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Who wants to become more conscientious, more extraverted, or less neurotic with the help of a digital intervention?

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ABSTRACT

Desires to increase in extraversion and conscientiousness as well as to decrease in neuroticism are the three most prevalent personality change goals. This study describes characteristics of people who wanted to change one of these personality traits (total N = 1196) with the help of a digital personality change intervention. The extent to which characteristics predicted the selection of one change goal over the other two was explored using machine learning. Individuals desired to change traits with lower (in case of desires to increase) or higher (in case of desires to decrease) self- and observer-reports and with greater self-other discrepancies. This identification of characteristics of people who desired to change certain personality traits informs future interventions.

1. Introduction

Recent research has shown that many people want to change certain aspects of their personality (Baranski, Morse, & Dunlop, 2017). Primarily, individuals prefer to become more conscientious, more extraverted, and less neurotic (Hudson & Roberts, 2014). The present research aimed to examine these three personality change goals in greater detail using data from a large-scale digital personality change intervention project (Stieger et al., 2018). The first goal of the present study was to describe characteristics of individuals who desired to become more conscientious, more extraverted, or less neurotic. The second goal was to explore the extent to which specific characteristics (e.g., self- and observer-reported personality traits and facets, satisfaction with and importance of life domains, and self-esteem) predict the selection of one of these three personality change goal over the other two personality change goals using a machine learning approach.

1.1. Personality change goals

In general, goals can be defined as cognitive representations of what a person wants or feels obliged to achieve in the future (Ryan, Sheldon, Kasser, & Deci, 1996). For more than 25 years, theorists have argued that individuals also form goals to change their personality (Baumeister, 1994; Kiecolt, 1994). However, only recently researchers have begun to examine personality change goals in a more systematic way by asking people whether and to what degree they would like to change their personality. For example, researchers developed the Change Goal Big Five Inventory (C-BFI; Hudson & Roberts, 2014) to study personality change goals. The C-BFI asks individuals whether they want to become - for example - much more talkative, much less talkative, or stay the same. They found that personality change goals can be organized along the Big Five domains (Hudson & Roberts, 2014). Another group of researchers developed the Big Five Trait-Change Goal Inventory (BF-TGI; Robinson, Noftle, Guo, Asadi, & Zhang, 2015). Each item of this measure describes a Big Five trait with six prototype adjectives (e.g., conscientiousness is characterized by being efficient, organized, planful, reliable, responsible, and thorough) and participants rate each item whether they have the goal to become less like this, have no goal, or want to become more like this. Finally, Baranski et al. (2017) used open-ended descriptions of desired

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change goals and quantified participants' responses using a coding system of the Big Five personality traits. In sum, these previous studies on personality change goals found that the majority of people have desires to change their personality. A large cross-sectional study using the C-BFI (Hudson & Roberts, 2014) found that most people wanted to decrease in neuroticism and, although personality change goals seemed to slightly ebb across adulthood, older adults still expressed substantial desires to change aspects of their personality (Hudson & Fraley, 2016).

However, people who report desires to change personality traits when responding to questionnaires may be at different motivational stages (Grawe, 2004; Heckhausen & Gollwitzer, 1987). People may indicate desired change goals and have an intention to change their behavior, but they may not actually take action, which is typically referred to as the "intention-behavior gap" in the behavior change literature (Sniehotta, Scholz, & Schwarzer, 2005). In the goal emergence and pre-decision phase (Heckhausen & Gollwitzer, 1987), people envision a change goal, but still feel ambivalent toward actually changing their behaviors. In the context of interventional psychology this emergence and pre-decision phase reminds of the contemplation stage (Prochaska & DiClemente, 2005). In the phase of actual goal-setting and implementation of plans, people metaphorically already crossed the Rubicon (Heckhausen & Gollwitzer, 1987). In this phase, people have committed to a specific goal and start taking active steps towards their change goals (Prochaska & DiClemente, 2005). As such, previous research that confronted participants with questionnaires on their personality change goals (e.g., Hudson & Roberts, 2014; Robinson et al., 2015), but did not ask them if they actually want to start taking active steps to change their personality, may have overestimated personality change goals across the Big Five traits.

The present study is the first to focus on a sample of people in the phase of actual goal-setting and implementation of plans. This means that, in contrast to previous approaches, the present study only included people who actually wanted to change themselves, have already signed up to take part in a personality change intervention, have committed to a specific goal, and are willing to start taking active steps towards their change goals. Participants had to select one Big Five personality trait they wanted to change the most (i.e., to increase or decrease in one Big Five trait) with the help of a digital intervention. Although it may be that they would have liked to change more than one personality trait, research on goal setting and achievement suggests that having one goal, which targets one specific area for improvement, is better than working on many different domains at the same time (Doran, 1981). Our approach forced participants to choose the personality change goal with their highest priority (see Supplementary Table 1 for the description of goals).

1.2. Why do people want to become more conscientious, extraverted or less neurotic?

There are several possible reasons why people want to change their personality in general and why they mainly desire to change in conscientiousness, extraversion, and neuroticism. Also, more than one of the following reasons may apply why individuals desire to change their personality. First, people may strive for personal growth. This means that they are not necessarily dissatisfied or do not suffer from their personality traits but still strive for personal growth; primarily to realize their personal potential and self-fulfillment. This motivation may reflect the level of "self-actualization" in the hierarchy of needs (Maslow, 1943), which can only take place once all basic and mental needs are essentially fulfilled.

Second, people may strive for adjustment towards socially acceptable personality traits (Reisz, Boudreaux, & Ozer, 2013) in order to reduce their dissatisfaction in certain life domains (Baumeister, 1994; Kiecolt, 1994). Especially social role expectations by the society and developmental tasks (e.g., social roles at work, in family life, or in the community) can lead to chronic role strain and dissatisfaction (Kiecolt, 1994), and finally lead to a desire to adjust personality traits. Previous research has shown that dissatisfaction with life domains was associated with personality change goals (Hudson & Roberts, 2014). For example, people who were dissatisfied with their sex lives and friendships, tended to express desires to increase in extraversion. In addition, low self-esteem can be seen as a domain-specific dissatisfaction with oneself (Robins, Hendin, & Trzesniewski, 2001), which may also elicit or reinforce desires to change oneself.

Third, based on previous research it is clear that higher levels in conscientiousness and extraversion and lower levels in neuroticism are important for success in different life domains such as love, work, and health (Roberts, Kuncel, Shiner, Caspi, & Goldberg, 2007; Soto, 2019). For example, high conscientiousness is positively related to better school performance (Poropat, 2009), job performance (Dudley, Orvis, Lebiecki, & Cortina, 2006), physical health (Hampson, Edmonds, Goldberg, Dubanoski, & Hillier, 2013), longevity (Kern & Friedman, 2008), and relationship quality (Hill, Nickel, & Roberts, 2014). The goal to increase in conscientiousness may be prioritized to improve self-regulation, which means to be able to control thoughts, feelings, and behaviors in an effort to act in goal-directed ways (Roberts, Lejuez, Krueger, Richards, & Hill, 2014). The goal to increase in extraversion may reflect the desire to receive more social attention (Ashton, Lee, & Paunonen, 2002). Also, higher extraversion and lower neuroticism are among the strongest predictors of positive affect and increased wellbeing (Costa & McCrae, 1980; Steel, Schmidt, & Shultz, 2008; Sun, Kaufman, & Smillie, 2018), which suggests that the goal to increase in extraversion or decrease in neuroticism may be prioritized when individuals want to improve their overall wellbeing.

Fourth, people may want to compensate for perceived lower or higher levels in certain traits and may be primarily motivated to change when they encounter a large discrepancy between their current and desired levels in personality traits. Indeed, previous research on personality change goals found that people who wanted to increase or decrease in a certain personality trait had lower or higher scores in this trait compared to personality traits they did not want to change (Hudson & Roberts, 2014). Recent research also suggests that individuals with scores on the more maladaptive ends of the Big Five traits (e.g., more neurotic or less conscientious) (Lamkin, Maples-Keller, & Miller, 2018) as well as individuals with personality disorders (Miller et al., 2018) do not like those levels of traits, believe that they cause them problems, and are interested in changing them towards more adaptive scores.

Finally, not only the way people see themselves, but also perceptions of close others such as friends and family members may influence people's desires to change. Direct and implicit interpersonal communication on the actual and desired personality trait levels (Back et al., 2011; Vazire, 2010)(may motivate or even reinforce people to change themselves. Researchers recently found that personality change goals were stronger when both self- and observer-reports rated a persons' trait levels as being low (Quintus, Egloff, & Wrzus, 2017).

1.3. The present study

As a wide variety of individual characteristics may elicit and reinforce a desire to change personality aspects, the present study aimed to have a closer look at several characteristics of people who actually wanted to increase in conscientiousness, increase in extraversion, or decrease in neuroticism with the help of an intervention. The present research is part of a larger digital personality change intervention project (Stieger et al., 2018), in which participants could choose to increase or decrease in one Big Five trait (Supplementary Table 1 includes a description of all change goals). In the present study, we focused on the three most prevalent personality change goals. Of all participants in the PEACH intervention project, 26.5% wanted to decrease in neuroticism, 26.7% wanted to increase in conscientiousness, and 24.5% wanted to increase in extraversion. In total, only 21.5% of all participants chose to increase or decrease in another Big Five trait. More specifically, 7.4% wanted to increase in openness, 1.8% decrease in openness, 4.1% increase in agreeableness, 6.4% decrease in agreeableness, 2.6% decrease in conscientiousness, and 0.2% decrease in extraversion. The present study focuses on the three largest groups as their samples were very similar in size, which increases comparability. The bias of produced estimates using machine learning would increase with smaller samples especially when taking into account that the training dataset only includes 80% of the sample (e.g., Kohavi, 1995). One limitation in previous research on the relation between personality variables and personality change goals lies in the restriction to investigate only a few predictors, primarily due to the requirements of regression analyses. We used a machine learning approach as it provides the opportunity to extract the feature importance of a large number of characteristics in the same model (Ng, 2004). Recently, machine learning has become more prominent in the field of personality science (Bleidorn & Hopwood, 2018; Weidman et al., 2019).

The present study goals were twofold. The first goal was to describe characteristics of people who wanted to become more conscientious, more extraverted, or less neurotic using self- and observer-reports of personality traits and facets, satisfaction with and importance of life domains, and self-esteem. As a part of that, we also compared the discrepancies between self- and observer-rated personality traits across the three personality change goals. The second goal was to explore the extent to which specific characteristics predict the selection of one of the three personality change goals over the other two personality change goals using a machine learning approach. To do so, we used 59 characteristics as predictor variables (Table 1) and logistic regression with a supervised machine learning approach (Hosmer, Lemeshow, & Sturdivant, 2013; Ng, 2004). For these analyses, we focused on a subsample of participants who received at least one observer-report as supervised machine learning algorithms cannot handle missing values.

2. Method

2.1. Participants

Participants came from a large-scale digital personality change intervention project (PEACH; Stieger et al., 2018), in which participants could select an intervention to increase or decrease in one Big Five personality trait. All participants who completed the pretest between April 2018 and August 2018 were considered for the present research. In the present study, we focused on people who desired to increase in conscientiousness, increase in extraversion, or decrease in neuroticism (total N = 1178) as these goals were selected most often (Supplementary Table 1). In total, 398 participants desired to increase in conscientiousness (age: M = 24.77, SD = 6.50; females: 46%), 374 participants desired to increase in extraversion (age: M = 24.27, SD = 6.20; females: 38%), and 406 participants desired to decrease in neuroticism (age: M = 25.53, SD = 6.98; females: 72%). Supplementary Table 2 includes the results for all provided personality change goals in the personality change intervention project.

2.2. Observers

We also assessed observer-reports by close others. In terms of the goal to increase in conscientiousness, there were 164 observers who rated 165 participants (age: M = 31.62, SD = 12,19; females: 59%). In terms of the goal to increase in extraversion, there were 206 observers who rated 118 participants (age: M = 30.16, SD = 11.64; females: 61%). And regarding the goal to decrease in neuroticism, there were 314 observers who rated 178 participants (age: M = 30.84, SD = 11.12; females: 54%).

As we could only use participants with observer-reports for the supervised machine learning approach, we compared characteristics of people with observer-reports (n = 461) against people without observer-reports (n = 717). The results revealed that people who obtained observer-reports were significantly more extraverted (d = 0.16), rated their emotions as more important (d = 0.15), were more satisfied in general with their lives (d = 0.12), their financial situation (d = 0.12), their sexual relationships (d = 0.15), their school/career (d = 0.12), their recreational activities (d = 0.18), and their friendships (d = 0.13). Although these differences were statistically significant, the differences were small in terms of effect sizes (Gignac & Szodorai, 2016).

2.3. Procedure

In the PEACH intervention study, we used university mailings and social media advertisements to recruit participants. Interested individuals downloaded the PEACH mobile application on their own Android or iOS smartphones. To be eligible for the study, participants had to pass a screening and be motivated to participate at the three-month digital personality change intervention. More information on the study procedure can be found in the Study Protocol (Stieger et al., 2018). When participants were eligible and passed the screening assessment, they had to fill in the pretest and select their personality change goal for the intervention. To help participants with their decision, they received descriptions of normal characteristics of people with high versus low levels in each personality trait (Supplementary Table 1). After completion of the pretest, the personality change intervention started and lasted over three months. The intervention itself is not of interest for the present research. Details of the interventional components, the study design, sample size calculations, and all assessed measures are provided in the corresponding Study Protocol (see Stieger et al., 2018).

2.4. Self-report measures

2.4.1. Personality traits and facets

We used the Big Five Inventory 2 (Soto & John, 2017) to assess the Big Five personality traits and facets. Participants rated their level of agreement using a 5-point Likert-type scale ranging from *strongly disagree* (1) to *strongly agree* (5). Cronbach's alphas for traits ranged between 0.71 and 0.88 (M = 0.85) and for facets ranged between 0.62 and 0.88 (M = 0.76).

2.4.2. Self-esteem

Self-esteem was measured using the Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1965). Participants had to rate their level of agreement with ten items using a 5-point Likert-type scale ranging from *strongly disagree* (1) to *strongly agree* (5). Cronbach's alpha was 0.88.

2.4.3. Satisfaction with life

Satisfaction with life was measured in different ways. First, to measure general life satisfaction, we used the Satisfaction with Life Scale (Diener, Emmons, Larsen, & Griffin, 1985). Participants rated

Table 1
Individual Differences Across Personality Change Goals.

	Increase in Conscientiousness (*N* = 398)				Increase in Extraversion (*N* = 374)				Decrease in Neuroticism (*N* = 406)			
	M	*SD*	*d*	CI_{95}	*M*	*SD*	*d*	CI_{95}	*M*	*SD*	*d*	CI_{95}
Extraversion	3.40	0.66	−0.29	−0.41; −0.18	**2.83**	**0.62**	**0.86**♣	**0.74; 0.99**	3.40	0.64	−0.30	−0.41; −0.18
Sociability	3.36	0.86	−0.40	−0.51; −0.28	**2.46**	**0.73**	**1.01**♣	**0.88; 1.13**	3.31	0.86	−0.34	−0.45; −0.22
Assertiveness	3.41	0.83	−0.24	−0.36; −0.13	**2.91**	**0.79**	**0.56**◆	**0.44; 0.68**	3.38	0.80	−0.19	−0.39; 0.00
Energy Level	3.44	0.74	−0.06	−0.17; 0.06	**3.12**	**0.78**	**0.50**◆	**0.38; 0.62**	3.52	0.73	−0.20	−0.40; −0.01
Conscientiousness	**2.97**	**0.62**	**1.00**♣	**0.88; 1.11**	3.57	0.66	−0.28	−0.39; −0.16	3.59	0.59	−0.33	−0.44; −0.21
Productiveness	**2.54**	**0.76**	**0.94**♣	**0.82; 1.06**	3.21	0.85	−0.19	−0.30; −0.07	3.32	0.75	−0.36	−0.47; −0.24
Organization	**2.97**	**0.93**	**0.81**♣	**0.69; 0.92**	3.68	0.94	−0.22	−0.34; −0.10	3.72	0.88	−0.28	−0.39; −0.17
Responsibility	**3.40**	**0.68**	**0.61**◆	**0.50; 0.73**	3.83	0.64	−0.29	−0.40; −0.17	3.75	0.60	−0.13	−0.25; −0.02
Neuroticism	2.50	0.62	0.41	0.29; 0.53	2.57	0.59	0.25	0.13; 0.37	**3.11**	**0.58**	**−0.96**♣	**−1.07; −0.84**
Emotional Volatility	2.42	0.80	0.28	0.17; 0.40	2.29	0.72	0.48	0.36; 0.60	**3.13**	**0.79**	**−0.94**♣	**−1.15; −0.73**
Depression	2.38	0.75	0.26	0.15; 0.38	2.55	0.74	−0.04	−0.15; 0.08	**2.82**	**0.74**	**−0.53**◆	**−0.73; −0.33**
Anxiety	2.70	0.70	0.48	0.37; 0.60	2.87	0.71	0.16	0.04; 0.28	**3.40**	**0.68**	**−0.85**♣	**−1.05; −0.64**
Agreeableness	3.87	0.49	−0.06	−0.17; 0.06	3.89	0.51	−0.11	−0.23; 0.01	3.82	0.51	0.09	−0.02; 0.20
Compassion	3.95	0.69	0.01	−0.11; 0.12	3.92	0.71	0.07	−0.05; 0.19	4.07	0.66	−0.23	−0.43; −0.04
Respectfulness	4.19	0.57	0.04	−0.08; 0.15	4.32	0.53	−0.28	−0.40; −0.16	4.11	0.61	0.22	0.11; 0.33
Trust	3.48	0.69	−0.16	−0.28; −0.05	3.44	0.71	−0.09	−0.20; 0.03	3.26	0.72	0.25	0.13; 0.36
Openness to Experience	3.82	0.61	−0.29	−0.40; −0.17	3.59	0.61	0.21	0.09; 0.33	3.72	0.63	−0.07	−0.18; 0.05
Aesthetic Sensitivity	3.61	0.98	−0.21	−0.32; −0.09	3.29	1.04	0.22	0.11; 0.34	3.58	0.94	−0.17	−0.37; 0.02
Intellectual Curiosity	4.12	0.66	−0.20	−0.31; −0.09	3.98	0.66	0.07	−0.04; 0.19	3.98	0.73	0.07	−0.04; 0.19
Creative Imagination	3.75	0.80	−0.23	−0.35; −0.12	3.50	0.84	0.15	0.04; 0.27	3.61	0.86	−0.01	−0.20; 0.19
Extraversion Obs.	3.52	0.70	−0.07	−0.25; 0.11	**3.24**	**0.64**	**0.47**	**0.27; 0.67**	3.56	0.63	−0.15	−0.33; 0.02
Sociability Obs.	3.42	0.85	−0.11	−0.29; 0.07	**3.07**	**0.79**	**0.44**	**0.23; 0.64**	3.46	0.79	−0.17	−0.35; 0.01
Assertiveness Obs.	3.31	0.94	−0.16	−0.34; 0.03	**2.91**	**0.82**	**0.41**	**0.21; 0.62**	3.27	0.89	−0.09	−0.27; 0.08
Energy Level Obs.	3.83	0.82	0.12	−0.06; 0.30	**3.74**	**0.76**	**0.26**	**0.06; 0.46**	3.96	0.74	−0.11	−0.28; 0.07
Conscientiousness Obs.	**3.40**	**0.69**	**0.81**♣	**0.63; 1.00**	3.90	0.65	−0.20	−0.40; 0.01	3.97	0.62	−0.37	−0.55; −0.20
Productiveness Obs.	**3.17**	**0.82**	**0.83**♣	**0.64; 1.01**	3.77	0.84	−0.17	−0.37; 0.03	3.90	0.75	−0.41	−0.58; −0.23
Organization Obs.	**3.08**	**0.95**	**0.64**◆	**0.46; 0.82**	3.66	0.96	−0.20	−0.40; 0.01	3.68	0.92	−0.25	−0.42; −0.07
Responsibility Obs.	**3.97**	**0.70**	**0.52**◆	**0.34; 0.71**	4.27	0.59	−0.11	−0.31; 0.09	4.35	0.59	−0.29	−0.47; −0.12
Neuroticism Obs.	2.35	0.69	0.34	0.16; 0.52	2.30	0.63	0.39	0.18; 0.60	**2.81**	0.68	**−0.63**◆	**−0.81; −0.45**
Emotional Volatility Obs.	2.27	0.88	0.27	0.09; 0.45	2.13	0.77	0.45	0.5; 0.65	2.70	0.83	**−0.44**	**−0.62; −0.26**
Depression Obs.	2.09	0.71	0.24	0.06; 0.42	2.12	0.72	0.15	−0.05; 0.36	2.46	0.82	**−0.46**	**−0.63; −0.28**
Anxiety Obs.	2.68	0.82	0.36	0.18; 0.54	2.65	0.73	0.37	0.17; 0.57	**3.28**	**0.76**	**−0.71**◆	**−0.89; −0.53**
Agreeableness Obs.	3.90	0.57	0.18	0.00; 0.36	4.02	0.54	−0.09	−0.29; 0.12	4.02	0.57	−0.10	−0.28; 0.07
Compassion Obs.	4.01	0.64	0.28	0.10; 0.47	4.12	0.69	0.06	−0.15; 0.26	4.26	0.61	−0.25	−0.43; −0.07
Respectfulness Obs.	4.14	0.71	0.16	−0.02; 0.34	4.28	0.69	−0.12	−0.32; 0.01	4.24	0.67	−0.05	−0.23; 0.12
Trust Obs.	3.55	0.70	0.02	−0.16; 0.20	3.64	0.64	−0.14	−0.34; 0.06	3.55	0.79	0.03	−0.15; 0.20
Openness to Experience Obs.	3.92	0.56	−0.22	−0.40; −0.04	3.75	0.61	0.19	−0.02; 0.39	3.89	0.55	−0.14	−0.31; 0.04
Aesthetic Sensitivity Obs.	3.69	0.95	−0.21	−0.39; −0.31	3.34	1.05	0.25	0.05; 0.46	3.67	0.96	−0.19	−0.36; 0.01
Intellectual Curiosity Obs.	4.01	0.72	−0.14	−0.32; 0.04	3.98	0.78	−0.07	−0.28; 0.13	3.89	0.78	0.07	−0.10; 0.25
Creative Imagination Obs.	4.07	0.64	−0.09	−0.27; 0.09	3.93	0.62	0.20	−0.00; 0.40	4.1	0.58	−0.17	−0.34; 0.01
Self-esteem	3.82	0.71	−0.11	−0.22; 0.00	3.77	0.67	−0.02	−0.14; 0.10	3.6	0.68	0.32	0.20; 0.43
Satisfaction with Life	3.54	0.74	−0.04	−0.15; 0.08	3.48	0.73	0.07	−0.04; 0.19	3.48	0.78	0.06	−0.05; 0.17
Importance School	4.35	0.74	0.12	0.01; 0.24	4.39	0.75	0.04	−0.07; 0.16	4.47	0.68	−0.11	−0.22; −0.00
Importance Finances	3.87	0.95	0.05	−0.07; 0.16	3.87	0.91	0.05	−0.07; 0.17	3.91	0.87	−0.01	−0.13; 0.10
Importance Family	4.26	0.89	0.04	−0.08; 0.15	4.22	0.93	0.09	−0.03; 0.21	4.37	0.84	−0.13	−0.25; −0.02
Importance Health	4.29	0.80	0.18	0.06; 0.29	4.44	0.74	−0.09	−0.21; 0.03	4.42	0.76	−0.06	−0.17; 0.06
Importance Sex	3.89	1.05	−0.07	−0.19; 0.04	3.75	1.04	0.11	−0.00; 0.23	3.89	1.01	−0.07	−0.19; 0.04
Importance Recreation	4.08	0.87	0.00	−0.12; 0.11	4.06	0.87	0.03	−0.09; 0.15	4.05	0.83	0.40	−0.08; 0.15
Importance Friends	4.37	0.77	0.00	−0.12; 0.11	4.31	0.82	0.11	−0.01; 0.23	4.45	0.71	−0.14	−0.25; −0.02
Importance Emotions	3.59	0.99	0.18	0.06; 0.29	3.50	0.95	0.30	0.18; 0.42	4.04	0.88	−0.47	−0.59; −0.36
Importance Own Person	4.11	0.87	−0.04	−0.15; 0.08	4.07	0.93	0.03	−0.09; 0.15	4.03	0.93	0.09	−0.03; 0.20
Satisfaction School	3.54	1.02	0.20	0.08; 0.31	3.81	0.94	−0.18	−0.30; −0.06	3.63	0.96	0.07	−0.04; 0.19
Satisfaction Finances	3.15	1.17	0.25	0.14; 0.37	3.49	1.13	−0.16	−0.27; −0.04	3.39	1.08	−0.04	−0.15; 0.08
Satisfaction Family	3.95	1.00	−0.08	−0.20; 0.03	3.89	1.01	0.00	−0.11; 0.12	3.73	1.10	0.21	0.10; 0.33
Satisfaction Health	3.61	1.03	0.23	0.12; 0.35	3.89	0.93	−0.15	−0.27; −0.03	3.74	0.96	0.05	−0.07; 0.16
Satisfaction Sex	3.30	1.27	−0.12	−0.23; −0.00	2.90	1.27	0.30	0.18; 0.41	3.28	1.31	−0.10	−0.21; 0.02
Satisfaction Recreation	3.58	0.96	0.02	−0.10; 0.13	3.52	1.02	0.11	−0.01; 0.22	3.61	0.94	−0.02	−0.13; 0.10
Satisfaction Friends	4.01	0.97	−0.26	−0.37; −0.14	3.59	1.09	0.32	0.20; 0.43	3.81	0.94	0.02	−0.10; 0.13
Satisfaction Emotions	3.59	0.86	−0.33	−0.45; −0.22	3.46	0.87	−0.14	−0.26; −0.02	2.97	0.86	0.64◆	0.52; 0.75
Satisfaction Own Person	3.36	0.88	−0.03	−0.14; 0.09	3.33	0.87	0.02	−0.10; 0.14	3.14	0.87	0.31	0.20; 0.42
Discrepancy School	0.81	1.14	−0.09	−0.21; 0.02	0.57	1.01	0.20	0.08; 0.31	0.84	1.02	−0.14	−0.25; −0.03
Discrepancy Finances	0.73	1.68	−0.15	−0.27; −0.04	0.38	1.56	0.14	0.02; 0.26	0.53	1.54	0.02	−0.10; 0.13
Discrepancy Family	0.30	1.01	0.12	−0.00; 0.23	0.33	1.07	0.11	−0.04; 0.19	0.64	1.02	−0.33	−0.44; −0.21
Discrepancy Health	0.68	1.17	−0.08	−0.20; 0.03	0.55	1.02	0.07	−0.04; 0.19	0.67	1.09	−0.07	−0.19; 0.03
Discrepancy Sex	0.59	1.52	0.05	−0.07; 0.16	0.84	1.54	−0.17	−0.29; −0.06	0.61	1.44	0.03	−0.08; 0.15
Discrepancy Recreation	0.50	0.96	−0.02	−0.13; 0.10	0.54	1.05	−0.08	−0.20; 0.04	0.45	0.97	0.05	−0.06; 0.16
Discrepancy Friends	0.36	0.90	0.27	0.15; 0.38	0.72	1.00	−0.24	−0.36; −0.12	0.64	0.92	−0.13	−0.25; −0.02
Discrepancy Emotions	0.00	1.31	0.36	0.23; 0.46	0.03	1.30	0.32	0.19; 0.43	1.08	1.19	−0.78♣	−0.90; −0.67
Discrepancy Own Person	0.75	1.02	−0.01	−0.12; 0.11	0.74	1.09	0.01	−0.11; 0.13	0.89	1.02	−0.19	−0.30; −0.07

Note. Bold font declares selected traits and facets; Cohen's d indicates differences between the selected change goal and the other two change goals; Obs. = observer-reports; Cohen's d were computed for groups with different sample size by adjusting the calculation of the pooled standard deviation with weights for the sample sizes. Confidence intervals for these effect sizes were computed according to Hedges and Olkin (1985).

♣ denotes a large effect size ($\geq$|0.80|); ◆ denotes a medium effect size ($\geq$|0.50|) (Cohen, 2013).

their level of agreement with five items using a 5-point Likert-type scale ranging from *strongly disagree* (1) to *strongly agree* (5). Cronbach's alpha was 0.80. Second, to measure domain-specific life satisfaction, participants rated their satisfaction with the following life domains: School/career, financial situation, family relationships, health, sexual relationships, recreational activities, friendships, the daily emotional experiences, and one's own person (Hudson & Roberts, 2014). Participants rated each domain on a 5-point Likert-type scale ranging from *very dissatisfied* (1) to *very satisfied* (5). Third, participants rated the importance of each life domain on a 5-point Likert-type scale ranging from *not important at all* (1) to *very important* (5). Finally, we calculated the discrepancy scores between satisfaction with and importance of the life domains as previous research found that a higher discrepancy between satisfaction and importance in a specific life domain may lead to greater desires to change (Hudson & Roberts, 2014).

2.5. Observer-report measures

2.5.1. Personality traits and facets

Observer-reports included the assessment of personality traits and facets of the targeted person using a shorter version of the BFI-2 (BFI-2-S; Soto & John, 2017). Observers rated their level of agreement using a 5-point Likert-type scale ranging from *strongly disagree* (1) to *strongly agree* (5). Cronbach's alphas for traits ranged between 0.76 and 0.83 (M = 0.77) and for facets ranged between 0.40 and 0.80 (M = 0.65). The reliabilities of the facets were partly low because the BFI-2-S only includes two items per facet.

2.6. Data analysis

To describe characteristics of people who wanted to become more conscientious, more extraverted, or less neurotic, we followed the "new statistics" approach (Cumming, 2014) and reported effect sizes (Cohens' d) and the 95% confidence intervals for the differences between the three change goals. To explore the extent to which characteristics predict the selection of one (e.g., the goal to increase in conscientiousness) of the three personality change goals over the other two (e.g., the goals to increase in extraversion and decrease in neuroticism), we used logistic regression with a supervised machine learning algorithm for classification problems. This approaches enabled us to explore the importance of multiple characteristics in a multivariate manner in one model and at the same time. Supervised machine learning is commonly used in the context of classification where the dataset is already labeled and these labels can be used to train the algorithm. For example, in our case, the dataset was labeled with people's change goals and the algorithm was trained to map predictors (individual characteristics) to the provided output (change goals). In contrast, the goal of unsupervised machine learning ("clustering") would be to group similar entities together if the dataset does not provide the explicit labels of these clusters or groups (Hosmer et al., 2013; Ng, 2004). The coefficients of the supervised machine learning algorithm were optimized using maximum-likelihood estimation (Hosmer et al., 2013). In general, a logistic regression takes the output of a linear function and limits it to the range [0, 1] using the sigmoid activation function:

$$\mathrm{Sigmoid}(x) = \frac{1}{1+e^{-\lambda x}}, \quad \text{where} \quad \lambda \text{ often} = 1 \tag{1}$$

The output of a logistic regression can be interpreted as the probability that a certain data point belongs to a target outcome (Hosmer et al., 2013). Next, we used the L1-norm as a regularization method. The L1-norm is the method used in a LASSO regression and is a built-in feature selection mechanism that tends to produce sparse coefficients. The L1-norm is a useful method for dealing with multicollinearity in machine learning. This norm limits the size of the coefficients. Also, coefficients that do not have a predictive value are driven towards zero and eliminated which reduces the estimation variance and complexity of the model and avoids over-fitting (Meier, Van De Geer, & Bühlmann, 2008; Ng, 2004; Tibshirani, 1997). The L1-regularized logistic regression was calculated as follows:

$$\min_{w,c} \|w\|_1 + C\sum_{i=1}^{n} \log\left(e^{-y_i(X_i^T w + c)} + 1\right) \tag{2}$$

In Eq. (2), the variable w denotes the weight vector of all parameters, C is a control parameter responsible for the inverse amount of the regularization strength, y_i is the target goal of the current data point, X_i is the input/feature vector of the current data point and n is the number of data points in the dataset. The logistic regression analysis was performed in two steps. In a first step, the regularization parameters of the logistic regression model were tuned by using grid search and ten-fold cross validation, which means to optimize the parameters in order to enable the algorithm to perform the best. Grid-search describes the process of scanning the data to configure optimal parameters for a given model. Cross-validation refers to the method to make a fixed number of folds (or partitions) of the data and to run the analysis on each fold to ensure that every observation from the original dataset has the chance of appearing in the training and test set (Kohavi, 1995). We also standardized all predictors (Pedregosa et al., 2011). In a second step, we aimed to improve the robustness (i.e., decrease the variance) of the final model coefficients and thus averaged the performance of 1,000 individual models using bootstrapping to create different random subsets of the original dataset, which are then used to train the individual models (Breiman, 1996). In order to measure the generalization accuracy of the predictor (i.e., its ability to predict the most likely change goal for a previously unseen data point), we opted for an 80/20 split of the dataset (Kohavi, 1995). That is, we randomly chose 80% of the available data to train our predictors and used the other 20% of the data to test the model performance. We repeated this process for 1000 models and averaged the coefficients across all models. We also repeated the process for 5000 models but it did not change the averaged coefficients. The analyses were performed using R (R Core Team, 2019) and Python (Python Core Team, 2019). The data and Python source code are available on the Open Science Frameworkhttps://osf.io/9fmcw/?view_only=431983cdeb8840488f02b1269bdee934

3. Results

3.1. Describing characteristics across personality change goals

Table 1 shows differences in characteristics between the three personality change goals in terms of effect sizes and 95% confidence intervals. The results indicate that people who wanted to change in a certain trait showed lower (in case of desires to increase) or higher (in case of desires to decrease) levels in their selected traits compared to people who chose another change goal (mean d = 0.81, range: ds = 0.53 – 1.01) with medium to large effect sizes. For example, people who desired to increase in conscientiousness mainly had lower levels in conscientiousness compared to people who chose to increase in extraversion or decrease in neuroticism. Fig. 1 depicts mean scores across the three change goals. Observer-reports reflected these change goal differences with effects ranging from small to large effect sizes (mean d = 0.60, range: ds = 0.26–0.83). The results also show that more women desired to decrease in neuroticism (d = 0.55). Moreover, people who wanted to become less neurotic, were less satisfied with their

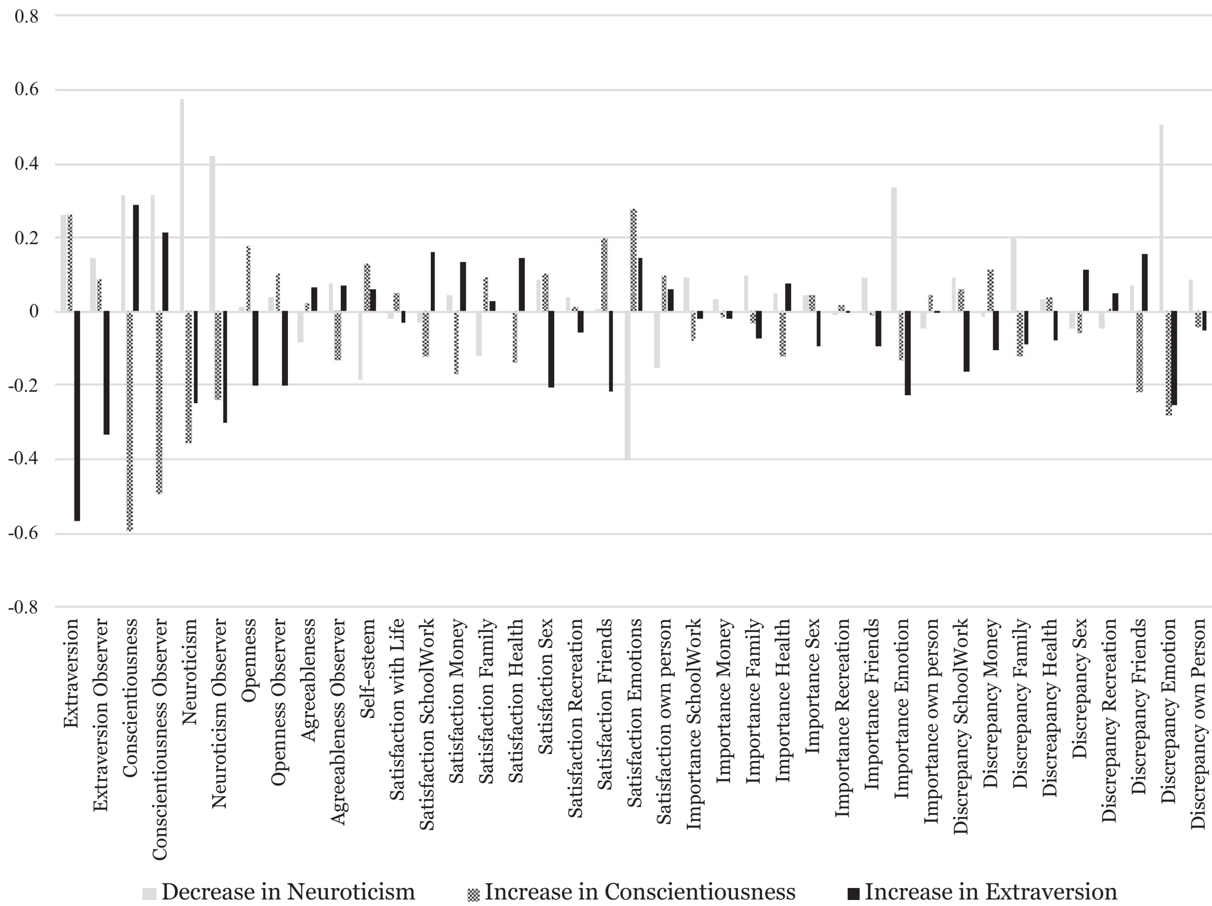

Fig. 1. Mean Scores Across Change Goals. Note. Reference score (0) = mean score of all participants of the three personality change goals.

daily emotions (d = 0.64), and had a higher discrepancy between their satisfaction with and importance of their daily emotions (d = 0.78). Other differences between the change goals only showed small effects ($d \leq 0.50$).

Moreover, we compared the discrepancies between self- and observer-rated personality traits across the three personality change goals. Table 2 shows the discrepancies between self-and observer-ratings across the three goals. In general, the results indicate that the change goal groups were characterized by large discrepancies between self- and observer-reports. People who desired to increase in conscientiousness showed the largest self-other discrepancy in productiveness (d = 0.81) whereas self-reports of productiveness were on average lower compared to observer-reports. People who wanted to become more extraverted showed the largest self-other discrepancy in sociability (d = 0.83) whereas self-reports of sociability were on average lower compared to observer-reports. People who desired decreases in neuroticism showed the largest self-other discrepancy in the conscientiousness facet productiveness (d = 0.77). Although smaller in terms of effect sizes, they also showed self-other discrepancies in neuroticism facets, mainly in emotional volatility (d = 0.54). Supplementary Table 2 shows group differences in these variables across all personality change goals.

3.2. Exploring the importance of characteristics across personality change goals

First, we examined the accuracies of the logistic regression model to predict change goals. The overall test accuracy was 75%, which provides the ratio number of correct predictions out of all predictions. Another accuracy measure are F1-scores which indicate the weighted average of precision and recall. As compared to the previously mentioned test accuracy score, F1-scores take both false positives and false negatives into account which gives a better measure of incorrectly classified cases. F1-scores reach their best values at 1 (perfect classification) and worst at 0 (Sasaki, 2007). The F1-scores were as follows: 0.71 for the goal to increase in conscientiousness, 0.74 for the goal to increase in extraversion, and 0.78 for the goal to decrease in neuroticism. Moreover, the out-of-bag estimate was 73.9%. The out-of-bag estimate is a measure of the classifier's generalizability on a part of the dataset which was not used during training and refers to the percentage of correctly predicted and classified data points across the bootstrapped subsamples.

In the following, we present the results of the predictive models separately for each personality change goal. Table 3 shows the prediction of the goal to increase in conscientiousness including log odds $\geq |0.03|$. That is, we only focus on variables that predict the change goal with a probability that is higher than 50.7%. A log odds is the logarithm of the odds ratio, which means $e^{\log \text{ odds}}$ = odds ratio. As an example, a log odds of -1.01 for productiveness equals an odds ratio of 0.36, which is ($e^{-1.01}$). The probability can be calculated as follows: odds ratio/(odds ration + 1). Accordingly, the probability that people with higher productiveness selected the change goal to increase in conscientiousness over the other two personality change goals was 26%, which is (0.36/1.36). In other words, the probability that people with lower productiveness chose this goal is 73%, which was the strongest predictor for this goal. Overall, a person with higher scores in facets of extraversion or lower scores in facets of neuroticism and higher satisfaction

Table 2
Discrepancies Between Self- and Observer-Ratings Across Personality Change Goals.

	Increase in Conscientiousness (*N* = 398)					Increase in Extraversion (*N* = 374)					Decrease in Neuroticism (*N* = 406)				
	M Self	*M* Obs.	*M* Δ	*d*	CI_{95}	*M* Self	*M* Obs.	*M* Δ	*d*	CI_{95}	*M* Self	*M* Obs.	*M* Δ	*d*	CI_{95}
Extraversion	3.40	3.52	−0.12	0.18	−0.00; 0.36	**2.83**	**3.24**	**−0.41**	**0.66♦**	**0.45; 0.87**	3.40	3.56	−0.16	0.35	0.07; 0.43
Sociability	3.36	3.42	−0.06	0.07	−0.11; 0.25	**2.46**	**3.07**	**−0.61**	**0.83♣**	**0.61; 1.04**	3.31	3.46	−0.15	0.18	0.00; 0.36
Assertiveness	3.41	3.31	0.10	−0.12	−0.30; 0.07	**2.91**	**2.91**	**0.00**	**0.00**	**−0.21; 0.21**	3.38	3.27	0.11	−0.13	−0.21; 0.04
Energy Level	3.44	3.83	−0.39	0.51♦	0.33; 0.70	**3.12**	**3.74**	**−0.62**	**0.80♣**	**0.59; 1.01**	3.52	3.96	−0.44	0.60♦	0.42; 0.78
Conscientiousness	**2.97**	**3.40**	**−0.43**	**0.67♦**	**0.49; 0.86**	3.57	3.90	−0.33	0.50♦	0.29; 0.71	3.59	3.97	−0.38	0.63♦	0.45; 0.81
Productiveness	**2.54**	**3.17**	**−0.63**	**0.81♣**	**0.62; 1.00**	3.21	3.77	−0.56	0.66♦	0.45; 0.87	3.32	3.90	−0.58	0.77♦	0.59; 0.96
Organization	**2.97**	**3.08**	**−0.11**	**0.12**	**−0.06; 0.30**	3.68	3.66	0.02	−0.02	−0.23; 0.19	3.71	3.68	0.03	−0.03	−0.21; 0.14
Responsibility	**3.40**	**3.97**	**−0.57**	**0.83♣**	**0.64; 1.02**	3.83	4.27	−0.44	0.70♦	0.49; 0.91	3.75	4.35	−0.60	1.00	0.82; 1.19
Neuroticism	2.50	2.35	0.15	−0.23	−0.42; −0.05	2.57	2.30	0.27	−0.45	−0.66; −0.24	**3.11**	**2.81**	**0.30**	**−0.49**	**−0.67; −0.31**
Emotional Volatility	2.42	2.27	0.15	−0.18	−0.36; 0.00	2.29	2.13	0.16	−0.22	−0.43; −0.01	**3.13**	**2.70**	**0.43**	**−0.54♦**	**−0.72; −0.36**
Depression	2.38	2.09	0.29	−0.39	−0.58; −0.21	2.55	2.12	0.43	−0.59♦	−0.80; −0.38	**2.82**	**2.46**	**0.36**	**−0.47**	**−0.65; −0.29**
Anxiety	2.70	2.68	0.02	−0.03	−0.21; 0.16	2.87	2.65	0.22	−0.31	−0.52; −0.10	**3.40**	**3.28**	**0.12**	**−0.17**	**−0.35; 0.01**
Agreeableness	3.87	3.90	−0.03	0.06	−0.12; 0.24	3.89	4.02	−0.13	0.25	0.04; 0.46	3.82	4.02	−0.20	0.38	0.20; 0.56
Compassion	3.95	4.01	−0.06	0.09	−0.09; 0.27	3.92	4.12	−0.20	0.28	0.08; 0.49	4.07	4.26	−0.19	0.29	0.12; 0.47
Respectfulness	4.19	4.14	0.05	−0.08	−0.26; 0.10	4.32	4.28	0.04	−0.07	−0.28; 0.14	4.11	4.24	−0.13	0.21	0.03; 0.38
Trust	3.48	3.55	−0.07	0.10	−0.08; 0.28	3.44	3.64	−0.20	0.29	0.08; 0.50	3.26	3.55	−0.29	0.39	0.21; 0.57
Openness to Experience	3.82	3.92	−0.10	0.17	−0.01; 0.35	3.59	3.75	−0.16	0.26	0.06; 0.47	3.72	3.89	−0.17	0.28	0.10; 0.46
Aesthetic Sensitivity	3.61	3.69	−0.08	0.08	−0.10; 0.26	3.29	3.34	−0.05	0.05	−0.16; 0.26	3.58	3.67	−0.09	0.10	−0.08; 0.27
Intellectual Curiosity	4.12	4.01	0.11	−0.16	−0.34; 0.02	3.98	3.98	0.00	0.00	−0.21; 0.21	3.98	3.89	0.09	−0.12	−0.30; 0.06
Creative Imagination	3.75	4.07	−0.32	0.42	0.24; 0.61	3.50	3.93	−0.43	0.54♦	0.33; 0.75	3.61	4.10	−0.49	0.62♦	0.44; 0.80

Note. Bold font declares selected traits and facets; Cohen's d indicates differences between the selected change goal and the other two change goals. ♣ denotes a large effect size (≥|0.80|); ♦ denotes a medium effect size (≥|0.50|) (Cohen, 2013).

Table 3
Differential Importance of Predictors for the Change Goal to Increase in Conscientiousness.

Variables	Log Odds	SE	95% CI
Productiveness	−1.01	0.01	−1.02; −1.00
Anxiety	−0.49	0.01	−0.50; −0.50
Sociability	0.33	0.00	0.32; 0.34
Organization	−0.30	0.00	−0.31; −0.29
Creative Imagination	0.25	0.00	0.24; 0.26
Discrepancy Emotion	−0.16	0.00	−0.17; −0.16
Productiveness Observer	−0.13	0.00	−0.13; −0.12
Emotional Volatility	−0.10	0.00	−0.10; −0.09
Assertiveness Observer	0.09	0.00	0.09; 0.10
Assertiveness	0.07	0.00	0.07; 0.08
Organization Observer	−0.06	0.00	−0.06; −0.05
Satisfaction Emotions	0.05	0.00	0.04; 0.05
Satisfaction Sex	0.04	0.00	0.04; 0.05
Discrepancy Friends	−0.04	0.00	−0.04; −0.03
Intellectual Curiosity Observer	0.04	0.00	0.04; 0.05
Discrepancy Sex	−0.03	0.00	−0.03; −0.03
Satisfaction Family	0.03	0.00	0.02; 0.03

Note. Gender: female = 0, male = 1; only log odds ≥ |0.03 |.

with their daily emotions as well as sexual and family relationships was more likely to be in the group with the goal to increase in conscientiousness.

Table 4 shows the prediction of the goal to increase in extraversion. The strongest predictor for this change goal was sociability.

Table 4
Differential Importance of Predictors for the Change Goal to Increase in Extraversion.

Variables	Log Odds	SE	95% CI
Sociability	−1.12	0.01	−1.12; −1.11
Emotional Volatility	−0.32	0.01	−0.33; −0.31
Productiveness	0.23	0.01	0.22; 0.24
Organization	0.18	0.00	0.17; 0.19
Importance Money	0.15	0.00	0.14; 0.16
Satisfaction School/Work	0.15	0.00	0.15; 0.16
Discrepancy Friends	0.14	0.00	0.14; 0.15
Discrepancy Emotions	−0.13	0.00	−0.14; −0.13
Trust	0.12	0.00	0.11; 0.13
Creative Imagination	−0.10	0.00	−0.11; −0.10
Satisfaction Health	0.08	0.00	0.07; 0.08
Anxiety Observer	−0.08	0.00	−0.09; −0.08
Self-esteem	0.08	0.00	0.07; 0.08
Aesthetic Sensitivity	−0.07	0.00	−0.08; −0.07
Satisfaction Emotions	0.06	0.00	0.06; 0.07
Discrepancy Sex	0.06	0.00	0.06; 0.07
Assertiveness	−0.05	0.00	−0.05; −0.04
Discrepancy Family	−0.05	0.00	−0.05; −0.05
Satisfaction Sex	−0.04	0.07	−0.05; −0.04
Responsibility	0.04	0.00	0.03; 0.04
Organization Observer	0.04	0.00	0.04; 0.04
Respectfulness	0.04	0.00	0.03; 0.04
Aesthetic Sensitivity Observer	−0.03	0.00	−0.03; −0.02
Discrepancy Health	−0.03	0.00	−0.04; −0.03
Discrepancy Money	0.03	0.00	0.03; 0.04

Note. Gender: female = 0, male = 1; only log odds ≥ |0.03 |.

Table 5
Differential Importance of Predictors for the Change Goal to Decrease in Neuroticism.

Variables	Log Odds	SE	95% CI
Productiveness	0.59	0.01	0.58; 0.60
Emotional Volatility	0.56	0.01	0.55; 0.57
Anxiety	0.47	0.01	0.45; 0.48
Discrepancy Emotions	0.37	0.00	0.36; 0.38
Sociability	0.23	0.00	0.22; 0.24
Productiveness Observer	0.20	0.01	0.19; 0.21
Anxiety Observer	0.19	0.00	0.18; 0.20
Gender	−0.10	0.00	−0.11; −0.09
Satisfaction Health	−0.05	0.00	−0.05; −0.04
Discrepancy Family	0.07	0.00	0.07; 0.08
Satisfaction Emotions	−0.04	0.00	−0.04; −0.03
Organization	0.04	0.00	0.04; 0.05
Organization Observer	0.04	0.00	0.04; 0.05
Trust	−0.03	0.00	−0.03; −0.02

Note. Gender: female = 0, male = 1; only log odds ≥ |0.03|.

The probability that a person with lower sociability chose this goal was 75%. Overall, a person with lower scores in facets of neuroticism, higher scores in facets of conscientiousness, higher satisfaction with health as well as school and work, higher self-esteem, and lower satisfaction with sexual relationships was more likely to desire changes in extraversion.

Table 5 shows the prediction of the goal to decrease in neuroticism, while the strongest predictor was high productiveness, a facet of conscientiousness. The probability that a person with higher productiveness chose this change goal was 64%. Moreover, a person with higher facets in neuroticism, extraversion, and conscientiousness as well as lower satisfaction with daily emotions and a higher discrepancy between satisfaction with and importance of the emotions was more likely to be in the group with the goal to decrease in neuroticism. Figs. 2, 3, and 4 depict the coefficients (log odds ≥ 0.015) of the prediction of the goals. The log odds across all predicting variables are shown in Supplementary

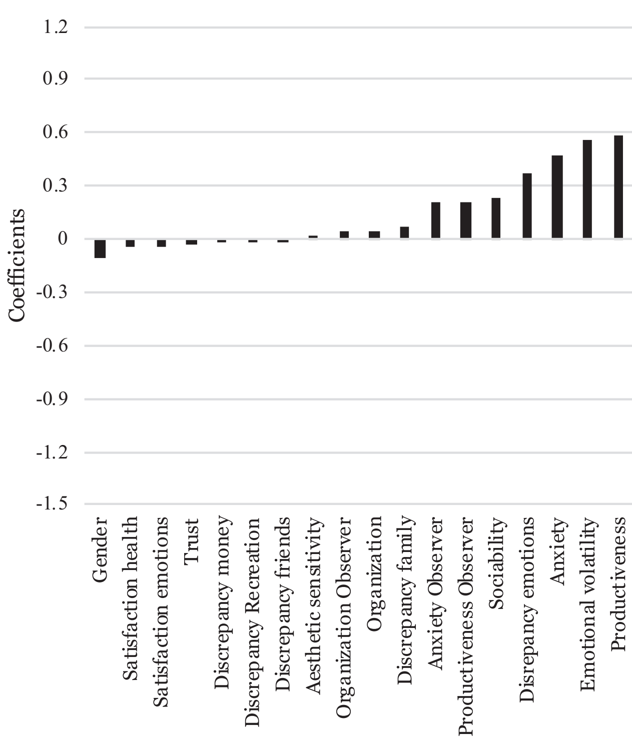

Fig. 2. Differential Importance of Characteristics - Goal to Decrease in Neuroticism. Note. Only log odds ≥ |0.015 |.

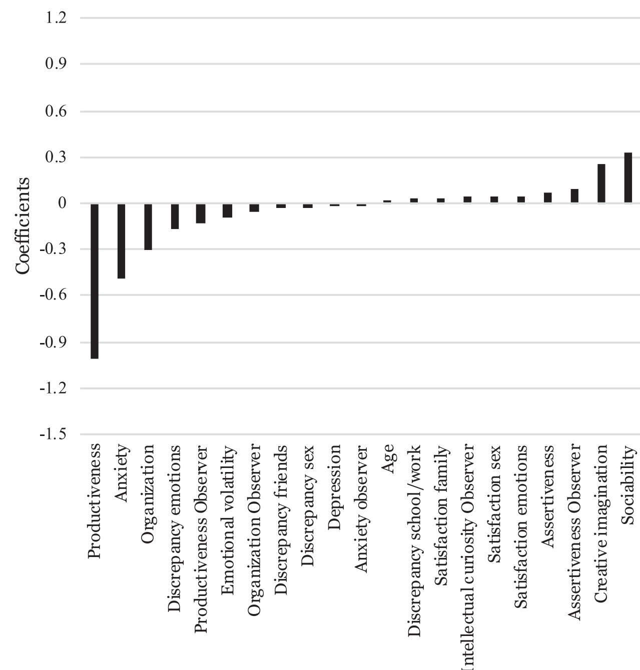

Fig. 3. Differential Importance of Characteristics – Goal to Increase in Conscientiousness. Note. Only log odds ≥ |0.015 |.

Tables 3, 4, and 5. Supplementary Tables 3, 4, and 5 also include regression coefficients of bivariate logistic regressions in order to compare them with the log odds of the machine learning analyses. The coefficients of these bivariate analyses paint a largely similar picture as the log odds of the machine learning models. The main difference is that the LASSO approach of the machine learning analyses drove some log odds to zero.

4. Discussion

The present study examined characteristics of people who desired to become more conscientious, more extraverted, or less neurotic with the help of a digital personality change intervention. The first goal was to describe characteristics of people across these three personality change goals. The results paint an intriguing picture: First, people who wanted to change in a certain trait showed lower (in case of desires to increase) or higher (in case of desires to decrease) self- and observer-reported levels in traits they wanted to change compared to others who did not want to change the same trait. The self-reported findings are largely consistent with those previously reported (Hudson & Roberts, 2014). In terms of observer-reports, we found that close others also rated participants as being lower or higher in traits they wanted to change. This is in line with previous research suggesting that change goals are greater when others rate a person's traits also as low (Quintus et al., 2017). As such, the present results provide additional evidence for these patterns found in previous studies while using a large sample of people who actually desire to change one personality trait and start taking active steps towards changing this specific trait with the help of an intervention. Overall, the present findings imply that individuals tended to select change goals in traits in which they had room for change. More broadly, the finding that people were lower or higher than others in personality traits they want to change can be interpreted as supporting the idea that change goals are primarily motivated by adjustment processes (i.e., mostly compensation of trait deficits) rather than "self-actualization" and personal growth (i.e., capitalization on trait capabilities).

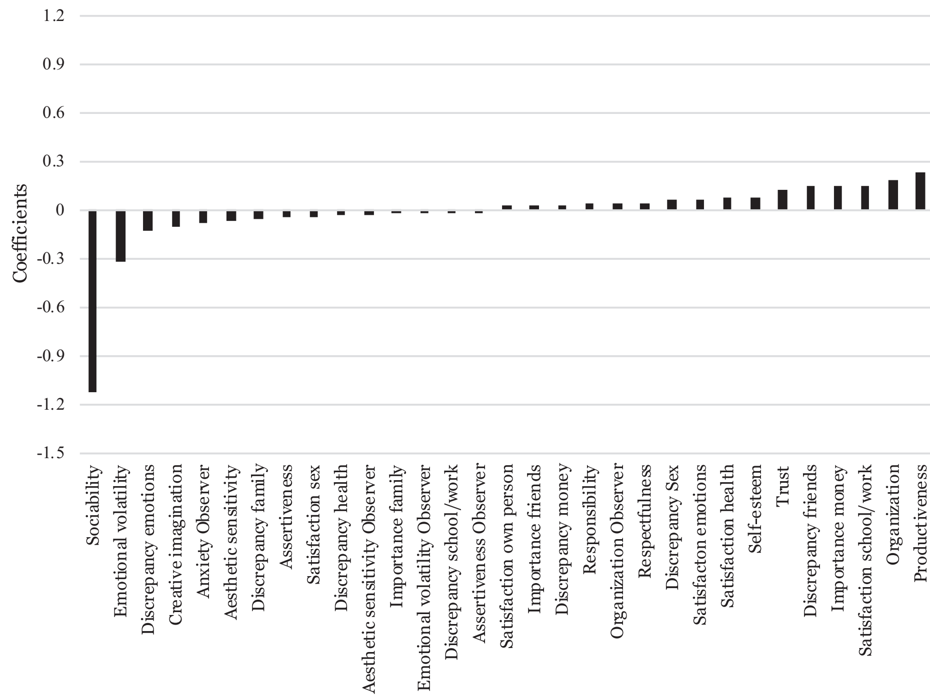

Fig. 4. Differential Importance of Characteristics – Goal to Increase in Extraversion. Note. Only log odds ≥ |0.015 |.

Second, we found that reported satisfaction with and importance of life domains differed between the three change goals. For example, people who were less satisfied with their sexual relationships desired to increase in extraversion, or people who were less satisfied with their emotions and health desired to decrease in neuroticism. These differences in domain-specific satisfaction are in line with previous findings on the relationship between satisfaction with life domains and change goals (Hudson & Roberts, 2014). However, in contrast to previous studies, the present approach using supervised machine learning enabled us to compare the predictive value of satisfaction with different life domains and other individual differences in the same model. The present results may support the claim that people tend to strive for adjustment towards socially acceptable personality levels in order to reduce their dissatisfaction in certain life domains (Baumeister, 1994; Kiecolt, 1994).

Third, the results have shown that discrepancies between self- and observer-reported personality traits and facets were greater in traits people desired to change. For example, people who wanted to become more conscientious rated themselves as being lower in conscientiousness compared to their close others. These findings are particularly novel and point to a likely larger self- and other-perception asymmetry (Vazire, 2010) in traits people want to change while observer reports were generally less extreme in the undesirable direction. There are at least two possible explanations for this self-observer discrepancy. On the one hand, self-perceptions may be biased in traits people want to change. That is, people may have an increased attention bias towards undesired behaviors they wish to change and these undesired behaviors may be more salient when rating the self's personality. In contrast, observers may not specifically focus on undesired behaviors and thus provide less extreme personality ratings on traits people want to change. Indeed, previous research has shown many instances of inaccuracies in self-perception (e.g. (Epley & Dunning, 2006) (Gosling, John, Craik, & Robins, 1998)

On the other hand, it may be that self-reports were more accurate than observer-reports. A previous study found that the self is – compared to observers – more accurate when rating socially undesirable behaviors (i.e., time spent arguing) (Vazire & Mehl, 2008). As such, it may be that observer-ratings are generally less pronounced on the unfavorable or maladaptive ends of personality traits. Overall, the findings support the notion that observer-ratings are highly useful as adjuncts to self-reports but do not substitute self-reports as a source of personality information (Paunonen & O'Neill, 2010). Typically, correlations between self- and observer-reports are far from ideal as self and observers have asymmetrical access to thoughts, feelings, and visual information of behaviors in specific situations which implies that for some personality traits self-ratings are more accurate, and for others other-ratings (Vazire, 2010). Also, personality traits differ in their observability. For example, neuroticism is suggested to be difficult and extraversion easier to observe (John & Robins, 1993). However, from the present findings, we cannot adjudicate which of the two perspectives provided more accurate personality ratings. Future research should investigate whether change goals result from biased self-perceptions or whether reports of close others are inflated in a more positive way.

The second goal of this study was to explore the extent to which specific characteristics predicted the selection of one of the three personality change goals over the other two personality change goals. This goal went beyond previous studies on personality change goals which were restricted to few predictors of change goals, primarily due to the requirements of regression analyses. The machine learning approach allowed us to extract the feature importance of a large number of characteristics in the same model (Ng, 2004). Overall, this approach reflected the findings of the descriptive analysis and showed that not only self- and observer-reported personality facets, but also levels in satisfaction with and importance of certain life domains were differentially related to the three change goals. In general, the machine learning approach was suitable to add multiple predictors into one model and to extract their feature importance. In this case, the machine learning approach served as a complementary approach to the descriptive analysis.

In sum, the finding that characteristics of people who chose a certain personality change goal differed from people who chose another change goal informs future targeted interventions. That is, the identification of characteristics of people who want to change a certain personality trait and take part in a digital personality change intervention can help to target future personality change interventions more effectively to the needs of those participants, which will also improve the adherence to and effectiveness of interventions (Chapman, Hampson, & Clarkin, 2014). For example, it may be helpful to target satisfaction with friendships or sexual relationships in addition to changing extraversion in people who want to increase in extraversion.

4.1. Limitations and future directions

The present research is limited in ways that should promote future research. First, future longitudinal research is needed to explicitly assess the reasons why people desire to change personality traits and to elucidate mechanisms that lead to certain change goals. The present findings cannot clearly adjudicate among the different motivations for personality change goals and individuals may have more than one reason why they want to change. Future studies on personality change goals should use designs in which different theoretical explanations can be tested. To do so, measures are needed to assess people's motivations behind personality change goals. For instance, individuals could be asked to provide a ranking of what their primary motivations are (e.g., self-fulfillment, increase satisfaction with certain life domains, or to meet social expectations) or they could be asked to write down their motivations in an open format. These texts could be analyzed with the help of a text analysis program (e.g., Tausczik & Pennebaker, 2010). Moreover, certain life events may lead to the impetus to change oneself (e.g., becoming parents and the desire to become more responsible). Thus, one could test whether certain (life) events lead to chronic role strain and thus to the desire to change personality aspects (Kiecolt, 1994).

Second, the present approach of letting people choose one prioritized change goal cannot be compared directly with findings of previous studies that assessed change goals across all Big Five traits with a questionnaire such as the C-BFI (Hudson & Roberts, 2014). In the present study, trait levels of participants who desired to change one specific trait were generally more extreme in the undesirable direction (i.e., lower levels in extraversion and conscientiousness; and higher levels in neuroticism) as compared to trait levels of individuals who filled in the C-BFI in a previous study (Hudson & Roberts, 2014). This may suggest that trait levels of participants in the present intervention study were more on the maladaptive ends of the Big Five traits and their goal to change their chosen traits may have been more pronounced. However, future research is needed to investigate the relation between participants' motivational stages, current trait levels, and goals to change.

Third, to examine our second study goal using the supervised machine learning analyses, the sample was limited to a subsample of participants with at least one observer-report because machine learning algorithms do not support data with missing values. In this study, we decided not to impute data in which the missing values would have been replaced by – for example – the mean values of available observer reports. Imputation of missing values would have maintained the entire sample size but the variability in the data would have been reduced, which would have produced biased estimates (Donders, Van Der Heijden, Stijnen, & Moons, 2006).

Fourth, it remains unclear from the present investigation whether and to what degree people have biased self-perceptions in personality traits they desire to change. Future research should examine why observer reports are less pronounced and more positive than self-reports. For instance, future studies could also assess meta-perceptions to investigate whether people are actually aware of how others would rate them in their personality traits (e.g., Schaffhuser, Allemand, & Martin, 2014).

Finally, it may be vital to compare characteristics of people who have the desire to change their personality with people who are satisfied with their levels in personality traits and do not want to change in any direction. It may be that people who want to change their personality and actually sign up for an intervention have lower levels in self-esteem and life satisfaction and desire to change aspects of their personality to reduce their dissatisfaction. Also, it may be that people who want to change have a greater bias in their self-perceptions, an increased attention bias towards undesired behaviors they wish to change, and higher levels in self-criticism such that they are harder to themselves and more self-critical towards their own behaviors. Moreover, these people may strive more towards personal growth and self-fulfillment compared to people who want to stay the same. Future research is needed to test these ideas.

4.2. Conclusion

The present study extended previous research by taking a closer look at personality change goals of people who actually signed up for a digital personality change intervention. The results showed that characteristics of people who desired to change a certain personality trait differed from people who chose to change another personality trait. These findings are not only relevant for future research in personality psychology, but may also help to target future personality change interventions more effectively to the needs of participants and may improve the adherence to and effectiveness of such interventions.

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Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jrp.2020.103983.

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