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Revealing complex relations between personality and fitness: HEXACO personality traits, life-time reproductive success and the age at first birth

Janko Međedović, Mina Šoljga, Ana Stojaković, Ivan Grojević

A B S T R A C T

HEXACO personality framework represents one of the most prominent models of human personality traits. Despite of this, there are no empirical studies that estimate the fitness outcomes of HEXACO traits, although this topic represents a basic foundation for the study of the contemporary evolution of personality. In the present research we explored the relations between HEXACO personality traits, and three fitness indicators: the number of children, the number of grandchildren and the age at first birth. Participants were selected from the community population of individuals in a post-reproductive stage (N=255; Mage=64.9 years). Results from the regression analyses showed that the number of children was associated with lower scores on Honesty and Openness and higher scores on Emotionality; Agreeableness was positively associated with this criterion but only in males. The number of grandchildren was predicted by low Openness and marginally by high Conscientiousness, while Honesty had positive zero-order correlation with the criterion measure. Individuals with higher Extraversion tended to reproduce earlier in their lifetime. Findings contribute to the empirical data which suggest that personality is related to biological fitness in contemporary human populations: this means that personality is likely under natural selection and hence, it continues to evolve.

Keywords: HEXACO personality traits, Fitness, Lifetime reproductive success, Age at first birth

1. Introduction

1.1. Personality and fitness

There are three conditions which must be fulfilled in order for natural selection to act on a specific trait: the trait must be substantially heritable, individuals must differ on that characteristic and the trait must be related to fitness (Sinervo & Calsbeek, 2010). If we analyze personality traits as possible targets for natural selection, it is clear that the first two conditions are met: there are large individual differences in personality traits and about 40% of these differences are genetically

determined (Bratko & Vukasović, 2015). The third condition can be most effectively evaluated by exploring the relations between personality and reproductive success, since it represents one of the core fitness indicators (Hunt & Hodgson, 2010). This is the reason why the research of the relation between personality and fertility is of high importance. Indeed, in the past decade studies on this topic have become more frequent. Empirical research in this field usually investigated the Big Five model of personality (John, Naumann, & Soto, 2008) which consists of the following traits: Neuroticism (emotional instability), Extraversion (sociability, activity and positive affect), Agreeableness (cooperation and gentleness), Conscientiousness (prudence and orderliness) and Openness to experience (creativity and inquisitiveness). Obtained findings are quite heterogeneous which should probably be expected since the relation in question is a complex one. The data on the positive relation between Extraversion and reproductive success are relatively congruent (Bailey et al., 2013; Gurven, von Rueden, Stieglitz, Kaplan, & Rodriguez, 2014). Findings of negative relations between Openness and the number of children are quite consistent as well (Jokela, Alvergne, Pollet, & Lummaa, 2011). Data for other traits are more equivocal. Empirical findings showed both positive and negative associations between Neuroticism (Alvergne, Jokela, & Lummaa, 2010; Jokela et al., 2011), Conscientiousness (Alvergne et al., 2010; Dijkstra & Barelds, 2009) and reproductive success. The effects of Agreeableness on fertility are rarely found, but detected associations are positive (Jokela et al., 2011). It is important in what stage of a life-span the number of offspring is measured. Life-time reproductive success is the best way of measuring fitness, because it provides the most accurate estimation of gene transmission by including not one, but two generations of offspring in the analysis. Furthermore, analyzing the number of children and grandchildren can provide an insight into the evolutionary trade-offs of personality. The same personality traits that facilitate fertility can lead to lower investment in offspring, thus decreasing the offspring quality and the probability of their own reproduction. Meta-analysis of the relations between personality and fitness in animals showed that bolder males have higher reproductive success but lower survival rates which negatively influences the upbringing of offspring (Smith & Blumstein, 2008). In the research of Berg, Lummaa, Lahdenperä, Rotkirch, and Jokela (2014) findings showed that there are no trade-offs regarding personality and fitness: higher Extraversion, lower Conscientiousness and Openness were related both to a higher number of children and grandchildren. However, the possibility of the fitness trade-offs still remains open: former research did find positive effects of Neuroticism on reproductive success, but negative on the offspring quality (Alvergne et al., 2010). When estimating the relations between personality and fitness, it could be very important to include the age at first birth in the analysis. Individuals who reproduce earlier in the lifetime could have higher

total number of offspring (Liu & Lummaa, 2011). We found only one study which explored the relations between personality and the age at first birth (Jokela et al., 2011). The results of this research showed that Extraversion and Agreeableness were negatively, while Openness to experience was positively related to the age of first reproduction. This finding means that cooperative and sociable individuals with more traditional values have their first child earlier in their lifetime.

1.2. Goals of the present research

Research of the link between personality and fitness is crucial in our understanding of evolutionary forces that influence personality. In the exploration of that relation, an estimation of both number of children and grandchildren and the age at first birth have important explanatory role. Having this in mind, we explored the predictive power of personality traits on both short and long-term reproductive success in the present research. Since previous research suggested that the associations between personality and fitness may differ for males and females (Penke & Jokela, 2016), we explored the moderating role of sex in this link as well. Finally, some data (Gangestad, 2010) suggest that personality may not be under directional selection (represented by linear relation between a trait and fitness) but stabilizing selection (which is depicted by inverse U relation between a trait and fitness). This is why we analyzed non-linear (quadratic) relations between HEXACO traits and life-time reproductive success in the present study too. The HEXACO model of personality (Ashton et al., 2004) is investigated in the present research. We believe that the HEXACO model could be fruitful for evolutionary research because the sixth factor, Honesty-Humility, is related to reciprocal altruism, together with Agreeableness trait, while Emotionality is interpreted as keen altruism (Ashton & Lee, 2007). As far as we are aware, this is the first research where the relations between HEXACO traits and fitness are investigated. The absence of existing findings between HEXACO traits and fitness makes this study exploratory in its nature. However, we made some approximate hypotheses leaning on the similar models of personality such is Big Five/Five Factor model. Previous research indicates that higher Extraversion and lower Openness should be related to fertility (for other traits the findings are equivocal), so we expect similar effects in the present study as well. Furthermore, the existing data show positive relations between psychopathy and the number of children (Međedović, Petrović, Želeskov-Đorić, & Savić, 2017); since psychopathy can be mapped on the negative pole of Honesty-Humility factor (Međedović & Petrović, 2015), we expect negative relations between Honesty and short-term reproductive success. Extraversion and Agreeableness

should be negatively related with age at first birth, while Openness should be positively associated with reproductive timing.

2. Method

2.1. Sample

In order to estimate the life-time reproductive success, we composed a heterogeneous community sample of individuals who have finished their reproductive stage, which was the main inclusion criterion for the study participants (we sampled males older than 55 and females older than 50 years). The sample was a convenient one and all of the subjects participated on a voluntary basis. Data were collected in several homes for elderly persons in Serbia, but also in the private homes of the participants. The sample numbered 255 individuals with a mean age of 64.9 (SD=11.06) years. Sex ratio in the sample was roughly the same (51.8% of male participants). On average, participants had 13 years of formal education, which corresponds to first year of faculty. This implies that research subjects are more educated than average citizen of Serbia. All participants had elementary reading skills. None of the subjects had diagnosed psychiatric disturbances at the time of data collection. Most of the participants were born and grew up in larger urban areas in Serbia (65%).

2.2. Measures

HEXACO-PI-R (Lee & Ashton, 2006; see Međedović, Čolović, Dinić, and Smederevac (2018) for the Serbian adaptation of the inventory) was used for the exploration of the participants' personality traits. It is a self-report measure with a standard 5-point Likert scale for responding. The instrument provides scores on six major personality dimensions, measured with 16 items each: Honesty-Humility, Emotionality, Extraversion, Agreeableness, Conscientiousness and Openness to experience. Filling the questionnaire lasted for 45 min on average.
Other data used in the analysis was collected by the interview, held with every participant independently. Subjects provided the number of children and grandchildren they have. Participants also reported how old they were when they got their first child.

3. Results

3.1. Descriptive statistics, reliabilities and bivariate relations between the Variables

The first conducted analysis aimed to show descriptive statistics, scale reliabilities and the associations between the examined measures. These results

are shown in Table 1. All of the personality scales have adequate reliabilities (αs≥0.70). Analysis of the measures' distribution showed that all three criteria measures significantly deviate from the normal distribution. Because of this we performed two correlation analyses. In the first one we used Spearman's correlations coefficient, which is robust to the distribution of the variables - this analysis was performed on raw measures. Secondly, the measures which deviated from normal distribution are normalized using the Blom's algorithm (Blom, 1958). Pearson's correlation coefficients are calculated on normalized measures afterwards. The results of these analyses are shown in Table 1. Analysis results revealed the relations between personality traits: Honesty was positively associated to Extraversion and Conscientiousness. Emotionality and Agreeableness positively correlated as well. Extraversion showed positive associations to Conscientiousness and Openness. Finally, Openness and Conscientiousness positively correlated between themselves. Theoretically expected associations were obtained between fitness measures as well: two indicators of reproductive success correlate positively and have negative associations with the age at first birth. This indicates the higher overall reproductive success in individuals who have earlier start of reproduction. Primary goal of the present research was to examine the relations between personality and fitness measures. Honesty-Humility showed opposite relations with two indicators of reproductive success: negative with the number of children and positive correlations with the number of grandchildren. Short-term fertility is positively associated with Emotionality trait as well (on normalized data). Finally, Extraversion is related to lower age at first birth, which implies that extraverts had their first child earlier in their lifetime. We analyzed quadratic relations between personality and fitness as well. However, no quadratic relations were detected, which suggests that the relations between personality and fitness are linear, at least in the present sample.

Table 1
Descriptive statistics, scale reliabilities and the relations between examined measures.

	M	SD	α	K-S z	1	2	3	4	5	6	7	8	9
1. Honesty	3.83	0.66	0.73	1.72**		0.09	0.12	−0.11	0.16*	0.08	−0.20**	0.16*	−0.12
2. Emotionality	3.03	0.66	0.70	0.87	0.07		0.05	0.34**	−0.13*	−0.07	0.13*	0.05	−0.20**
3. Extraversion	3.31	0.70	0.80	0.90	0.16*	0.06		−0.03	0.23**	0.28**	0.01	0.03	−0.26**
4. Agreeableness	3.31	0.72	0.75	0.85	−0.09	0.30**	−0.05		−0.04	0.11	0.07	−0.02	0.07
5. Conscientiousness	3.71	0.67	0.80	0.85	0.18**	−0.08	0.22**	−0.04		0.10	−0.02	0.06	0.04
6. Openness	3.43	0.74	0.74	1.17	0.11	−0.07	0.28**	0.07	0.14*		−0.11	−0.19**	−0.00
7. Number of children	1.67	0.94		4.37**	−0.17**	0.10	0.01	0.03	−0.00	−0.12		0.28**	−0.19**
8. Number of grandchildren	0.90	1.39		5.54**	0.19**	0.05	0.05	−0.02	0.06	−0.15*	0.30**		−0.49**
9. Age at first birth	27.69	5.09		1.71**	−0.11	−0.21**	−0.27**	0.10	0.02	0.02	−0.24**	−0.50**	

Notes: Spearman coefficients of correlation obtained on raw measures are shown below the diagonal; Pearson coefficients of correlation obtained on normalized measures are shown above the diagonal.

* $p < .05$.

** $p < .01$.

3.2. Personality as a predictor of fitness

Since bivariate analysis showed that some of the personality traits significantly correlate, a multivariate analysis probably provides more accurate estimations of the link between personality and fitness. In order to explore the prediction of fitness measures, three regression models are postulated. The number of children and grandchildren and the age at first birth are set as criteria variables. Personality traits were set as predictor variables. Participants' sex and age are controlled in the analysis as well. Similarly to the correlation analyses we show regression models where both raw and normalized fitness measures were set as the criteria variables. However, since the fitness indicators are count measures, we added the Poisson's regressions on raw measures as well[1]. The results of the regression analysis are shown in Table 2. The first regression function showed that the number of children is associated with elevated Emotionality and lower scores on Honesty and Openness factor. Agreeableness had marginally significant contribution to the prediction of the number of children. The second regression model showed that older subjects with lower scores on Openness to experience had more grandchildren. Conscientiousness was marginally significant in linear models and fully significant predictor in Poisson's regression. Finally, the third model showed that individuals who are more extraverted tend to reproduce earlier in their lifetime. The age at first birth is higher in younger and more educated males as well. We conducted additional analyses in order to further clarify the relation between personality and fitness. Since the short-term and longterm reproductive success mutually covariate, we wanted to examine the unique variance of the long-term reproductive success, similarly as it was done in the previous research (Berg et al., 2014). This is why we ran another regression model where the number of children was added to the predictors set in order to control its variance. A slightly different regression function was obtained in this case: Openness ($\beta=-0.09$; $p=.08$ for linear model based on a raw data; $\beta=-0.10$; $p=.06$ for linear model based on normalized data and $z=-2.51$; $p < .05$ in Poisson's regression) and Conscientiousness ($\beta=0.10$; $p=.06$ for linear model based on a row data; $\beta=0.10$; $p=.05$ for linear model based on normalized data and $z=3.22$; $p < .01$ in Poisson's regression) were marginally significant (in linear regression models) while Honesty was a fully significant predictor of the long-term reproductive success's when the number of children was controlled ($\beta=0.11$; $p < .05$ for linear model based on a row data; $\beta=0.11$; $p < .05$ for linear model based on normalized data and $z=3.00$; $p < .01$ as estimated in Poisson's regression).

[1] Beside of the fact that criteria variables are count measures, it is important to mention that the distribution of fertility measures did not fit Poisson's distribution (K-Sz=2.22; $p < .001$ for the number of children and K-Sz=3.19; $p < .001$ for the number of grandchildren; the age at first birth did have Poisson's distribution in the present data: KSz= 0.96; $p > .05$). This is another reason why we showed all regression models in order to display the results obtained under different assumptions. However, we believe that in these circumstances linear regression with normalized criteria measures may represent the most optimal model.

3.3. Sex as a moderator of the personality-fitness link

Previous research suggested that the associations between personality traits and reproductive success may differ between males and females (Penke & Jokela, 2016). This is why we explored the moderating role of sex in the relations between personality traits and the number of children. Following the recommendations of West, Aiken, and Krull (1996), we mean centered personality measures and calculated the product terms of personality and participants' sex. These terms are entered as new variables in the regression models. Only one statistically significant interaction emerged, the one which depicts moderating role of sex on the link between Agreeableness and the number of children ($\Delta R2=0.02$; $\Delta F(1, 246)=3.96$; $p < .05$ for normalized data; although, the interaction is detected in all models): elevated Agreeableness facilitates reproductive success, but only in males. This interaction is graphically shown on Fig. 1.

4. Discussion

HEXACO personality model represents a prominent contemporary operationalization of personality traits (Lee & Ashton, 2006). Although the model is frequently used in research, there are no data regarding the links between HEXACO traits and Darwinian fitness, so far. This represents a major gap in a literature since the relations between a personality and fitness represent a starting point for the exploration of evolutionary forces which may influence personality. In the present research we wanted to address this question by examining the relations between HEXACO traits and three common fitness indicators in a sample of post-reproductive individuals. Research findings are largely in line with previous data obtained on similar personality models, but provide novel insights as well, especially in regard to the associations between Honesty-Humility trait and fitness. Hence, the present data contribute to the assumptions that personality traits are related to fitness in contemporary humans which makes them a probable target for natural selection.

Table 2
Personality traits as predictors of fitness measures.

	Number of children			Number of grandchildren			Age at first birth		
	Linear (raw)	Linear (normalized)	Poisson (raw)	Linear (raw)	Linear (normalized)	Poisson (raw)	Linear (raw)	Linear (normalized)	Poisson (raw)
	β	β	z	β	β	z	β	β	z
Sex	−0.10	−0.09	−0.88	0.01	0.02	−0.04	−0.39**	−0.39**	−4.37**
Age	−0.18**	−0.18**	−1.97*	0.46**	0.47**	9.57**	−0.18**	−0.22**	−2.52*
Honesty	−0.15*	−0.15*	−1.57	0.07	0.05	1.76†	0.02	0.01	0.31
Emotionality	0.23**	0.23**	2.19*	0.03	0.02	0.24	0.02	0.03	0.21
Extraversion	0.08	0.08	0.91	−0.01	0.01	−0.57	−0.20**	−0.19**	−2.60**
Agreeableness	0.12†	0.12†	1.29	0.04	0.04	0.35	−0.05	−0.04	−0.66
Conscientiousness	0.02	0.01	0.21	0.11†	0.11†	2.42*	0.05	0.05	0.60
Openness	−0.14*	−0.13*	−1.45	−0.15*	−0.15**	−3.55**	0.06	0.04	0.79
F	4.23**	4.21**		11.07**	11.96**		8.83**	9.75**	
R^2	0.12	0.12		0.27	0.28		0.25	0.27	
AIC			730.12			634.61			1302.5

† $p < .1$.
* $p < .05$.
** $p < .01$.

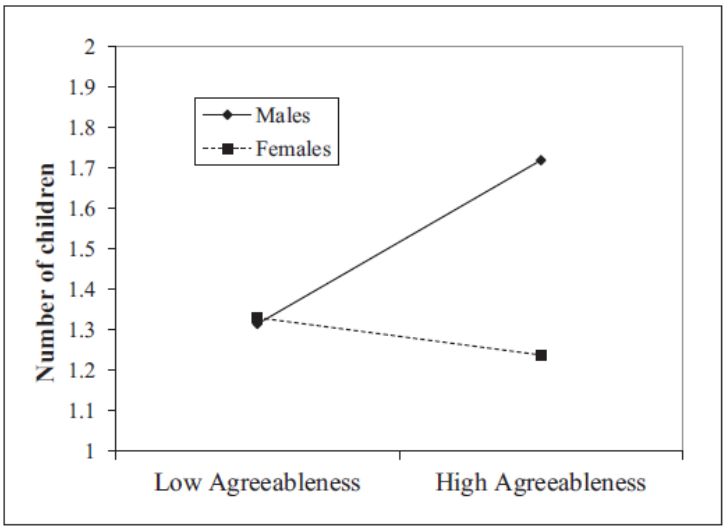

Fig. 1. Moderating role of the participants' sex on the link between Agreeableness and the number of children.

4.1. Personality traits associated with the number of children

Three personality traits are found to be related with short-term reproductive success. The number of children is negatively predicted by Openness to experience. Individuals who are more cognitively rigid and conventional tend to have more children. This finding is in line with several previous studies (Berg et al., 2014; Jokela et al., 2011). Openness is related to higher education and academic achievement (Diseth, 2003), while persons high on this trait tend to reject traditional social norms (Lee, Ashton, Ogunfowora, Bourdage, & Shin, 2010) which could lead to delayed reproduction and lower fertility. Results showed that Emotionality is positively related to the number of children. This result is congruent with previous studies which showed that emotional instability can facilitate fertility (Jokela et al., 2011). Persons who tend to be more emphatic, anxious and emotionally bonded with other people have a higher number of children. These traits could be related to easier finding and retaining romantic partners which in turn can lead to successful reproduction. Previous data showed that Neuroticism, a trait similar to Emotionality can facilitate sensitivity towards social exclusion which can have positive adaptive consequences (Denissen & Penke, 2008). Individuals high on Emotionality are very risk averse (Weller & Tikir, 2011) which can also be beneficial for fitness. Low Honesty-Humility is also related to the short-time reproductive success. The negative pole of Honesty can be described by manipulativeness, a low sense for fair-play, heightened motivation for wealth and privilege, followed by entitlement and superiority over others (Ashton, Lee, & de Vries, 2014). It has been theorized that low Honesty can provide adaptive gains as a result of exploitation of others (Ashton & Lee,

2007). Possible proximate mechanisms that could enable higher fitness to individuals with low Honesty could include elevated motivation for gaining resources like power and social status (Pozzebon & Ashton, 2009). Finally, this result is in line with the data showing that low Honesty is positively related to short-term mating (Lee et al., 2013) and the data showing that psychopathy, a trait depicted by low Honesty (Međedović & Petrović, 2015), is positively related to the reproductive success (Međedović et al., 2017). Detected interaction revealed another relation between personality and fertility: Agreeableness was positively related to the number of children but only in males. There are previous data which suggest that Agreeableness may facilitate fitness in males: women rate the long-term relationships with more agreeable male partners as more satisfying (Donnellan, Conger, & Bryant, 2004). Furthermore, Agreeableness is positively related to parenting qualities in males - responsiveness of fathers and the ability to create positive ambience in the relations with children (Kochanska, Friesenborg, Lange, & Martel, 2004). This is why high Agreeableness in males is positively evaluated by sexual and romantic partners (Miller, 2007), a fact which could elevate reproductive success in agreeable men. It should be noted that the current study differs in some results comparing to the previous ones. Probably the most noticeable difference is the absence of Extraversion from the set of fitness predictors, because previous research highlighted its importance in the explanation of fertility (e.g. Bailey et al., 2013; Berg et al., 2014). However, there are studies that did not found association between Extraversion and fertility (Nettle, 2005). Furthermore, some differences between the present and former research are expected because HEXACO and the Big Five factors differ in certain aspects. For example, HEXACO Extraversion does not have indicators of positive affect (Lee & Ashton, 2006) which are present in the Big Five operationalizations. These subtle differences between two personality models could be attributed for incongruence in the findings.

4.2. Personality traits related to the number of grand-offspring

The only personality trait which predicted long-term reproductive success was low Openness. This finding is in the line with the previous research which explored the link between personality and the number of grandchildren (Berg et al., 2014). Furthermore, it is congruent with the abovementioned data of the negative link between Openness and the number of children; similar mediating processes can be assumed in this case as well. The only remaining trait which showed some relations with the number of grandchildren is Conscientiousness; although the data regarding this link is more inconclusive (Conscientiousness was fully significant predictor of the number of grandchildren only in Poisson's regression, while it was marginally significant in linear models). The result of positive association between Conscientiousness and the number of children is not congruent with the earlier findings (Berg et al., 2014). Many authors point that

more conscientious individuals have increased achievement and career seeking, which in turn can decrease number of children (Jokela et al., 2011). However, this can lead to higher resource gaining (money, status, education) which may facilitate parental investment. Consequently, this could reflect in higher number of grand-offspring in conscientious individuals. However, this result certainly needs a replication and it should be interpreted with caution. 4.3. The role of personality in explaining the age at first birth Previous study showed that more extraverted and agreeable individuals with lower Openness to experience tend to reproduce earlier in their lifetime (Jokela et al., 2010). Present findings confirmed the negative link between Extraversion and the reproduction timing. Extraversion is related to higher mating motivation and extraverted individuals are indeed more effective in finding sexual partners (Nettle, 2005). However, in our research the lower age at first birth of extraverts is not translated to higher fertility in general, in contrast to previous studies (Bailey et al., 2013; Berg et al., 2014). Emotionality showed negative zero-order correlation with the age at first birth: individuals with elevated Emotionality tend to have their first child earlier in their lifetime. Emotionality is based on affective empathy which represents a core feature of keen altruism (Ashton & Lee, 2007) and care for others. This trait probably represents a major source of parental investment (Montag & Panksepp, 2017) which facilitates the desire for children and thus decreases the timing of reproduction.

4.4. Are there adaptive trade-offs regarding the relation between personality and fitness?

Low Honesty facilitates the short-term reproductive success. However, our data suggests that highly pronounced Honesty can enhance long-term fertility since it had positive zero-order association with the number of grandchildren and it predicted this criterion measure when the number of children was controlled in the regression. This finding indicates that there could be adaptive trade-offs regarding the relation between the Honesty trait and fitness. This result is in the line with the assumptions of many scholars regarding the adaptive tradeoffs of personality (Jokela et al., 2011; Smith & Blumstein, 2008). Besides potential adaptive advantages of low Honesty, this trait has several disadvantages which can affect long-term reproductive success. Individuals with low Honesty are more prone to risk-taking, especially risks related to health and safety (Weller & Tikir, 2011). Low Honesty is also related to psychopathy, a cluster of traits linked with manipulation, low emotional investment in personal relations and more frequent changing of romantic partners (Međedović & Petrović, 2015). All of this data suggests that honest individuals can be more successful in retaining their romantic partners and invest more in the partner relation and offspring, which can be beneficial for long-time reproductive success.

4.5. Limitations

The potential advantage of the implemented research design is in the sample structure: examining individuals who have finished their reproductive stage should provide the most valid estimation of fitness. However, the same design suffers from a shortage: personality traits are measured after the phenomenon of interest (reproduction) has happened. This means that it is not easy to determine causality in such a design because reproduction could affect personality, not vice versa. Findings that personality is relatively stable in adulthood (Caspi, Roberts, & Shiner, 2005) suggest that personality influences fertility; however, the opposite relation cannot be completely rejected. Causal links between personality and fitness can be inferred in longitudinal studies only. Longitudinal research that assess HEXACO personality traits (in adolescence or young adulthood) and post-reproductive fitness in the same individuals are lacking in the present moment, but they will probably emerge in future. So far, we need to use cross-sectional designs, bearing in mind their limitations. Another shortcoming of the present study is that various socio-cultural processes, which cannot be controlled by the researchers, could affect personality-fitness link. Our participants belong to post-war generation which was faced with specific adaptive challenges in the whole world, but perhaps especially in former Yugoslavia because of the change in political system (transition from monarchy to communism). These economic, historical and cultural factors could moderate the relation between personality and fitness and thus decrease the generalizability of the present findings. However, the fact that many of the present study results are congruent with the previous research is encouraging.

4.6. Future directions

The data regarding the link between personality and fitness represents a necessary basis in the research of contemporary evolution of personality. But it is only a starting point. Since personality is related to fitness a new question instantly emerges: why there is a variance in personality than? Indeed, there are already attempts to explain the evolutionary mechanisms which maintain the variance in personality traits (Penke, Denissen, & Miller, 2007). However, more comprehensive behavioral ecological approach to this problem is probably needed, as it was argued in recent theoretical work (Međedović, in press). This framework includes the examination of various moderators which influence the link between personality fitness, including numerous characteristics of both individual and the environment. Furthermore, the mediating processes which link personality traits to fitness outcomes should be more thoroughly explored as well.

5. Concluding remarks

Behavioral ecologists aim to explain personality variation by exploring potential adaptive outcomes of personality traits in contemporary populations. Certainly, not all behavioral traits are related to evolutionary fitness, thus, a first goal in this research program is to analyze the associations between personality and fitness outcomes. In the present research we provided the first analysis of this kind for the HEXACO personality traits. Similarly to previous research in the field, significant relations between personality, fertility, and reproduction timing have been detected. Since personality traits are partially heritable, these findings imply that HEXACO personality traits are most likely under current natural selection. This opens up the space for further and more detailed research of the conditions, constraints and mediating mechanisms that link personality to fitness. Combined with the existing data, the present findings contribute to the emerging science of behavioral ecology of human personality.

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