Full Length Article

Do people know how they've changed? A longitudinal investigation of volitional personality change and participants' retrospective perceptions thereof

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ABSTRACT

Prior research has found that most people want to change their personalities. Moreover, these change goals predict trait growth. The present study extended this by examining both actual change in self-report traits and people's perceptions of how they have changed across 16 weeks. Results indicated moderate alignment between trait growth and perceived change (average $r = 0.49$)—with 39% of responses indicating perceived changes in the opposite direction of trait growth. Moreover, change goals predicted trait growth holding perceptions constant, and both trait growth and perceptions independently predicted well-being. These data elucidate how people perceive the process of volitional change. Moreover, these data suggest people change in desired ways, even if they do not perceive those changes.

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1. Introduction

In the beloved 1939 musical classic, *The Wizard of Oz*, Dorothy is accompanied on an adventure through a magical land by three companions—a Scarecrow, a Tin Man, and a Cowardly Lion—each of whom desperately wants to change aspects of himself. Ironically, however, even from the start of their journey, most of Dorothy's travel mates have *already attained* the very attributes that they crave. For example, the Tin Man—who covets a warm, compassionate, and friendly heart—is the group's most tenderhearted constituent, frequently being reduced to tears by his friends' sufferings. Nevertheless, Dorothy's companions seem oblivious to the fact that they have already attained the self-change that they desire. Indeed, each of their explicit motives for joining Dorothy on her quest is to beg the "Wonderful Wizard of Oz" to magically instill within them the very traits that they already unknowingly possess.

Research has found that, similar to Dorothy's imaginary companions, the vast majority of real people also want to change aspects of their personalities (Baranski, Morse, & Dunlop, 2017; Hudson & Roberts, 2014; Miller, Baranski, Dunlop, & Ozer, 2019). Moreover, an emerging body of studies suggests that people actu-

ally tend to change in desired ways (Hudson & Fraley, 2015, 2016a; Hudson, Fraley, Chopik, & Briley, 2019). For example, individuals who want to become more extraverted tend to increase in extraversion across time. However, no studies to date have examined the extent to which people accurately *perceive* volitional trait changes. Thus, it remains unclear whether—similar to Dorothy's companions—people are unaware of how their personality has grown in response to their self-change efforts, or whether they might be more self-aware. The purpose of the present study was to fill this gap in the literature by examining the extent to which people accurately perceive how their personality has changed within the context of volitional change efforts.

2. Adult personality development

Before discussing volitional change, it is useful to overview how personality is thought to develop more generally across adulthood. People's personality traits change as a function of both age and life experiences (e.g., Bleidorn, Hopwood, & Lucas, 2018; Roberts, Walton, & Viechtbauer, 2006; Soto, John, Gosling, & Potter, 2011). For example, as people get older, they tend to become more agreeable, conscientious, and emotionally stable (e.g., Lucas & Donnellan, 2011; Roberts & Mroczek, 2008). There are at least two highly interrelated processes through which these changes occur. First, mirroring their physical bodies, people's personalities

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may mature in response to biological development (Roberts, Wood, & Caspi, 2008). That is, individuals tend to increase in traits reflective of psychological maturity as they age—such as generosity, selflessness, responsibility, and emotional steadfastness—potentially due to processes that play out "under the skin," which could include aspects of brain maturation (Steinberg et al., 2008) and hormone functioning (Harden et al., 2018). Indeed, studies have found that trajectories of trait growth across time are partially heritable (Bleidorn, Kandler, Riemann, Angleitner, & Spinath, 2009; Mottus, Briley, Zheng, Mann, Engelhardt, Tackett, & Tucker-Drob, 2018).

In addition to and in conjunction with genetic forces, traits also appear to change in response to life events (e.g., Bleidorn et al., 2018; Hudson & Roberts, 2016; Lehnart, Neyer, & Eccles, 2010; Roberts & Bogg, 2004). For example, psychologically committing to one's career is associated with increases in conscientiousness (Hudson & Roberts, 2016; Hudson, Roberts, & Lodi-Smith, 2012; Lodi-Smith & Roberts, 2007). These changes are thought to occur because workplaces reinforce conscientious behaviors (e.g., responsibility, thoroughness) with praise and promotions—and they punish non-conscientious behaviors (e.g., shoddy work, non-punctuality) with reprimands and stagnant salaries. Consequently, workplaces serve as strong, consistent presses for individuals to behave conscientiously. Other social roles (e.g., romantic relationships) may function similarly—chronically evoking thoughts, feelings, and behaviors relevant to various traits such as agreeableness, conscientiousness, or emotional stability (Hutteman, Hennecke, Orth, Reitz, & Specht, 2014; Lehnart et al., 2010; Lodi-Smith & Roberts, 2007).

Theoretically, any changes to thoughts, feelings, and behaviors that are maintained for a sufficiently long period of time can eventually coalesce into enduring trait growth (e.g., Burke, 2006; Magidson, Roberts, Collado-Rodriguez, & Lejuez, 2012; Roberts, 2018; Roberts & Jackson, 2008; Roberts & Wood, 2006). This may occur because new patterns of thoughts, feelings, and behaviors become learned, automatized, and habitual (Hennecke, Bleidorn, Denissen, & Wood, 2014; Hudson, 2019; Hudson & Fraley, 2017)—or new thoughts, feelings, and behaviors may also promote changes that etch trait growth into biological systems (e.g., McEwen, Eiland, Hunter, & Miller, 2012; Roberts & Jackson, 2008; Weaver et al., 2004). Thus, life events such as committing to one's career are thought to change personality by repeatedly encouraging new thoughts, feelings, and behaviors until those temporary, state-like changes coalesce into enduring trait growth.

That said, it currently remains unclear *how much time* is sufficient to produce trait change. Preliminary evidence suggests that reliable growth in trait measures can be observed in as little as a few months (e.g., Carnelley & Rowe, 2007; Gillath, Selcuk, & Shaver, 2008; Hudson & Fraley, 2015, 2016a, 2018). Moreover, one recent meta-analysis found that clinical interventions (e.g., psychotherapy, psychopharmacology) can produce trait changes within six weeks that endure for years after the cessation of treatment (Roberts et al., 2017; however, this finding should be approached with caution as it may be an artifact of using mostly clinical samples). Thus, the available evidence tentatively suggests that new patterns of thoughts, feelings, and behaviors can calcify into enduring trait growth relatively quickly.

3. Volitional personality change

Recently, scholars have theorized that, in addition to external factors such as social roles, *intrapsychic forces*, such as goals to change one's own personality, may also be strong enough to consistently shape thoughts, feelings, and behaviors over a sufficient period of time to produce trait growth (Baumeister, 1994;

Hennecke et al., 2014; Hudson & Roberts, 2014; Kiecolt, 1994). In other words, people may be able to volitionally modify their thoughts, feelings, and behaviors over extended periods of time in order to change their traits in desired ways.

To that end, research has found that—akin to Dorothy's companions in the Wizard of Oz—the vast majority of people wish to change aspects of their personality (Baranski et al., 2017; Hudson & Roberts, 2014; Miller et al., 2019; Robinson, Noftle, Guo, Asadi, & Zhang, 2015) (the idea that many people wish to change aspects of themselves, potentially including their personality traits, has been explored in both the social and clinical literatures, as well; e.g., Higgins, 1987; Markus & Nurius, 1986; Rogers, 1957). For example, in one online sample of 6,800 participants with ages ranging from 18 to 70 years, a minimum of 85% of people wanted to increase with respect to the socially desirable pole of each big five personality trait (Hudson & Fraley, 2016b). These desires—or *change goals*—were most prevalent for emotional stability and conscientiousness (94% of people wanted to increase in each of these traits) and least common for agreeableness (85% of people wanted to increase in agreeableness). Research suggests that change goals are correlated with dissatisfaction with relevant life domains—indicating that people may wish to change traits they believe will have utility value in improving their lives (e.g., college students may desire increases in conscientiousness to aid their academic performance; Hudson & Fraley, 2016b; Hudson & Roberts, 2014). Similarly, the big five personality traits are socially desirable in and of themselves—and consequently people may intrinsically desire them (Dunlop, Telford, & Morrison, 2012; Hudson & Roberts, 2014).

3.1. Can people actually change their personalities?

The vast majority of people want to increase in each big five trait. This naturally leads to the question: Can people successfully change their personality traits in desired ways? In other words, can people take intentional action toward changing their own personality traits, rather than merely being passively changed by their genes, life experiences, and social circumstances? The emerging body of literature on this issue provides a promising outlook. To date, a total of thirteen studies have examined the links between change goals and subsequent trait growth. In a mega-analysis of twelve separate weekly intensive longitudinal studies spanning four months each (with a combined total of more than 24,000 observations from 2,238 total participants), change goals predicted corresponding subsequent growth in all five traits (Hudson, Fraley, et al., 2019). For example, averaging across all 12 studies, people who wanted to become more extraverted at the beginning of the studies were predicted to actually increase in extraversion over the subsequent four months at a faster rate than their peers who did not wish to change. Similar associations were found for agreeableness, conscientiousness, emotional stability, and openness—although the effect sizes were largest for extraversion and emotional stability.

Further supporting the robustness of this finding, similar effects have been replicated with daily behavior checklists (e.g., extraversion change goals predict performing increasing numbers of extraverted daily behaviors over time; Hudson & Fraley, 2015). Moreover, the change process appears to operate in a theoretically sensible manner. Interventions that encourage individuals to modify their patterns of thoughts, feelings, and behaviors to align with desired traits appear to increase the amount of volitional change that people experience (Hudson, Briley, Chopik, & Derringer, 2019; Hudson & Fraley, 2015). Finally, as people attain desired trait changes, their change goals dissipate (e.g., people who want to increase in extraversion and then actually become more extraverted subsequently report lesser desires to continue increasing

in extraversion; Hudson & Fraley, 2015). This seems to indicate that, as individuals attain desired trait changes, their change goals are satisfied and thus abate. In short, people appear to change in ways that align with their desires.

Indeed, the idea that people can change aspects of themselves in desired ways is not new. In fact, this premise forms a cornerstone of the clinical psychology literature. For example, psychotherapists report that the single most common treatment goal among clients is reducing negative affect, such as anxiety and depression (Hamp, Stamm, Lin, & Christidis, 2016). Although the clinical diagnoses of anxiety and depression are not isomorphic with the big five personality trait of emotional stability, subclinical anxiety and depression are facets of emotional stability (e.g., Goldberg et al., 2006). To this end, one recent quantitative review of 207 clinical intervention studies found that psychotherapy and psychopharmacology are associated with enduring gains in emotional stability (as well as extraversion) (Roberts et al., 2017). This seems to suggest that professional interventions can be efficacious in helping people to attain desired personality changes, such as decreased negative affect (i.e., increased emotional stability).

Nevertheless, studies on volitional change contribute knowledge beyond the clinical literature. Namely, the evidence that clinical interventions can change traits remains somewhat ambiguous. For example, it is possible that psychopathology (e.g., anxiety and depression) "artificially" reduces levels of personality traits such as emotional stability and extraversion (e.g., the onset of depression may lead an individual to be less outgoing and sociable). Thus, it is possible that successfully treating psychopathology merely reverts individuals to their baseline trait levels, rather than spurring new trait growth (Roberts et al., 2017). Studies on volitional change examine whether it is also possible for nonclinical samples with more typical trait levels to change themselves—even in the absence of psychopathology.

Despite the evidence in the clinical and volitional change literatures that people may be able to change themselves in desired ways, there is not necessarily universal support for the finding that change goals predict trait growth. In one longitudinal study with two measurement occasions spanning one year (n = 170), single-item measures of change goals did not predict trait change for graduating college seniors (Robinson et al., 2015). It is not clear whether this study's discrepant findings are attributable to methodological differences from studies that found positive results (e.g., differences in measures used and the number of waves of data collected) or important theoretical issues. For example, studies that have found that change goals predict trait growth have typically used relatively shorter timeframes, such as four months (Hudson, Fraley, et al., 2019). Thus, it may be the case that volitional changes are short-lived and/or cyclical in nature and revert with longer time periods, such as one year. Alternatively, it may be the case that self-change efforts are difficult to sustain across major life transitions, such as graduating from college.

Nevertheless, the preponderance of evidence suggests that people change in ways that align with their desires—at least over short periods of time, such as four months. And moreover, research suggests that this type of volitional change may have important implications for consequential outcomes, such as well-being. For example, in one intensive longitudinal study with weekly measurement occasions spanning four months, participants who experienced changes in any big five personality trait were likely to report simultaneous gains in life satisfaction (Hudson & Fraley, 2016a). For example, participants who increased in extraversion tended to report becoming more satisfied with their lives. Critically, this association was moderated by change goals for most of the big five traits. In other words, the association between trait growth and change in life satisfaction was larger *if that trait growth was desired*. For example, individuals who wanted to become more

agreeable and then actually increased in agreeableness experienced relatively large gains in life satisfaction. In contrast, individuals who experienced identical growth in agreeableness, despite not desiring to change with respect to agreeableness, experienced smaller gains in life satisfaction. Thus, preliminary evidence suggests that people may be able to improve the quality of their lives through pursuing and attaining volitional change.

That said, it is important to note that there may be circumstances in which self-change efforts are ill-advised, such as when individuals experience substantial difficulty in changing their traits. In such circumstances, self-acceptance may be a preferable strategy to attempting volitional change (Hudson & Fraley, 2016a; Polivy & Herman, 2002; Rogers, 1957).

4. Do people accurately retrospectively perceive changes to their traits?

One of the critical, unexplored issues in the volitional change literature is the extent to which people's retrospective perceptions of the process of attempting to change their traits matches the actual, longitudinal trait growth that they experience over time. Do individuals—similar to Dorothy's companions in *The Wizard of Oz*—fail to perceive growth resulting from their self-change efforts? Conversely, do they perhaps commit the opposite error—perceiving potentially illusory changes where none have actually occurred? Or, in contrast, are real people more attuned to and aware of their progress in volitionally changing their traits than were the Scarecrow, Tin Man, and Cowardly Lion? This is an important issue, as it has several crucial theoretical and methodological implications.

4.1. Theoretical implications

4.1.1. Do people accurately perceive volitional changes?

Most individuals retrospectively believe that their personality traits have changed in the past (e.g., Baranski et al., 2017; Quoidbach, Gilbert, & Wilson, 2013). Nevertheless, the limited body of available research suggests that people are not particularly accurate in perceiving the specific ways in which their traits have actually changed across time (e.g., Costa & McCrae, 1989; Gunty et al., 2011; Robins, Noftle, Trzesniewski, & Roberts, 2005). For example, individuals may be motivated to retrospectively report that they have grown in socially desirable ways, even if such changes have not actually occurred (e.g., Wilson & Ross, 2001). Importantly, however, these studies have largely examined people's retrospective perceptions of change in general contexts. Thus, it remains unclear whether these findings might generalize to situations in which people are actively attempting to change their own traits (e.g., in which they may be more motivated to accurately perceive trait growth).

Elucidating the extent to which individuals accurately retrospectively perceive their own trait growth is critical in the context of volitional change efforts. For one, this sheds light onto people's subjective experience of desiring and pursuing trait change. But more importantly, errors in perceiving how one's traits have changed may lead to ineffective goal pursuit strategies and undermine goal attainment—with potential downstream consequences for well-being (e.g., Harkin et al., 2016; Hudson & Fraley, 2016a; Trottier, Polivy, & Herman, 2009). Specifically, when monitoring changes to their traits, there are at least two errors that people can commit. First, individuals may fail to perceive real trait changes that have actually occurred. Similar to the Scarecrow, Tin Man, and Cowardly Lion, this may lead individuals to waste substantial effort in fruitlessly pursuing *a goal that they have already attained* (which may entail opportunity costs; see King &

Hicks, 2007). Moreover, pursuing a goal without perceiving that one is making progress may also lead individuals to experience needless frustration and declines in well-being across time (e.g., Hudson & Fraley, 2016a; Polivy, Heatherton, & Herman, 1988; Polivy & Herman, 2002; Trottier et al., 2009).

A second error people may commit is perceiving illusory trait growth. In other words, individuals may retrospectively believe that their traits have changed when no longitudinal growth has actually occurred. For example, prior research suggests that individuals oftentimes denigrate their prior selves (i.e., view their past selves more negatively) in order to facilitate a narrative that they have experienced positive growth over time—even when no such growth has occurred (Wilson & Ross, 2001). This type of phenomenon may lead people to prematurely terminate volitional change efforts—believing that their goals have already been attained. To the extent that traits are linked to consequential outcomes (e.g., conscientiousness is linked to occupational attainment; Barrick & Mount, 1991), individuals who cease self-change efforts prior to attaining actual trait growth may miss the opportunity to improve their lives in potentially meaningful ways. In sum, it is important to understand the extent to which people accurately perceive the fruits of their volitional change efforts, as these perceptions may have consequences for effective goal pursuit and well-being.

4.1.2. What are the independent associations between actual change, retrospective perceptions of change, and outcome variables?

To the extent that individuals do not perfectly accurately perceive changes to their traits, trait growth and retrospective perceptions thereof may have unique associations with important outcomes (e.g., Lodi-Smith, Geise, Roberts, & Robins, 2009; Robins et al., 2005). Specifically, personality traits are linked to a wide array of consequential life outcomes (Ozer & Benet-Martínez, 2006; Roberts, Kuncel, Shiner, Caspi, & Goldberg, 2007). For example, higher levels of conscientiousness predict greater occupational attainment and decreased mortality. Theoretically, conscientiousness is linked to these outcomes via real behaviors. For example, conscientious individuals presumably earn higher occupational attainment through responsibly and reliably producing higher-quality work than their peers (e.g., Barrick & Mount, 1991). Thus, true trait growth should promote gains in these outcomes, irrespective of whether that growth is perceived. For example, if an individual behaves more conscientiously, those behaviors (e.g., performing better at work) should translate into outcomes (e.g., greater occupational success), even if the individual is unaware that his or her trait has changed.

Similarly, retrospective perceptions of changes to one's traits may also uniquely and independently predict outcomes, above and beyond actual trait change (see Lodi-Smith et al., 2009; Robins et al., 2005). For example, one study found that perceived changes in extraversion—but not actual changes therein—were correlated with the extent to which students felt they had a positive relationship with their university as a whole (Robins et al., 2005). In terms of mechanisms, perceived changes may be linked to outcomes through self-fulfilling processes (see Jussim, 1986). For example, believing that one's level of extraversion has increased may lead one to expect positive social interactions with other people and behave confidently—ultimately evoking positive reactions from others.

In the present study, we focused on the extent to which actual trait changes and retrospective perceived trait changes predicted well-being, operationalized in terms of life satisfaction. This choice was made primarily for two reasons. First, prior research has found links between volitional change and well-being (Hudson & Fraley,

2016a). Specifically, Hudson and Fraley (2016a) found that growth in any of the big five personality traits predicted simultaneous changes in life satisfaction. Moreover, this association was moderated by change goals for most traits. For example, changes in agreeableness predicted greater gains in life satisfaction *for people who wanted to change*. Thus, it appears that gains in the big five personality traits are especially predictive of well-being if those changes are *desired*.

Second, well-being is, in many ways, an ultimate psychological outcome variable. People generally just want to be happy more than anything else in life; and other outcomes such as income or health are ultimately mechanisms for increasing well-being (e.g., Diener, 2000). Thus, our data allowed us to speak to whether longitudinal trait growth—even growth that is not retrospectively perceived—predicts gains in well-being (e.g., because traits are associated with real behaviors that might improve life satisfaction; Ozer & Benet-Martínez, 2006; Roberts et al., 2007), and whether perceiving trait change—even if none has actually longitudinally occurred—also predicts increases in well-being (e.g., due to self-fulfilling prophecies or the sense that one's life is progressing well because one has attained a valued self-change goal; Higgins, 1987; Higgins, Shah, & Friedman, 1997; Jussim, 1986).

4.2. Methodological implications

Beyond theory, understanding the extent to which people retrospectively perceive changes to their personality traits in the context of volitional change efforts can also help address several methodological limitations of prior studies. Namely, one criticism of the existing volitional change literature is that prior findings may be attributable to demand characteristics or placebo effects (Hudson & Fraley, 2015). For example, people may have believed that participation in a volitional change study would enable them to modify their traits in desired ways. Consequently, participants in such studies may have perceived and reported illusory growth when, in reality, no trait change had actually occurred.

In the present study, we addressed this possibility by explicitly asking participants how much they retrospectively perceived their traits had grown across time. Thus, we were able to ascertain whether participants *realized* that their self-report traits had changed. By holding constant participants' retrospective reports of perceived change, we were able to examine the extent to which change goals predicted prospective trait growth *that participants did not retrospectively perceive*. To the extent that participants were unaware that their traits had changed, it seems unlikely that observed growth in their self-report traits could be attributable to their beliefs, expectations, self-serving biases, or perceived study demand. Using similar logic, by simultaneously regressing well-being onto longitudinal growth and retrospective perceptions thereof, we were able to examine the extent to which life satisfaction varied as a function of (1) trait growth that was not perceived; and (2) perceptions that traits had changed, despite no change actually occurring in the self-report measures.

5. Overview of the present study

The present study was a 16-wave, weekly intensive longitudinal design in which participants provided self-report ratings of their (1) change goals, (2) personality traits, (3) perceived changes in their traits, and (4) well-being. These data were used to address four major issues.

First, we attempted to replicate prior findings that change goals prospectively predict trait growth (Hudson & Fraley, 2015, 2016a)—and that attaining desired changes predicts gains in

well-being (Hudson & Fraley, 2016a). Second, we examined the correlations between retrospective perceptions and actual longitudinal trait growth. These analyses shed light on people's subjective experience of desiring and pursuing trait change—and allowed us to understand the extent to which people's self-reported traits grow with or without their knowledge, even during explicit self-change efforts.

Third, we tested the extent to which retrospective perceptions and actual longitudinal trait growth independently predicted changes in well-being. These analyses allowed us to test the extent to which gains in life satisfaction as a function of trait growth observed in prior research (e.g., Hudson & Fraley, 2016a) are attributable to actual changes in the self-report measures (e.g., because traits have real behavioral implications with natural downstream consequences on well-being; Ozer & Benet-Martínez, 2006) versus retrospective perceptual/cognitive/evaluative processes (e.g., because attaining a valued goal or believing that one possesses desirable traits enhances the sense that one's life is progressing well; Higgins, 1987; Higgins et al., 1997).

Finally, we tested the extent to which change goals predicted prospective trait growth holding constant perceived trait changes. Similarly, we tested the extent to which attaining desired trait changes predicted well-being, holding constant perceived trait changes. These analyses addressed methodological limitations of prior work. Namely, to the extent that change goals predict trait growth above and beyond perceived trait change, this seems to suggest that the trait growth observed in prior studies cannot be merely attributed to participants' beliefs, expectations, self-serving biases, and/or perceived study demand. Similarly, we examined whether actual trait growth in the self-report trait measures predicted well-being above and beyond perceived trait changes.

6. Method

6.1. Participants

Participants were students in an introductory personality psychology course at the University of Illinois at Urbana-Champaign who were offered extra course credit in exchange for completing waves of the study. Students were provided a link to the study website, and were required to register a user account to participate. Participants were instructed to complete one wave of the study per week for the 16-week semester. However, to afford leniency and flexibility, participants were allowed to complete waves as frequently as once every 5 days. Participants who waited longer than 7 days between completing waves of the study were sent automated email reminders.

A total of 146 participants completed at least one wave of the study. Data were collected for one semester; the total sample size was determined by enrollment in the personality course and students' voluntary choice to complete the study; no participants' data were excluded for any reason. This sample size afforded approximately 72% power to detect average-sized zero order effects (equivalent to $r \sim 0.21$; Richard, Bond, & Stokes-Zoota, 2003).[1] At wave 1, the sample was predominantly (69%) female, with an average age of 20.12 years ($SD = 2.39$). Participants were asked to nominate all racial or ethnic groups with which they identified; 51% of the sample identified as White, 28% as Asian, 15% as Hispanic/Latino, 8% as Black, 5% as Indian (Asian), and 1% each as Middle

Eastern, Native American, and Pacific Islander. Sixty-six percent of the sample was single—and the remainder were in committed (32%) or casual (3%) romantic relationships.

Participants provided an average of 10.18 waves of data ($SD = 5.03$), with 134 (92%), 119 (82%), 86 (59%), and 30 (21%) providing data at waves 2, 5, 10, and 16, respectively. Attrition analyses revealed that students who were higher in conscientiousness and lower in openness at wave 1 tended to participate in more numerous waves of the study (respective correlations: $r = 0.24$, 95% CI [0.08, 0.39] and $r = -0.20$, 95% CI [−0.35, −0.04]). No other study variables, as measured at wave 1, were statistically significantly related to attrition (all $|r|s \leq 0.14$).

After completing all 16 waves, participants were provided with a results webpage that summarized their scores on the personality measures and contained graphs depicting how those scores had changed over the course of the semester. At the end of the semester, after all data collection had ceased, participants who completed fewer than 16 waves were also allowed to access their results pages. Students were awarded prorated extra credit in their personality course based on the total number of waves they had completed.[2,3]

6.2. Measures

6.2.1. Personality traits

At all waves, participants provided self-report ratings of their big five personality traits using the 60-item Big Five Inventory 2 (BFI2; Soto & John, 2017).[4] The BFI2 contains separate subscales to measure extraversion (e.g., "I am someone who is outgoing, sociable"), agreeableness (e.g., "I am someone who is respectful, treats others well"), conscientiousness (e.g., "I am someone who is systematic, likes to keep things in order"), emotional stability (the opposite of neuroticism; e.g., "I am someone who rarely feels anxious or afraid") and openness to experience (e.g., "I am someone who is fascinated by art, music, or literature"). All items were rated using a 5-point scale running from *strongly disagree* (1) to *strongly agree* (5). Items were averaged to form separate composites for each big five trait (wave 1 αs ranged from 0.80 [agreeableness] to 0.91 [emotional stability]).

6.2.2. Trait change goals.

At wave 1 only, participants' goals to change their personality traits were measured using the 60-item Change Goals Big Five Inventory 2 (C-BFI2; Hudson & Roberts, 2014). The C-BFI2 contains the same items as the regular BFI2. However, the instructions, wording on each item, and the response scale are modified to allow participants to indicate the extent to which they would like to *change* with respect to each item. For example, the instructions read, "Here are a number of personality traits that you may or may not want to change within yourself. Please rate the extent to which you **want to change** each trait." A sample item measuring goals to change extraversion is "I want to be someone who is outgoing, sociable." All items were rated on a 5-point scale ranging from *much less than I currently am* (-2) to *I do not wish to change* (0) to *much more than I currently am* (+2). Consequently, participants could indicate goals to increase, decrease, or stay the same as they currently were with respect to each item. Items were averaged to form separate composites for goals to change each big five

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[1] Given that participants provided an average of 10.18 waves of data, and assuming that approximately 50% of the variance in our outcome measures is between-persons, our effective sample size for longitudinal analyses is 265.88 (Kish, 1965). This effective sample size affords 93% power to detect longitudinal effects equivalent to $r = 0.21$ and 80% power to detect longitudinal effects equivalent to $r = 0.17$.

[2] This study was not preregistered.

[3] The relevant variables from this dataset are available to qualified scientists upon request. The wording on our consent forms does not allow us to share participants' individual responses in public repositories.

[4] Instructions read, "You will be presented with several statements that may or may not describe you and your personality. Please rate the extent to which each statement accurately describes your current personality."

trait (αs ranged from 0.84 [extraversion] to 0.91 [stability]). For these composites, positive values represent goals to increase in the respective trait and negative values represent goals to decrease.

6.2.3. Perceived change

Every fourth wave beginning at wave 3 (i.e., on waves 3, 7, 11, and 15), participants were presented with instructions that read, "At the beginning of this study, we asked you how you would like to change yourself. The following questions ask about the extent to which you believe you have actually changed over the past four weeks. Please rate the extent to which you believe you have changed over the past four weeks." Participants subsequently completed a modified version of the Ten Item Personality Inventory (TIPI; Gosling, Rentfrow, & Swann, 2003) that allowed them to rate the extent to which they believed they had changed in each big five trait over the prior 4 weeks. For example, one item measuring perceived change in extraversion was, "I think I have become extraverted, enthusiastic." All items were rated using a 5-point scale running from *much less than I was* (−2) to *I have not changed* (0) to *much more than I was* (+2). Items were averaged to form separate composites for each big five trait (wave 3 αs ranged from 0.30 [openness] to 0.67 [stability]; the TIPI is explicitly designed to emphasize measuring the breadth of traits [i.e., content validity] at the potential expense of lower item correlations [i.e., internal consistency]). This measure was administered only every 4 waves (1) to reduce the overall length of the survey, and (2) because we believed that noticeable trait change (i.e., change in *patterns* of thoughts, feelings, and behaviors) would likely take time to accrue; and thus asking participants how much their traits had changed *each week* might have produced little variation in these measures.[5]

6.2.4. Well-being

Every wave, participants provided self-report ratings of their life satisfaction using the 5-item Satisfaction with Life Scale (SWLS; Diener, Emmons, Larsen, & Griffin, 1985).[6] Items (e.g., "In most ways my life is close to ideal") were rated on a 5-point scale from *strongly disagree* (1) to *strongly agree* (5) and averaged to form a composite (wave 1 α = 0.84).

6.3. Summary of procedure

Participants completed up to 16 waves. At wave 1 only, participants provided ratings of their change goals. At every wave, including wave 1, participants also provided self-report ratings of their big five personality traits and well-being. Finally, at waves 3, 7, 11, and 15, participants provided ratings of the extent to which they perceived they had changed over the prior 4 weeks.

7. Results

In the sections that follow, we (1) attempted to replicate the finding that change goals prospectively predict subsequent trait growth; (2) examined the extent to which people accurately retro-

spectively perceive changes to their personality traits across time; and (3) tested the extent to which both actual longitudinal trait growth and retrospective perceived trait change independently predicted growth in well-being. For clarity, throughout the results narrative, we refer to observed growth in the self-reported trait measure as *actual (trait) growth* or *actual (trait) change*. In contrast, we refer to the perceived change measure as *perceived (trait) change*. Please note that we use the word "actual" for the sake of semantic simplicity and consistency with the existing literature (e.g., Gunty et al., 2011; Robins et al., 2005); no operationalization perfectly captures the construct of interest, and thus we do not mean to imply that changes in self-report trait measures are isometric with "real" or "actual" latent trait growth (e.g., there are a variety of ways to measure personality traits, which all entail costs and benefits; Paulhus & Vazire, 2007).

7.1. Do change goals predict subsequent trait growth?

Previous research has found that the vast majority of people want to change their personality traits (e.g., Baranski et al., 2017; Hudson & Fraley, 2016b; Hudson & Roberts, 2014)—and that change goals predict subsequent trait growth (e.g., people who want to increase in extraversion tend to actually grow in extraversion across time; Hudson & Fraley, 2015, 2016a). For our first series of analyses, we attempted to replicate these findings.

7.1.1. Do people want to change their personality traits?

Table 1 contains descriptive statistics and correlations for all study variables. Replicating prior research, the average participant in our sample wanted to increase with respect to each big five personality trait. Specifically, positive values for the change goals scales indicate desires to increase with respect to a trait; mean change goals ranged from $M = 0.56$ ($SD = 0.47$; agreeableness) to $M = 0.99$ ($SD = 0.53$; emotional stability). Another way to conceptualize the distribution of change goals is to report their *prevalence*—the percent of participants wanting to increase to any degree in each dimension (i.e., the percent of participants with composite scores greater than zero). A minimum of 91% of participants wanted to increase in each big five trait—with the prevalence of goals to change specific traits ranging from 91% (agreeableness) to 98% (emotional stability). Thus, as in prior research, the vast majority of our participants wanted to increase in each big five trait.

Also replicating prior studies, change goals were negatively correlated with life satisfaction for all traits except openness (correlations ranged from $r = −0.19$, 95% CI [−0.34, −0.03] for extraversion and agreeableness to r −0.34, 95% CI [−0.48, −0.19] for emotional stability). These correlations suggest that individuals who are dissatisfied with aspects of their lives—or even their life as a whole—are more likely to desire to change their personality traits (Hudson & Roberts, 2014; Kiecolt, 1994). Along these lines, change goals were also negatively related to existing trait levels for extraversion, agreeableness, conscientiousness, and emotional stability (average $r = −0.44$)—but not openness to experience ($r = −0.14$, 95% CI [−0.30, 0.02]). These correlations suggest that people who are low with respect to socially desirable traits especially wish to increase in those traits (Hudson & Roberts, 2014).

7.1.2. Do change goals predict prospective trait growth?

For our next series of analyses, we attempted to replicate the finding that change goals prospectively predict subsequent growth in the corresponding trait (e.g., do people who want to become more emotionally stable actually increase in emotional stability across time?). Using the same statistical methods as Hudson and Fraley (2015), we constructed separate multilevel models (MLMs) for each trait, each of which examined the extent to which change

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[5] We used the TIPI—rather than the BFI—to measure perceived change in order to reduce the total survey length and respondent burden. As a consequence, the personality trait and perceived change measures included slightly different items. However, as we note in the Results section, we ran exploratory versions of our primary analyses in which we selectively analyzed items from the BFI that best matched those in the TIPI. As noted below, our general pattern of results replicated even when the personality and perceived change scales were matched in terms of item content. Thus, our results seemingly cannot be attributed to different item content across these scales.

[6] The SWLS items were randomly intermixed with the BFI2 items. Thus, participants read the instructions for the BFI2 and then completed both the BFI2 and the SWLS at the same time.

Table 1
Descriptive statistics and correlations.

Variable	M	SD	ICC	Correlations														
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Traits																		
1. Extraversion	3.18	0.64	0.90	–														
2. Agreeableness	3.68	0.53	0.86	0.15	–													
3. Conscientiousness	3.31	0.60	0.89	**0.17**	**0.26**	–												
4. Stability	3.05	0.72	0.87	**0.26**	**0.32**	**0.26**	–											
5. Openness	3.84	0.58	0.88	**0.39**	**0.28**	−0.06	0.09	–										
Change goals																		
6. Extraversion	0.74	0.43	–	**−0.37**	0.05	0.02	**−0.17**	−0.12	–								
7. Agreeableness	0.56	0.47	–	−0.07	**−0.27**	−0.10	−0.12	0.06	**0.38**	–							
8. Conscientiousness	0.91	0.47	–	−0.04	**−0.16**	**−0.42**	**−0.27**	**0.17**	**0.29**	**0.57**	–						
9. Stability	0.99	0.53	–	**−0.28**	**−0.16**	−0.06	**−0.68**	−0.08	**0.47**	**0.44**	**0.47**	–					
10. Openness	0.75	0.44	–	−0.11	0.01	0.06	0.02	−0.14	**0.55**	**0.51**	**0.44**	**0.35**	–				
Perceived change																		
11. Extraversion	0.25	0.49	0.40	0.03	**0.28**	0.13	**0.25**	−0.01	**0.23**	−0.01	−0.09	−0.07	0.01	–			
12. Agreeableness	0.14	0.44	0.40	0.08	**0.21**	−0.04	**0.23**	0.05	0.09	0.11	0.08	−0.08	0.04	**0.31**	–		
13. Conscientiousness	0.35	0.53	0.41	0.01	0.01	0.05	0.10	0.03	0.10	0.16	**0.38**	0.12	0.14	**0.21**	**0.29**	–	
14. Stability	0.15	0.53	0.24	−0.03	**0.24**	0.14	**0.28**	0.02	0.06	0.04	0.11	−0.04	0.02	**0.46**	**0.45**	**0.45**	–
15. Openness	0.39	0.40	0.39	−0.01	**0.22**	0.16	0.09	0.07	**0.20**	0.06	0.12	0.10	0.17	**0.33**	0.15	**0.25**	**0.33**	–
Well-being																		
16. Life Satisfaction	3.28	0.82	0.82	**0.34**	**0.39**	**0.37**	**0.54**	0.11	**−0.19**	**−0.19**	**−0.24**	**−0.34**	−0.03	0.13	0.14	**0.23**	**0.19**	0.08

Note: Individuals' mean scores across all waves were computed for each variable. These correlations are among those cross-wave mean variables. Ninety-five percent confidence intervals for correlations in **boldface** do not include zero.
ICC = intraclass correlation; the ICCs represent the portion of variance that was between-persons (or equivalently, stable within persons) across the study's duration.

goals moderated monthly trait growth. A simplified version of the MLM used was:[7,8]

$$(Trait)_{ij} = b_0 + b_1(Change\ Goal)_j + b_2(Month)_{ij}$$
$$+ b_3(Month)_{ij}(Change\ Goal)_j + U_j + \varepsilon_{ij}$$

In these models, traits and change goals were standardized across the entire sample (see Ackerman, Donnellan, & Kashy, 2011) and time was scaled in months and centered on wave 1.[9] Consequently, the b_2(Month) parameter captures the expected trait growth for individuals with average change goals, scaled in *SD*s per month (e.g., a coefficient of $b_2 = 0.05$ would indicate that participants with average change goals were expected to increase 0.05 *SD*s in the trait per month). The b_3 interaction term captures the extent to which change goals moderated monthly trait growth. Thus, a positive interaction term would indicate that participants with greater change goals experienced more positively growth each month, as compared with their peers with lesser change goals (e.g., a coefficient of $b_3 = 0.04$ would indicate that participants 1 *SD* above the mean in change goals experienced 0.04 *SD*s *greater* growth each month, as compared with their peers with average change goals).

The parameter estimates from these models are presented in Table 2. Generally aligning with the existing literature (Hudson & Fraley, 2015, 2016a; Hudson, Fraley, et al., 2019), change goals predicted greater monthly growth in extraversion ($b = 0.02$, 95% CI [0.01, 0.04]), emotional stability ($b = 0.04$, 95% CI [0.02, 0.05]) and openness to experience ($b = 0.03$, 95% CI [0.02, 0.05])—but not agreeableness ($b = −0.02$, 95% CI [−0.04, 0.001]) or conscientiousness ($b = 0.00$, 95% CI [−0.04, 0.03]). Fig. 1a illustrates this interaction for extraversion. A person with high extraversion change goals (1 *SD* above the mean; original scale score = 1.17) would be expected to increase 0.05 *SD*s in extraversion each month (95% CI [0.03, 0.07])—accumulating to 0.19 *SD*s of growth across the entire study duration (95% CI [0.11, 0.26]). In contrast, a person with low change goals (1 *SD* below the mean; original scale score = 0.31) would be expected to remain stagnant in extraversion across time (simple $b = 0.00$, 95% CI [−0.02, 0.02]). The interactions for emotional stability and openness are depicted in Figs. 1b and 1c, and the interactions for agreeableness and conscientiousness can be found in the Appendix Figs. A1 and A2.

7.2. Retrospective perceptions of trait growth

For our next series of analyses, we examined the longitudinal associations between actual trait growth (i.e., actual longitudinal changes in participants' self-reported traits) and participants' retrospective perceptions that their personality had changed. We first examined the extent to which actual and perceived changes were correlated. Subsequently, we tested whether the correlations between change goals and actual trait growth could be accounted for by retrospective perceived trait change.

7.2.1. Do people accurately perceive changes to their personality traits?

First, we examined the extent to which people accurately perceive changes in their personality traits across time. To do so, we modeled people's retrospective perceptions of how much their personality had changed at each wave as a function of [1] their trait score at wave 1 (i.e., between-person trait variation); [2] their trait score at each wave, centered around their wave-1 score (i.e., within-person trait variation); and [3] a random intercept (to model and control for within-persons dependencies in the data). All variables were standardized across the entire sample prior to being within-person centered and entered into the model—and thus the metric of the parameter estimates is similar (albeit not identical) to a correlation or standardized regression coefficient (Ackerman et al., 2011). Consequently, these analyses capture the extent to which actual changes in individuals' self-reported personality traits relative to wave 1 were correlated with their retrospective perceptions that their traits had changed over the prior month.

[7] Although not depicted in the text for simplicity, all analyses included the appropriate wave 1 trait to control for regression to the mean.

[8] For readers who are more familiar with HLM notation, the mixed model presented in the text can be written as the following level one and level two equations: $(Trait)_{ij} = b_{0j} + b_{1j}(Month)_{ij} + \varepsilon_{ij}$; $b_{0j} = \gamma_{00} + \gamma_{01}(Change\ Goals)_j + U_j$; $b_{1j} = \gamma_{00} + \gamma_{01}(Change\ Goals)_j$

[9] Thus, at wave 1, Month = 0 for all participants. If a participant completed wave 2 six days later, Month would equal 6/30 = 0.20.

Table 2
Growth in traits as a function of change goals.

Predictors	Outcomes: Personality traits														
	E			A			C			S			O		
	b	95% CI		b	95% CI		b	95% CI		b	95% CI		b	95% CI	
		LB	UB		LB	UB		LB	UB		LB	UB		LB	UB
Intercept	0.02	−0.05	0.08	−0.03	−0.10	0.04	**−0.05**	−0.10	−0.03	0.03	−0.05	0.11	−0.02	−0.09	0.05
Change Goal	−0.03	−0.10	03	−0.03	−0.11	0.04	−0.05	−0.10	0.00	**−0.19**	−0.30	−0.09	−0.03	−0.10	0.04
Month	**0.03**	0.01	0.04	−0.01	−0.02	0.01	−01	−0.04	0.03	0.01	−0.01	0.02	**0.05**	0.03	0.07
Month × Change Goal	**0.02**	0.01	0.04	−0.02	−0.04	0.001	0.00	−0.04	0.03	**0.04**	0.02	0.05	**0.03**	0.02	0.05

Note: E = extraversion, A = agreeableness, C = conscientiousness, S = stability, O = openness, CI = confidence interval, LB = lower bound, UB = upper bound. All models controlled for the appropriate Time 1 trait. Ninety-five percent CIs for parameter estimates in **boldface** do not include zero.
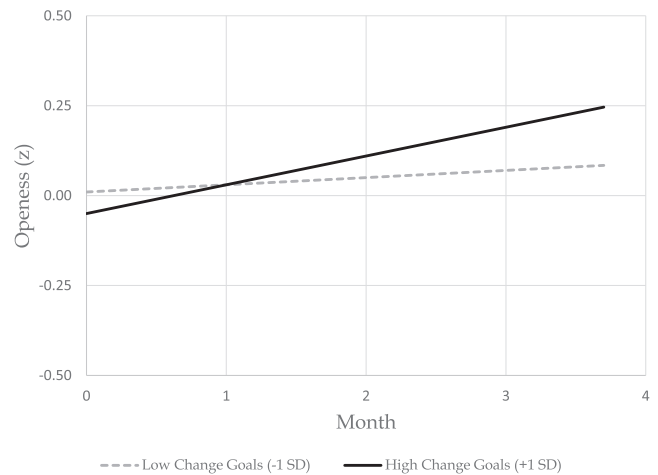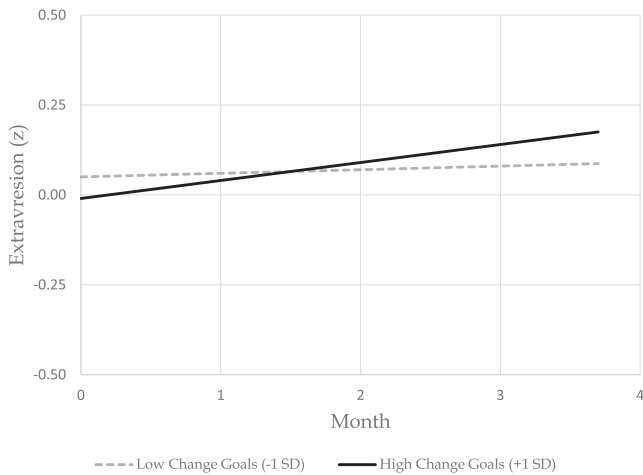

Fig. 1a. Model-predicted growth in standardized trait extraversion as a function of extraversion change goals. Participants with high extraversion change goals (1 *SD* above the mean; original scale score = 1.17) were predicted to increase 0.19 *SD*s in trait extraversion across the semester. In contrast, participants with low change goals (1 *SD* below the mean; original scale score = 0.31) were predicted to remain relatively constant in trait extraversion across time.
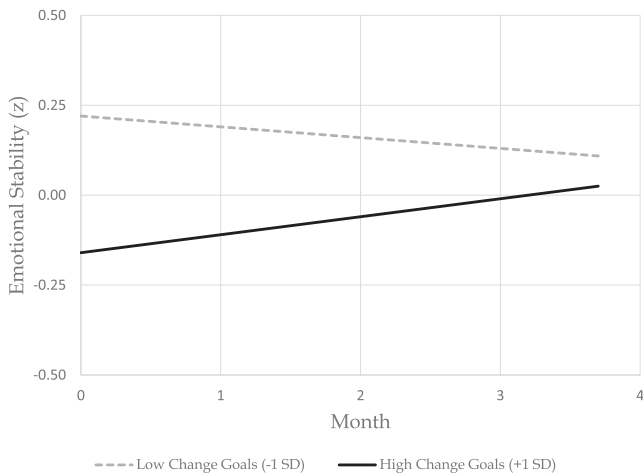

Fig. 1b. Model-predicted growth in standardized trait emotional stability as a function of emotional stability change goals.

As seen in Table 3, participants were moderately sensitive to changes in their personality traits. Replicating prior research (e.g., Robins et al., 2005), actual within-person changes in all five personality traits were positively correlated with retrospective

Fig. 1c. Model-predicted growth in standardized trait openness as a function of openness change goals.

perceived changes in those traits. The within-person correlation was strongest for emotional stability (b_{within} = 0.78, 95% CI [0.61, 0.95])—and weakest for agreeableness (b_{within} = 0.33, 95% CI [0.15, 0.51]). Fig. 2 illustrates the within-person association for extraversion (b_{within} = 0.53, 95% CI [0.29, 0.76]). As can be seen in the scatterplot, although there was moderate agreement between actual and perceived changes in extraversion, people's retrospective perceptions of the extent to which their traits had changed were not perfect. Indeed, 25% of the data points fell within the upper-left quadrant of the scatterplot—representing measurement occasions in which individuals retrospectively perceived that their traits had increased when, in fact, their actual scores on the personality measures had decreased across time (perhaps suggesting that participants were denigrating their prior selves to see illusory positive growth where none had actually occurred; see Wilson & Ross, 2001). Similarly, 10% of data points fell within the lower-right quadrant of the scatterplot—representing measurement occasions in which individuals retrospectively perceived that their extraversion had decreased, despite the fact that their scores on the personality trait measures had actually increased across time. Similar patterns were found for the other four traits, as well. For agreeableness, conscientiousness, emotional stability, and openness, respectively, on 35%, 41%, 19%, and 39% of measurement occasions, people perceived trait increases when their actual trait scores had decreased; and on 9%, 4%, 9%, and 2% of measurement occasions, they retrospectively perceived trait decreases for each respective trait, when their actual scores had increased. In sum, collapsing across all five traits, on nearly 40% of measurement

Table 3
Associations between trait growth and perceived trait growth.

Predictors	Outcomes: Perceptions of trait growth														
	E			A			C			S			O		
		95% CI			95% CI			95% CI			95% CI			95% CI	
	b	LB	UB	b	LB	UB	b	LB	UB	b	LB	UB	b	LB	UB
Intercept	−0.04	−0.18	0.10	0.01	−0.12	0.15	0.03	−0.10	0.17	−0.06	−0.17	0.05	−0.03	−0.17	0.10
Trait$_{Between}$	0.03	−0.11	0.17	**0.17**	0.02	0.32	0.07	−0.07	0.21	**0.24**	0.13	0.36	0.06	−0.08	0.20
Trait$_{Within}$	**0.53**	0.29	0.76	**0.33**	0.15	0.51	**0.44**	0.25	0.64	**0.78**	0.61	0.95	**0.39**	0.18	0.60

Note: E = extraversion, A = agreeableness, C = conscientiousness, S = stability, O = openness, Trait$_{Between}$ = between-persons trait (i.e., trait at wave 1), Trait$_{Within}$ = within-person trait, CI = confidence interval, LB = lower bound, UB = upper bound. Ninety-five percent CIs for parameter estimates in **boldface** do not include zero.
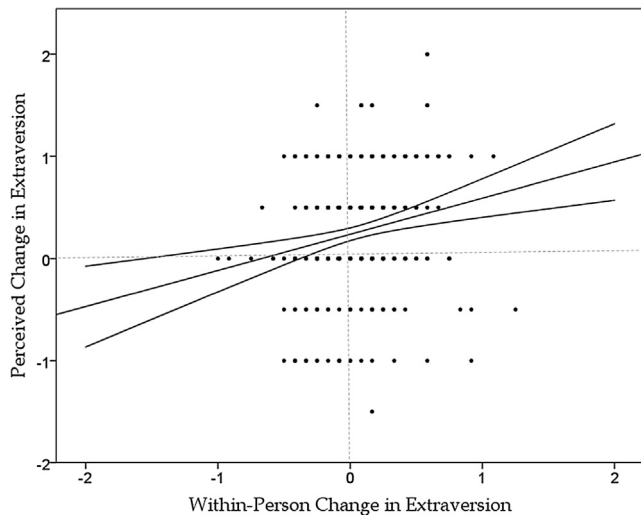

Fig. 2. Scatterplot of actual within-person changes in extraversion versus perceived change in extraversion. The standardized within-persons regression line (b = 0.53) with 95% confidence intervals is depicted. Although the two variables were moderately correlated, 25.25% of people perceived that they had increased in extraversion when they had, in fact, decreased (upper-left quadrant)—while 10.10% perceived that they had decreased in extraversion when they had, in fact, increased (lower-right quadrant).

occasions, participants retrospectively perceived changes in the *opposite* direction of the observed growth in their self-reported trait measures.

7.2.2. Do change goals predict actual trait change above and beyond retrospective perceptions?

For our next series of analyses, we examined the extent to which the association between change goals and subsequent trait growth could be accounted for by people's perceptions that their traits had changed across time. These analyses help to elucidate whether people are aware of desired changes that occur in their traits. Moreover, they provide information regarding whether the association between change goals and trait growth might be merely attributable to beliefs, expectations, self-serving biases, and/or perceived demand (e.g., people might perceive illusory trait growth that aligns with their desires).

Because the "perceived change" measure asked participants to rate how much their traits had changed *in the past 4 weeks* (and thus repeated affirmative responses would indicate accumulating change), we computed participants' average retrospective perceived change across all measurement occasions. We then modeled trait growth as a function of both change goals and average perceived change (when multiplied by Time [i.e., Month × Average Perceived Change], higher average perceived change represents

accumulating perceived growth).[10] Specifically, we constructed separate MLMs for each trait:

$$
\begin{aligned}
(Trait)_{ij} = {} & b_1 + b_2(Change\ Goal)_j + b_3(Month)_{ij} \\
& + b_4(Month)_{ij}(Change\ Goal)_j + b_5(Perceived\ Change)_i \\
& + b_6(Month)_{ij}(Perceived\ Change)_i \\
& + b_7(Perceived\ Change)_i(Change\ Goal)_i \\
& + b_8(Month)_{ij}(Perceived\ Change)_i(Change\ Goal)_i + U_j + \varepsilon_{ij}
\end{aligned}
$$

These models estimated the extent to which monthly growth in personality traits was separately and independently predicted by participants' change goals (b_3) and perceptions that their traits had changed (b_5). Because change goals and perceptions were modeled simultaneously, the b_3 interaction term captured the extent to which change goals predicted actual trait growth *of which participants may not have even been fully aware*. Moreover, the three-way (Month)(Perceived Change)(Change Goal) interaction term captured whether change goals were more strongly linked to trait growth if people *perceived* those changes (e.g., does perceiving or failing to perceive trait change exaggerate or buffer the association between change goals and trait growth?). All variables were standardized across the entire sample prior to being entered into the model, except Time, which was scaled in terms of months and centered at wave 1.

The parameter estimates from these models can be found in Table 4. As would be expected based on our prior within-person analyses (see Table 3), retrospective perceived change was related to actual growth in all five traits (Month × Perception bs ranged from b = 0.03, 95% CI [0.01, 0.05] for extraversion to b = 0.11, 95% CI [0.08, 0.13] for emotional stability). These parameters indicate that there was moderate agreement between changes in people's self-reported traits and their retrospective perceptions of how they had changed across time (these parameters are a slightly different way to conceptualize the estimates reported in Table 3). As a concrete illustration of the level of agreement between perceived and actual trait growth, the average actual growth in extraversion observed in the sample was 0.02 standardized units per month,

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[10] The alternative to these analyses would be modeling week-to-week variation in traits as a function of week-to-week variation in perceived change (e.g., Trait$_{ij}$ = [Perceived Change]$_{ij}$). These analyses, however, hold different assumptions for how the change process might unfold. Modeling *growth* in traits as a function of average perceived change (e.g., Trait$_{ij}$ = [Month]$_{ij}$ + [Perceived Change]$_j$ + [Month]$_{ij}$[Perceived Change]$_j$) assumes that perceived changes endure from week to week. For example, a person who perceived lots of trait change in early weeks and then perceived stagnation thereafter would still be expected to have grown somewhat in the trait across the study's duration (as the early perceived trait change should have endured). In contrast, a within-persons variation model (e.g., Trait$_{ij}$ = [Perceived Change]$_{ij}$) does not assume that perceived changes have an enduring or accumulating effect. Rather, such a model would assume that a person who experienced lots of trait change in early weeks and then perceived stagnation thereafter would: (1) temporarily increase in the trait early in the study, but (2) return to baseline thereafter.

Table 4
Growth in traits as a function of change goals and perceptions of change.

Predictors	Outcomes: Personality traits														
	E			A			C			S			O		
	b	95% CI		b	95% CI		b	95% CI		b	95% CI		b	95% CI	
		LB	UB		LB	UB		LB	UB		LB	UB		LB	UB
Intercept	0.03	−0.04	0.09	−0.03	−0.11	0.05	−0.05	−0.10	0.01	0.04	−0.03	0.12	−0.03	−0.10	0.05
Change Goal	−0.05	−0.13	0.02	−0.04	−0.13	0.04	−0.06	−0.12	0.00	**−0.20**	−0.30	−0.10	−0.03	−0.11	0.05
Month	**0.03**	0.01	0.04	−0.01	−0.02	0.01	0.00	−0.04	0.03	0.01	−0.01	0.02	**0.05**	0.04	0.07
Month × Change Goal	**0.02**	0.001	0.03	−0.03	−0.04	0.00	−0.03	−0.07	0.01	**0.04**	0.02	0.06	**0.03**	0.01	0.04
Perception	0.05	−0.04	0.13	0.05	−0.05	0.16	0.02	−0.05	0.09	0.14	0.04	0.25	0.06	−0.04	0.15
Month × Perception	**0.03**	0.01	0.05	**0.06**	0.03	0.09	**0.07**	0.03	0.13	**0.11**	0.08	0.13	**0.03**	0.01	0.06
Perception × Change Goal	−0.03	−0.13	0.07	−0.01	−0.09	0.08	−0.01	−0.06	0.05	0.00	−0.10	0.10	0.02	−0.08	0.13
Month × Perception × Change Goal	0.00	−0.03	0.02	−0.02	−0.04	0.00	0.01	−0.05	0.03	0.00	−0.02	0.04	0.00	−0.02	0.02

Note: E = extraversion, A = agreeableness, C = conscientiousness, S = stability, O = openness, CI = confidence interval, LB = lower bound, UB = upper bound, Perception = perceived trait change. All models controlled for the appropriate Time 1 trait. Ninety-five percent CIs for parameter estimates in **boldface** do not include zero.

and the standard deviation in growth was $SD = 0.10$.[11] Thus, an individual 1 SD above the mean in actual growth would be expected to increase 0.12 standardized units in extraversion each month. Yet, simple slopes analyses revealed that a person 1 SD above the mean in perceived growth was predicted to increase only 0.06 standardized units per month in extraversion. In other words, if people retrospectively perceived that their personality had changed, those changes were likely to be partially reflected in actual changes to their trait ratings—but there was certainly not perfect agreement between perceived and actual growth (see Fig. 2).

Importantly, however, even holding retrospective perceived changes constant, change goals continued to predict trait growth for extraversion ($b = 0.02$, 95% CI [0.001, 0.03]), emotional stability ($b = 0.04$, 95% CI [0.02, 0.06]), and openness to experience ($b = 0.03$, 95% CI [0.01, 0.04]). Thus, perceptions and change goals had separable and independent associations with trait growth; the finding that change goals predict subsequent trait growth seemingly cannot be accounted for by people's perceptions that their personality traits had changed.

Finally, people's perceptions of how much they had changed did not moderate the association between change goals and trait growth for any trait (all $|b|s \leq 0.02$). Thus, change goals predicted trait growth to a similar extent, irrespective of whether those changes were perceived or not. In other words, people's beliefs and expectations regarding the amount of change that they had experienced neither buffered nor exaggerated the association between change goals and trait growth. Collectively, these findings seem to indicate that people change in ways that align with their desires irrespective of whether they perceive those changes—and that people are only partially aware of the changes that occur in their traits across time.

7.2.3. Robustness check: Scale item content

For logistic reasons (e.g., time constraints and avoiding participant fatigue), the "perceived change" variable was measured using a different scale (the TIPI) than the trait and change goals measures (the BFI2). This is not inconsistent with prior research (e.g., Robins et al., 2005 used single-item indicators of perceived change in each big five domain). Nevertheless, the finding that perceived change and change goals independently predicted trait growth may be attributable to differences in item content across the scales. To address this issue, we created new composites for traits and change goals using a subset of the BFI2 items, matching the item content from the TIPI as closely as possible.

Specifically, the TIPI extraversion items are "extraverted, enthusiastic," and "reserved, quiet." We constructed new extraversion composites from the BFI2 using the items, "outgoing, sociable," "shows a lot of enthusiasm," and "tends to be quiet." The TIPI agreeableness items are "critical, quarrelsome," and "sympathetic, warm." Our new agreeableness composites used the BFI2 items, "tends to find fault with others," "starts arguments with others," "is compassionate, has a soft heart," and "can be cold and uncaring." The TIPI conscientiousness items are "dependable, self-disciplined," and "disorganized, careless." Our new conscientiousness composites used the BFI2 items, "is dependable, steady," "tends to be disorganized," and "can be somewhat careless." The TIPI emotional stability items are, "anxious, easily upset," and "calm, emotionally stable." Our new emotional stability composites used the BFI2 items, "rarely feels anxious or afraid," and "is emotionally stable, not easily upset." Finally, the TIPI openness items are "open to new experiences, complex" and "conventional, uncreative." Our new openness composites used the BFI2 items, "is complex, a deep thinker," and "has little creativity." Thus, our new scales much more closely matched the TIPI in terms of item content.

Rerunning our analyses using these new composites for change goals and traits, our pattern of results was generally unchanged. Change goals and perceptions continued to independently predict trait growth for extraversion (Month × Change Goal $b = 0.02$, 95% [0.001, 0.04]; Month × Perception $b = 0.02$, 95% CI [0.0003, 0.05]), emotional stability (Month × Change Goal $b = 0.04$, 95% [0.02, 0.07]; Month × Perception $b = 0.09$, 95% CI [0.05, 0.12]) and openness to experience (Month × Change Goal $b = 0.02$, 95% [0.003, 0.05]; Month × Perception $b = 0.05$, 95% CI [0.01, 0.08]). Similarly, perceptions continued to predict trait growth for agreeableness (Month × Perception $b = 0.03$, 95% CI [0.003, 0.06]) and conscientiousness (Month × Perception $b = 0.07$, 95% CI [0.03, 0.10])—whereas change goals did not ($bs = 0.00$). Thus, our pattern of findings was nearly identical across both analyses. The primary results reported in this manuscript therefore do not appear to be attributable to differences in item content across the various scales used in the study.

7.3. Does well-being vary as a function of actual and perceived change?

For our final series of analyses, we examined the associations between change goals, actual trait growth, retrospective perceived trait change, and well-being. First, we attempted to replicate Hudson and Fraley (2016a) findings that successfully attaining desired changes predicts increased well-being. Second, we examined whether any gains in well-being due to attaining desired trait

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[11] Mean standardized monthly growth was −0.01 ($SD = 0.14$) for agreeableness, −0.01 ($SD = 0.16$) for conscientiousness, 0.01 ($SD = 0.16$) for emotional stability, and 0.04 ($SD = 0.14$) for openness.

Table 5
Multilevel model predicting life satisfaction from actual and perceived trait growth.

Predictors	Model														
	E			A			C			S			O		
	b	95% CI		b	95% CI		b	95% CI		b	95% CI		b	95% CI	
		LB	UB		LB	UB		LB	UB		LB	UB		LB	UB
Intercept	0.00	−0.16	0.16	−0.02	−0.17	0.14	−0.03	−0.18	0.12	−0.01	−0.14	0.13	−0.03	−0.19	0.13
Trait$_{Between}$	**0.24**	0.08	0.40	**0.24**	0.07	0.40	**0.25**	0.10	0.39	**0.44**	0.27	0.61	0.07	−0.09	0.22
Trait$_{Within}$	**0.30**	0.23	0.38	**0.18**	0.12	0.23	**0.15**	0.09	0.22	**0.41**	0.36	0.47	**0.25**	0.18	0.32
Month	0.00	−0.02	0.02	0.02	−0.004	0.04	0.02	−0.01	0.04	0.01	−0.01	0.03	0.00	−0.02	0.02
Change Goal	−0.13	−0.30	0.05	−0.13	−0.28	0.03	**−0.19**	−0.36	−0.02	−0.06	−0.25	0.13	−0.05	−0.21	0.12
Month × Change Goal	0.01	−0.02	0.03	−0.01	−0.03	0.01	**−0.04**	−0.06	−0.01	0.02	−0.001	0.04	−0.01	−0.03	0.01
Trait$_W$ × Change Goal	**0.10**	0.03	0.18	0.03	−0.03	0.09	0.05	−0.01	0.12	**0.08**	0.02	0.14	0.00	−0.06	0.07
Perception	0.07	−0.12	0.27	0.09	−0.11	0.29	**0.24**	0.06	0.43	0.00	−0.19	0.19	0.00	−0.20	0.20
Month × Perception	**0.07**	0.04	0.09	**0.05**	0.02	0.08	**0.08**	0.05	0.10	**0.06**	0.03	0.09	**0.06**	0.03	0.08
Trait$_{Within}$ × Perception	**−0.13**	−0.22	−0.03	−0.07	−0.14	0.005	−0.07	−0.15	0.001	**−0.08**	−0.15	−0.01	−0.02	−0.10	0.05
Perception × Change Goal	−0.11	−0.34	0.12	−0.09	−0.26	0.07	0.01	−0.14	0.14	0.04	−0.15	0.24	0.05	−0.16	0.26
Month × Perception × Change Goal	0.01	−0.02	0.04	0.01	−0.02	0.04	−0.01	−0.04	0.02	**−0.03**	−0.07	−0.01	−0.01	−0.04	0.02
Trait$_{Within}$ × Perception × Change Goal	−0.07	−0.16	0.03	0.06	−0.001	0.12	0.02	−0.03	0.09	−0.04	−0.11	0.04	−0.03	−0.10	0.05

Note: E = extraversion, A = agreeableness, C = conscientiousness, S = stability, O = openness, CI = confidence interval, LB = lower bound, UB = upper bound, Trait$_{Between}$ = between-persons trait (i.e., trait at wave 1), Trait$_{Within}$ = within-person trait, Perception = perceived trait change. Ninety-five percent CIs for parameter estimates in **boldface** do not include zero.

changes could be accounted for by people's perceptions that their traits had changed. These analyses shed light on whether trait change *per se* is associated with growth in well-being—or whether it is instead people's *perceptions* of trait change that predict well-being.

For these analyses, we modeled deviations in life satisfaction as a function of (1) within-person changes in personality traits. We also modeled growth in life satisfaction as a function of (2) change goals, and (3) perceived change. All parameters included in the model are listed in Table 5 (the models also included a random intercept to control for within-person dependencies in the data). Importantly, because all variables were included as simultaneous predictors of life satisfaction, our models have several desirable properties. Specifically, because within-person changes in personality traits were held constant, the Month × Goal interaction captures the effect of desiring change *but not experiencing any trait growth*. Similarly, the Month × Perception interaction captures the effect of perceiving trait changes *that did not actually occur*. Finally, the within-person change parameter (Trait$_{Within}$) captures the effect of experiencing actual personality trait growth, holding constant both change goals and perceived changes (i.e., trait growth that was neither wanted nor perceived).

7.3.1. Replication of Hudson and Fraley (2016a)

As can be seen in the top seven rows of Table 5, we replicated many of Hudson and Fraley (2016a) findings. First, Hudson and Fraley (2016a) found that merely desiring to change with respect to conscientiousness and openness predicted declines in life satisfaction over time (perhaps because desiring to change oneself and not making progress is frustrating; Trottier et al., 2009). As can be seen by examining the "Month × Change Goal" parameters in Table 5, we found that conscientiousness change goals predicted relative declines in life satisfaction across time (b = −0.04, 95% CI [−0.06, −0.01]). In other words, participants who wanted to increase in conscientiousness tended to experience less positive growth in life satisfaction across time, as compared with their peers who did not wish to change. Goals to change the other four traits, in contrast, did not predict drops in life satisfaction across time (all $|b|$s ≤ 0.02).

Next, Hudson and Fraley (2016a) found that within-person increases in any big five personality trait predicted gains in life sat-

isfaction—and this was especially true if those changes were desired. We largely replicated this pattern. As can be seen by examining the Trait$_{Within}$ parameters in Table 5, within-person increases in all of the big five personality traits were associated with concurrent gains in life satisfaction (bs ranged from b = 0.15, 95% CI [0.09, 0.22] for conscientiousness to b = 0.41, 95% CI [0.36, 0.47] for emotional stability). Thus, people who increased in any big five trait tended to experience simultaneous gains in well-being, irrespective of whether they originally wanted to change their personality traits or not.

Importantly, there was an interaction between within-person trait changes and change goals for extraversion (Trait$_{Within}$ × Goal b = 0.10, 95% CI [0.03, 0.18]) and emotional stability (b = 0.08, 95% CI [0.02, 0.14]). These interactions indicate that changes in extraversion and emotional stability were especially predictive of growth in life satisfaction *if those changes were desired*. For example, as illustrated in Fig. 3, a person with high extraversion change goals (1 *SD* above the mean; original scale score = 1.17) who increased one-half *SD* in extraversion over the course of the semester[12] would be expected to increase 0.20 *SD*s in life satisfaction, relative to his/her peers with equivalently high change goals who experienced no trait growth over time (i.e., in the left-hand panel of Fig. 3, the rightmost edge of the black solid line is 0.20 *SD*s higher than the rightmost edge of the dashed grey line). In contrast, a person with low change goals (1 *SD* below the mean; original scale score = 0.31) who increased one-half *SD* in extraversion over the course of the study would be expected to increase only 0.10 *SD*s in life satisfaction, relative to his/her peers with equivalently low change goals who experienced no trait growth over time (i.e., in the right-hand panel of Fig. 3, the rightmost edge of the black solid line is 0.10 *SD*s higher than the rightmost edge of the dashed grey line).

Notably, because these models controlled for participants' perceived changes to their personality traits, these findings suggest

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[12] The average growth in extraversion across the course of the semester was 0.08 *SD*s. In other words, the average participant increased 0.08 standardized extraversion units across the study's duration. The standard deviation in growth was 0.38. Thus, persons who were 1 *SD* above the mean in *growth* would have increased 0.46 *SD*s in extraversion over the study's duration. Thus, participants who increased one-half *SD* in extraversion over the course of the semester were approximately 1 *SD* above the mean in growth.
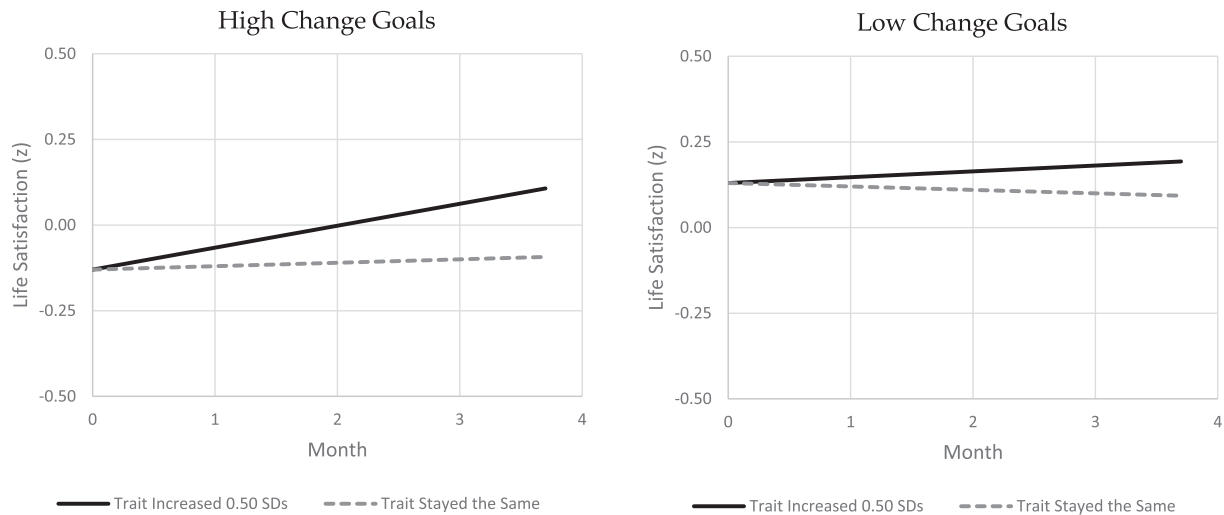
Fig. 3. Model-predicted growth in standardized life satisfaction as a function of extraversion change goals and growth in extraversion over the course of the semester. The left-hand panel depicts participants with high change goals (1 *SD* above the mean; original scale score = 1.17). The right-hand panel depicts participants with low change goals (1 *SD* below the mean; original scale score = 0.31). The black solid lines represent individuals who increased in extraversion 0.50 *SD*s over the course of the semester at a constant rate (on average, participants increased 0.08 *SD*s in extraversion over the semester, with a standard deviation of 0.38; thus participants who increased 0.50 *SD*s over the semester were about a standard deviation above the mean in terms of growth). The grey dashed lines represent individuals who remained constant in extraversion over the semester (0.21 standard deviations below the mean in growth). As can be seen in the left-hand panel, participants who wanted to increase in extraversion and then actually did so were predicted to be 0.20 *SD*s higher in life satisfaction by the end of the semester, as compared with their peers with equivalently high change goals who did not experience any change. In contrast, participants with low change goals who increased in extraversion were predicted to be only 0.10 *SD*s higher in life satisfaction by the end of the semester, as compared with their peers with equivalently low change goals. Thus, equivalent changes in extraversion were associated with greater gains in life satisfaction if the trait gains were desired.

that within-person trait changes predict well-being *above and beyond* the effect of people perceiving those trait changes. In other words, growth in traits appears to predict gains in life satisfaction, irrespective of whether people realize that their traits have changed. This is consistent with the notion that trait changes have real cognitive, affective, and behavioral implications that can influence well-being (e.g., Ozer & Benet-Martínez, 2006), above and beyond the individuals' perceptions that their traits have changed.[13]

7.3.2. Does retrospectively perceiving trait change predict well-being?

Finally, as can be seen in the bottom six rows of Table 5, people's retrospective perceptions that their traits had changed predicted gains in life satisfaction above and beyond the effects of actual within-person growth for all traits (Month × Perception *b*s ranged from *b* = 0.05, 95% CI [0.02, 0.08] for agreeableness to *b* = 0.08, 95% CI [0.05, 0.10] for emotional stability). This seems to indicate that, irrespective of whether one's self-reported traits have actually changed, *believing/perceiving* that change has occurred predicts greater well-being across time.

As an important qualifier, for extraversion and emotional stability, there was a negative interaction between within-person trait changes and perceived changes (respective Trait$_{Within}$ × Perception *b*s = −0.13, 95% CI [−0.22, −0.03]; −0.08, 95% CI [−0.15, −0.01]). As depicted in Fig. 4, this indicates a type of "mutually compensatory interaction" whereby *either* experiencing trait growth (without perceiving it) *or* perceiving trait growth (where none actually occurred) predicted relatively large gains in well-being. However, the combination of *both* experiencing trait growth *and* perceiving it yielded smaller gains than would be expected based on the additive effects alone. This type of "mutually compensatory interaction" was not found for agreeableness, conscientiousness, or openness (all |*b*|s ≤ 0.07).

Finally, there were generally no two- or three-way interactions involving both perceived change and change goals. Thus, for exam-

ple, the finding that desired changes predicted greater boosts to well-being than non-desired ones (see Fig. 3) did not depend on whether those changes were perceived. For example, a person who wanted to become more extraverted and then actually increased in extraversion would be predicted to experience especially large gains in well-being—irrespective of whether that person accurately perceived that his or her personality had changed.

In sum, our findings indicate that within-person trait changes and perceived changes to one's traits separately and independently predict gains in well-being. That is, growth in self-reported trait measures predicts gains in well-being, irrespective of whether those trait changes are perceived by the self. Similarly, perceiving that one's traits have changed predicts growth in well-being, irrespective of whether one's self-reported traits have actually changed across time.

8. Discussion

Prior research suggests that the vast majority of people wish to change aspects of their personality—and that people tend to actually change in ways that align with their desires over time (Baranski et al., 2017; Hudson & Fraley, 2015; Hudson & Roberts, 2014; Miller et al., 2019; Robinson et al., 2015). Moreover, attaining desired changes has been linked to gains in well-being (Hudson & Fraley, 2016a). The present study was designed both to replicate these findings, and to extend them by examining the degree to which people accurately *retrospectively perceive* that their traits have grown during volitional change efforts. We also tested the extent to which actual and perceived trait changes independently predicted well-being.

Our findings generally replicated previous research. In our sample, a minimum of 91% of participants wanted to increase with respect to each big five personality trait. Moreover, individual variation in these change goals prospectively predicted subsequent trait growth for extraversion, emotional stability, and openness to experience—but not agreeableness or conscientiousness. For example, participants who expressed goals to become more

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[13] In models not controlling perceptions (i.e., only including the terms listed in the first seven rows of Table 5), the pattern of findings remained unchanged.
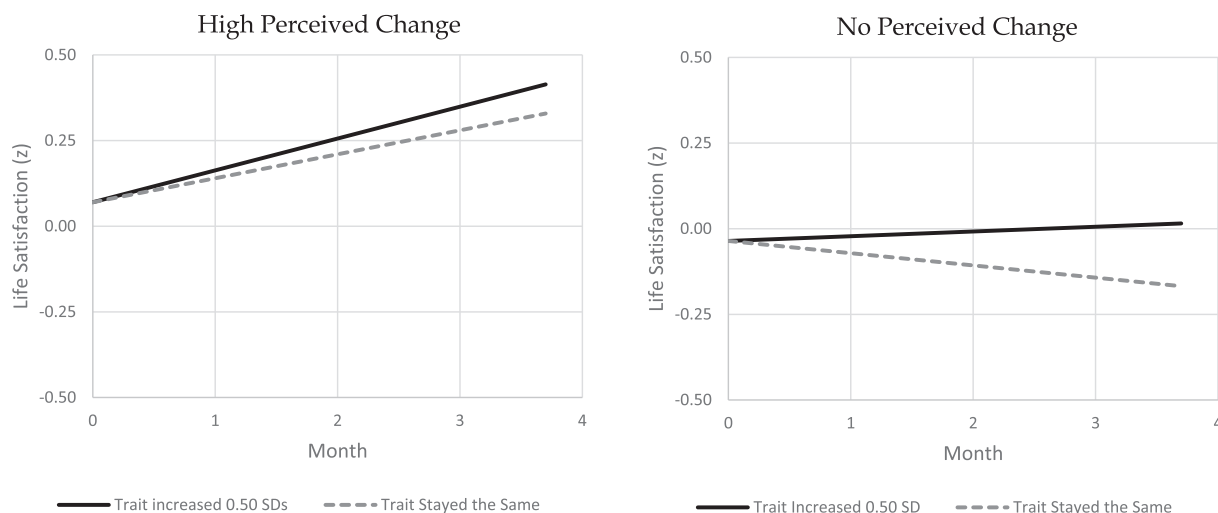
Fig. 4. Model-predicted growth in standardized life satisfaction as a function of actual within-person growth in extraversion and perceived growth in extraversion. The left-hand panel depicts participants with high perceived changes in extraversion (1 *SD* above the mean; original scale score = 0.74). The right-hand panel depicts participants who perceived no changes to their extraversion across the study (0.51 *SD*s below the mean; original scale score = 0.00). The black solid lines represent individuals who increased in extraversion 0.50 *SD*s over the course of the semester at a constant rate (on average, participants increased 0.08 *SD*s in extraversion over the semester, with a standard deviation of 0.38; thus participants who increased 0.50 *SD*s over the semester were about a standard deviation above the mean in terms of growth). The grey dashed lines represent individuals who remained constant in extraversion over the semester (0.21 standard deviations below the mean in growth). When both actual and perceived changes were high, their effects on well-being were mutually reduced. For example, persons who actually increase 0.50 *SD*s in extraversion over the semester and perceived those changes were predicted to be only 0.09 *SD*s higher in well-being by the end of the semester, as compared with their peers who experienced no actual change in extraversion but nevertheless perceived high levels of change. In contrast, participants who actually increased 0.50 *SD*s in extraversion over the semester but did not perceive those changes were predicted to be 0.22 *SD*s higher in well-being by the end of the semester, as compared with their peers who did not change and also perceived low levels of change.

extraverted tended to actually increase in self-reported extraversion at a faster rate, as compared with their peers who did not wish to change. Finally, gains in any trait were associated with simultaneous growth in life satisfaction. For extraversion and emotional stability, this was especially true if those changes were desired. In other words, a person who increased in extraversion *and originally wanted those increases* was predicted to experience greater gains in life satisfaction than his/her peers who experienced equivalent growth in extraversion despite not desiring the change.

As a summary of the existing volitional change literature, there have been twelve intensive longitudinal studies to date (including the present study) examining whether change goals predict subsequent trait change (for a mega-analysis, see Hudson, Fraley, et al., 2019). Averaging across all twelve studies, goals to increase in any of the big five personality traits predicted prospective gains in the relevant trait. Effect sizes appear to be largest for extraversion and emotional stability (approximate Month × Goal $b = 0.04$) and smallest for agreeableness and emotional stability (approximate Month × Goal $b = 0.01$). This explains why across individual published studies (including the present study) effects appear to be least robust for agreeableness and openness. Thus, future volitional change studies would benefit from using larger sample sizes—insofar as it is possible—to increase statistical power to detect the apparently smaller effect sizes for agreeableness and particularly openness. Nevertheless, our study is consistent with prior findings that people want to change their traits—and, when taken as a whole, the literature suggests that change goals predict subsequent growth in each of the big five traits—but especially extraversion and emotional stability.

In addition to the twelve intensive longitudinal studies described above, one additional study examined whether a single-item per domain change goals measure predicted growth in traits across two time points separated by one year (Robinson et al., 2015). This study found that change goals did not predict trait change. There were numerous differences between Hudson and colleagues' studies (described above) and that of Robinson and colleagues, which may explain their discrepant results. On

one hand, the divergent findings may be attributable to methodological differences. Robinson and colleagues used a single-item (per domain) measure of change goals (whereas Hudson and colleagues used 8–12 items per domain) and included only two assessment waves (versus an average of 11 waves in Hudson and colleagues' studies). These methodological features may have limited variation in change goals as well as power to detect effects.

Alternatively, the differences in these studies may foreshadow important theoretical issues. For example, Robinson and colleagues followed graduating college students for a full year, whereas Hudson and colleagues followed undergraduates across only one 4-month semester. Thus, it may be the case that volitional changes are short-lived and/or cyclical in nature and revert across longer periods of time (e.g., a year). Similarly, it may be the case that self-change efforts are difficult to sustain across major life transitions (e.g., graduating). Finally, Hudson and colleagues frequently contacted participants, and their studies oftentimes included interventions and/or repeated measures of change goals, which may have kept volitional change salient in participants' minds, leading to more fruitful goal pursuit. Clearly, much future research is needed to understand how volitional change processes unfold over long periods of time (e.g., several years) and what factors are important in facilitating successful self-change efforts.

8.1. Do people accurately retrospectively perceive changes to their traits?

One of the major innovations of the present work was examining the extent to which people accurately retrospectively perceive changes to their personality traits in the context of volitional change efforts. Replicating prior research, we found moderate—albeit certainly not perfect—correspondence between the amount of growth participants actually experienced in their self-reported traits and their retrospective perceptions of the extent to which they had changed (Costa & McCrae, 1989; Robins et al., 2005). As a concrete illustration of the level of agreement in our sample, collapsing across all five traits, for approximately 61% of measurement

occasions, people perceived changes in the correct direction (e.g., they believed they had increased when their self-report trait scores indicated that they had increased). However, averaging across all five traits, for a full 32% of measurement occasions, people perceived that they had increased in the traits when their self-reported scores had actually *decreased*. This may indicate a self-serving bias in which participants were motivated to *perceive* that they had changed in socially desirable ways, despite such changes not actually occurring in their self-reported traits (Wilson & Ross, 2001). Conversely, collapsing across the big five, for approximately 7% of measurement occasions, individuals indicated that they perceived that their traits had decreased, when, in fact, their self-report trait scores had increased. This lattermost finding does not seem to reflect a self-serving bias per se; but it may rather indicate that there is substantial error in people's judgments of the extent to which their traits have changed (Costa & McCrae, 1989). Irrespective, these findings collectively indicate that people are only moderately accurate in perceiving the ways in which their personality traits scores change over time—even in contexts in which they should presumably be motivated to accurately track changes in their personality (e.g., when attempting to change their own traits).

These findings are interesting in and of themselves because they elucidate people's subjective experience of the process of seeking trait change. More importantly, though, these results may have critical implications for valuable life outcomes. Namely, for nearly a third of measurement occasions, participants perceived seemingly illusory growth. For example, they reported believing they had become more agreeable, when no change had actually occurred in their self-report trait scores. To the extent that people falsely believe that their change goals have been fulfilled and terminate their self-change efforts prematurely (e.g., Hudson & Fraley, 2015), they may miss the opportunity to improve critical life outcomes. For example, higher levels of agreeableness predict thriving in one's marriage (Ozer & Benet-Martínez, 2006). Presumably, this association exists due to real behaviors and their consequences; agreeable individuals are kinder, more responsive to their partners' needs, and less likely to engage in destructive conflict behaviors. To the extent that an individual *perceives* that his or her agreeableness has increased—when it has, in fact, not actually increased—he or she may cease self-change efforts without actually becoming more agreeable (i.e., without actually incorporating more agreeable behaviors into his/her behavioral repertoire). Presumably, in the absence of more agreeable behavioral patterns, an individual would not experience an increase in marital satisfaction that he or she otherwise could have attained.

Conversely, for approximately 7% of measurement occasions, participants committed the opposite error: They failed to perceive trait growth that was evident in their self-report trait measures. Such errors might be an artifact of measurement error—or they may occur if participants are not particularly motivated to perceive changes in their personality (e.g., because they are low in self-reflection) or if they are actively motivated to *not* perceive changes to their personality (e.g., because they wish to see themselves consistently across time; Swann, Stein-Seroussi, & Giesler, 1992). Nevertheless, as with Dorothy's companions in *The Wizard of Oz*, such a phenomenon might lead participants to waste valuable time and effort pursuing changes *that they have already attained*. This may lead to opportunity costs (i.e., missing opportunities to pursue other more fruitful ventures with their time). Moreover, endlessly pursuing a valued goal without perceiving any progress toward that goal has the potential to produce a cycle of frustration and declining well-being across time (e.g., Polivy & Herman, 2002; Trottier et al., 2009).

That said, the present study was limited in its ability to fully explore these potential consequences of errors in perceiving trait change—as we did not include measures of concrete outcomes (e.g., occupational attainment, relationship quality) or active goal pursuit (e.g., the actions participants were taking to actively attempt to change their traits). Future studies should include a wider array of outcome variables and concrete measures of the extent to which participants are actively pursuing volitional change. These measures should be used to test [1] the independent effects of actual and perceived changes on outcomes (e.g., does perceiving changes in agreeableness predict marital satisfaction, holding actual trait change constant?), and [2] the effects of perceiving illusory trait change and failing to perceive actual trait change on continued efforts to change (e.g., do people who perceive illusory trait growth disengage from goal pursuit behaviors?).

8.2. Do actual and perceived changes independently predict well-being?

A second major innovation of our study was examining the extent to which actual changes in people's self-reported traits and retrospective perceived trait changes predicted well-being across time. Replicating prior research (Hudson & Fraley, 2016a), within-person changes in any big five trait were associated with concurrent gains in life satisfaction. For example, individuals who increased in extraversion were also likely to report that they had become more satisfied with their lives. More importantly, this association was not attenuated when controlling for people's retrospective perceived changes to their traits. This seems to indicate that personality traits entail concrete patterns of thoughts, feelings, and behaviors that have real implications for well-being. For example, extraverted individuals may construe life events in an optimistic fashion and seek out supportive and enjoyable social interactions (Ozer & Benet-Martínez, 2006). Thus, persons who actually increase in extraversion may accrue gains in well-being through these concrete behavioral mechanisms, even if they do not realize that their extraversion has increased.

Similarly, perceived trait changes predicted gains in well-being, even holding constant actual change in the self-reported traits. In other words, people who *believed* that their traits had changed reported greater well-being, even if their self-reported traits had not *actually* changed. There are multiple reasons why such an effect might occur. First, the subjective sense that one has grown and matured to better fit one's own internal standards may foster well-being and the feelings that one's life is progressing well (e.g., Higgins, 1987). In other words, *believing* that one better aligns with one's desired self may spur positive emotions, even if that belief is false. Relatedly, the perception that one has attained a valued goal may also facilitate positive affect and life satisfaction (e.g., Higgins et al., 1997). Finally, people's perceptions may operate in a self-fulfilling fashion (Jussim, 1986). For example, an individual who believes that s/he has increased in extraversion may feel more confident in his/her social interactions, leading to improved relational outcomes. Ultimately, however, these explanations are speculative and should be directly tested in future research.

Nevertheless, our findings align with a growing body of literature suggesting that actual growth in self-reported traits and retrospective perceived trait changes are not isometric with one another—and they frequently have independent associations with predictors and outcome variables (e.g., Costa & McCrae, 1989; Lodi-Smith et al., 2009; Robins et al., 2005). This underscores that importance of not conflating observed changes in self-report trait measures with participants' *perceptions* that their traits have changed.

Along these lines, the fact that both actual longitudinal changes and retrospective perceived changes independently predicted well-being in our study may have important implications for the personality literature more broadly. Namely, our findings suggest that retrospective reports may provide valid information above and beyond observed longitudinal changes in trait measures. Of

course, this phenomenon may be a quirk specific to the variables in the present study: It is possible that both actually changing one's traits and also perceiving changes to one's traits have the potential to spur the sense that one's life is progressing well. Alternatively, it may be the case more generally that both changes in trait measures and retrospective reports provide partially overlapping, valid information. In other words, people's retrospective reports may provide information about how they have *actually* changed above and beyond observed changes in their self-report trait measures across time. Future studies should more thoroughly explore the extent to which actual trait change and retrospective reports of trait change exhibit incremental validity in predicting outcomes across a wide gamut of criterion variables.

8.3. Methodological issues

Finally, our data were able to speak to several methodological limitations of prior studies. The existing longitudinal studies on volitional change have relied exclusively on self-report data (Hudson & Fraley, 2015, 2016a; Robinson et al., 2015). Thus, one major criticism of these studies is that their effects may have been partially attributable to demand characteristics or placebo effects. For example, participants who wanted to increase in extraversion may have reported gradual gains in extraversion across time because (1) they felt it was what the study required from them, or (2) they believed that study would help them attain desired changes, and thus they experienced placebo-like growth.

Our findings cast doubt on these explanations. Namely, as reviewed above, there was only moderate correspondence between actual changes to people's self-report traits and their retrospective perceptions of how their traits had changed. Thus, participants appeared to be only partially aware of how their own self-reported traits had changed. More importantly, in subsequent analyses, change goals continued to predict trait growth, even holding perceived trait changes constant. In other words, change goals predicted trait growth, even if participants did not realize that their traits had changed. The fact that participants were unable to accurately articulate that their self-reported traits had changed—and that change goals predicted trait growth *that was not perceived*—seems to indicate that the observed trait growth in our study cannot be accounted for by participants' beliefs, expectations, self-serving biases, or perceived demand to respond in a certain way.

8.4. Other limitations and future directions

In addition to those we have already reviewed above, several limitations of our study are worth noting. First and foremost, our results were based exclusively on self-reported, correlational data. Thus, we cannot draw strong conclusions about causal processes from this study. For example, rather than change goals causing growth in personality traits, the association between the two variables may be attributable to reverse causality (e.g., people may desire changes that are already in-process within them; however, for data that seem to refute this idea, see Study 2 in Hudson & Fraley, 2015) or third variables (e.g., psychological maturity may cause people to desire increases in certain traits *and* to also experience actual increases in those traits across time). When studying *volitional* change, individuals' free choice may be important; nevertheless, it may be possible to experimentally manipulate aspects of the volitional change processes to increase internal validity. For example, several experiments have found that asking participants to engage in trait-relevant behaviors over time spurs trait gain (Hudson, Briley, et al., 2019; Hudson & Fraley, 2015). Similarly, it may be possible to experimentally manipulate change goals.

Relatedly, it is important to emphasize that self-report measures do not necessarily perfectly capture the constructs of inter-

est. For example, in the present manuscript, we generally interpreted changes in participants' self-report traits as reflecting "actual" changes in their traits. This is consistent with both prior studies examining "actual" and "perceived" changes (e.g., Gunty et al., 2011; Robins et al., 2005) as well as the broader literature on adult personality development—which has extensively utilized and validated observed growth in self-report measures as an operationalization of "true" latent trait change (Costa & McCrae, 1989; Lucas & Donnellan, 2011; Roberts et al., 2017, 2006; Roberts & Mroczek, 2008). Nevertheless, self-report measures are not perfect and are susceptible to a variety of biases (e.g., Paulhus & Vazire, 2007; Vazire, 2010). For example, manifest changes in self-report measures may partially reflect changes in participants' self-serving biases (e.g., seeing themselves more-or-less favorably across time) rather than "true" trait change (e.g., changes in identity and patterns of thoughts, feelings, and behavior).

For this reason, future volitional change studies should corroborate changes in participants' personality traits with observer reports. Although existing studies have found that change goals predict growth in traits (Hudson & Fraley, 2015, 2016a), daily behavior checklists (Hudson & Fraley, 2015), and self-reported traits, holding perceived change constant (the present study), ultimately all of these measures were self-reported. Self- and observer-reports both entail costs and benefits—and the inclusion of both types of reports may compensate for each other's weaknesses (Paulhus & Vazire, 2007). For example, observers are likely not susceptible to the same self-serving biases as the self in perceiving the self's trait growth. However, observers do not have access to as much information about the self's personality and may not be motivated to perceive changes therein. Thus, the use of observer reports in future research will likely require intimate observers who know the self well (e.g., spouses) and longer time frames to allow larger trait changes that are obvious enough to be evident to others.

In addition to obtaining multiple measures of personality traits (e.g., self- and observer reports), future research might also consider collecting different measures of change goals (e.g., Baranski et al., 2017) and perceived trait change. For example, it would be valuable to more thoroughly measure the extent to which participants are actively and intentionally working on changing their personality traits, as opposed to merely desiring change without actively pursuing it. Similarly, in the present study, we measured perceived change using the short Ten Item Personality Inventory. Future research might replicate our results using longer measures of perceived change.

An additional limitation of our study is that we focused on linear associations between change goals and outcome variables (e.g., trait growth, well-being). Although the vast majority of people want to increase with respect to the socially desirable pole of each big five personality domain, some individuals do express desires to decrease in extraversion, agreeableness, conscientiousness, emotional stability, and/or openness to experience. However, the psychology of individuals who desire to change in non-normative ways is not well-understood. Thus, future research with larger samples might consider modeling nonlinear associations between change goals and outcome variables to better understand whether desiring *decreases* in traits functions differently from desiring *increases* in traits.

One final limitation of the present study—and the entire volitional change literature at present—is that the extended process of pursuing and attaining self-change is not yet well-understood. Future research is needed to understand both (1) the extent to which participants can change their traits, and (2) whether such changes can be maintained over extended periods of time. Although twelve studies thus far have observed growth in participants' traits over a period of approximately four months (Hudson,

Fraley, et al., 2019), presumably those seeking self-change will eventually experience diminishing returns in their ability to change their traits (e.g., Robinson et al., 2015 found that change goals did not predict trait change across two time points separated by one year). As an analog, a recent meta-analysis of the effects of interventions (primarily psychotherapy) on personality change found that trait growth was maximized within about two months—and then leveled off thereafter (Roberts et al., 2017). However, that growth was maintained for up to several years after the conclusion of therapy. Similar studies are needed to understand (1) whether and when individuals reach a similar point of diminishing returns with self-change efforts, and (2) whether those changes can be maintained over several years, or whether they might eventually revert over life transitions or extended periods of time (e.g., Robinson et al., 2015).

8.5. Conclusion

In the 1939 classic film, *The Wizard of Oz*, the Scarecrow, Tin Man, and Cowardly Lion set off on an adventure desperately seeking to change aspects of themselves—changes they have ironically already achieved without realizing it. Our study suggests that real people also want to change aspects of themselves and—and although most people *do* perceive changes to their traits at least somewhat accurately—many individuals do not perfectly perceive how their personality has grown in response to their volitional change efforts. Moreover, real and perceived changes appear to have independent associations with consequential outcomes, such as life satisfaction. We believe that this research serves as fodder for many important future directions (e.g., better understanding the extent to which real and perceived changes are related to a wide swath of outcome variables). We hope that future research will continue to more fully elucidate the consequences of both actual and perceived volitional personality trait change.

Author note

Hudson conceptualized the study. All authors collected data. Hudson analyzed the data. All authors contributed to drafting this manuscript.

Appendix A
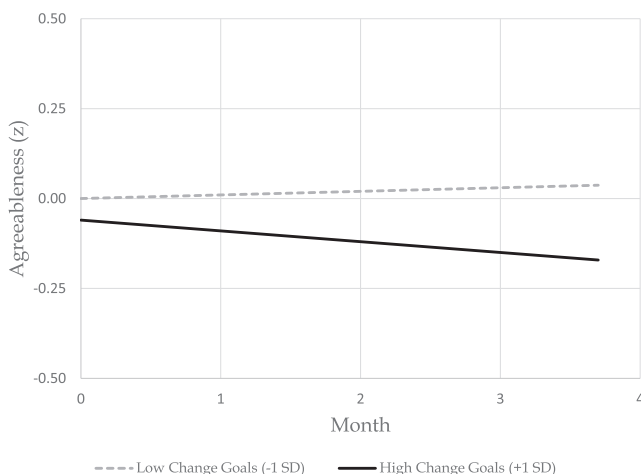
See Figs. A1 and A2.

Fig. A1. Model-predicted growth in standardized trait agreeableness as a function of agreeableness change goals. The interaction is not statistically significant.
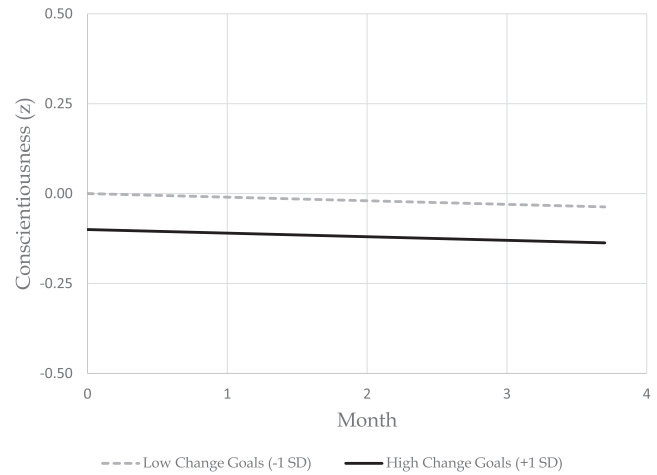

Fig. A2. Model-predicted growth in standardized trait conscientiousness as a function of conscientiousness change goals. The interaction is not statistically significant.

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