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Predicting Satisfaction With Life and Affect Balance Using Trait Interactions

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There is robust support for the finding that subjective well-being (SWB) relates positively to extraversion, agreeableness, and conscientiousness; and negatively to neuroticism (Soto, 2015), but little research has examined how SWB can be predicted from interactions between traits. It was hypothesized that conscientiousness, extraversion, and agreeableness would moderate the relationship between neuroticism and SWB, as measured by satisfaction with life (SWL) and affect balance (AB). In Study 1, self-reports of the Big Five personality traits, SWL, and AB were collected via MTurk (N=1035). Hierarchical regression analyses were used to predict SWL and AB from interactions between traits. The relationship between neuroticism and SWL was moderated by conscientiousness (b=.15, p=.02) and extraversion (b=11, p=.03), while the relationship between neuroticism and AB was moderated by conscientiousness (b=.09, p=.02) and agreeableness (b=.09, p=.03). Positive personality traits (defined as extraversion, agreeableness, and conscientiousness within this study) were positively related to SWB at high levels of neuroticism, but unrelated to SWB at low levels of neuroticism. This was explored further using a student population in Study 2 (N=151), and the results were partially replicated. This study highlights the importance of considering more than one trait at a time when predicting important outcomes such as SWB.

Keywords: Subjective well-being, Satisfaction with life, Positive and Negative Affect, Big Five personality traits, Trait interactions, Affect Balance

On July 4th, 1776 the Continental Congress approved a document declaring that all people have the right to "life, liberty, and the pursuit of happiness" (U.S. Declaration of Independence, 1776, para. 2). Similar wording was used earlier that same year in the Virginia Declaration of Rights which stated that everyone should be able to "[pursue] and [obtain] happiness and safety" (Virginia Declaration of Rights, 1776, para. 1). Aristotle claimed that when we are pursuing "honor, pleasure, intellect, [and] in fact every excellence" we are in reality using these pursuits to obtain happiness (Aristotle, ca. 350 B.C.E./1994). These and many other works throughout history, religion, philosophy, and science display a seemingly universal human desire to pursue and obtain happiness.

The pursuit of happiness naturally leads to the question "What makes us happy?". If we can identify some of the conditions under which an individual is likely to be happy, we can work towards helping others achieve higher levels of happiness and general well-being. The term happiness has been notoriously difficult to operationalize (see Gilbert, 2007; Mogilner et al., 2011; Myers & Diener, 1995), and so many researchers instead prefer to use the term well-being. In the current study, well-being is defined as an individual's subjective evaluations of their overall life satisfaction and their experience of positive and negative emotions. This is a common conceptualization of well-being that is typically referred to as subjective well-being (SWB; Diener et al., 2018). SWB research typically uses self-report measures, which allow both affective and cognitive information to be gathered simultaneously (Andrews & Mckennell, 2005; Horley & Little, 1985; Larsen et al., 1985), and focuses on subjective self-perceptions about one's own life instead of using an external frame of reference (Diener et al., 1997; Diener et al., 2018). SWB can be broken down into three separate components: the presence of positive emotions or affect (PA), the absence of negative emotions or affect (NA), and general satisfaction with life (SWL; Diener et al., 2018). It is also common to create a single score of affect balance (AB) by subtracting NA from PA (Gutiérrez et al., 2005). Structural equation modeling has been used to demonstrate that SWB can effectively be broken down into these three separate but related components (Arthaud-day et al., 2005, Lee & Oguzoglu, 2007; Singh & Jha, 2008).

In many ways, SWB can be conceptualized as a personality trait because it is relatively stable across situations and time, with situational and environmental factors only exerting a short-term impact (Diener et al., 1999). Several studies have shown that SWB often acts as a homeostatic process, with individuals readily returning to some SWB set point following a major life event that caused deviation from that set point (Cummins et al., 2012; Headey & Wearing, 1989). Stable environmental factors such as daily hassles and job satisfaction cannot fully account for the stability seen

in SWB, so other factors must be involved (Kozma et al., 2000). Affect in particular has long-term implications, with one study finding that positive emotion in college (as measured from the intensity of an individual's smile in pictures from their college yearbook) significantly predicted well-being 30 years later (Harker & Keltner, 2001). Finally, like traits, SWB shows stability across situations such as work and recreation (Diener & Larsen, 1984) and also shows some state-like features that are sensitive to situational factors (Kozma et al., 2000).

The fact that SWB shows so many features that are similar to personality traits suggests that there may be a relationship between personality traits and SWB, which has been demonstrated in the literature (Gutiérrez et al., 2005). The most commonly used model of broad personality traits is the Five Factor Model, which includes the traits of extraversion (sociability, assertiveness, energy level), agreeableness (compassion, respectfulness, trust), conscientiousness (organization, productiveness, responsibility), neuroticism/negative emotionality (anxiety, depression, emotional volatility), and openness to experience (also sometimes called intellect or open-mindedness; intellectual curiosity, aesthetic sensitivity, creative imagination; Goldberg, 1990; John et al., 2008; Soto & John, 2017). The most empirically supported correlates of personality traits and SWB are between extraversion and PA, and between neuroticism and NA (Costa & McCrae, 1980). There is also some evidence that openness is related to higher PA (McCrae & Costa 1991). A meta-analysis of 148 studies found that neuroticism consistently predicts lower SWL and higher NA, agreeableness and extraversion predict higher PA, and conscientiousness is the best predictor of higher SWL (DeNeve & Cooper, 1998). The authors argue that extraversion and agreeableness impact SWB by leading to more positive emotion, while conscientiousness leads individuals to set goals and work to achieve those goals, which leads to more SWL. Finally, McCrae and Costa (1991) argued that openness was a positive predictor of both PA and NA and that it led to more emotions overall. However, the meta-analysis by DeNeve et al. found openness to be the weakest predictor of SWB compared to the other traits. This may be due to DeNeve et al.'s use of an expanded definition with openness to include cognitive variables (e.g., belief in a just world, mental absorption, and rigidity) or to the fact that openness is still the least understood of the five factors (see DeYoung, 2015 for an attempt to rectify this problem). For this reason, openness was not included in the current study.

Overall, the mechanisms behind the connection between SWB and personality traits are still not well understood. With regards to extraversion, it may be that extraversion is related to greater sociability which in turn is related to higher SWB (Bradburn, 1969; Okun et al., 1984), but there is research that suggests sociability cannot account completely for this relationship (Harris et al., 2017) and that even if extraverts are in nonsocial occupations, they still have higher SWB than introverts (Diener et al., 1984). There is also not a perfect relationship between extraversion and happiness. Indeed, research has found support for happy introverts who seem to not be significantly different in many of their preferences (such as friendship relations and introspective activities) from happy extraverts, possibly due to extraversion playing a mediating role in how individuals pursue happiness (Hills & Argyle, 2001). Another possibility not mentioned or investigated in previous research is the idea that personality traits can interact with each other in how they influence SWB. For example, an agreeable extravert may act differently than a disagreeable extravert and therefore have different levels of SWB.

A good place to start when investigating the moderating role of various traits may be an examination of the strong and consistent relationship between neuroticism and SWB. Neuroticism is essentially a measure of negative emotions such as fear, anger, sadness, and anxiety (Soto & John, 2017) and is sometimes referred to as negative emotionality. It may be no surprise that there is a strong negative relationship between neuroticism and SWB, and other personality traits possibly serve moderating roles in the relationship between neuroticism and SWB. The current work builds on past research linking personality and SWB and looks at the moderating role of extraversion, agreeableness, and conscientiousness on the negative relationship between neuroticism and SWB. Neuroticism has been consistently linked with SWB and has been shown to have a negative relationship with SWL and PA and a positive relationship with NA. Conscientiousness, extraversion, and agreeableness all have positive relationships with well-being.

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Considering this, the following was hypothesized.
Hypothesis 1: Neuroticism will have a negative relationship with SWB.
Hypothesis 2: "Positive traits," or conscientiousness, extraversion, and agreeableness, will moderate the negative relationship between neuroticism and SWB, with higher levels of each positive trait predicting a weaker relationship between neuroticism and SWB.

Study 1[1]

Method[2]

Participants

Data for study 1 were taken from three separate online studies that used Amazon's Mechanical Turk (Mturk). Participation was voluntary through the MTurk website, and a 50-cent compensation was offered as payment for completing the study. Only those who correctly answered at least 80% of attention checks and completed at least 80% of the procedure received payment and were included in the data analyses. This stipulation was clearly stated in the MTurk posting and the informed consent document. A total of 1150 participants were recruited for this study, and 120 participants did not pass at least 80% of the attention checks or were removed because of missing data. The final participants included 1035 individuals (69.57% female, 29.95% male, .004% non-binary gender identity) from the United States between the ages of 18 and 78 (Mage = 37.28, SDage = 12.65). Race was 78.9% White, 7.2% Black/African American, 5.2% Asian, 8.0% other, and 0.6% no response. An a priori power analysis to determine the sample size for the current analyses was not conducted because the data were collected for other purposes. A sensitivity analysis was used to determine how large of an effect could be detected with the current sample size. G*power was set to "Linear multiple regression: Fixed model, R2 increase." A power of .80 was selected with an alpha of .05. The sample size was set to match the current study and the number of predictors was set to 3 (neuroticism, [other trait of current interest], neuroticism * [trait of interest] interaction). This resulted in an f2 of .011 reliably detectable by the current power level and sample size[3].

Measures

Big Five Inventory (BFI). The BFI is a 44-item measure made up of brief descriptions of behavior, thoughts, and feelings (John et al., 2008). Respondents indicate the extent to which these items describe themselves on a 5-point scale, ranging from "Strongly disagree" to "Strongly agree." The BFI has adequate internal reliability (α = .75-.80) and test-retest reliability over a period of three months (r = .80-.90; Rammstedt & John, 2005, 2007). It assesses the five major domains of personality: extraversion, agreeableness, openness, conscientiousness, and neuroticism. Within the current study, all domains had adequate reliability (α = .82-86).

Satisfaction With Life Scale (SWLS). The SWLS is a 5-item measure of global cognitive judgments of satisfaction with one's life (Diener et al., 1985). Responses are measured on a 7-point scale, ranging from "Strongly disagree" to "Strongly agree." The SWLS has adequate internal reliability (α = .87) and test-retest reliability over a period of two months (r = .82; Diener et al., 1985). Within the current study, the scale had high reliability (α = .94).

Positive and Negative Affect Schedule (PANAS). The PANAS is a 20-item measure of both positive and negative affect (Watson et al., 1988). Items include words that correspond to positive or negative emotions. The trait version of the scale was used, which asks participants to "indicate to what extent you generally feel this way, that is, how you feel on the average." Responses are on a 5-point scale ranging from "Not at all" to "Extremely." The PANAS has good internal reliability for both scales (PA α = .88; NA α = .77) and has demonstrated adequate reliability over a 2-month period (PA r = .68; NA r = .71; Watson et al., 1988). Within the current study, the scale had high reliability (PA α = .94; NA α = .94). To compute scores representative of Affect Balance, negative affect was subtracted from positive affect. Thus, numerically positive scores indicate more positive affect than negative affect, while numerically negative scores indicate more negative affect than positive affect.

Procedure

For Study 1, participants responded to at least the three self-report measures described in the previ

[1]Study 1 was not pre-registered, but Study 2 was. This can be found at: https://osf.io/qyv3g/?view_only=74c6fc489bf94e15bd66eef34e6cc422
[2] All R script and data for this study can be found at https://osf.io/n5jhv/?view_only=b8f1af679dad4fe281701928b5c4ac27
[3] All effect sizes in this study were calculated using (R2AB - R2A)/(1- R2AB).

ous section. They also observed recorded interactions and provided personality judgments of the person in each video (these data were not used for this paper).

Analyses

Hypothesis 1 Analysis. The relationship between Neuroticism and SWB was assessed in two ways. First, we examined Pearson's correlation coefficient between Neuroticism and SWL, and Neuroticism and Affect Balance. Second, we examined regression models wherein Neuroticism predicted SWL and Affect Balance separately. Most assumptions for correlational analysis were met in that variables appeared to have a linear relationship based on the examination of scatter plots and were normally distributed based on examination of histograms, skewness, and kurtosis. When examining outliers, five outliers were identified for the variable of Affect Balance, with participants having lower Affect Balance scores than 1.5 times the interquartile range below the first quartile. However, no significant differences were found throughout the analysis when these outliers were excluded compared to when the outliers were included. Outliers did not appear to be due to measurement error and simply represented a few participants with particularly negative affect. For both of these reasons, outliers were included in the analysis.

Hypothesis 2 Analysis. Hierarchical regression analyses were conducted with SWL and AB as the dependent variables in separate analyses to examine how the positive personality traits of extraversion, agreeableness, and conscientiousness moderated the relationship between neuroticism and SWB (Baron & Kenny, 1986). Age was significantly correlated with affect balance. All analyses were computed with and without control for age, but this did not change the interpretation of results, so the more parsimonious (without age) model was used. The analyses assessed the incremental explanatory power of the variables in each block. The variables were entered into separate hierarchical regression models in the following order: extraversion, agreeableness, and conscientiousness, respectively, as well as neuroticism, were entered in step 1. Two-way interaction terms (neuroticism x extraversion, neuroticism x agreeableness, neuroticism x conscientiousness) were entered in step 2. According to Baron and Kenny (1986), a significant moderator effect is indicated by significant incremental variance in the dependent variable after the interaction terms are added to the regression equation.

Assumptions of multiple regression were not violated such that there appeared to be linear relationships between independent and dependent variables when examining scatter plots, normality and homoscedasticity of residuals when examining Normal Q-Q and Residual vs Fitted plots respectively, and independence of residuals, as checked using VIF values, which were well below acceptable levels.

Results

Descriptive statistics and correlations between the Big Five, SWLS, and AB are presented in Table 1. Consistent with previous research, and in support of Hypothesis 1, neuroticism was negatively correlated with SWL ($r(1033) = -.38$, $p < .001$, 95% CI [-.43, -.33]) and AB ($r(1033) = -.63$, $p < .001$, 95% CI [-.67, -.60]). Additionally, neuroticism was negatively correlated with the positive personality traits of extraversion, agreeableness, and conscientiousness. In further support of Hypothesis 1, simple linear regressions found that for SWL, the overall regression was statistically significant ($R2 = .14$, $F(1, 1043) = 176.95$, $p < .001$), and neuroticism significantly predicted SWL ($b = -0.68$, $p < .001$). And for AB, the overall regression was again statistically significant ($R2 = .4$, $F(1, 1043) = 709.6$, $p < .001$), with neuroticism significantly predicting AB ($b = -0.95$, $p < .001$).

Table 2 shows that, as expected from previous literature, in Step 1, positive personality traits significantly predicted SWL, while neuroticism was a negative predictor of SWL. In Step 2, adding interaction terms revealed extraversion ($b = .12$, $p = .02$, $f2 = .005$, R2 change = .004) and conscientiousness ($b = .15$, $p = .02$, $f2 = .006$, $R2$ change = .005) to be significant moderators of neuroticism on SWL, while agreeableness was not a significant moderator ($b = .06$, $p = .31$, $f2 < .001$, $R2$ change < .001).

Table 3 shows that, in Step 1, positive personality traits significantly positively predicted AB while neuroticism negatively predicted AB. In Step 2, adding interaction terms to the model revealed that agreeableness ($b = .09$, $p = .02$, $f2 = .005$, $R2$ change = .003) and conscientiousness ($b = .09$, $p = .02$, $f2 = .005$, $R2$ change = .003) significantly moderated the effect of neuroticism on AB, but extraversion did not ($b < .01$, $p = .92$, $f2 < .001$, $R2$ change < .001). Thus, Hypothesis 2 was partially supported.

To examine the interaction patterns, the interac-

tion effects were plotted by simple slopes of SWL and AB at high and low levels (±1SD from the mean) for Neuroticism and positive personality traits. The interaction patterns for extraversion, conscientiousness, and agreeableness with the outcome variable SWL are depicted in Figures 1a, 1b, and 1c, respectively. Figure 1a suggests that across all levels of neuroticism, higher extraversion is associated with higher SWL. However, the difference in SWL at high levels of neuroticism is much more pronounced than at low levels of neuroticism. Figure 1b illustrates a similar story, with higher conscientiousness predicting higher SWL across levels of neuroticism, but with larger differences between levels of extraversion at high levels of neuroticism as opposed to low levels of neuroticism. Figure 1c shows a similar pattern in terms of higher neuroticism predicting lower SWL, and lower levels of agreeableness predicting lower SWL. However, Figure 1c illustrates that agreeableness was not a significant moderator, such that individuals with both high and low levels of agreeableness have similar relationships between SWL and neuroticism. In other words, highly neurotic individuals may benefit more in terms of SWL from high levels of positive traits like extraversion and conscientiousness than individuals low in neuroticism, but this is not necessarily true for the positive trait of agreeableness.

Figures 2a, 2b, and 2c show the moderating effect of extraversion, conscientiousness, and agreeableness on the relationships between neuroticism and AB, respectively. Figures 2b and 2c show the significant interaction effect, again showing that higher conscientiousness and agreeableness are related to higher AB, with the difference in AB being more pronounced at higher levels of neuroticism. On the other hand, Figure 2a shows that the level of neuroticism does not interact with the level of extraversion to influence AB, with the difference in AB at high and low levels of neuroticism being similar regardless of level of extraversion.

Discussion

Overall, the findings for this study were a little mixed. In some instances, positive personality traits seemed to moderate the relationship between neuroticism and SWB while in other instances they did not. It is possible that there is still a clear relationship between these variables, but more research is needed to help investigate this further.

Study 2 - Replication

Within the last decade, research in psychology has begun to increasingly stress the importance of replicating results. Several studies have been published that call into question some seminal research that is taught in many introductory psychology classes (Open, 2015). Although the debate over the replicability of many of these studies continues, what is clear is that attempting to replicate results is important. For this reason, Study 2 attempted to replicate the results in Study 1 within a different sample and with different but conceptually similar measures. Many things can impact the likelihood of a successful replication, including the a priori assumptions about what constitutes a successful replication (see Asendorpf et al., 2016, for a discussion on recommendations for increasing replication). The most conservative and straightforward method is to compare the key parameters of the replication attempt to those in the original study, focusing specifically on the replication of statistical significance and the corresponding direction of effects. One main issue with determining a replication in this manner is that it creates a dichotomy where small differences in p-values could lead to a conclusion that the original results were not replicated. This is especially true when replication studies have less power than the original study (Asendorpf et al., 2016), and therefore have a smaller probability of finding a statistically significant effect of the same magnitude (which is the case within this study).

Another way of determining the success of a replication is by looking at the overlap between confidence intervals (CI). If the parameters of interest from the replication study are contained within the CI of the original study, or if there is a significant overlap between the CIs of both studies, a case can be made for the replicability of the original results. This method is less conservative than relying on statistical significance but is still sensitive to power differences between studies (Asendorpf et al., 2016). This means that if a replication study is powered differently from the original study, results should be interpreted with caution.

The current study used all of these methods. When comparing parameters from the replication to the original study, if the direction of the effect is the same, CI's overlap, the replication parameters are contained within the CI of the original study, and both are statistically significant, a strong case for replication can be made. The fewer of these standards that a repli

cation effect meets, the weaker the case for replication. All results should be interpreted with this in mind.

Method

Data from this study were taken from a separate unrelated study that examined the impact of prior information on personality judgment accuracy (Gibson 2019).

Participants

Participants were recruited using Idaho State University's psychology department participant pool. Participation was voluntary, and participants were compensated with class credit. Only participants who correctly answered 80% of attention checks were included in the data analysis. The final participants included 151 individuals (this number was determined based on power analysis for the original study; Gibson 2019); 73% female, 26% male, <1% other gender identity) between the ages of 18 and 46 (*M*age = 21.44, *SD*age = 4.15). Self-identified ethnicity in the form of a free-response question was 80.9% White/Caucasian (Non-Hispanic), 11.1% Hispanic/Latinx, 1.9% Asian, and 6.1% other. A sensitivity analysis was used to determine how large of an effect could be detected with the current sample size. G*power was set to "Linear multiple regression: Fixed model, R2 increase". A power of .80 was selected with an alpha of .05. The sample size was set to match the current study and the number of predictors was set to 3 (neuroticism, [other trait of current interest], neuroticism * [trait of interest] interaction). This resulted in an f2 of .074 reliably detectable by the current power level and sample size.

Measures

The following measures, while not inclusive of all the measures completed by participants in this study, are the relevant measures used in the following analysis[4].

The Big Five Inventory-2 (BFI-2). The BFI-2 is a 60-item measure made up of brief descriptions of behavior, thoughts, and feelings (Soto & John, 2017). Respondents indicate the extent to which these items describe themselves on a 5-point scale, ranging from "Strongly disagree" to "Strongly agree." The BFI-2 has adequate internal reliability (α = .84-.91). It assesses the five major domains of personality: extraversion, agreeableness, open-mindedness, conscientiousness, and negative emotionality (previously labeled neuroticism). Within the current study, the Cronbach's alpha reliabilities of each of the 12-item domain scales were highly reliable (Extraversion α = .82, Agreeableness α = .82, Conscientiousness α = .86, Emotional Stability α = .90, and Openness α = .80).

Satisfaction With Life Scale. Within this study, the Cronbach's alpha reliability of the 5 items within the SWLS measure was found to be highly reliable (α = .85).

Positive and Negative Affect Schedule. Within this study, the Cronbach's alpha reliability of the two scales was found to be highly reliable (PA α = .88, NA α = .83).

Procedure

Participants were brought into a lab and asked to sit in front of a computer. After a short introduction video, participants completed the informed consent form and provided personality information using the BFI-2 (Soto & John, 2017) via the self-report form. Participants then watched video interactions of other individuals and judged their personalities, which is not relevant to the research question currently being explored. After completing this judgment portion, participants completed another set of self-report measures, including the PANAS (Watson et al., 1988) and SWLS (Diener et al.,1985).

Analyses

All analyses were performed in the same way as in Study 1. Assumptions for correlational analysis and multiple regression analysis were not violated.

Results

Descriptive statistics and correlations between the Big Five domains, SWL, and AB are presented in Table 4. Consistent with previous research and Study 1, neuroticism was negatively correlated with extraversion, agreeableness, conscientiousness, SWL, and AB. Age was not related to either outcome, but gender was related to SWL such that males had higher levels of SWL than females. As in study 1, all models were run with and without a gender control and this resulted in no differences in interpretation of the results, so the more parsimonious model was used for results.

Table 5 shows that extraversion and conscientiousness significantly predicted SWL, while neuroticism was a negative predictor of SWL. In Step 2, adding interaction terms revealed extraversion (*b* = .37, *p* = .02, *f*2 = .028, *R*2 change = .027) to be a significant moderator of neuroticism on SWL, while conscientiousness (*b* = .31, *p* = .07, *f2* = .022, *R2* change =.015)

[4] Participants also completed Ryff's Psychological Well-being Scale and a measure of fixed and growth mindset of intelligence.

and agreeableness (b = .24, p = .20 $f2$ = 011, $R2$ change = .008) were not statistically significant moderators. Table 6 shows that, surprisingly, in Step 1, only conscientiousness significantly positively predicted AB, while neuroticism negatively predicted AB. In Step 2, adding interaction terms to the models revealed that agreeableness (b = -.26, p = .04, $f2$ = .029, $R2$ change = .022) significantly moderated the effect of neuroticism on AB, but extraversion (b = -.03, p = .79 $f2$ < .001, $R2$ change < .001) and conscientiousness (b = .01 p = .95 $f2$ < .001, $R2$ change < .001) did not.

To examine the interaction patterns, the interaction effects were plotted in the same way as in Study 1. The interaction pattern for extraversion with the outcome variable SWL is depicted in Figure 3. Figure 3 suggests that at high levels of neuroticism, higher extraversion is associated with higher SWL. However, the difference in SWL at low levels of neuroticism between levels of extraversion is negligible. This mirrors the patterns found in Study 1, with individuals high in neuroticism potentially benefiting more from possessing the trait of high extraversion. Figure 4 displays the interaction pattern for agreeableness with the outcome of AB. This figure shows a distinctly different pattern than what was found in Study 1. At high levels of neuroticism, the difference in AB is negligible, whereas, at low levels of neuroticism, the difference in AB at different levels of agreeableness is more pronounced, with high agreeableness predicting higher AB. This suggests that for individuals high in neuroticism, AB is low despite the presence of high levels of agreeableness.

Discussion

As mentioned earlier, evidence in support of replication can come in many forms, some more stringent than others. Within this study, multiple methods were used to examine how well Study 2 replicated the results found in Study 1, including 1) whether the effects were in the same direction in both studies, 2) whether the CIs overlapped, 3) whether the replication parameters were contained within the CI of the original study, and 4) whether statistical significance was present across both studies. The more of these standards that a replication effect meets, the stronger the case for replication. Table 7 concisely depicts these results.

Based on these findings, replication of the results found in Study 1 is most clear when examining trait interactions that predict SWL. Predicting SWL, both the extraversion by neuroticism interaction and the agreeableness by neuroticism interaction met three of the four replication standards. A weaker, but still legitimate case can also be made for the conscientiousness by neuroticism interaction within SWL because both are in the same direction, and the CIs overlap. When trait interactions were used to predict AB, the extraversion by neuroticism and the agreeableness by neuroticism parameter estimates from Study 2 were in the opposite direction of those found in Study 1. This means that there is a fairly weak case (at least within this replication attempt) for the replicability of these effects from Study 1. A stronger case can be made for the conscientiousness by neuroticism effect, which met 3 of the 4 criteria for replication.

General Discussion

People with different personalities can experience the same life events or situations and come away with vastly different positive or negative experiences (Magnus et al., 1993). A long history of research linking SWB and personality has demonstrated how various personality traits are related to our subjective sense of well-being. Neuroticism has consistently been shown to have a negative relationship with SWB, while extraversion, agreeableness, and conscientiousness have been shown to have positive relationships (Costa & McCrae, 1980; DeNeve & Copper, 1998; McCrae & Costa, 1991). The current studies explored how the relationships between neuroticism and SWB can be moderated by other traits. Significant interactions among the personality traits and their relationship to SWB have been demonstrated and need to be considered and explored further in future research. As with previous studies, this study replicated results showing that neuroticism is inversely related to SWB through a negative correlation with both SWL and AB, while extraversion, agreeableness, and conscientiousness were positively related to SWB through a positive correlation with both SWL and AB. Neuroticism also showed a negative relationship with extraversion, agreeableness, and conscientiousness.

When interactions among traits were considered, the results from Study 1 indicated that only extraversion and consciousness moderated the relationship between neuroticism and SWL, and that conscientiousness and agreeableness moderated the relationship between neuroticism and AB. The meta-analysis by DeNeve and Copper (1998) theo rized that neuroticism causes people to experience

less SWB overall. Our results show how this effect could be reduced through other personality traits. We found that the effect of positive personality traits on neuroticism was larger at higher levels of neuroticism compared to lower levels of neuroticism. Thus, as neuroticism increases, the observed effect of positive personality traits such as extraversion, agreeableness, and consciousness on the relationship between neuroticism and SWB becomes more pronounced.

Study 2 was designed to examine the replicability of the effects found in Study 1. The strongest case for replication can be made for the moderating effect of extraversion and the lack of moderation for agreeableness on the negative relationship between neuroticism and SWL. In both cases, three lines of evidence supported the results found in Study 1. There was also evidence for the moderating impact of conscientiousness. This suggests that, even in this different sample, the negative impact of neuroticism on SWL is less for individuals high in extraversion or consciousness, but is not significantly impacted by levels of agreeableness.

The impact of positive personality traits on neuroticism and AB relationships was mostly not replicated. In some cases (extraversion by neuroticism and agreeableness by neuroticism), the effects were in the opposite direction. The effects of the interaction of conscientiousness by neuroticism on AB were mostly replicated. There could be a number of explanations for these findings. First, the sample in Study 2 was about 15% of the size of the sample in Study 1, so it did not have as much power to detect small effects. Study 1 could detect effects as small as f2 = .011, but Study 2 could only detect effects as small as f2 = .074. Study 2 also collected data only from college students and had less diverse demographics than Study 1. A smaller and more homogenous sample could make it more difficult to detect effects due to lower variability. It is also important to keep in mind that college students differ from other adults in some important ways, such as being younger, and also differ from adults of the same age who have not gone to college in substantive ways such as a greater tendency to rationalize choices, higher levels of individualism, weaker motivations to conform, and less prosocial behaviors (Henrich et al., 2010). Future research on this topic would benefit from larger and more diverse samples to more directly examine how trait interactions are related to well-being across different age groups and groups with different experiences (such as attending college).

Another potentially important difference between the studies is that Study 1 used the original BFI to assess personality traits, while Study 2 used the BFI-2. This may have made a difference in the two studies, but the two measures have high convergent validity and trait scores tend to be highly correlated between the two (Soto & John, 2017). For this reason, it is unlikely that this difference can account for the differences between the two studies.

Due to the larger sample size and greater diversity of the sample, Study 1 is a more reliable study and the results from Study 2 should be taken as only moderate evidence for the replicability, or lack thereof, of the findings. Overall, there is some evidence that positive personality traits can attenuate the negative relationship between neuroticism and SWB, specifically when it comes to SWL. Some of these differences could affect how personality is related to well-being, which would be a useful avenue for future research. Research also suggests that SWB is only one part of a broader construct of overall well-being (Chen et al., 2013) and research may benefit by further investigating the relationship between personality traits and psychological well-being.

One of the major limitations of this paper is that both studies are correlational and all measures were completed at only one time point, which means that cause-and-effect relationships cannot be identified. Additionally, both studies suffer from self-selection bias. The types of individuals who decided to devote time to completing psychological surveys on Mturk, and those who chose to take psychology classes, may not represent the broader population. Future research should look at these effects in multiple groups and over longer periods of time to investigate the temporal validity of the results and causal directions of the relationships between personality traits and well-being.

Conclusion

This research contributes to a more nuanced understanding of the complex interactions between well-being and personality. Often personality traits are treated as if they operate alone, but individuals are complex. For example, an agreeable extravert will likely act differently than an agreeable introvert, so it is important to examine how traits interact with each other to influence important psychological outcomes and behavior. The predictions made in this study that conscientiousness, extraversion, and agreeableness would moderate

the relationship between neuroticism and SWB were partially supported. Positive personality traits were generally positively related to SWB at high levels of neuroticism, but generally unrelated to SWB at low levels of neuroticism. This lends support to the idea that personality traits interact and highlights the importance of considering more than one trait at a time when predicting important outcomes such as SWB.

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Table 1

Descriptive Statistics and Zero-order Correlations for Study 1

	Mean	SD	1	2	3	4	5	6
1. Ext	3.02	.90	-					
2. Agr	3.70	.72	.15 *** [.09, .21]					
3. Con	3.77	.75	.27 *** [.22, .33]	.37 *** [.32, .42]				
4. Neu	2.90	.85	-.34 *** [-.4, -.29]	-.36 *** [-.42, -.31]	-.5 *** [-.55, -.46]			
5. SWL	4.17	1.53	.22 *** [.16, .28]	.24 *** [.18, .29]	.3 *** [.24, .35]	-.38 *** [-.43, -.33]		
6. AB	1.34	1.40	.41 *** [.36, .46]	.42 *** [.37, .47]	.6 *** [.56, .64]	-.63 *** [-.67, -.60]	.47 *** [.42, .51]	
7. Age	37.28	12.66	.04 [-.02, .11]	.17 *** [.11, .23]	.23 *** [.18, .29]	-.22 *** [-.28, -.17]	.02 [-.04, .08]	.22 *** [.16, .28]
8. Gen†	-	-	-0.03 [-.09,.04]	0.18 *** [.12,.23]	0.11 *** [.05,.17]	0.11 *** [.05,.17]	0.05 [-.01,.11]	0.02 [-.04,.08]

Note. SWL = Satisfaction With Life, AB = Affect Balance, Ext = Extraversion, Agr = Agreeableness, Con = Conscientiousness, Neu = Neuroticism/Negative emotionality, Gen = Gender. N = 1035, values in brackets are the 95% confidence intervals.

$^{**}p < .01$, $^{*}p < .05$, †For gender, Male = 0 and Female = 1, non-binary individuals were excluded from the correlation matrix (but included in all other analysis) so that results could be interpreted properly (N=1030 for gender correlations).

Table 2

Hierarchical Regression Analyses Predicting Satisfaction with Life (SWL)

Predictors	*b*	R^2	*F*
Step 1		.156	95.14***
Extraversion	.17***		
Neuroticism	-.62***		
Step 2		.160	65.50***
Extraversion x Neuroticism	.12* [.02, .21]		
Step 1		.157	95.95***
Agreeableness	.24***		
Neuroticism	-.61***		
Step 2		.158	64.31***
Agreeableness x Neuroticism	.06 [-.06, .18]		
Step 1		.160	98.93***
Conscientiousness	.28***		
Neuroticism	-.56***		
Step 2		.170	68.16***
Conscientiousness x Neuroticism	.15* [.03, .27]		

Note. N= 1035, values in brackets are the 95% confidence intervals.

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

Table 3

Hierarchical Regression Analyses Predicting Affect Balance (AB)

Predictors	*b*	R^2	*F*
Step 1		.411.8	411.8***
Extraversion	.31***		
Neuroticism	-.84***		
Step 2		.444	274.3***
Extraversion x Neuroticism	.001 [-.06, .07]		
Step 1		.445	414.4***
Agreeableness	.40***		
Neuroticism	-.83***		
Step 2		.450	279.1***
Agreeableness x Neuroticism	.09* [.01, .18]		
Step 1		.508	599.4 ***
Conscientiousness	.64***		
Neuroticism	-.67***		
Step 2		.511	358.9***
Conscientiousness x Neuroticism	.09* [.01, .17]		

Note. N= 1035, values in brackets are the 95% confidence intervals.

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

Table 4

Descriptive Statistics and Zero-order Correlations

	Mean	SD	1	2	3	4	5	6
1. Ext	3.39	.66	-					
2. Agr	3.84	.61	.13 [-.03, .28]					
3. Con	3.70	.66	.25** [.10, .40]	.32*** [.17, .46]				
4. Neu	3.06	.83	-.32*** [-.46, -.17]	-.28*** [-.42, -.12]	-.39*** [-.51 ,-.24]			
5. SWL	4.34	1.42	.31*** [.16, .45]	.25** [.09, .39]	.41*** [.27, .54]	-.49*** [-.60, -.36]		
6. AB	1.18	.96	.22** [.06, .36]	.26** [.10, .40]	.33*** [.18, .46]	-.45*** [-.57, -.32]	.38*** [.23, .51]	
7. Age	21.44	4.17	-.05 [-.20, .11]	-.02 [-.18, .14]	.07 [-.09, .23]	.01 [-.15, .17]	-.1 [-.26, .06]	-.07 [-.23, .09]
8. Gen†	-	-	0.03 [-.13,.19]	0.31 *** [.15,.44]	0.12 [-.05,.27]	0.07 [-.09,.23]	0.24 ** [.09,.39]	-0.04 [-.2,.12]

Note. SWL = Satisfaction With Life, AB = Affect Balance, Ext = Extraversion, Agr = Agreeableness, Con = Conscientiousness, Neu = Neuroticism/Negative emotionality, Gen = Gender. $N = 151$, values in brackets are the 95% confidence intervals.

$^{**}p < .01$, $^{*}p < .05$, †For gender, Male = 0 and Female = 1, non-binary individuals were excluded from the correlation matrix (but included in all other analysis) so that results could be interpreted properly (N=149 for gender correlations).

Table 5

Hierarchical Regression Analyses Predicting Satisfaction with Life (SWL)

Predictors	*b*	R^2	*F*
Step 1		.268	27.15***
Extraversion	.37*		
Neuroticism	-.75***		
Step 2		.296	20.58***
Extraversion x Neuroticism	.42* [.07, .76]		
Step 1		.257	25.53***
Agreeableness	.29		
Neuroticism	-.79***		
Step 2		.265	17.64***
Agreeableness x Neuroticism	.24 [-.13, .61]		
Step 1		.302	32.02***
Conscientiousness	.57***		
Neuroticism	-.67***		
Step 2		.318	22.79***
Conscientiousness x Neuroticism	.31 [-.03, .64]		

Note. Values in brackets are the 95% confidence intervals.

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

Table 6

Hierarchical Regression Analyses Predicting Affect Balance (AB)

Predictors	*b*	R^2	*F*
Step 1		.213	19.99***
Extraversion	.12		
Neuroticism	-.50***		
Step 2		.213	13.26***
Extraversion x Neuroticism	-.03 [-.28, .21]		
Step 1		.226	21.64***
Agreeableness	.23		
Neuroticism	-.48***		
Step 2		.248	16.16***
Agreeableness x Neuroticism	-.26* [-.52, -.01]		
Step 1		.234	22.64***
Conscientiousness	.26*		
Neuroticism	-.46***		
Step 2		.234	14.99***
Conscientiousness x Neuroticism	.01 [-.23, .25]		

Note. Values in brackets are the 95% confidence intervals.

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

Table 7

Lines of Evidence for the Replication in Study 2 of the Trait Interactions found in Study 1

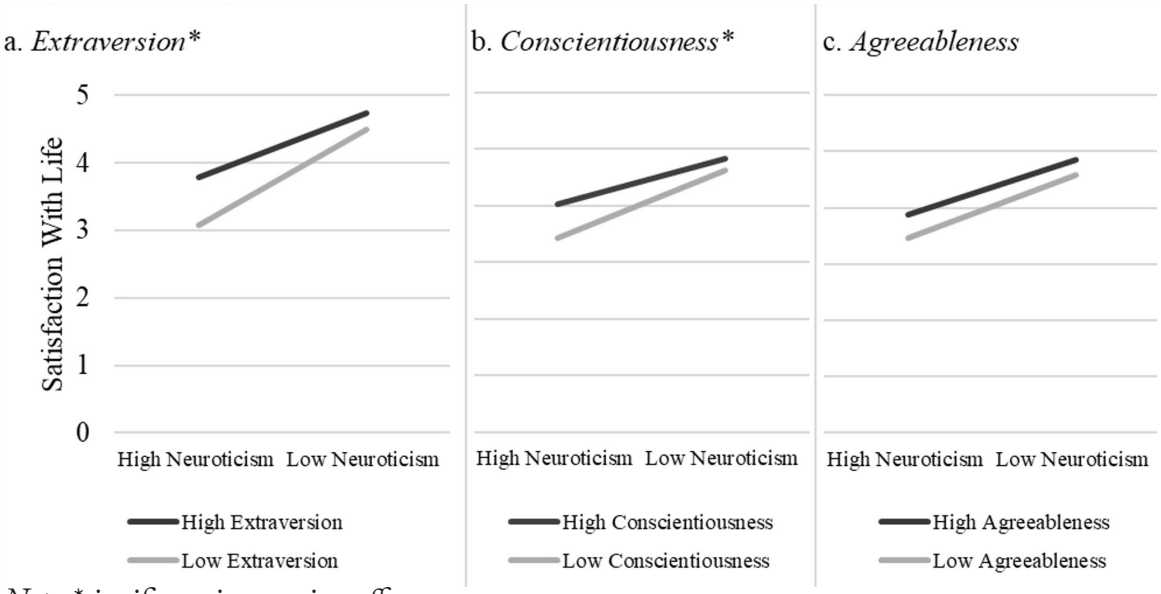
Trait interactions	Consistent direction	Overlapping CI	Study 2 *b* in Study 1 CI	Shared significance
Satisfaction With life				
Ext:Neur*	X	X		X
Agr:Neur	X	X		X
Con:Neur*	X	X		
Affect Balance				
Ext:Neur		X	X	X
Agr:Neur*				X
Con:Neur*	X	X	X	

Note. CI = 95% confidence interval, Ext = Extraversion, Agr = Agreeableness, Con = Conscientiousness, Neur = Neuroticism/Negative emotionality. An X in the Shared significance column means that either both were significant, or both were not significant.

*$p < .05$ in Study 1.

Figure 1

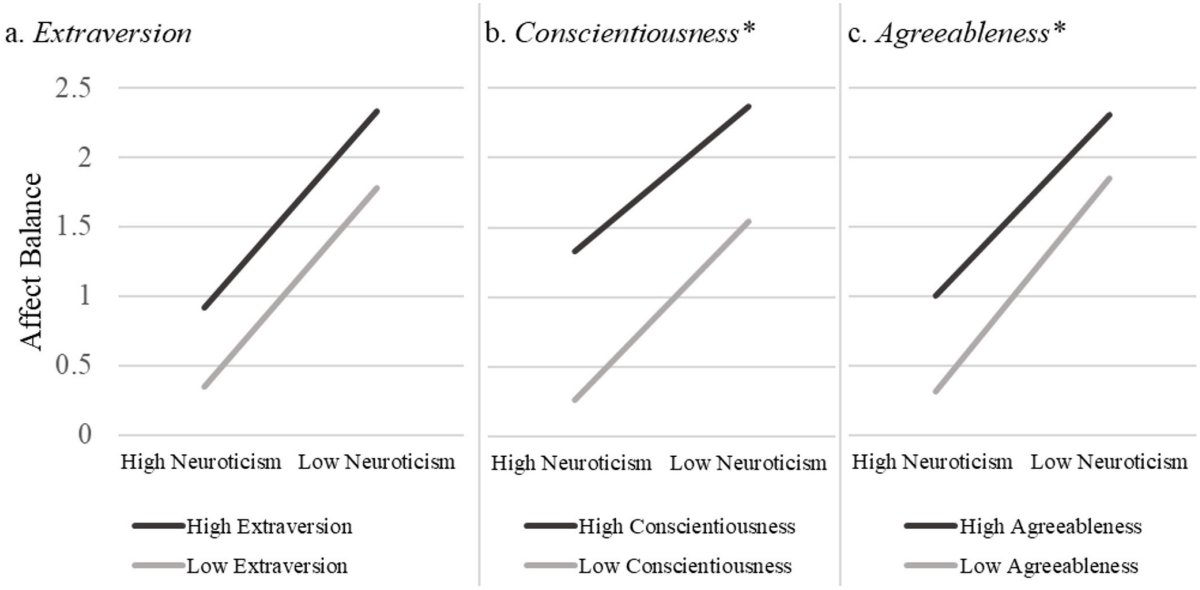
The Moderating Effect of Positive Traits on the Relationship Between Neuroticism and Satisfaction With Life



Note. *significant interaction effects.

Figure 2

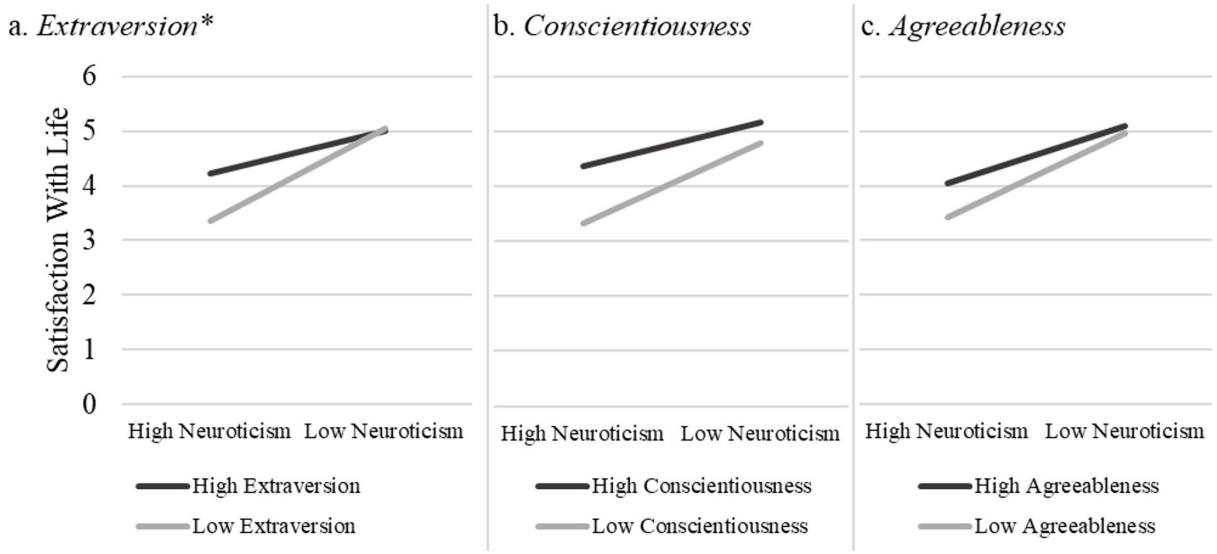
The Moderating Effect of Positive Traits on the Relationship Between Neuroticism and Affect Balance



Note. *significant interaction effects.

Figure 3

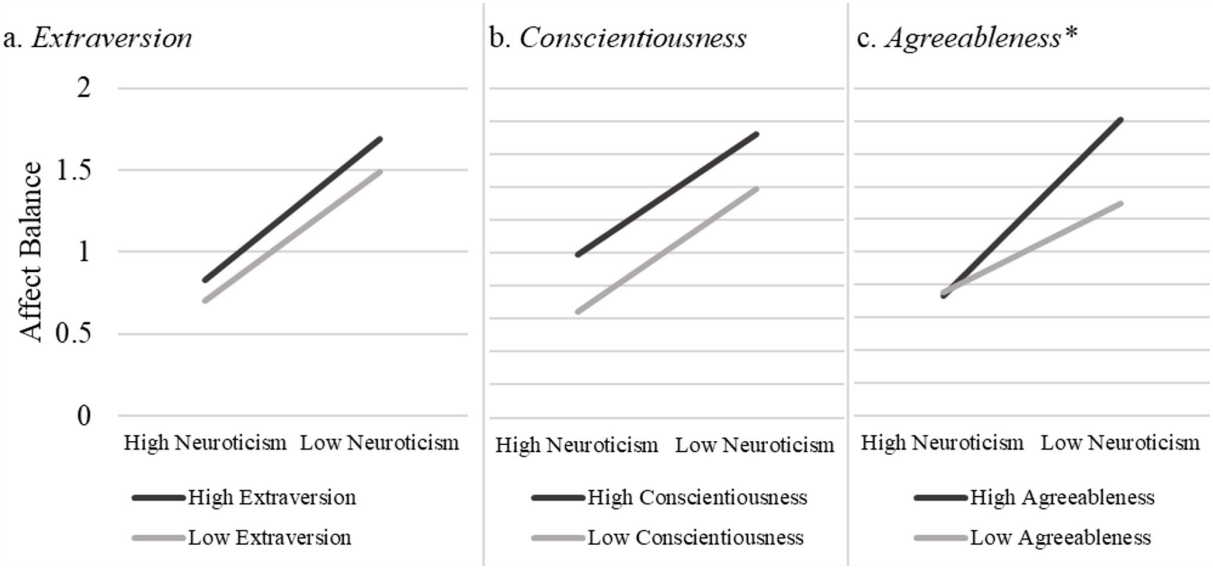
The Moderating Effect of Positive Traits on the Relationship Between Neuroticism and Satisfaction with Life



Note. *significant interaction effects.

Figure 4

The Moderating Effect of Positive Traits on the Relationship Between Neuroticism and Affect Balance



Note. *significant interaction effects.