; SA TSC = self-affirming temporal self-comparison at Time 2; SD TSC = self-deflating temporal self-comparison at Time 2; SCom = social comparison at Time 2; ERQ = emotion regulation at Time 3; Esteem = single-item self-esteem at Time 3; RSE = Rosenberg self-esteem scale at Time 3; SWLS = satisfaction with life scale at Time 3; ASE = academic self-efficacy at Time 2; Disengage = academic disengagement at Time 2; value = academic valuing at Time 2; Grad = graduation likelihood at Time 2; Expect = expected GPA for that semester at Time 2. † $p \leq .10$, * $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$.

Table 7. Exploratory analyses. Tests of whether constraining similarity and connectedness to be equal worsens model fit.

Model	χ^2 (*df*)	CFI	RMSEA	SRMR	$\Delta\chi^2(1)$	$\Delta\chi^2$ *p*
Base Model, No Constraints	106.76 (32)	.947	.056	.042	n/a	n/a
Constraint: FSC on SCom	108.84 (32)	.947	.055	.043	2.08	.15
Constraint: FSC on SA TSC	108.72 (33)	.947	.055	.043	1.96	.16
Constraint: FSC on SD TSC	108.71 (33)	.947	.055	.043	1.95	.16
Constraint: FSC on Motivation	107.33 (33)	.948	.055	.042	.57	.45
Constraint: FSC on Adjustment	106.85 (33)	.948	.054	.042	.09	.76
Constraint: FSC on EmoReg	106.98 (33)	.948	.054	.042	.22	.64

Note: FSC1 = future self-similarity single item; FSC2 = future self-connectedness single item; SA TSC = self-affirming temporal self-comparison; SD TSC = self-deflating temporal self comparison; SCom = social comparison aggregate; adjustment = psychological adjustment latent variable; motivation = academic motivation latent variable; EmoReg = emotion regulation. Paths from FSC1 and FSC2 to criteria were individually constrained to be equal, denoted by "FSC." Base model

Table 8. Study 1 exploratory analyses. Examination of moderation by college generation status for paths in Study 1B SEM.

Model	χ^2 (*df*)	CFI	RMSEA	SRMR	$\Delta\chi^2(1)$	$\Delta\chi^2$ *p*
Base Model Fully Constrained	225.11 (100)	.909	.058	.093	n/a	n/a
Release Motivation on FSC1	224.98 (999)	.909	.058	.092	0.13	.72
Release Motivation on FSC2	223.52 (999)	.910	.058	.092	1.59	.21
Release Motivation SCom	225.11 (999)	.909	.058	.093	0	1.0
Release Motivation on SA TSC	224.90 (999)	.909	.058	.093	0.21	.65
Release Motivation on SD TSC	225.10 (999)	.909	.058	.093	0.01	.92
Release EmoReg on FSC1	224.27 (999)	.909	.058	.092	0.84	.36
Release EmoReg on FSC2	220.23 (999)	.912	.057	.090	**4.88**	**.03**
Release EmoReg SCom	224.92 (999)	.909	.058	.092	0.19	.66
Release EmoReg on SA TSC	225.06 (999)	.909	.058	.093	0.05	.82
Release EmoReg on SD TSC	223.73 (999)	.910	.058	.094	1.38	.24
Release Adjustment on FSC1	224.93 (999)	.909	.058	.093	0.18	.67
Release Adjustment on FSC2	224.97 (999)	.909	.058	.093	0.14	.71
Release Adjustment SCom	223.54 (999)	.910	.058	.091	1.57	.15
Release Adjustment on SA TSC	221.05 (999)	.912	.057	.089	**4.06**	**.04**
Release Adjustment on SD TSC	220.67 (999)	.912	.057	.087	**4.44**	**.04**
Release SA TSC on FSC1	218.28 (999)	.914	.057	.088	**6.83**	**.008**
Release SA TSC on FSC2	224.32 (999)	.909	.058	.090	0.79	.37
Release SA TSC with SD TSC	224.24 (999)	.909	.058	.091	0.87	.35
Release SA TSC with SCOM	224.89 (999)	.909	.058	.092	0.22	.64
Release SD TSC with SCOM	224.95 (999)	.909	.058	.092	0.16	.69
Release SD TSC on FSC1	224.16 (999)	.909	.058	.094	0.95	.33
Release SD TSC on FSC2	223.72 (999)	.910	.058	.091	1.39	.24
Release SCom on FSC1	223.27 (999)	.910	.058	.092	1.84	.17
Release SCom on FSC2	221.11 (999)	.911	.057	.093	**4**	**.05**
Release FSC1 with FSC2	218.74 (999)	.913	.057	.088	**6.37**	**.01**
Release Motivation with EmoReg	224.61 (999)	.909	.058	.092	0.5	.48
Release Motivation with Adjustment	224.05 (999)	.909	.058	.091	1.06	.30
Release EmoReg with Adjustment	224.93 (999)	0.910	0.059	0.095	0.19	0.68

Note: FSC1 = future self-similarity single item; FSC2 = future self-connectedness single item; SA TSC = self-affirming temporal self-comparison; SD TSC = self-deflating temporal self comparison; SCom = social comparison aggregate; adjustment = psychological adjustment latent variable; motivation = academic motivation latent variable; EmoReg = emotion regulation. Base model was the stacked model from exploratory analyses with all paths constrained to be equal for first-generation and continuing-generation college students.

Table 9. Study 2. Experimental effects of condition on future self-connectedness.

Measure	Control	FSC	IS	ANOVA
S-C Aggregate	4.13 (1.31)	4.23 (1.19)	4.14 (1.20)	$F(2,425) = .31$, $p = .74$
Positivity Aggregate	5.59 (1.15)	5.70 (.88)	5.73 (.95)	$F(2,425) = .81$, $p = .45$
Vividness Aggregate	4.48 (1.47)	4.64 (1.52)	4.62 (1.35)	$F(2,423) = .53$, $p = .59$
Similarity	4.11 (1.38)	4.20 (1.30)	4.12 (1.23)	$F(2,424) = .19$, $p = .83$
Connectedness	4.14 (1.56)	4.27 (1.42)	4.16 (1.48)	$F(2,424) = .32$, $p = .73$
Future Self Liking	5.54 (1.39)	5.69 (1.17)	5.68 (1.13)	$F(2,424) = .58$, $p = .56$
Positivity 100	74.22 (21.26)	77.71 (17.02)	74.29 (18.69)	$F(2,422) = 1.51$, $p = .22$
Positivity 7	5.65 (1.22)	5.71 (1.02)	5.78 (1.06)	$F(2,423) = .48$, $p = .62$
Vividness	4.47 (1.59)	4.61 (1.57)	4.50 (1.43)	$F(2,423) = .30$, $p = .74$
Ease	4.49 (1.45)	4.68 (1.59)	4.74 (1.45)	$F(2,423) = 1.12$, $p = .33$

Note: Table describes means and standard deviations of future self-connectedness measures according to experimental condition; FSC = pilot future self-connectedness manipulation; IS = identity-stability manipulation. S-C Aggregate = similarity-connectedness aggregate measure; Positivity 100 = negativity-positivity on a 100-point scale; Positivity 7 = negativity-positivity on a seven-point scale; Ease = ease of creating mental imagery of the future.

Table 10. Study 2. Experimental effects on social comparison and temporal self-comparison.

Measure	Control	FSC	IS	ANOVA	Contrast
Social Comparison	4.76 (1.08)	4.64 (1.11)	4.87 (.96)	$F(2, 426) = 1.67$	
Self-Affirming TSC	5.26 (.87)	5.33 (.79)	5.30 (.69)	$F(2, 426) = .23$	
Self-Deflating TSC	3.92 (1.03)	3.77 (.95)	4.01 (.83)	$F(2,426) = 2.50$ †	4* 5*
SC unspecified	4.96 (1.18)	4.86 (1.23)	5.09 (1.03)	$F(2, 426) = 1.42$	
SC upward	4.49 (1.21)	4.34 (1.18)	4.52 (1.14)	$F(2, 426) = .88$	
SC downward	4.86 (1.28)	4.74 (1.25)	5.05 (1.22)	$F(2, 426) = 2.23$	
TSC future unspec	5.35 (.90)	5.42 (.86)	5.33 (.89)	$F(2, 426) = .38$	
TSC future down	3.47 (1.09)	3.32 (1.06)	3.48 (.98)	$F(2, 426) = 1.10$	
TSC future up	5.39 (.97)	5.54 (.93)	5.50 (.79)	$F(2, 426) = 1.06$	
TSC past unspec	5.19 (.96)	5.27 (.90)	5.23 (.92)	$F(2, 426) = .23$	
TSC past down	5.17 (1.04)	5.16 (1.02)	5.15 (.87)	$F(2, 426) = .01$	
TSC past up	4.25 (1.31)	4.10 (1.23)	4.41 (1.08)	$F(2,426) = 2.36$ †	4* 5†

Note: Table describes means and standard deviations of comparison measures according to experimental condition; FSC = pilot future self-connectedness manipulation; IS = identity-stability manipulation. Self-Affirming TSC = self-affirming temporal self-comparison; Self-Deflating TSC = self-deflating temporal self-comparison; SC unspecified = social comparison, unspecified direction; SC upward = upward social comparison; SC downward = downward social comparison; TSC future unspec = temporal self-comparison with the future self, direction unspecified; TSC future down = future-downward temporal self-comparison; TSC future up = future-upward temporal self-comparison; TSC past unspec = temporal self-comparison with the past self, direction unspecified; TSC past down = past-downward temporal self-comparison; TSC past up = past-upward temporal self-comparison. Contrasts = significant and marginally significant contrast tests, 1 = control vs. both manipulations, 2 = control vs. pilot connectedness manipulation, 3 = control vs. identity-stability manipulation, 4 = connectedness vs. identity-stability; 5 = connectedness vs. control and identity-stability. † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 11. Study 2. Experimental effects on motivation, emotion, and well-being.

Measure	Control	FSC	IS	ANOVA	Contrast
Emotion Regulation	3.66 (.78)	3.68 (.69)	3.61 (.73)	$F(2, 421) = .40$	
Satisfaction with Life	4.71 (1.26)	4.62 (1.20)	4.74 (1.19)	$F(2, 423) = .36$	
Rosenberg Self-Esteem	4.77 (1.21)	4.95 (1.17)	4.92 (1.13)	$F(2, 420) = .92$	
Self-Esteem 1-item	3.26 (1.13)	3.31 (.93)	3.33 (1.05)	$F(2, 421) = .18$	
Academic Self-Efficacy	4.99 (.97)	5.18 (.91)	5.06 (.92)	$F(2, 414) = 1.54$	
Academic Valuing	5.94 (.86)	5.85 (.97)	5.86 (.94)	$F(2, 420) = .35$	
Academic Disengagement	2.35 (1.31)	2.40 (1.39)	2.21 (1.13)	$F(2, 420) = .85$	
Expected GPA	3.45 (.42)	3.56 (.36)	3.53 (.38)	$F(2, 420) = 2.89$ †	1* 2* 3† 5†
Graduation Likely	6.62 (.72)	6.60 (.90)	6.67 (.69)	$F(2, 420) = .39$	

Note: Table describes means and standard deviations of comparison measures according to experimental condition; FSC = pilot future self-connectedness manipulation; IS = identity-stability manipulation. Contrasts = significant and marginally significant contrast tests, 1 = control vs. both manipulations, 2 = control vs. pilot connectedness manipulation, 3 = control vs. identity-stability manipulation, 4 = connectedness vs. identity-stability; 5 = connectedness vs. control and identity-stability. † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 12. Study 2. Experimental effects of condition on mood.

Measure	Control	FSC	IS	ANOVA	Contrast
Positive Affect	1.90 (.86)	1.82 (.81)	1.86 (.77)	$F(2, 414) = .33$	
Negative Affect	2.92 (.95)	2.98 (.86)	2.95 (.92)	$F(2, 414) = .15$	
Distressed	2.55 (1.20)	2.33 (1.13)	2.53 (1.16)	$F(2, 414) = 1.58$	
Excited	2.73 (1.27)	2.69 (1.19)	2.69 (1.19)	$F(2, 414) = .06$	
Upset	2.14 (1.21)	1.95 (1.11)	2.01 (1.09)	$F(2, 414) = 1.08$	
Guilty	1.70 (1.11)	1.76 (1.18)	1.73 (1.03)	$F(2, 414) = .11$	
Scared	1.98 (1.18)	2.01 (1.21)	2.08 (1.24)	$F(2, 414) = .29$	
Hostile	1.47 (.90)	1.54 (1.01)	1.54 (.96)	$F(2, 413) = .25$	
Enthusiastic	2.66 (1.32)	2.71 (1.22)	2.73 (1.25)	$F(2, 414) = .10$	
Proud	2.83 (1.31)	2.75 (1.19)	2.82 (1.23)	$F(2, 414) = .20$	
Irritable	2.22 (1.18)	2.31 (1.21)	2.13 (1.18)	$F(2, 414) = .75$	
Alert	2.73 (1.25)	2.96 (1.24)	2.73 (1.25)	$F(2, 414) = 1.57$	
Ashamed	1.85 (1.24)	1.63 (1.05)	1.65 (1.04)	$F(2, 414) = 1.69$	
Inspired	2.84 (1.42)	2.96 (1.28)	2.78 (1.27)	$F(2, 414) = .63$	
Nervous	2.58 (1.37)	2.33 (1.21)	2.56 (1.27)	$F(2, 414) = 1.61$	
Determined	3.39 (1.27)	3.49 (1.14)	3.54 (1.16)	$F(2, 414) = .60$	
Attentive	3.19 (1.17)	3.16 (1.15)	3.17 (1.10)	$F(2, 414) = .03$	
Active	3.02 (1.41)	3.09 (1.31)	3.06 (1.26)	$F(2, 414) = .09$	
Afriad	2.00 (1.22)	1.89 (1.21)	1.94 (1.24)	$F(2, 414) = .29$	
Disgusted	1.60 (1.14)	1.51 (.98)	1.51 (.94)	$F(2, 414) = .40$	
Threatened	1.48 (1.02)	1.46 (.97)	1.33 (.72)	$F(2, 414) = 1.08$	
In Control	2.91 (1.23)	3.07 (1.18)	2.99 (1.23)	$F(2, 413) = .60$	
Helpless	1.96 (1.28)	1.58 (.98)	1.88 (1.10)	$F(2, 414) = 4.18$*	1† 2**4* 5**
Angry	1.67 (1.09)	1.67 (1.13)	1.59 (.94)	$F(2, 414) = .27$	
Aggressive	1.45 (.89)	1.59 (1.12)	1.53 (.92)	$F(2, 414) = .74$	

Note: FSC = pilot future self-connectedness manipulation; IS = identity-stability manipulation. Contrasts = significant and marginally significant contrast tests, 1 = control vs. both manipulations, 2 = control vs. pilot connectedness manipulation, 3 = control vs. identity-stability manipulation, 4 = connectedness vs. identity-stability; 5 = connectedness vs. control and identity-stability. † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 13. Study 2. Measures of future self-connectedness before and after manipulation.

Measure	Control		FSC		IS	
	Pre	Post	Pre	Post	Pre	Post
S-C Aggregate	3.76 (1.12)	4.04 (1.09)	3.95 (1.20)	4.09 (1.29)	4.20 (1.12)	4.18 (1.20)
Similarity	3.88 (1.17)	4.08 (.104)	3.91 (1.38)	4.14 (1.28)	4.29 (1.21)	4.32 (1.22)
Connectedness	3.64 (1.55)	4.00 (1.41)	4.00 (1.38)	4.05 (1.43)	4.11 (1.26)	4.04 (1.40)
Positivity Agg	5.72 (.90)	5.50 (1.06)	5.84 (.89)	5.91 (.78)	5.77 (.92)	5.66 (.89)
Liking	5.64 (1.11)	5.44 (1.33)	5.55 (1.22)	6.09 (1.11)	5.61 (1.29)	5.57 (1.14)
Positivity 100	74.08 (19.04)	74.44 (18.18)	80.10 (13.96)	79.95 (11.14)	76.75 (16.53)	74.57 (15.46)
Positivity 7	5.80 (.96)	5.56 (1.12)	6.14 (.77)	5.73 (1.08)	5.89 (.92)	5.75 (.93)
Vividness Agg	4.96 (1.43)	4.30 (1.38)	4.77 (1.24)	4.86 (1.46)	4.34 (1.56)	4.23 (1.37)
Vividness	5.00 (1.38)	4.40 (1.41)	4.68 (1.49)	4.82 (1.62)	4.25 (1.67)	4.04 (1.53)
Ease	4.92 (1.63)	4.20 (1.44)	4.86 (1.25)	4.91 (1.34)	4.43 (1.60)	4.43 (1.43)

Note: Table describes means and standard deviations of future self-connectedness measures according to experimental condition and pre-manipulation vs. post-manipulation; FSC = pilot future self-connectedness manipulation; IS = identity-stability manipulation. Pre = PSY 101 questionnaire at Week 3; Post = Study 2 survey after experimental condition at Week 6. S-C Aggregate = similarity-connectedness aggregate measure; Positivity Agg = positivity aggregate measure; Vividness Agg = vividness aggregate measure; Liking = Liking of the future self; Positivity 100 = negativity-positivity on a 100-point scale; Positivity 7 = negativity-positivity on a seven-point scale; Ease = ease of creating mental imagery of the future.

Table 14. Study 2. Pre-manipulation differences in future self-connectedness by condition.

Measure	*SD*	Control *n* = 25	FSC *n* = 22-24	IS *n* = 28	Effect Size (*d*) Control vs. FSC	Control vs. IS	FSC vs. IS
S-C Aggregate	1.16	3.76 (1.12)	3.95 (1.20)	4.20 (1.12)	0.16	0.38	0.22
Similarity	1.25	3.88 (1.17)	3.91 (1.38)	4.29 (1.21)	0.02	0.33	0.30
Connectedness	1.26	3.64 (1.55)	4.00 (1.38)	4.11 (1.26)	0.29	0.37	0.09
Positivity Agg	.927	5.72 (.90)	5.84 (.89)	5.77 (.92)	0.13	0.05	0.08
Liking	1.20	5.64 (1.11)	5.55 (1.22)	5.61 (1.29)	0.07	0.02	0.05
Positivity 100	16.57	74.08 (19.04)	80.10 (13.96)	76.75 (16.53)	0.36	0.16	0.20
Positivity 7	.906	5.80 (.96)	6.14 (.77)	5.89 (.92)	0.38	0.10	0.28
Vividness Agg	1.44	4.96 (1.43)	4.77 (1.24)	4.34 (1.56)	0.13	0.43	0.30
Vividness	1.55	5.00 (1.38)	4.68 (1.49)	4.25 (1.67)	0.21	0.48	0.28
Ease	1.52	4.92 (1.63)	4.86 (1.25)	4.43 (1.60)	0.04	0.32	0.28

Note: Table describes means and standard deviations of pre-manipulations future self-connectedness measures according to experimental condition. In addition, differences among means are given in Cohen's *d*. FSC = pilot future self-connectedness manipulation; IS = identity-stability manipulation. Pre = PSY 101 questionnaire. S-C Aggregate = similarity-connectedness aggregate measure; Positivity Agg = positivity aggregate measure; Vividness Agg = vividness aggregate measure; Liking = Liking of the future self; Positivity 100 = negativity-positivity on a 100-point scale; Positivity 7 = negativity-positivity on a seven-point scale; Ease = ease of creating mental imagery of the future self.

APPENDIX II
FIGURES

Figure 1. Simplified structural model of SEM in Study 1B. This model is intended to convey the main hypotheses in a clear, concise manner by grouping the future self-connectedness measures together and the temporal self-comparison measures together. Dotted lines indicate paths predicted to be negative.

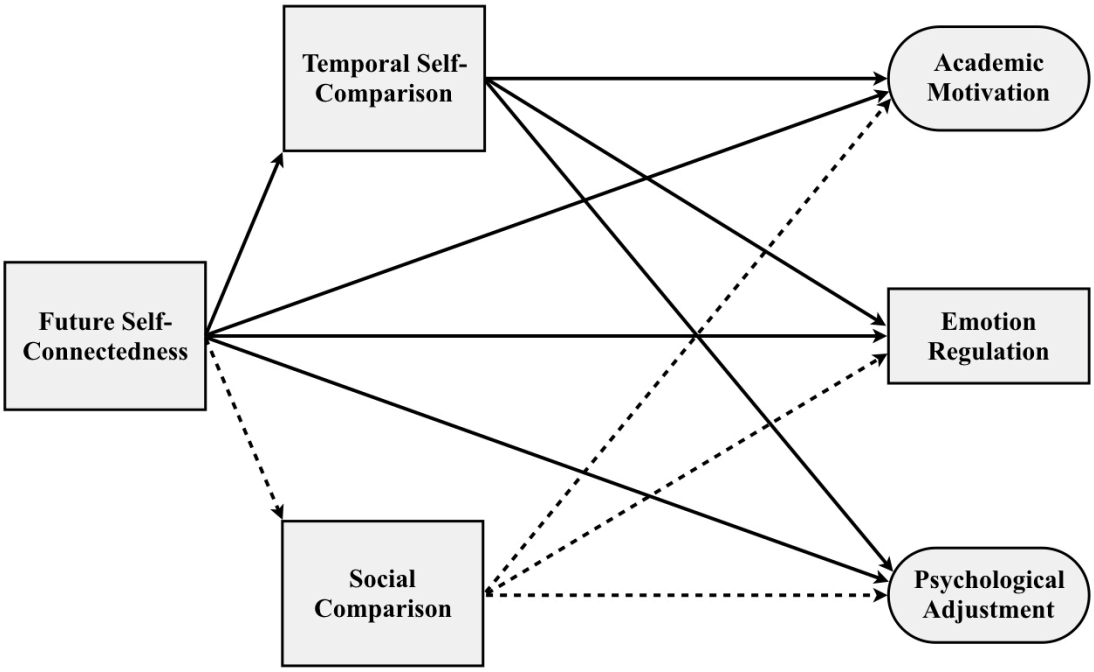


Figure 1. Simplified structural model of proposed SEM in Study 1B.

Figure 2. Structural equation model for Study 1B with three separate components of future self-connectedness. Path coefficients are not given. Black lines represent significant or marginally significant paths. Green lines represent nonsignificant paths. Solid lines represent positive paths. Dotted lines represent negative paths.

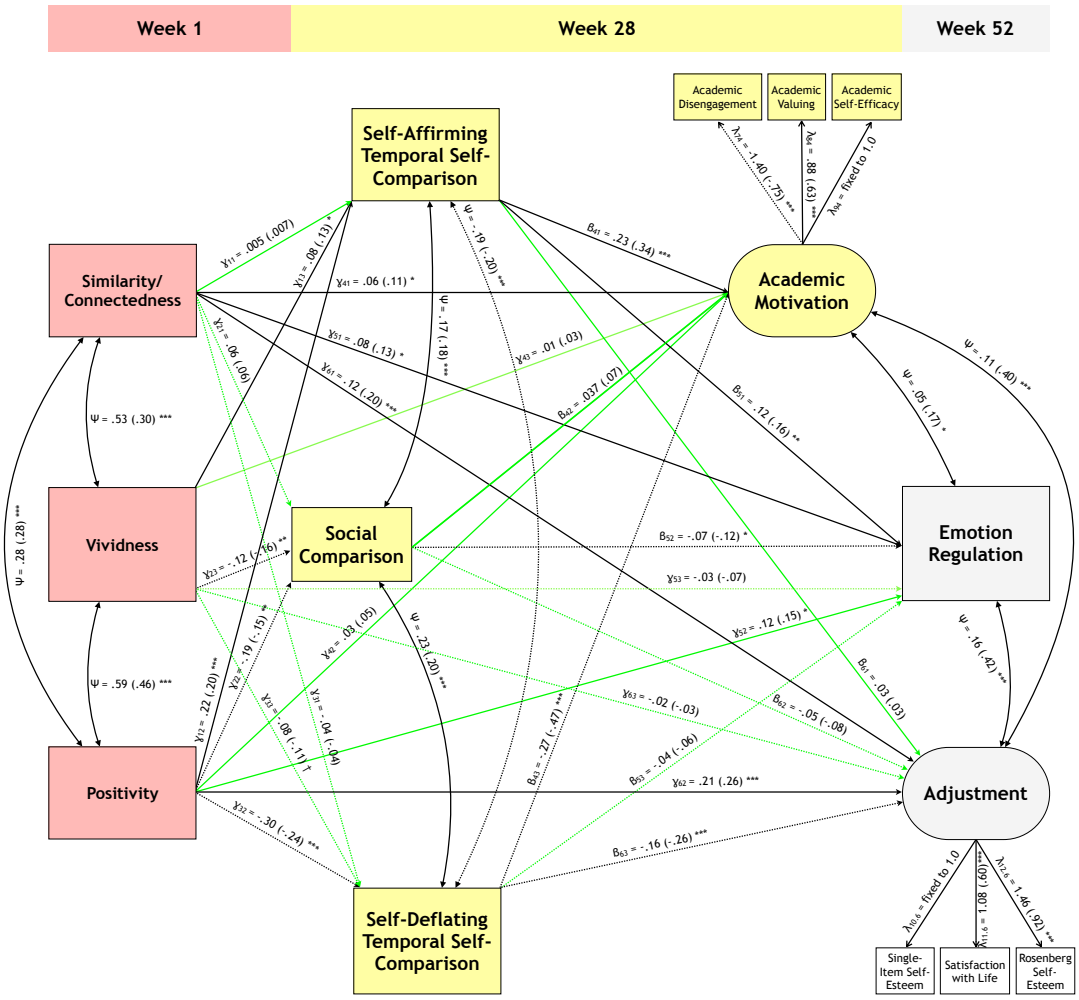


Figure 3. Structural equation model for exploratory analyses in Study 1B. This model examines the effects of single-item future self-similarity and single-item future self-connectedness in lieu of the other future self-connectedness measures. Blue lines indicate significant paths, gray lines indicate nonsignificant paths, dotted lines indicate negative relations, and solid lines indicate positive relations. Unstandardized path coefficients are given with standardized path coefficients in parentheses.

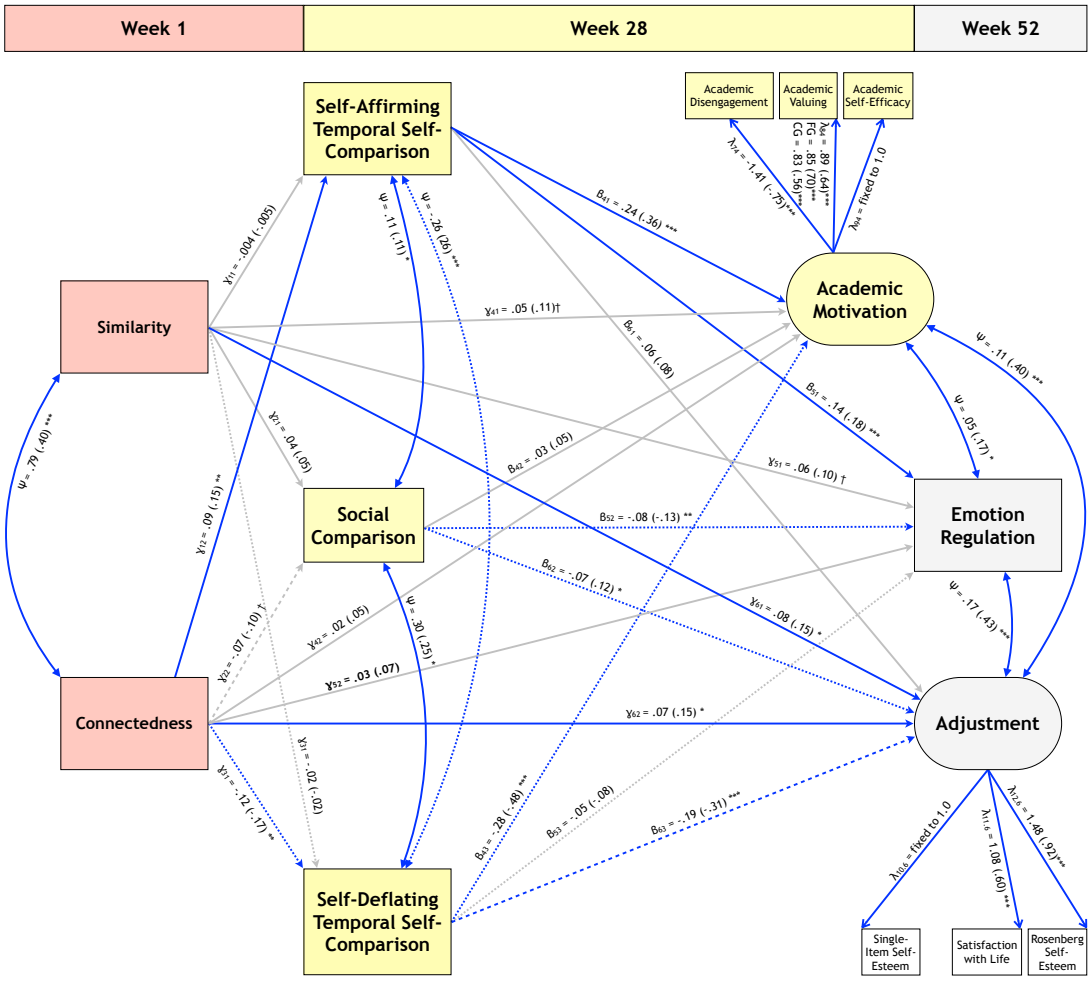


Figure 4. Structural equation model Study 1 exploratory analyses, stacked by college generation status. Blue lines indicate significant paths, gray lines indicate nonsignificant paths, and black lines indicate paths moderated by college generation status. Path coefficients, with standardized coefficients in parentheses, are provided separately for first- and continuing-generation college students.

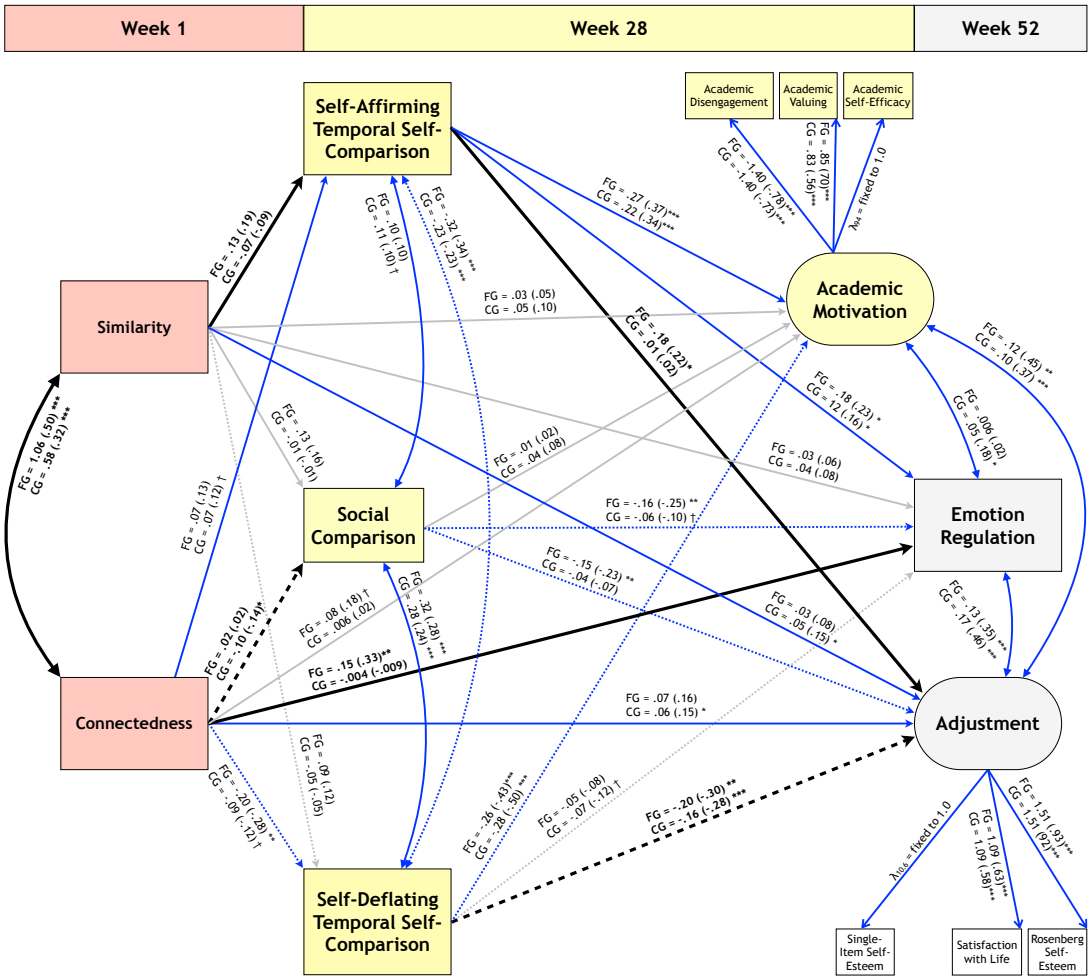


Figure 5. The interaction of vividness and similarity-connectedness predicting past-downward temporal self-comparison. The figure depicts the relation between vividness (x-axis) and past-downward temporal self-comparison (y-axis) at different levels of similarity-connectedness (blue line = low similarity at -1 SD, black line = high similarity at +1 SD).

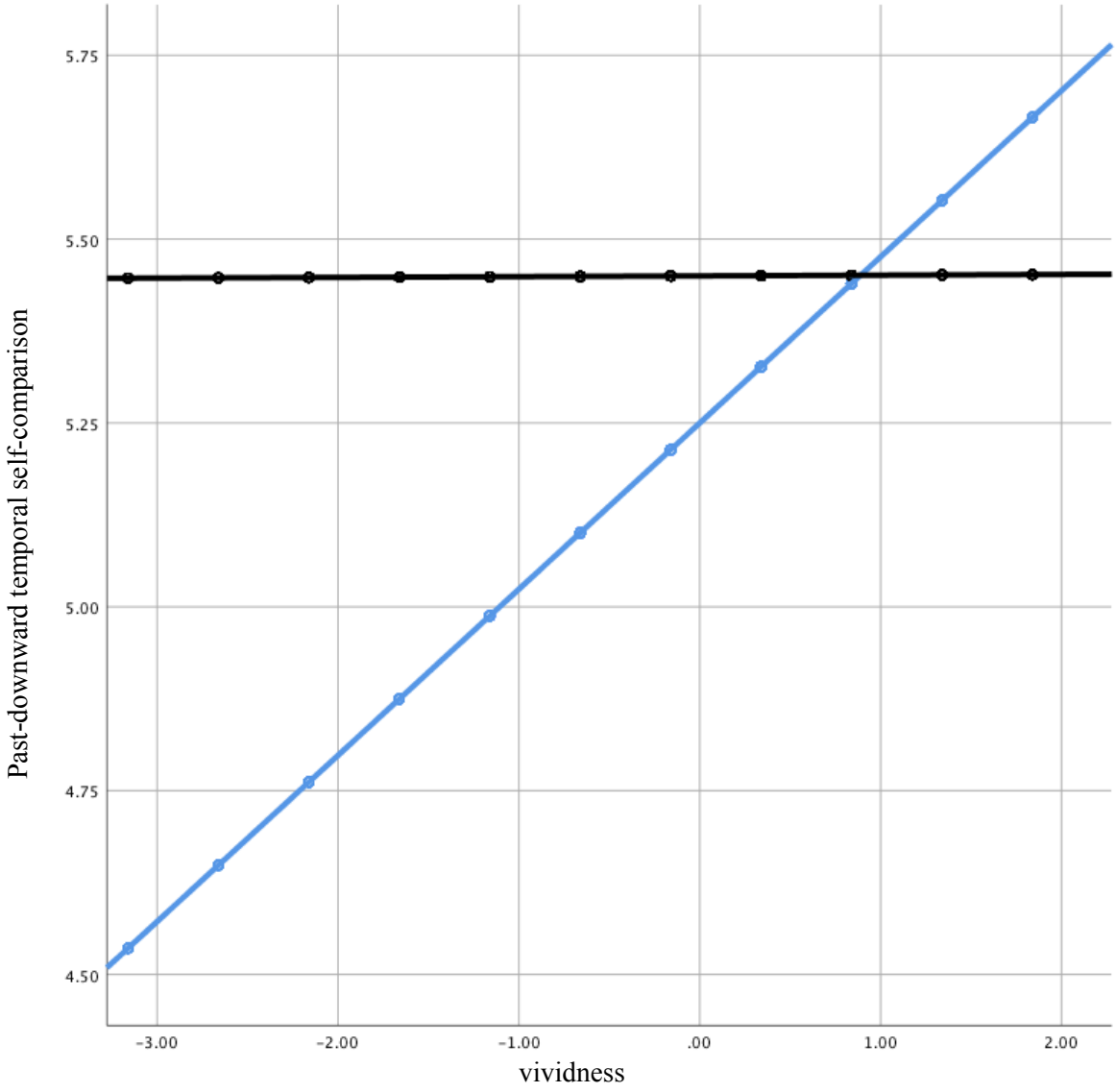


Figure 6. The interaction of vividness and similarity-connectedness predicting past-downward temporal self-comparison. The figure depicts the relation between similarity-connectedness (x-axis) and past-downward temporal self-comparison (y-axis) at different levels of vividness (blue line = low vividness at -1 SD, black line = high vividness at +1 SD).

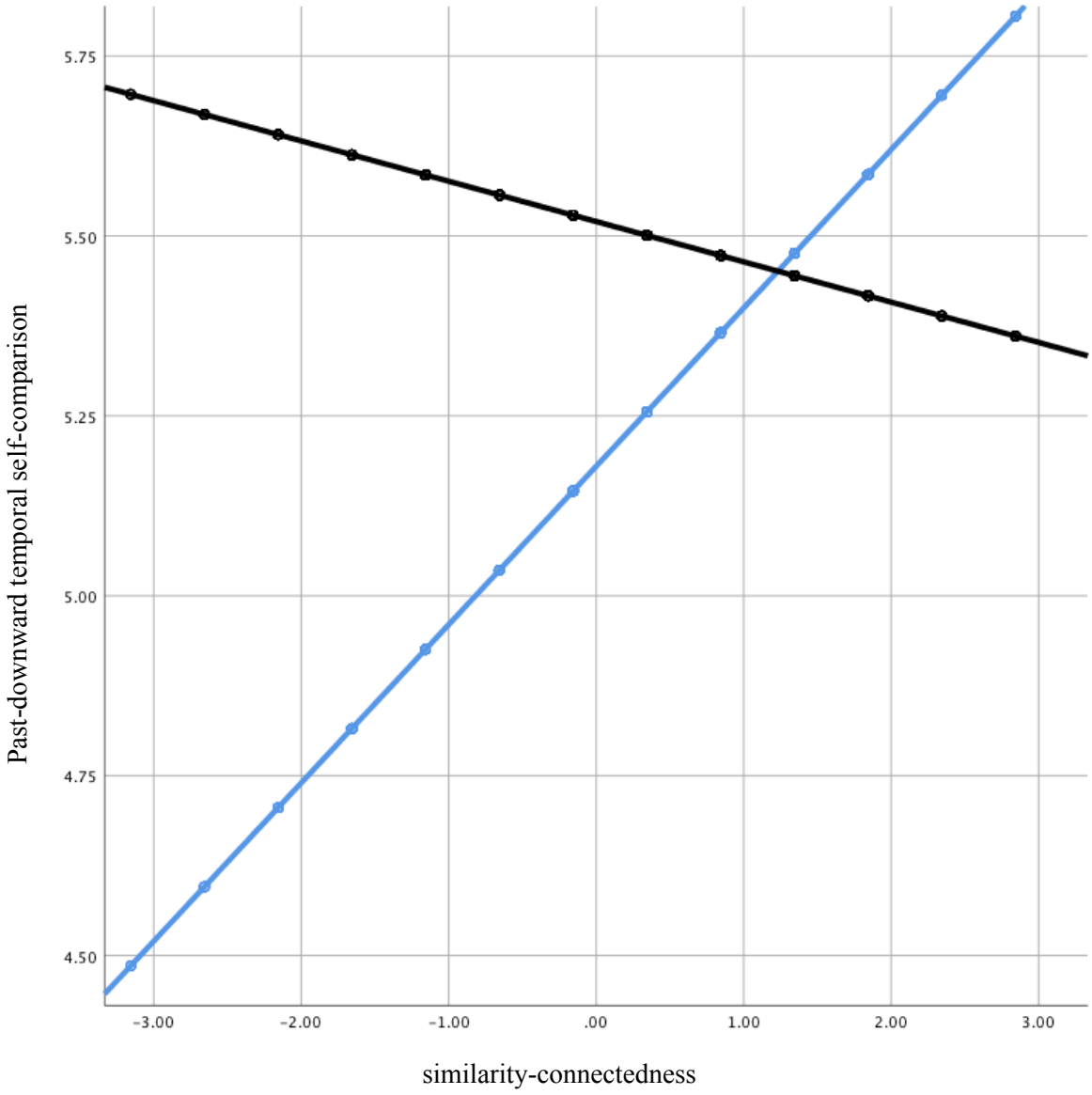


Figure 7. The interaction of positivity and similarity-connectedness predicting past-downward temporal self-comparison. The figure depicts the relation between positivity (x-axis) and past-downward temporal self-comparison (y-axis) at different levels of similarity-connectedness (blue line = low similarity at -1 SD, black line = high similarity at +1 SD).

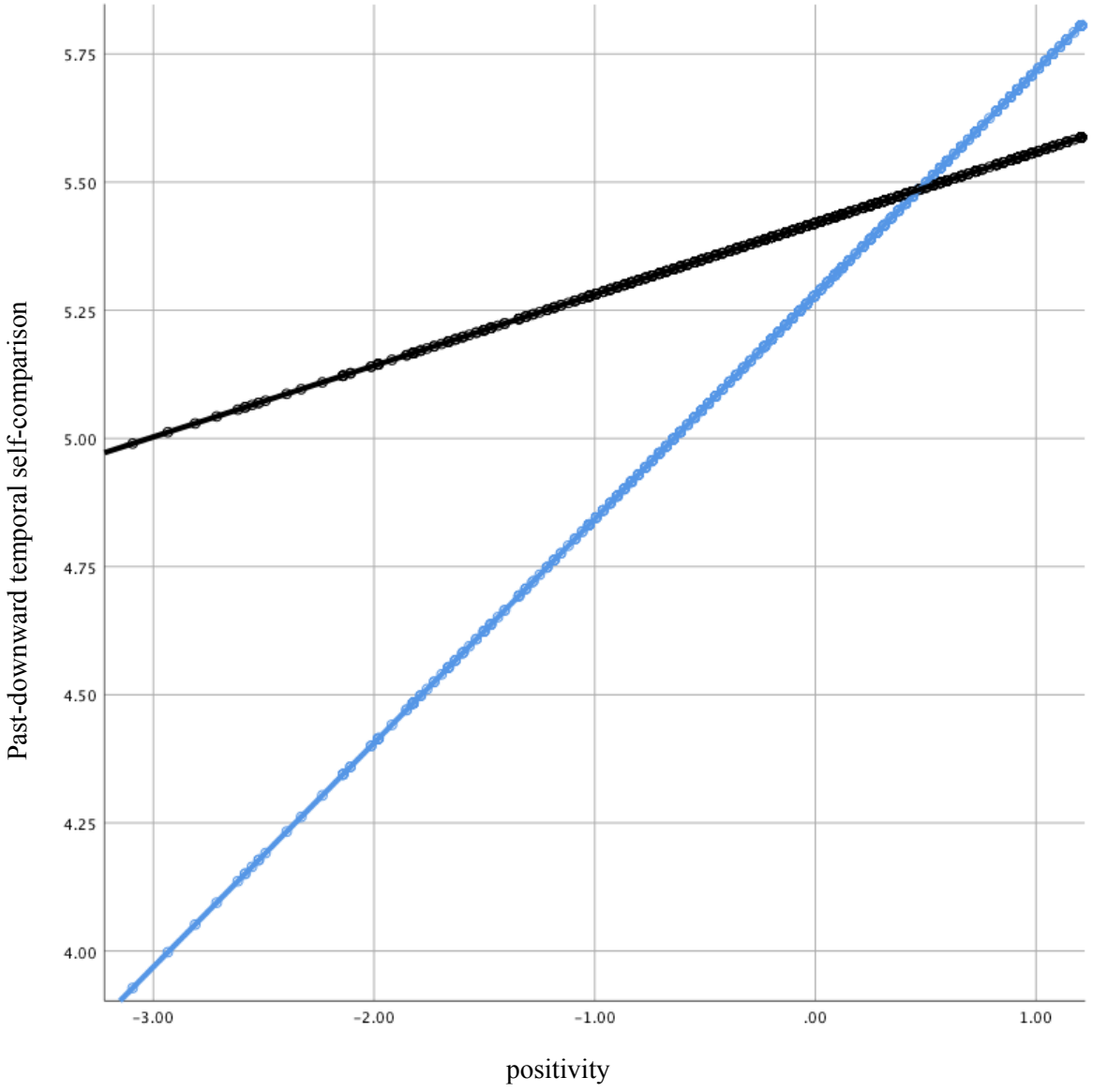
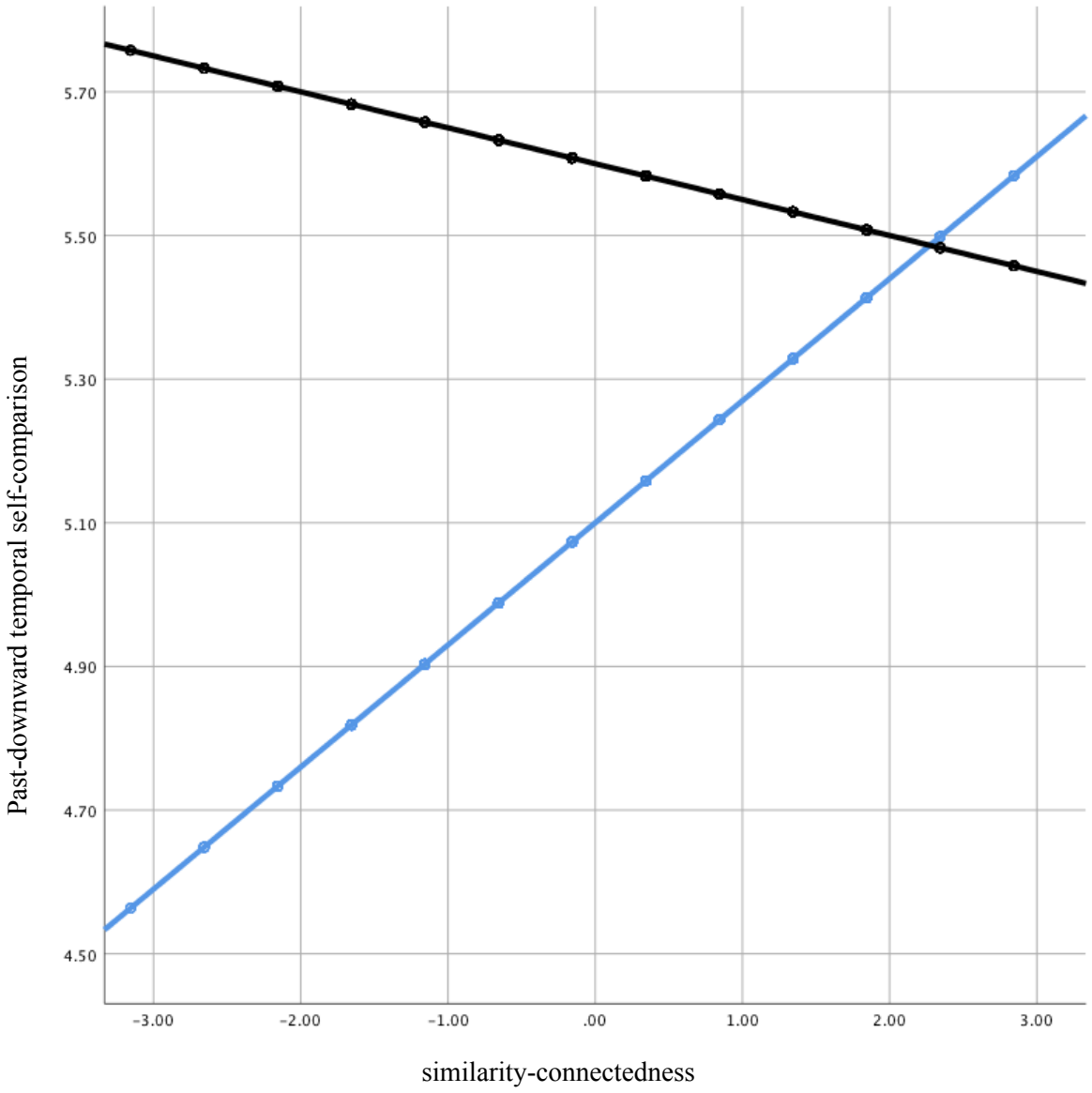


Figure 8. The interaction of positivity and similarity-connectedness predicting past-downward temporal self-comparison. The figure depicts the relation between similarity-connectedness (x-axis) and past-downward temporal self-comparison (y-axis) at different levels of positivity (blue line = low positivity at -1 SD, black line = high positivity at +1 SD).



APPENDIX III
HUMAN SUBJECTS APPROVAL

ASU Knowledge Enterprise Development

APPROVAL: EXPEDITED REVIEW

Sau Kwan
Psychology
-
Virginia.Kwan@asu.edu

Dear Sau Kwan:

On 3/28/2016 the ASU IRB reviewed the following protocol:

Type of Review:	Initial Study
Title:	Strengthening Present-Future Self-Continuity Mitigates Temporal Discounting and Improves College Persistence
Investigator:	Sau Kwan
IRB ID:	STUDY00004110
Category of review:	(7)(b) Social science methods, (5) Data, documents, records, or specimens, (7)(a) Behavioral research
Funding:	Name: ^DUPLICATE: DOEd - Institute of Education Sciences (IES)
Grant Title:	
Grant ID:	
Documents Reviewed:	• Grant Draft, Category: Grant application; • COMPENSATED Consent Form copy.pdf, Category: Consent Form; • Funding.pdf, Category: Other (to reflect anything not captured above); • Grant IRB Spring 2016_draft3172016_vk.docx, Category: IRB Protocol; • PILOT Recruitment.pdf, Category: Recruitment Materials; • Response to requested modifications.pdf, Category: Other (to reflect anything not captured above); • research design and FSC measure, Category: Technical materials/diagrams; • COMPENSATED Recruitment .pdf, Category: Recruitment Materials;
	• measures, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions); • PILOT Consent Form.pdf, Category: Consent Form;

The IRB approved the protocol from 3/28/2016 to 3/27/2017 inclusive. Three weeks before 3/27/2017 you are to submit a completed Continuing Review application and required attachments to request continuing approval or closure.

If continuing review approval is not granted before the expiration date of 3/27/2017 approval of this protocol expires on that date. When consent is appropriate, you must use final, watermarked versions available under the "Documents" tab in ERA-IRB.

In conducting this protocol you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-103).

Sincerely,

IRB Administrator

cc: Robert Adelman
Nancy Gonzales
Kevin Grimm
Sau Kwan
Oliver Graudejus
Robert Adelman
Morris Okun