

Selka Sadiković¹
Snežana
Smederevac
Dužanka Mitrović
Ilija Milovanović

Department of
 Psychology, Faculty of
 Philosophy, University
 of Novi Sad

BEHAVIORAL GENETICS FOUNDATIONS OF RELATIONS BETWEEN PERSONALITY TRAITS AND SATISFACTION WITH LIFE²

The long-term stability of subjective wellbeing has directed an attention to stable dispositions as the probable source of individual differences in the satisfaction with life (SWL). The main objective of this study was to examine the extent of genetic overlap between SWL and personality traits of the five-factor model (FFM). The sample consisted of 121 monozygotic and 61 dizygotic twin pairs (the average age was 24.59, SD = 7.11). Satisfaction with Life Scale and The Revised NEO Personality Inventory (NEO-PI-R) were applied. Multivariate genetic modeling was performed. The results show the most appropriate fit indices for Independent AE model ($\chi^2/df = 1.41$, CFI = .92, TLI = .91, RMSEA = .07, AIC = 17400.81, BIC = 17558.68, SRMR = .10). SWL and all NEO-PI-R personality traits have a moderate to strong genetic bases, while the common genetic influences for SWL are 40%. The results show that unique environmental contributions are moderate to strong (from 61% for Neuroticism, 41% for SWL, to 23% for Conscientiousness). Genetically driven tendency common to Neuroticism, Extraversion, and Conscientiousness, underlines individual differences in SWL, and therefore a cognitive evaluation of SWL seems to be substantially based on emotional tendencies encompassed by the FFM. Also, SWL appears to be uniquely environmentally influenced, which implies benefits of wellbeing interventions through the process of learning or adopting a different life philosophy.

¹ Corresponding author email:
 selkasadikovic@uns.ac.rs

Key words: FFM, multivariate genetic modeling, satisfaction with life, twin study

Primljeno: 15. 12. 2018.
 Primljena korekcija:
 27. 12. 2018.
 Prihvaćeno za štampu:
 29. 12. 2018.

² This study was supported by the Ministry of Education, Science and Technological Development of the Republic of Serbia [Grant ON179006].

Introduction

In recent decades, there has been a growing consensus that mental health should be viewed not only as the absence of psychopathological symptoms, but rather as the presence of positive indicators (Keyes, 2005). This leads to the recognition of subjective wellbeing as an important aspect of mental health, as well as to the expansion of the research on happiness. A significant progress has been made in the research of subjective wellbeing and its correlates.

Subjective wellbeing is often defined as a cognitive and emotional evaluation of life (Diener, 2000). It comprises a hedonic balance, i.e. the balance between positive and negative affects, which constitutes its affective component, while satisfaction with life is assessed according to subjective standards, as its cognitive component. However, it has been proposed that cognitive component could, to some extent, rely on hedonic balance, because the overall assessment of satisfaction with life implies retrieval of pleasant and unpleasant experiences, with their ratio forming such judgment (Schimmack, Diener, & Oishi, 2002; Schimmack, Radhakrishnan, Oishi, Dzokoto, & Ahadi, 2002). Hence some personality traits can affect not only the level of positive and negative affects, but, indirectly, the assessment of satisfaction with life as well.

It has been well documented that, among many correlates of wellbeing, personality traits play a particularly important role (e.g., DeNeve & Cooper, 1998). Findings suggesting a long-term stability of subjective wellbeing have directed attention to stable dispositions as the probable important source of the individual differences in the overall sense of happiness and satisfaction with life. It has been suggested that personality traits could affect subjective wellbeing both directly and indirectly. More direct links derive from the fact that personality traits predispose individuals for certain emotional responses and experiences. However, personal dispositions could also lead to engagement in certain types of activities and situations more frequently. Since many of these activities and experiences might further promote or impair subjective sense of happiness, the personality traits can affect subjective wellbeing indirectly, through situational choices (e.g., Steel, Schmidt, & Shultz, 2008). Consequently, environments with reduced situational choice opportunities could decrease the role of stable dispositions in subjective wellbeing.

Findings point to Extraversion and Neuroticism as personality traits which are most consistently linked to subjective wellbeing, and which demonstrate that these two dimensions explain substantial amounts of variance in wellbeing. The findings regarding Conscientiousness are inconsistent, while Agreeableness and Openness seem to play a limited role in wellbeing (DeNeve & Cooper, 1998; Steel et al., 2008; Vitterso, 2001). Individuals with a high level of Extraversion and a low level of Neuroticism tend to be happier and more satisfied with their lives. Extraversion is often considered as the proneness to positive affective experiences, and Neuroticism as the tendency to experience negative affect. Therefore, a con-

nection between these traits and the affective component of subjective wellbeing is quite straightforward. However, research suggests that these traits are also correlated with measures of wellbeing which do not imply direct reports of affective experience, such as personal security and satisfaction with life (Costa & McCrae, 1980; Grevenstein & Bluemke, 2015). Some findings suggest that the influence of Extraversion and Neuroticism on satisfaction with life is largely mediated by hedonic balance (e.g., Schimmack et al., 2002).

The issue of genetic contributions to the individual differences in wellbeing are based on the well-established link with personality traits, which have already demonstrated substantial heritability (e.g., Butković, Hlupić, & Bratko, 2017; Johnson, Vernon, & Feiler, 2008), as well as from findings regarding a long-term stability of wellbeing. In accordance with popularity of the wellbeing phenomenon, a large number of behavioral genetic studies have been carried out in many countries and cultures, on samples of more than 80.000 twins and family members, covering the life span from early adolescence through senior years. These studies have tried to find out whether happiness is a hereditary predisposition, or it is associated with the process of learning and/or adopting a specific life philosophy (Archontaki, Lewis, & Bates, 2013; Bartels & Boomsma, 2009; Gigantesco et al., 2011; Hahn, Johnson, & Spinath, 2013; Kendler, Myers, & Keyes, 2011; Keyes, Myers, & Kendler, 2010; Nes, Roysamb, Tambs, Harris, & Reichborn-Kjennerud, 2006; Stubbe, Posthuma, Boomsma, & De Geus, 2005). Different definitions of wellbeing have contributed to the use of terms like wellbeing, satisfaction with life, happiness, or quality of life interchangeably (Layard, 2010). A large variety of definitions in wellbeing questionnaires, scales, subscales, and items makes a meta-analysis vulnerable to heterogeneity, complicating the estimation of genetic and environmental variance (Bartels, 2015). Nevertheless, meta-analysis conducted by Bartels (2015) has shown that individual differences in wellbeing and its components, such as satisfaction with life, happiness, and quality of life, are accounted for by both genetic and environmental factors. For overall wellbeing, heritability estimates, mainly represented by additive genetic effects, range from 17 to 56%, for satisfaction with life they range from 0 to 60%, for happiness they range from 22 to 41%, and for quality of life heritability estimates range from 22 to 42% (Bartels, 2015). These results indicate the unambiguous impact of hereditary factors on subjective wellbeing. However, Diener has emphasized that, although genetic effects are undoubtedly important, cultural and situational factors also influence subjective wellbeing, sometimes strongly (Larsen & Eid, 2008). Moreover, he has argued against the idea that subjective wellbeing is determined by genetic inheritance, providing evidence for environmental influences, such as differences in subjective wellbeing between young vs. old people (Diener & Suh, 1998), employed vs. unemployed people (Diener, Nickerson, Lucas, & Sandvik, 2002), married vs. unmarried women (Lucas, Clark, Georgellis, & Diener, 2003), the poorest vs. richest nations (Diener & Suh, 1999). Furthermore, behavioral genetic studies (Weiss, Bates, & Luciano, 2008) have demonstrated that there are no

genetic effects unique to subjective wellbeing. Namely, since subjective wellbeing is strongly linked to personality traits (DeNeve & Cooper, 1998), the basic question in behavioral genetic studies of subjective wellbeing is whether it shares the same additive genetic variance with personality traits.

On the other hand, results of behavioral genetic studies of personality traits (Bouchard, 1997; Butković, et al., 2017; Jang, Livesley & Vernon, 1996; Johnson et al., 2008; Rieman, Angleitner, & Strelau, 1997) have shown that approximately half of the variance in all FFM domains are genetically influenced. The results have indicated that the average heritability for personality traits is about 40% (Vukasović & Bratko, 2015), or even 48% and 49% (Johnson et al., 2008; van den Berg et al., 2014). By explaining relations between personality traits and subjective wellbeing, some studies have shown that personality and subjective wellbeing may be correlated, because they share the same genetics bases (e.g., Kendler, Gatz, Gardner, & Pedersen, 2006). Moreover, some authors have hypothesized that the heritable component of subjective wellbeing is entirely explained by the genetic architecture of the FFM (e.g., Weiss et al., 2008), suggesting that the genetic and environmental variance of subjective wellbeing may be explained in terms of personality.

Based on the strong evidence of a correlation between subjective wellbeing and personality traits, primarily Extraversion and Neuroticism, the first objective of the present study is to replicate the association of these constructs. Subsequently, we will examine the extent of a genetic overlap between subjective wellbeing and all FFM personality traits. Namely, we will decompose the genetic and environmental components of subjective wellbeing into those linked to personality and those specific to wellbeing, with main hypothesis that subjective wellbeing represents one of manifestations of personality traits, without an independent hereditary basis.

Method

Sample and Procedure

Participants in the present study were recruited from the Twin Registry, a voluntary based sample of Serbian twins. Twins were recruited as a part of the project "Psychological Foundations of Mental Health: Hereditary and Environmental Factors" during 2011-2018 period. A call for participation in the research was published through media, Internet and press. The participation in the research was voluntary, and every respondent signed an informed consent. Data collection protocol was approved by the Ethic Committee of Department of Psychology, Faculty of Philosophy, University of Novi Sad.

The sample consisted of 364 twins of whom 242 were monozygotic (76% female pairs of MZ twins) and 122 dizygotic (DZ). From 61 DZ twin pairs, 9 pairs

were males, 25 were females, and 27 were different gender. Participants ages ranged from 18 to 48 ($M = 24.59$, $SD = 7.11$). Zygosity was determined based on DNA analysis of the buccal swab, which was performed at the Institute of Forensic Medicine in Novi Sad, and John Jay College of Criminal Justice in New York. Data collection was carried out in Novi Sad, Belgrade, Niš, Zrenjanin, and Novi Pazar. A part of participants' data was collected by an online platform. Respondents did not receive any fee for participating in the research.

Instruments

Satisfaction with Life Scale (SWLS: Diener, Emmons, Larsen, & Griffin, 1985; Serbian version: Vasić, Šarčević, & Trogrlić, 2011). This scale was used to assess a cognitive component of subjective wellbeing. Answers to each of the five items (e.g., *The conditions of my life are excellent*) range from 1 - *strongly disagree*, to 7 - *strongly agree*. This scale was widely used, and it showed good psychometric properties in previous research. Cronbach's alpha coefficient of SWLS for our sample (.83) was acceptable according to Loewenthal (2004).

The Revised NEO Personality Inventory (NEO-PI-R: Costa & McCrae, 1990, Serbian version: Knežević, Džamonja Ignjatović, & Đurić Jočić, 2004). NEO PI-R consisted of 240 Likert-type items, and it was used to assess the Big Five personality traits: Openness to Experience (O), Conscientiousness (C), Extraversion (E), Agreeableness (A), and Neuroticism (N). Each item is rated on a five-point scale, from 1 - *strongly disagree*, to 5 - *strongly agree*. Cronbach's alpha coefficient for all scales (N = .81, E = .84; O = .80; C = .80; A = .81) was acceptable.

Data Analysis

For exploring the nature of the phenotypic associations between satisfaction with life and personality traits, multivariate twin modeling was applied. The twin design compares the degree of phenotypic similarity between monozygotic twins, sharing 100% of their genes, with dizygotic twins, who shared 50% of their genes on average (Rijsdijk & Sham, 2002). Independent and common multivariate models were applied in order to estimate additive genetic factors (A); shared environmental (C), and non-shared environmental (E) factors. Different combinations of A, C and E (ACE, AE, E) were compared, and the best model was selected based on an optimal balance between goodness of fit and parsimony. A descriptive analysis and phenotypic correlations were carried out in the SPSS v.21 software (IBM corp., 2012), while the multivariate SEM modeling was conducted in the "lavaan" R package (Rosseel, 2012).

Results

Descriptive Statistics

The first step in the analysis was the partialization of the gender effect, as well as the linear and quadratic partialization of the age effect, conducted by using the standard regression procedures proposed by McGue and Bouchard (McGue & Bouchard, 1984). Table 1 shows descriptive statistics for all the variables. The results in Table 1 show that all variables are normally distributed (skewness and kurtosis are lower/higher than 1.50/-1.50; Tabachnick & Fidell, 2013). The measure of satisfaction with life has been normalized by Tuckey transformation.

Table 1
Descriptive statistic for SWLS and NEO-PI-R scales

| | Monozygotic | | Dizygotic | | | |
|------------------------|-------------|-----------|-----------|-----------|-----------|-----------|
| | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>Sk</i> | <i>Ku</i> |
| Satisfaction with Life | 5.04 | 0.90 | 4.88 | 1.02 | -0.79 | -0.16 |
| Neuroticism | 2.72 | 0.59 | 2.79 | 0.59 | 0.19 | 0.02 |
| Openness | 3.45 | 0.48 | 3.44 | 0.47 | -0.33 | -0.27 |
| Conscientiousness | 3.66 | 0.47 | 3.56 | 0.50 | -0.15 | -0.20 |
| Extraversion | 3.49 | 0.50 | 3.40 | 0.53 | -0.32 | 0.31 |
| Agreeableness | 3.45 | 0.70 | 3.46 | 0.68 | -0.16 | 0.09 |

Note. *M* – mean, *SD* – standard deviation, *Sk* – skewness, *Ku* – kurtosis.

Intraclass and Cross-Twin – Cross-Trait Correlations

Table 2 presents the phenotypic correlations between SWLS and NEO-PI-R scales. Both types of correlation coefficients (intraclass and cross twin – cross trait) have been calculated separately for the monozygotic and dizygotic twins.

Table 2

Cross-twin within-trait (diagonal), and cross-twin cross-trait (off-diagonal) correlations

| | N | | E | | O | | C | | A | | SWL | |
|-----|-------|--------|-------|-------|-------|------|-------|------|-------|-----|-------|-------|
| | MZ | DZ | MZ | DZ | MZ | DZ | MZ | DZ | MZ | DZ | MZ | DZ |
| N | .35** | .25* | | | | | | | | | | |
| E | -.21* | -.20* | .60** | .40** | | | | | | | | |
| O | -.03 | -.16 | .27** | .09 | .56** | .21* | | | | | | |
| C | -.20* | -.23* | .14 | .17 | .20* | .14 | .63** | .41* | | | | |
| A | .01 | -.36** | -.17 | .27* | -.03 | -.09 | .04 | .22* | .52** | .19 | | |
| SWL | -.23* | -.30* | .11 | .24* | .03 | .08 | .36** | .04 | .01 | .14 | .54** | .42** |

Notes. MZ – monozygotic twins, DZ – dizygotic twins. O - Openness to Experience, C - Conscientiousness, E - Extraversion, A - Agreeableness, N – Neuroticism, SWL – Satisfaction With Life.

* $p < .05$. ** $p < .01$.

Correlations between MZ twins are consistently higher than correlations between DZ twins on all variables. The biggest correlation difference is for Openness ($\Delta r = .35$), and the smallest one for Neuroticism ($\Delta r = .10$).

Multivariate Genetic Modeling: Model Comparison and Parameter Estimation

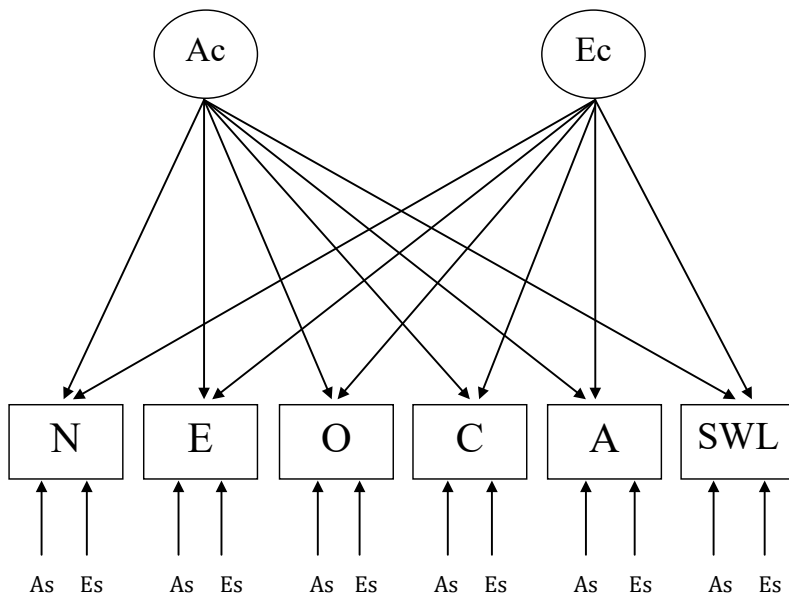
In order to specify the form of the observed covariates among the personality traits and satisfaction with life, multivariate Independent Pathway Models and Common Pathway Models were tested. A comparison of the two groups of models, as well as the comparison between full (ACE) and reduced (AE, CE) models, was carried out by using several fit indicators for all plausible models. Analysis parameters were calculated by using the method of maximum likelihood. Model evaluation was conducted based on the Akaike Information Criterion (AIC; Akaike, 1973), Bayesian Information Criterion (BIC; Schwarz, 1978), comparative fit index and the Tucker–Lewis index (CFI and TLI – optimal values higher than .95, acceptable higher than .90), the root mean square error of approximation (RMSEA - optimal values lower than .05, acceptable lower than .08), the standardized root mean square residual (SRMR), with acceptable value below .08 (Hu & Bentler, 1999), and the quotient χ^2/df (recommended < 2) (Kline, 2010).

Table 3
Fit indices for multivariate models

| | Model | χ^2/df | CFI | TLI | AIC | BIC | RMSEA (95% CI) | SRMR |
|-------------|-----------|-------------|------------|------------|-----------------|-----------------|----------------------|------------|
| Independent | ACE | 1.50 | .89 | .89 | 17411.89 | 17598.85 | .07 (.05-.10) | .11 |
| | AE | 1.41 | .92 | .91 | 17400.81 | 17558.68 | .07 (.04-.10) | .10 |
| | CE | 1.72 | .84 | .84 | 17440.81 | 17595.60 | .09 (.07-.11) | .11 |
| Common | ACE | 1.59 | .87 | .87 | 17424.44 | 17588.85 | .08 (.06-.10) | .11 |
| | AE | 1.56 | .89 | .89 | 17417.07 | 17566.05 | .07 (.05-.10) | .11 |
| | CE | 1.76 | .83 | .83 | 17444.57 | 17586.54 | .09 (.07-.11) | .11 |

Note. A – additive genetic variance, C – shared environmental variance, E – non-shared environmental variance and measurement error.

The most appropriate fit indices (Table 3) were for Independent AE model (Graph 1). All the indices were within acceptable boundaries, $\chi^2/df = 1.41$, CFI = .92, TLI = .91, RMSEA = .07, AIC = 17400.81, BIC = 17558.68, except SRMR (SRMR = .10). The estimation of the parameters of the independent AE model is showed in Table 4.



Graph 1. Independent AE model of satisfaction with life and personality traits.

Note. Ac – a common additive genetic factor, As – a unique additive genetic factor, Ec – a common non-shared environmental factor, Es – a unique non-shared environmental factor. N – Neuroticism, E – Extraversion, O – Openness to Experience, C – Conscientiousness, A – Agreeableness, SWL – Satisfaction With Life.

Table 4

Specific and common genetic and environmental contributions for AE multivariate models

| Scale | Ac^2 | As^2 | ΣA^2 | Ec^2 | Es^2 | ΣE^2 |
|------------------------|--------|--------|--------------|--------|--------|--------------|
| Satisfaction with life | .40 | .12 | .52 | .07 | .41 | .48 |
| Neuroticism | .19 | .20 | .39 | .19 | .42 | .61 |
| Extraversion | .09 | .49 | .58 | .17 | .25 | .42 |
| Openness to experience | .00 | .50 | .50 | .15 | .35 | .50 |
| Conscientiousness | .13 | .44 | .57 | .22 | .21 | .23 |
| Agreeableness | .00 | .49 | .49 | .08 | .43 | .51 |

Note. Ac^2 – a common genetic factor, As^2 – a unique genetic factor, ΣA^2 – total genetic variance, Ec^2 – a common non-shared environmental factor, Es^2 – a unique non-shared environmental factor, ΣE^2 – total environmental variance.

Results presented in Table 4 show that satisfaction with life and all personality traits have a moderate to strong genetic bases (from 58% for Extraversion to 39% for Neuroticism). Also, common genetic influences range from 40% (for satisfaction with life) to 0% (for Openness to Experience and Agreeableness). Unique genetic factors are most prominent in Openness (50%), Agreeableness (49%), Extraversion (49%) and Conscientiousness (40%). Common environmental impacts are generally low, foremost being Conscientiousness (22%) and Neuroticism (19%). However, unique environmental contributions are moderate to strong (from 61% for Neuroticism, Openness and Agreeableness - 50% and 51%, to 23% for Conscientiousness).

Table 5

Additive genetic and non-shared environmental contributions to phenotypic correlations of SWL and personality traits

| Sources of variance | r_f | $Ac\%$ | $Ec\%$ |
|--|-------|--------|--------|
| Satisfaction with life X neuroticism | .38 | 71 | 29 |
| Satisfaction with life X extraversion | .29 | 66 | 34 |
| Satisfaction with life X openness | .10 | 0 | 100 |
| Satisfaction with life X conscientiousness | .31 | 61 | 39 |
| Satisfaction with life X agreeableness | .07 | 0 | 100 |

Note. r_f – coefficient of phenotypic correlations, Ac – a common genetic factor, Ec – a common non-shared environmental factor.

Phenotypic correlations between satisfaction with life and different personality traits (Table 5) were low to moderate ($.07 \leq r \leq .38$), and the share of genetic factors in the covariance of these measures ranged from 0% to 71%. Non-shared environmental factors explained significantly less of co-variations, except for Openness and Agreeableness. For these two dimensions environmental factors determined 100% of phenotypic correlations with satisfaction with life. Genetic factors had the main role in the case of co-variation between satisfaction with life and Neuroticism (71%), Extraversion (66%) and Conscientiousness (61%).

Discussion

The first objective of this study was to replicate the association of FFM domain traits and satisfaction with life. Personality traits were well-established predictors of wellbeing in satisfaction with life in particular (Kandler et al., 2006; Kandler et al., 2007; Weiss et al., 2008). We set out to examine the etiological factors involved in the associations between personality and satisfaction with life: the role of genetic and environmental factors in the link between personality and satisfaction with life. The results were in line with previous studies showing that satisfaction with life was connected to all personality traits (DeNeve & Cooper, 1998; Steel et al., 2008; Vitterso, 2001), with higher correlations among monozygotic twin pairs, suggesting a potential genetic base.

We have also hypothesized that satisfaction with life represents one of the manifestations of personality traits, without independent genetic basis, in line with some previous studies (e.g., Weiss et al., 2008). An important finding of the current study is that satisfaction with life is genetically indistinct from personality traits, especially those reflecting emotional stability as low Neuroticism, social or physical activity as Extraversion, and constraint and self-discipline as Conscientiousness. The close genetic relationship between personality traits such as Emotional Stability, Extraversion and Conscientiousness, and so-called Happiness traits could be the key to understanding the comorbidity in psychopathology (Kandler et al., 2007). These findings show that general genetic variance, underlying individual differences in satisfaction with life, is indeed responsible for individual differences in Neuroticism, Extraversion, and Conscientiousness. Thus, the cognitive evaluation of satisfaction with life seems to be mostly based on emotional tendencies constituted in the five-factor model. A negligible unique genetic effect that contributes to variance in satisfaction with life suggests the importance of environmental factors for this phenomenon.

Moreover, findings have actually pointed to both genetic and environmental influences, yet with the unique environmental effect being the most important. As such, satisfaction with life appears to be environmentally influenced by life events, situations, social relationships, but also by genetically driven tendency common to most personality traits. Such interpretation implies potentials for

change in satisfaction with life, and benefits of wellbeing interventions through the process of relearning, social learning or adopting a different life philosophy (e.g., Archontaki et al., 2013; Hahn et al., 2013; Kendler et al., 2011). The present findings indicate that the relationship between subjective wellbeing and a range of health and social relationship factors may also be mediated by common genetic effects. In future twin studies, researchers could be interested in examining the relationships between subjective wellbeing and factors such as cognitive styles, important life events, controlling for personality, preferably at a behavior-genetic level. Such studies could determine whether these relationships are also moderated by common genetic effects.

While genetic factors seem to play a moderate role in the total variability in satisfaction with life, they appear to have a major role in the relations between distinct personality traits and satisfaction with life. Genetic factors are more important in explaining the correlation between Neuroticism, Extraversion, and Conscientiousness with satisfaction with life. More specifically, the genetic dispositions to experience a low degree of depression and anxiety, and a high degree of positive emotions and activity, as well as being constrained, self-efficient, achievement-strived and self-disciplined, contribute to a perception of life as good and satisfactory. Environmental factors fully explain the relationship between satisfaction with life and Openness and Agreeableness, which might be accounted by complex processes of social learning and individual experience.

These findings have potential implications for the set point theory of subjective wellbeing (Diener, 2000). Previous findings (e.g., Steel et al., 2008) have shown that both personality traits and environmental events bring up changes in the set point of wellbeing. A degree of adaptation to various situations and circumstances could be due to individual personality differences. Therefore, the genetic effects of personality may affect the rate that wellbeing returns to the set point after a misbalance and response to environmental factors. There are suggestions (e.g., Weiss et al., 2008) that personality may create an affective reserve, which can be called upon in times of stress and recovery. Moreover, a person with a strong tendency to experience positive emotions, activity, energy, self-efficiency, and self-discipline, combined with a low tendency to depression and anxiety, might recall a high number of pleasant life episodes and consequently summarize life as mostly positive. On the other hand, a person scoring low on these dimensions might have mental images comprising of situations in life that are less satisfactory.

The results of this study have implications for further molecular genetics studies of subjective wellbeing, which require focusing on searching for specific genes that influence personality, in order to understand how the complex processes starting with DNA-molecules end up with a personal evaluation of one's life as good and satisfactory.

The results of this study provide a confirmation of the previous research on satisfaction with life and personality traits. At the same time, the results provide guidance for future research in the field of behavior genetics. Besides a larger

sample, satisfaction with life additionally needs to be operationalized through an emotional component in order to gain more specific insights into the connection of cognitive and emotional aspects of satisfaction with life and personality traits, in light of genetic and environmental factors. Findings on the environmental impacts would be extended by a family design that would provide insights into the impact of the passive gene-environment correlation, in shaping of co-variation between satisfaction with life and personality traits.

References

- Akaike, H. (1970). Statistical predictor identification. *Annals of the Institute of Statistical Mathematics*, 22, 203–217.
- Archontaki, D., Lewis, G. J., & Bates, T. C. (2013). Genetic influences on psychological wellbeing: a nationally representative twin study. *Journal of Personality*, 81, 221–230. doi:10.1111/j.1467-6494.2012.00787.x
- Bartels, M. (2015). Genetics of wellbeing and its components satisfaction with life, happiness, and quality of life: A review and meta-analysis of heritability studies. *Behavior Genetics*, 45, 137–156. doi:10.1007/s1051
- Bartels, M., & Boomsma, D. I. (2009). Born to be happy? The etiology of subjective wellbeing. *Behavior Genetics*, 39, 605–615. doi:10.1007/s10519-009-9294-8
- Bouchard, T. J., Jr. (1997). The genetics of personality. In K. Blum & E. P. Noble (Eds.), *Handbook of Psychiatric Genetics* (pp. 273–296). Chemical Rubber Company; Boca Raton, FL.
- Butković, A., Hlupić, T. V., & Bratko, D. (2017). Physical activity and personality: A behaviour genetic analysis. *Psychology of Sport and Exercise*, 30, 128–134. doi:10.1016/j.psychsport.2017.02.005
- Costa, P. T., & McCrae, R. R. (1980). Influence of Extraversion and Neuroticism on subjective wellbeing: Happy and unhappy people. *Journal of Personality and Social Psychology*, 38(4), 668–678. doi:10.1037/0022-3514.38.4.668
- DeNeve, K. M., & Cooper, H. (1998). The happy personality: A meta-analysis of 137 personality traits and subjective wellbeing. *Psychological Bulletin*, 124, 197–229.
- Diener, E. (2000). Subjective wellbeing, the science of happiness and a proposal for a national index. *American Psychologist*, 55, 34–43. doi:10.1037//0003-066X.55.1.34
- Diener, E. D., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The Satisfaction With Life Scale. *Journal of Personality Assessment*, 49(1), 71–75. doi:10.1207/s15327752jpa4901_13
- Diener, E., & Suh, E. M. (1998). Subjective wellbeing and age: An international analysis. In K. W. Schaie & M. P. Lawton (Eds.), *Annual review of gerontology and geriatrics, Vol. 17: Focus on emotion and adult development* (pp. 304–324). New York: Springer. doi:10.1891/0198-8794.17.1.304

- Diener, E., & Suh, E. M. (1999). National differences in subjective wellbeing. In D. Kahneman, E. Diener, & N. Schwarz (Eds.), *Wellbeing: The foundations of hedonic psychology* (pp. 434–450). New York: Sage.
- Diener, E., Nickerson, C., Lucas, R. E., & Sandvik, E. (2002). Dispositional affect and job outcomes. *Social Indicators Research*, *59*, 229–259. doi:10.1023/A:1019672513984
- Gigantesco, A., Stazi, M. A., Alessandri, G., Medda, E., Tarolla, E., & Fagnani, C. (2011). Psychological wellbeing (PWB): a natural life outlook? An Italian twin study on heritability of PWB in young adults. *Psychological Medicine*, *41*, 2637–2649. doi:10.1017/S0033291711000663
- Grevenstein, D., & Bluemke, M. (2015). Can the Big Five explain the criterion validity of Sense of Coherence for mental health, satisfaction with life, and personal distress? *Personality and Individual Differences*, *77*, 106–111. doi:10.1016/j.paid.2014.12.053
- Hahn, E., Johnson, W., & Spinath, F. M. (2013). Beyond the heritability of satisfaction with life—the roles of personality and twin-specific influences. *Journal of Research in Personality*, *47*, 757–767. doi:10.1016/j.jrp.2013.07.003
- Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, *6*, 1–55. doi:10.1080/10705519909540118
- IBM Corp. (2012). *IBM SPSS Statistics for Windows, version 21.0*. Armonk, NY: IBM Corp.
- Jang, K. L., Livesley, W. J., & Vernon, P. A. (1996). Heritability of Big Five dimensions and their facets: A twin study. *Journal of Personality*, *64*, 577–591. doi:10.1111/j.14676494.1996.tb00522.x
- Johnson, A. M., Vernon, P. A., & Feiler, A. R. (2008). Behavioral genetic studies of personality: An introduction and review of the results of 50 years of research. In G. J. Boyle, G. Matthews, & D. H. Saklofske (Eds.), *The Sage handbook of personality theory and assessment*. Vol. 1: Personality theories and models (pp. 145–173). London, England: Sage.
- Kendler, K. S., Gatz, M., Gardner, C. O., & Pedersen, N. L. (2006). A Swedish national twin study of lifetime major depression. *American Journal of Psychiatry*, *163*(1), 109–114. doi:10.1176/appi.ajp.163.1.109
- Kendler, K. S., Myers, J. M., & Keyes, C. L. (2011). The relationship between the genetic and environmental influences on common externalizing psychopathology and mental wellbeing. *Twin Research and Human Genetics*, *14*, 516–523. doi:10.1375/twin.14.6.516
- Keyes, C. L. M. (2005). Mental illness and/or mental health? Investigating axioms of the complete state model of health. *Journal of Consulting and Clinical Psychology*, *73*, 539–548. doi:10.1037/0022-006X.73.3.539
- Keyes, C. L. M., Myers, J. M., & Kendler, K. S. (2010). The structure of genetic and environmental influences on mental wellbeing. *American Journal of Public Health*, *100*, 2379–2384. doi:10.2105/AJPH.2010.193615

- Kline, R. B. (2010). *Principles and practice of structural equation modeling*. New York, NY: Guilford.
- Knežević, G., Džamonja Ignjatović, T., & Đurić Jočić, D. (2004). *Petofaktorski model ličnosti [Five Factor Model of Personality]*. Beograd: Centar za primenjenu psihologiju.
- Larsen, R. J., & Eid, M. (2008). Ed Diener and the Science of Subjective Wellbeing. In M. Eid & R. J. Larsen (Eds.). *The science of subjective wellbeing* (pp. 1–13). New York, NY: Guilford Press.
- Layard, R. (2010). Measuring subjective wellbeing. *Science*, 327, 534–535. doi:10.1126/science.1186315
- Loewenthal, K. M. (2004). *An introduction to psychological tests and scales*, 2nd ed. Hove: Psychology Press.
- Lucas, R. E., Clark, A. E., Georgellis, Y., & Diener, E. (2003). Reexamining adaptation and the set point model of happiness: Reactions to changes in marital status. *Journal of Personality and Social Psychology*, 84, 527–539. doi:10.1037/0022-3514.84.3.527
- Nes, R. B., Roysamb, E., Tambs, K., Harris, J. R., & Reichborn-Kjennerud, T. (2006). Subjective wellbeing: genetic and environmental contributions to stability and change. *Psychological Medicine*, 36, 1033–1042. doi:10.1017/S0033291706007409
- Riemann, R., Angleitner, A., & Strelau, J. (1997). Genetic and environmental influences on personality: A study of twins reared together using the self- and peer-report NEO-FFI scales. *Journal of Personality*, 65(3), 449–475. doi:10.1111/j.14676494.1997.tb00324.x
- Rijsdijk, F. V., & Sham, P. C. (2002). Analytic approaches to twin data using structural equation models. *Briefings in Bioinformatics*, 3(2), 119–133. doi:10.1093/bib/3.2.119
- Rosseel, Y. (2012). lavaan: An R package for structural equation modeling. *Journal of Statistical Software*, 48, 1–36. Retrieved from <http://www.jstatsoft.org/v48/i02/>
- Schimmack, U., Diener, E., & Oishi, S. (2002). Life-satisfaction is a momentary judgment and a stable personality characteristic: The use of chronically accessible and stable sources. *Journal of Personality*, 70, 345–385. doi:10.1007/978-90-481-2354-4_9
- Schimmack, U., Radhakrishnan, P., Oishi, S., Dzokoto, V., & Ahadi, S. (2002). Culture, personality, and subjective wellbeing: Integrating process models of satisfaction with life. *Journal of Personality and Social Psychology*, 82, 582–593. doi:10.1037/0022-3514.82.4.582
- Schwarz, G. (1978). Estimating the dimension of a model. *The Annals of Statistics*, 6(2), 461–464.
- Steel, P., Schmidt, J., & Shultz, J. (2008). Refining the relationship between personality and subjective wellbeing. *Psychological Bulletin*, 134(1), 138–161.

- Stubbe, J. H., Posthuma, D., Boomsma, D. I., & De Geus, E. J. (2005). Heritability of satisfaction with life in adults: a twin-family study. *Psychological Medicine, 35*, 1581–1588. doi:10.1017/S0033291705005374
- Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics, 6th ed.* Boston: Pearson.
- Van den Berg, S. M., de Moor, M. H., McGue, M., Pettersson, E., Terracciano, A., Verweij, K. J., ... & Boomsma, D. I. (2014). Harmonization of Neuroticism and Extraversion phenotypes across inventories and cohorts in the Genetics of Personality Consortium: An application of the item response theory. *Behavior Genetics, 44*, 295–313. doi:10.1007/s10519-014-9654-x
- Vasić, A., Šarčević, D., & Trogrlić, A. (2011). Zadovoljstvo životom u Srbiji [Satisfaction with life in Serbia]. *Primenjena psihologija, 4*, 151–177. doi:10.19090/pp.2011.2.151-177
- Vitterso, J. (2001). Personality traits and subjective wellbeing: Emotional stability, not Extraversion, is probably the important predictor. *Personality and Individual Differences, 31*, 903–914. doi:10.1016/S0191-8869(00)00192-6
- Vukasović, T., & Bratko, D. (2015). Heritability of personality: a meta-analysis of behavior genetic studies. *Psychological Bulletin, 141*(4), 769–785. doi:10.1037/bul0000017
- Weiss A., Bates T. C., & Luciano M. (2008). Happiness is a personal(ity) thing: the genetics of personality and wellbeing in a representative sample. *Psychological Science, 19*(3), 205–210. doi:10.1111/j.1467-9280.2008.02068.x

Selka Sadiković
Snežana
Smederevac
Duškanka Mitrović
Ilija Milovanović

Odsek za psihologiju,
Filozofski fakultet,
Univerzitet u Novom
Sadu

BIHEJVORALNO-GENETIČKE OSNOVE RELACIJA OSOBINA LIČNOSTI I ZADOVOLJSTVA ŽIVOTOM

Rezultati savremenih istraživanja o vremenskoj stabilnosti subjektivnog blagostanja usmerili su pažnju istraživača na stabilne dispozicione karakteristike kao verovatan izvor individualnih razlika u zadovoljstvu životom. Glavni cilj ovog istraživanja usmeren je na ispitivanje stepena preklapanja genske varijanse zadovoljstva životom i osobina ličnosti iz modela Velikih pet (FFM). Uzorak su činili 121 par monozigotnih i 61 par dizigotnih blizanaca (prosečna starost 24.59 godina, SD = 7.11) sa teritorije Srbije. Na podacima prikupljenim pomoću Skale zadovoljstva životom i Revidiranog inventara ličnosti NEO-PI-R sprovedeno je multivarijatno genetsko modelovanje. Rezultati istraživanja ukazuju na to da najprikladnije indekse podesnosti ostvaruje AE model nezavisne putanje ($\chi^2/df = 1.41$, CFI = .92, TLI = .91, RMSEA = .07, AIC = 17400.81, BIC = 17558.68, SRMR = .10). Zadovoljstvo životom i svih pet osobina ličnosti dele umerene do jake genske osnove, dok zajednički genski doprinos za zadovoljstvo životom iznosi 40%. Rezultati istraživanja ukazuju na to da se specifični doprinosi nedeljene sredine mogu opisati kao umereni do jaki (od 61% za Neuroticizam, preko 41% za zadovoljstvo životom, do 23% za Savesnost). Čini se da genske osnove koje su zajedničke Neurotizmu, Ekstraverziji i Savesnosti doprinose individualnim razlikama u zadovoljstvu životom, te da je kognitivna procena zadovoljstva životom u velikoj meri zasnovana na emocionalnim tendencijama obuhvaćenim FFM. Rezultat da jedinstveni sredinski činioци značajno oblikuju zadovoljstvo životom ukazuje na potencijalne dobiti od sprovođenja intervencija zasnovanih na učenju ili usvajanju određene životne filozofije.

Ključne reči: blizanačka studija, multivarijatno genetsko modelovanje, Petofaktorski model, zadovoljstvo životom