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Lack of Publication Bias in Intelligence and Working Memory Research: Reanalysis of Ackerman, Beier, & Boyle, 2005

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A meta-analysis was carried out to demonstrate the existence of publication bias in research on the relationship between measures of fluid intelligence and working memory. Reanalysis of data collected in Ackerman, Beier, & Boyle, 2005 was conducted. A heterogeneous distribution of correlation coefficients in the absence of asymmetry in the distribution of coefficients was observed. According to the author of the analysis, there are no arguments for the presence of publication bias in this particular set of results drawn from research on intelligence and working memory.

Key words: fluid intelligence, working memory, meta-analysis, publication bias

Introduction

Measures of fluid intelligence moderately correlate with wide repertoire of intellectual abilities. This well-known phenomenon is called *positive manifold* (Spearman, 1904). However, the relationship between measures of working memory and fluid intelligence is mostly known in the realm of cognitive psychology. Estimates of common variance of working memory capacity and fluid intelligence measures range from 50% (Kane, Hambrick, & Conway, 2005) to 92% (Colom, Rebollo, Palacios, Juan-Espinosa, & Kyllonen, 2004). As a result, working memory is asserted by some researchers as a base of fluid intelligence (Jensen, 1998; Colom, Flores-Mendoza, & Rebollo, 2003; Engle, 2002). These strong correlations affect the imagination of the researchers, who may think that working memory and fluid intelligence are highly related or even identical. Working memory capacity also strongly correlates with the following intellectual abilities considered to be components of intelligence: comprehension (Daneman & Carpenter, 1980), reasoning ability (Kyllonen & Christal, 1990), and test results, which reflect intellectual capacity – the SAT (e.g., Turner & Engle, 1989). It should be noted that there are no other candidates, besides working memory, so closely related to fluid intelligence (Kyllonen, 2002). Due to these facts, researchers might not be interested in reporting moderate correlation coefficients – since this resembles the positive manifold – and publish mostly results depicting strong correlations between working memory capacity and fluid intelligence measures.

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The hypothesis that fluid intelligence and working memory are identical has no theoretical justification. Even the ideal correlation ($R = 1$) between two measures does not mean that the same mechanism is responsible for the variability of both measures. A good example of such a strong atheoretical correlation, from a slightly different field of science, is the relationship between chocolate consumption and the number of Nobel laureates in different populations (Messerli, 2012). The Pearson correlation coefficient in this case is equal to 0.79. It is unreasonable to interpret this relationship as causal, although there are studies showing a positive effect of the consumption of flavonoids contained in chocolate on cognitive functioning (see Nurk, Refsum, Drevon, Tell, Nygaard, Engedal, & Smith, 2002; Desideri, Kwik-Uribe, & Grassi, 2012; Corti, Flammer, Hollenberg, & Lüscher, 2009; Sorond, Lipsitz, Hollenberg, & Fisher, 2008; Bisson, Nejdi, Rozan, Hidalgo, Lalonde, & Messaoudi, 2008). The correlation is strong, but we do not have a theoretical model, which explains the linkage number of Nobel laureates to chocolate consumption. It can be presumed that this strong correlation is an effect of another variable, e.g. a socio-economic status. In countries characterized by wealth (people with high socio-economic status) there is a greater chance to conduct scientific research as well as to consume chocolate. Thus, even very high values of correlation coefficients between working memory capacity and fluid intelligence measures are not proof that we are dealing with the same phenomenon.

Leaving aside the issues of the mechanisms that are responsible for the observed strong correlations of working memory and fluid intelligence, let us consider this: Is there a phenomenon that can systematically overstate the value of correlation coefficients? The author suspects that correlation coefficients reported in the research on fluid intelligence and working memory are inflated due to these facts: researchers are interested in reporting strong relationships, since low correlations are explained as positive manifold. A higher value of correlation coefficient suggests that the factor is more important in the context of intelligence. Open Science Collaboration (2015) reported that replications usually end with the effects strength lower by half on average, compared to the original studies.

Publication Bias

Publication bias is the effect of the policy of scientific journals. Unfortunately, a large part of scientific publications is focused on publishing innovative results or simply those in which some effect has been demonstrated. In practice, this means that it is far easier to publish the results of a research, in which the null hypothesis has been rejected, than those in which null effect is presented. Research in which the null hypothesis has not been rejected is sometimes considered inconclusive, because it is not entirely clear whether the lack of effect is the result of a mistake in the research procedure, or there is, indeed, no relationship between the measured variables.

Since it is more likely to publish results in which the null hypothesis was rejected, researchers are more likely to prepare manuscripts of articles from research in which the null hypothesis was rejected. We deal with the so-called *file drawer effect* (Rosenthal, 1979); results in which the null hypothesis could not be rejected, more often go to the researcher's desk drawer and no one but the researcher himself, knows that such a study was carried out. One can imagine that in an extreme situation, some research is carried out repeatedly, and only the results in which the null hypothesis is rejected are published. If we use the conventional statistical test significance level ($\alpha = .05$), then with 20 replications of a particular test procedure, we will obtain 1 result indicating the presence

of an effect that does not actually exist (the so-called first type error). Therefore, it should be expected that in the literature we will face over-representation of the research, in which the null hypothesis was rejected, despite the lack of a given effect in reality.

The impact of publication bias is difficult to estimate. In order to estimate publication bias in psychology, a reproducibility project has been set up and conducted by Open Science Collaboration. The aim of the project is to replicate 100 studies published in the magazines of prestigious psychological journals, Psychological Science, Journal of Personality and Social Psychology, and Journal of Experimental Psychology: Learning, Memory, and Cognition. The first results of the project show that from the set of articles, which contains 97% of results with the null hypothesis rejected, only 36% of replications reproduced null rejections. Moreover, the strength of replication effects observed in replication is on average lower by half, compared to the original studies (Open Science Collaboration, 2015).

Gilbert, Pettigrew, and Wilson (2016) are critical in their approach to the results obtained by Open Science Collaboration. They argue that the conclusion drawn from the results of the reproducibility project actually supports the opposite conclusion. First of all, they accuse Open Science Collaboration of making a crucial mistake in the way research is selected for replication. The application of the criterion of replicating results from specific journals leads to obtaining an idiosyncratic data set, which is not representative of the typical results in psychology. Secondly, they claim that obtaining results for which only some of the effects are reproducible should not be surprising, since replications are carried out on samples that do not match the same population. In addition, using the wrong statistical procedure is lowering the power of the effects, states Gilbert and his collaborators.

The power of publication bias can be observed in the example of research for which all replications have been registered. Turner, Matthews, Linardatos, Tell, and Rosenthal (2008) have analyzed the collection of studies on the effectiveness of antidepressants registered by the US Food and Drug Administration. The Food and Drug Administration data show that 74 experimental studies were carried out. In 38, the null hypothesis was rejected, while 36 failed to reject the null hypothesis. Then, the researchers checked what part of these results was published in scientific journals. It turned out that 37/38 studies in which the effectiveness of antidepressants was shown and only 3 out of 36 in which no effect was demonstrated. This gross disproportion illustrates the strong publication bias: 97% of results were published in which the null hypothesis was rejected and only 8% of those in which the null hypothesis was not rejected.

A publication bias is a significant threat in the case of a meta-analysis, because it is possible that the meta-analysis is based on results in which there are no negative results (the null hypothesis could not be rejected). Thus, a false image of reality is obtained, despite the large number of research attempts. The way to determine if we are dealing with publication bias is to compare the distributions of estimators obtained in studies with their expected theoretical distributions. For this purpose, we use funnel plots, in which the effect size (on the horizontal axis) and the sample size or error of measurement are plotted. In the absence of publication bias, one should expect a set of points arranged in a symmetrical inverted funnel on the graph. An asymmetrical shape of the chart – the advantage of results in which high power was obtained in comparison with those of low power, is the premise for the belief that we are dealing with publication bias (Sterne, Sutton, Ioannidis, Terrin, Jones, & Lau, 2011).

The Strength of the Gf - WMC Correlation

The meta-analysis by Ackerman, Beier, and Boyle (2005) shows the relationship between the working memory capacity and fluid intelligence measures at 25%. Oberauer, Schulze, Wilhelm, and Süß (2005) critically commented on Ackerman, Beier, and Boyle (2005), stressing the use of unappropriated fixed effect model in the metanalysis and unjustified selection of working memory tasks. Oberauer et al. (2005) decided that a re-analysis is necessary and undertook it within the appropriate statistical model. The relationship between fluid intelligence and working memory measures proved to be much stronger, accounting for 72% of the common variation. The authors of both previous meta-analysis did not analyze the results in terms of publication bias.

It should be noted that measures of the strength of the relationship between fluid intelligence and working memory are characterized by a wide confidence interval (average interval = 0.17 based on data from the meta-analysis by Ackerman, Beier, and Boyle 2005). Considering the existence of publication bias in other areas of science, one should assume that research on fluid intelligence and working memory relationship is not free from this phenomenon. It can be assumed that inflated correlations coefficients are especially probable in the field of working memory and fluid intelligence research. Since fluid intelligence correlates moderately with wide repertoire of cognitive abilities, several influential papers claimed that working memory and fluid intelligence are identical or that working memory capacity is not isomorphic with fluid intelligence but that it is a very strong predictor of fluid intelligence.

Method

Reanalysis was conducted on Ackerman, Beier and Boyle (2005). All the analyses were conducted in R with package "metafor" (Viechtbauer, 2010). These data contain correlation coefficients taken from 57 publications (including 4 doctoral dissertations). The meta-analysis is based on 86 independent research trials, in which 9778 people took part. The data from 40 trials were classified in this analysis (all the coefficients were statistically significant). A theoretical criterion was used – the author used data, which represents the correlation between measures of intelligence and working memory capacity measures.

The purpose of this analysis is to examine the distribution of correlation coefficients between working memory measures and the test results used to measure fluid intelligence. The model was introduced with uncorrected correlation coefficients of fluid intelligence measures (Raven's test, *g*, reasoning measures: spatial, numerical and verbal), working memory capacity measures (verbal, numerical and spatial), number of individual samples, and standard error of estimation of the correlation coefficient.

Results

The analysis was conducted using a random effect model. Heterogeneity of estimators was observed $I^2 = 85.5\%$, $Q(39) = 387.2$, $p < 0.0001$ ($AIC = -70.61$, $BIC = -67.29$).

Figure 1 illustrates correlation coefficients in 40 samples subject to meta-analysis.

Pearson correlation coefficients between working memory capacity and *Gf* measures is on average equal to .35, $CI_{95}\%$ [.32, .38]; $se = .015$, $z = 23.2$, $p < .0001$.

Figure 2 presents the relationship between the value of the correlation coefficient (horizontal axis) and the standard error of the measurement in a given sample (vertical axis). Correlation coefficients are distributed symmetrically around the value of .35. The hypothesis of a zero asymmetry test in the funnel chart ($t = -1.77$, $df = 38$, $p = .085$) could not be rejected.

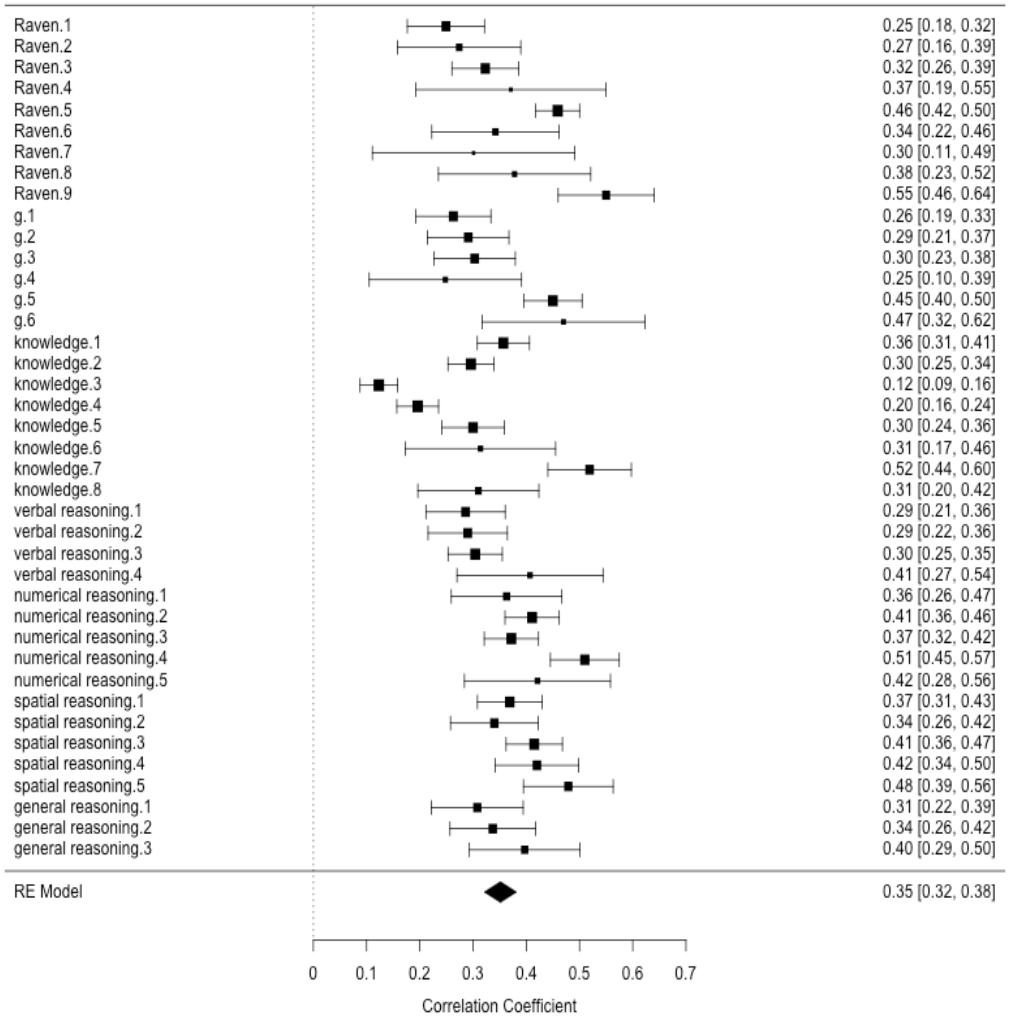

Figure 1 Forest plot: correlation coefficients and standard errors in 40 analyzed trials (Effect Size and 95% confidence interval).

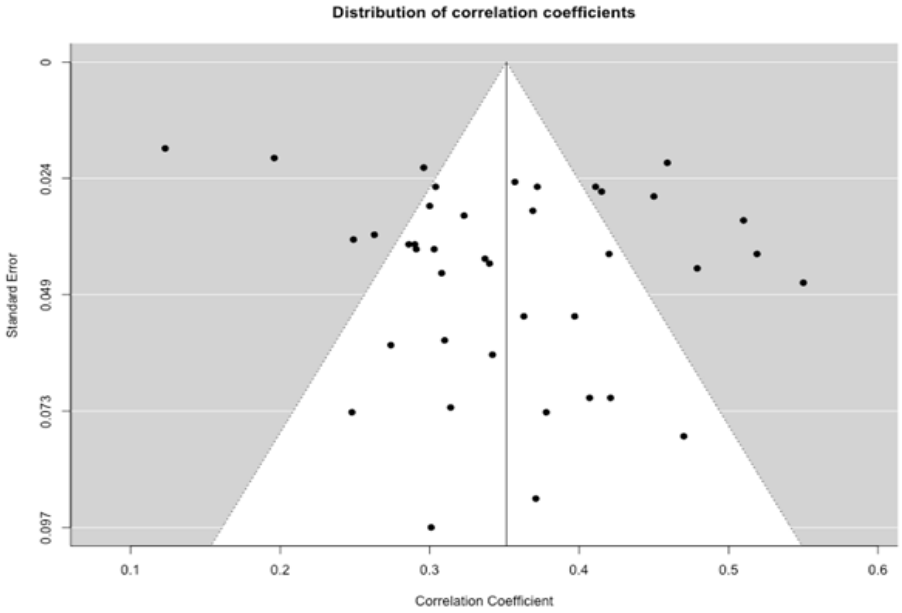

Figure 2 Funnel plot: symmetrical distribution of correlation coefficients.

Discussion

Publication bias is a serious threat to science, since it creates a false image of the observed phenomenon. Presence of publication bias in psychology is indicated by the results of replication studies (Open Science Collaboration, 2015). In these studies, less than 40% of the significant results were found with half the magnitude of the original effects. The main purpose of this analysis is to answer the question whether the results published in an influential paper, which has over 1000 citations (Ackerman, Beier, & Boyle, 2005), were free of publication bias. The author expected to see an asymmetric distribution of results on the funnel chart, which would indicate the effect of publication bias. The hypothesis has not been confirmed in the results of the statistical analysis.

Although this meta-analysis did not bring forth a concern about the results of the original paper, we must be careful not to draw farfetched conclusions, considering the limitations of this study. This result does not prove that other meta-analyses of the relationship between fluid intelligence and working memory are free from publication bias. In this case, a specific set of observations was subjected to an analysis, therefore, we cannot generalize the conclusions to the whole realm of *Gf* and working memory relations. In order to determine the presence of publication bias in this field of research, a wide range of results published to date should be analyzed. Nevertheless, the results of this meta-analysis indicate clearly that the results of Ackerman, Beier, and Boyle (2005) are not influenced by publication bias.

The observed heterogeneity of the results (Figure 2) does not undermine the conclusions

about the relationship between working memory and fluid intelligence. The heterogeneity is the result of introducing to the analysis tests that are not identical. Narrowing the set only to coefficients of one type would limit heterogeneity. However, the division into groups would contribute to obtaining funnel charts, where visible asymmetry is the result of division into groups, and not the actual impact of publication bias. Therefore, a decision was made to uphold the analysis of a heterogeneous set of results.

A symmetric distribution of correlation coefficients was observed in the funnel chart (Figure 2). The lack of a clear asymmetry suggests that an absence of publication bias in the meta-analysis of Ackerman, Beier, and Boyle (2005). A more detailed inspection of the funnel plots leads to the conclusion that low precision (high standard error value) and a high Pearson correlation coefficient were published less frequently. This is not surprising. Lack of precision of working memory capacity and fluid intelligence measures leads to underestimating the empirical Pearson correlation coefficient. We can suspect that researchers do not publish results in which the Pearson correlation coefficient exceeds standardized reliability measures for working memory capacity and fluid intelligence.

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Subjective Well-Being and Income Below the 'At-Risk-of-Poverty Threshold': Analysis of Slovak EU-SILC Data

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The objective of the present research was to examine the relationship of income below the 'at-risk-of-poverty threshold' and well-being variables among selected groups of Slovak citizens based on the analysis of secondary data. Responses of 7851 Slovaks selected from the EU-SILC 2013 data (N = 13286) were analyzed. The participants were selected on the basis of self-defined current economic status as follows: employees working full-time (n = 5156), the unemployed (n = 845), retirees (n = 1850). The stepwise multiple regression revealed that the relationship of income to well-being variables in each of these three groups was different. The differentiated income effect in relation to well-being variables depending on selfdefined economic status and study limitations were discussed.

Key words: poverty, subjective well-being, EU-SILC 2013 data, at-risk-of-poverty threshold

Introduction

The European Union - Statistics on Income and Living Conditions (EU-SILC) is the most relevant household survey at the European level in the field of household income, living standards and poverty. In 2004 the Slovak Republic became a member of the European Union and since 2005 the Statistical Office of the Slovak Republic has carried out a sample survey on the income and living conditions of households in Slovakia. In 2013 a new instrument, the EU-SILC ad-hoc module for measuring subjective well-being (EU-SILC 2013 Module On Well-Being) was administered for the first time. The inclusion of this module was also perceived in the sense that the data obtained would represent an important potential for researchers to engage in an in-depth analysis (De Smedt, 2013). Using data collected in 2012 among individuals over 16 years old living in Slovakia (N = 13286) based on the EU-SILC 2013 sample statistical survey, the present paper aims to analyze the relationship of income poverty in three groups of the Slovak population – employees working full-time, the unemployed, and retirees – to psychological variables detected with the Module On Well-Being. In particular, the paper analyzes whether the differences in income below and above the 'at-risk-of-poverty threshold' explain subjective well-being of these three groups. In the year under review, 12.8% of the Slovak population (about 695 thousand persons) had income below the 'at-risk-of-poverty threshold' (Vlačuha & Kováčová, 2014).

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Definition of Basic Concepts and an Overview of Earlier Research

Income Poverty

Poverty as one of the two key variables in the paper was delimited on the basis of a monetary approach, which identifies poverty as a shortfall in consumption or income from some poverty line. As Annoni and Weziak-Bialowolska (2016, p. 183) state, "the perfect measure of poverty in terms of economic well-being should be a combination of income, consumption and welfare. Although the measurement of income is not a problematic issue, at least to some extent, the measurement of consumption level and welfare is not straightforward. For these reasons, the level of disposable income is often used as a proxy of consumption". This kind of relative measure is the EU-SILC income poverty threshold that sets the relative risk-of-poverty line at 60% of the national median equivalized disposable income.[1] Thus, this approach is not always applied equally in research analyses. For example, Nygård, Härtull, Wentjärvi and Jungerstam (2017) describe income poverty as "objective poverty", and in their analysis of secondary data (the 2010 GERDA Survey) they identify it as a dichotomized variable constructed on the basis of one question in which people did not assess their net income but gross monthly income. Three other well-known approaches to the definition of poverty (see Laderchi, Saith, & Stewart, 2003) put an emphasis on its different aspects. Participatory Poverty Assessment (PPA)[2] uses a person's subjective decision about what it means to be poor and the extent to which they perceive to be poor. The capability approach considers that person to be poor whose freedom or chances to materialize his/her own lifestyle (Arndt & Volkert, 2007) are limited. The fourth approach to poverty is known as a social exclusion approach, in which an emphasis is placed on social rather than individual perspective, and poverty is defined as a person's membership in particular groups of people (the aged, disabled, ethnic minority). In industrialized societies they are generally the unemployed, people with poor access to housing or people with very low income. The four approaches to the definition of poverty are one-dimensional. Several economists

[1] For poverty indicators, the equivalized disposable income is calculated from the total disposable income of each household divided by the equivalized household size. In order to reflect differences in a household's size and composition, the total net household income (income from work, investment and social benefits, plus any other household income after tax and other deductions), that is available for spending or saving, is divided by the number of 'equivalent adults', using the so-called modified OECD equivalence scale. The scale gives a weight to all members of the household (1.0 to the first adult; 0.5 to the second and each subsequent person aged 14 and over; 0.3 to each child aged under 14) and then adds these up to arrive at the equivalized household size. Finally, the resulting equivalized disposable income is attributed equally to each member of the household. In case of the EU-SILC data the income reference period is a fixed 12-month period (such as the previous calendar or tax year) for all countries except UK for which the income reference period is the current year and Ireland for which the survey is continuous and income is collected for the last twelve months (Eurostat, 2018).

[2] Participatory Poverty Assessment (PPA) as an approach to poverty measurement takes account of the attitudes of poor people in the analysis of poverty and in the formulation of poverty reduction strategies through public policy instruments. The methodological specificity of recent PPA approaches lies in the fact that researchers do not seek to prioritize the criteria on the basis of which poverty is assessed. They focus mainly on the perception of respondents about their well-being. Benefits of a participatory approach lie primarily in identifying the hidden dimensions of poverty and in the possibilities of analysis of causality and processes that make people become poor or lose poverty (Norton et al., 2001).

have suggested multidimensional approaches, which have brought about several indices such as Human Development Index (HDI), Physical Quality of Life Index (PQLI) or Multidimensional Poverty Index (MPI). For example, MPI is a global multidimensional poverty index (Alkire et al., 2015), which includes 10 indicators grouped into three dimensions – education, health, and living standard. In the present paper, the income approach is used and, in accordance with the EU-SILC 2013 definition, the object of interest are the people below the 'at-risk-of-poverty threshold', i.e. persons whose income was less than 60% of the median of the national equivalized disposable income per household assigned to individuals.

Well-Being Correlates

The analyzed psychological variables represent, in contrast with income poverty (real income level), subjectively assessed attributes of a person's own experiencing. The choice of psychological variables was limited by the variables identified by the EU-SILC 2013 Module On Well-Being. Specifically, these are the three subjectively assessed psychological aspects of experiencing for which we have used the terms overall life satisfaction, mean score of satisfaction with three aspects of life, and affect. The variables bearing these names are considered by subjective well-being (SWB) researchers as basic components of SWB. For example, Diener (2000, p. 34) defines subjective well-being as follows: "Thus, there are a number of separable components of SWB: life satisfaction (global judgments of one's life), satisfaction with important domains (e.g., work satisfaction), positive affect (experiencing many pleasant emotions and moods), and low levels of negative affect (experiencing few unpleasant emotions and moods". The psychological variables identified by the EU-SILC 2013 Module On Well-Being are not identical with the SWB construct but they can be considered to be an approximation of the SWB concept quoted above. This is not a case of sameness but of approximation because, despite a considerable degree of content similarity between the constructs, their operationalization and the way they are measured in the EU-SILC 2013 are different. While the EU-SILC 2013 uses a single self-report item to measure each construct, "Recent measures of SWB, however, contain multiple items" (Diener, 2000, p. 35). For the sake of a higher approximation, items of the EU-SILC 2013 Module on Well-Being concerning satisfaction with important domains and affect were integrated into the scales. Another frequent concept in the field of income and psychological variables research is quality of life (QoL). It is not unusual for SWB and QoL to be interchanged or used as if they were equivalent alternatives. For example, Smith, Sim, Scharf, and Phillipson (2004) state in the objectives of their work: "While the focus of the article is on the determinants of quality of life among older people who live in a particular type of geographic location, the analysis raises several broader issues for research on wellbeing in later life" (p. 794). It may be added that other psychological variables are examined only rarely. One exception to this is, for example, Haushofer's (2013) publication which highlights the fact that, while among researchers there has been a growing interest in the research on the relationship of income levels to happiness and life satisfaction, the relationship of income to other psychological consequences is rarely studied. His analysis was concerned with the effect of income poverty on locus of control, intrinsic motivation, trust, prosocial attitudes, feelings of meaninglessness, and risk-taking. These variables were not taken into account in our analysis because the EU-SILC 2013 Module On Well-Being did not detect them.

Income Poverty and Well-Being Correlates

Smith et al. (2004) analyzed the quality of life factors among people over the age of 60 and stated that out of thirteen predictors tested using multiple linear regression and sequence regression, the equivalized income (nearly 40% of the sample had an equivalized weekly income of less than £100) and socio-demographic characteristics of the interviewed did not have relationships to life satisfaction. The strongest predictor of subjective life satisfaction (Diener, Emmons, Larsen, & Griffin, 1985) and in single-item measure of quality of life ("very good – very bad") was the perception of one's own health. Similarly, Diener, Suh, Lucas, and Smith (1999) stated that external factors, such as various resources and demographic factors, are responsible for only a small part of the variance in SWB. Although we can state that the findings from the viewpoint of methodology, sampling strategies and procedures used to measure the variables are incomparable, the impact of the income on SWB was small or zero. In their recent study, Ngamaba, Panagioti, and Armitage (2017) report the results of their meta-analysis of the relationship between income inequality and SWB. They analyzed 619 publications in total. After removing duplicates and after screening for relevance, they performed a systematic review of 39 studies from which they selected 24 studies for meta-analysis. They came to the conclusion that the association between income inequality (endogenous Gini[3] – calculated from individuals' responses and exogenous Gini extracted from nation-level data) and SWB (happiness and/or life satisfaction) in developed countries is weak, almost zero and not statistically significant, suggesting thus no association between income inequality and SWB. Apart from research that confirms a weak or missing relationship between income and SWB, other studies indicate the opposite. As to income inequality and SWB, Yu and Wang (2017, p. 1) explain its existence as follows: "...the Gini coefficient (a common index of a society's income inequality) and its quadratic term were significant predictors of personal happiness." They argue that the existence of a curvilinear relationship between income inequality and happiness is underpinned by psychological processes of jealousy and signal effects (Senik, 2008). Another explanation regarding the existence of the relationship between income and SWB was published by Cummins (2000). He assumes that 1) income does not influence SWB directly: "Income can act on all processes at the second order level to make the maintenance of SWB homeostasis more likely. In terms of the internal buffers, income has the power to directly facilitate each one. Thus, income has a positive relationship with primary control (Lussier et al., 1997), self-esteem (e.g., Carpenter, 1997; Tran et al., 1991), and optimism (e.g., Eckersley, 1997)" (p. 138). 2) The second explanation is related to the statistical procedure used, which can mask the income effect. If income effect in relation to SWB is tested using hierarchical regression together with the subjective variable and, in the first step, the subjective and objective variables are inserted into the equation together, the objective variable effect is low because subjective variables share more variance with other subjective rather than objective variables. As an example, the author concludes that if perceived health was inserted together with income in the first step, then the conclusion about the relationship of both variables to SWB is not correct. Based on his homeostatic theory, Cummins

[3] Income distribution measures the gap between the various strata of the population. In a very uneven income distribution, the rich are very rich and the poor are very poor, comparatively. Gini coefficient is an economic measure of inequality in income distribution. It is calculated from the Lorenz curve, in which cumulative family income is plotted against the number of families arranged from the poorest to the richest. On a scale of 0 to 1, the lower the Gini coefficient, the more evenly distributed the wealth (Eurostat, 2013b).

(2000) draws two conclusions: people who are poor experience lower SWB; and the relationship between income and SWB is strongest for people who are poor.

Current Study

The objective of the study was, based on secondary data from the EU-SILC 2013 statistical sample survey, to analyze the relationship of income above and below the poverty line and subjective well-being in three groups of people who have their own income – employees working full-time, the unemployed and retirees. We assume that in all three groups the income below the 'at-risk-of-poverty threshold' is in a negative relationship to subjective well-being variables.

Method

Our data which come from the EU-SILC 2013 were obtained on the basis of a written request sent to Eurostat (December 2016). After verifying the registration of the institution as a research entity and after assessing the applicant's research intention, we asked for and received the so-called EU-SILC microdata in .csv format. Before their proper analysis, the .csv data were converted to .sav format (see Mack, 2016). For a detailed description of data sets of this survey see Methodological Guidelines and Description of the EU-SILC Target Variables (Eurostat, 2013a). Even though the EU-SILC project started earlier, we present results from this wave because psychological variables were a part of research for the first time in 2013 (Module On Well-Being).

Participants

The variables were available for 13286 individuals from Slovakia, which is a nationally representative sample (the demographics of the total sample is available from the authors). We restricted our analysis, based on self-defined current economic status, to three groups – employees working full-time, the unemployed and retirees, and, at the same time, only to the never married and married persons (widowed and divorced persons were omitted). Persons who belong to relatively small subgroups or who do not have their own income (pupils, students) were also omitted from the analysis. This procedure left us with a total of 7900 participants. Prior to the analysis, the variables were checked for the presence of extreme values (income) and for data completeness. The income variable for 3 people showed extreme (unrealistic) values: 2 persons reported an annual equivalized income of 10.85 Euro and 1 person an income of 41529.90 Euro. The education variable contained 7 missing data, and 39 participants did not provide information about their subjectively assessed health. These 49 persons (0.6%) were omitted from the analysis. The analyzed sample consisted of 7851 persons of whom employees working full-time numbered 5156 (65.7%), the unemployed 845 (10.7%), and retirees 1850 (23.6%). Above the 'at-risk-of-poverty threshold' were 7344 (93.5 %) persons and 507 (6.5 %) persons were below the 'at-risk-of-poverty threshold'. Females numbered 3791 (48.3%) and males 4,060 (51.7%), never married 2224 (28.3%) and married 5627 (71.7%), lower education (below secondary education inclusive) 5959 (75.9%) and higher education (above secondary education) 1892 (24.1%). For descriptives of the analyzed groups see Table 1.

Variables of Interest

A list of all identified dimensions, topics and subtopics and all variables of the EU-SILC 2013 Module On Well-Being has been published by, for example, De Smedt (2013).

Equivalized Household Income

Equivalized household income is the household disposable income for that year (2012) di-

Table 1 *Descriptives for the analyzed groups (N = 7851)*

Variable	Employees working full-time (*n* = 5156)	Unemployed (*n* = 845)	Retirees (*n* = 1850)
Gender			
Female	2424 (47%)	426 (50.4%)	941 (50.9%)
Male	2732 (53%)	419 (49.6%)	909 (49.1%)
Age, in years			
M	41.3	35.1	67.4
SD	11.1	12.5	6.65
Mdn	41.0	12.54	66.0
Range	18-70	16-63	34-93
Marital status			
Never married	1643 (31.9%)	465 (55.0%)	116 (6.3%)
Married	3513 (68.1%)	380 (45.0%)	1734 (93.7%)
Level of education			
Below secondary education inclusive	3645 (70.7%)	723 (85.6%)	1591 (86%)
Above secondary education	1511 (29.3%)	122 (14.4%)	259 (14%)
A Person's Income			
Above the 'at-risk-of-poverty threshold'	5004 (97.1%)	558 (66%)	1782 (96.3%)
Below the 'at-risk-of-poverty threshold'	152 (2.9%)	287 (34%)	68 (3.7%)
Equivalized household income			
M	8884.52	5606.05	6950.03
SD	3455.64	3101.67	2214.37
Mdn	8401.59	5432.58	6472.74
Range	334.7-36622.5	107.1-33970.1	1201.7-21109.5

Notes. Equivalized household income is a household's disposable income for that year (2012) divided by the sum of consumption equivalents of that household using the modified OECD scale to reflect economies of scale.

A person is counted as being below the 'at-risk-of-poverty threshold' in a given year if his or her equivalized household disposable income is less than 60% of the national median equivalized household income for that year (The 'at-risk-of-poverty threshold' in Slovakia in 2012 was: 7007.88 * 0.6 = 4204.73).

vided by the sum of consumption equivalents of that household, using the modified OECD scale to reflect economies of the scale: for each household the first adult receives a weight of 1, each additional adult gets a weight of 0.5 and each (additional) child under 14 years receives a weight of 0.3. For further details of the sources included in household income and the equivalence scale, see Eurostat (2010). It is an indicator, which expresses the calculated net annual income of the person living in a given household, who answered the questions from the questionnaire regarding all the variables analyzed in this article.

A Person's Income below the 'At-Risk-of-Poverty Threshold'

A person is counted as being below the 'at-risk-of-poverty threshold' in a given year if his or her equivalized household disposable income is less than 60% of the national median equivalized household income for that year (in

2012 the 'at-risk-of-poverty threshold' in Slovakia was: 7007.88 * 0.6 = 4204.73).

Self-Defined Current Economic Status

Employees working full-time, the Unemployed and Retirees.

Well-Being Variables

Items from the EU-SILC 2013 Module On Well-Being were used to create measures of overall life satisfaction (1 Item), mean score of satisfaction with three aspects of life (3 Items) and affect (5 Items).

Overall Life Satisfaction (1 Item)

"Assess the situation and state how satisfied you are ..." "with your present life" (Use a scale from 0 to 10 where 0 means absolute dissatisfaction and 10 means complete satisfaction). Respondents also had the option to use the "I do not know" response, which also applies to questions about mean score of satisfaction with three aspects of life and affect.

Mean Score of Satisfaction with Three Aspects of Life (3 Items)

The EU-SILC 2013 Module On Well-Being contained eight items related to satisfaction with different areas of life (accommodation, job, commuting time, time use, personal relationships, recreational or green areas, living environment, financial situation) measured by a response scale identical with that for overall life satisfaction. Because satisfaction with financial situation is a subjective assessment of income, this item has not been included among domains of satisfaction because of its possible contamination with objective income. Similarly, job satisfaction and job commuting time were not included among the domains because a part of the sample consisted of persons, who are not employed (unemployed or retired). The remaining three items, i.e. satisfaction with time use, recreational or green areas and living environment do not correspond with the construct of subjective well-being, for which reason they were not included among the domains of satisfaction. Only the following three items were used and grouped into a scale: "Assess the situation and state how satisfied you are ...:" "... with your housing", "... with your personal relationships" and "How much do you feel that the things you do in your life are worth doing? (Use a scale from 0 to 10 in which 0 means not worth doing at all and 10 means they are absolutely worth it)". The reliability of this scale of mean score of satisfaction with three aspects of life was alpha = .71.

Affect (5 Items)

Five items that concerned emotional experiencing were analyzed using PCA. Based on a single-factor solution they could be grouped into a scale: "How much time in the last four weeks: " "... have you been very nervous?", "have you felt so down that nothing could cheer you up?", "... have you felt calm and balanced?", "have you felt sorry and depressed?" "have you been happy?" These items used a five-point score of 5 to 1: "Never", "Seldom", "Sometimes", "Mostly" and "Always". Before calculating the reliability and adding the score into the scale, the responses were recoded so that the higher value expressed higher frequency of positive experiencing. The reliability of scale alpha = .83.

Socio-Demographic Characteristics

Gender, Age in years, Level of education (below secondary education inclusive, above secondary education), Marital status (Never married, Married).

Subjective Health Rating

The EU-SILC 2013 Module On Well-Being included an item that was related to subjective assessment of one's own health using a five-point response scale (1 to 5): "How would you assess your overall health? It is: very bad, bad, neither good nor bad, good, very good".

Results

The Level of Equivalized Household Income among Employees Working Full-Time, the Unemployed, and Retirees

Before analyzing the relationship of income below and above the 'at-risk of poverty threshold' of three groups of Slovak population with the well-being correlates surveyed by means of the Module On Well-Being, we compared these groups in terms of their equivalized household income. One-way ANOVA was used with the three-level group factor of self-defined current economic status for employees working full-time, the unemployed, retirees and the dependent variable of equivalized household income. The analysis was performed using IBM SPSS One-way ANOVA. Prior to the analysis, the dependent variable income was checked for completeness – there were no missing data. The assumption of normal distributions of the dependent variable in the entire sample was violated, skew = 1.62. In order to improve the normality of income distribution, we transformed the variable with the help of sqrt-transformation so that the skew was = .41 and within each group <1. The assumption of homogeneity of variances was violated (Levene's test was significant) and group sizes were different. Therefore, the Robust Test of Equality of Means (Welch) and the Games-Howell post hoc test were used. The differences between groups were statistically highly significant ($F(2, 2081.67) = 623.64$, $p < .001$). Games-Howell post hoc tests revealed statistically significant differences between all three groups. The lowest income was identified among the unemployed (M = 5606.05 Euro), which was followed by retirees (M = 6950.03 Euro) and the highest income was detected in the category of employees working full-time (8884.52 Euro).

Income below and above the 'At-Risk-of-Poverty Threshold' and Well-Being Correlates

Prior to the analysis, the dependent variables of overall life satisfaction, mean score of satisfaction with three aspects of life, and affect were checked for completeness of data. Two kinds of missing data were identified: system data with a relatively low number (n = 66, 0.8%) and also data representing the "I do not know" responses. This type of missing data could not be replaced; in both cases the missing data were eliminated by excluding people from the analysis (a listwise method). Therefore, the number of persons analyzed was lower than the total number of persons in each group and varied depending on the dependent variable analyzed.

Regression Analysis

For each group – employees working full-time, the unemployed and retirees, sequential regression was calculated separately. The predictors – income below and above the 'at-risk-of-poverty threshold' as dummy variables, gender, age, education, marital status and subjectively assessed health – were added in blocks and their relationship to the criterion was tested statistically using the stepwise method. "The regression is sequential over blocks, but statistical within blocks" (Tabachnick & Fidell, 2013, p. 140). When building blocks, we used Cummins' (2000) opinion that subjective variables share more variance with other subjective variables. Therefore, in the first block, income was entered stepwise, socio-de-

mographic characteristics of the individuals were entered stepwise in the second block, and subjective health ratings were entered stepwise in the third block. In all three groups, the dependent variables – overall life satisfaction, mean score of satisfaction with three aspects of life, and affect were normally distributed; multicolinearity was controlled (Tolerance value > 1- R^2, Leech, Barrett, & Morgan, 2015); in each of the groups represented by codes on the dummy variables there was a sufficient number of scores ($n > 50$, Warner, 2008). The analysis was performed using IBM SPSS Regression.

Table 2 shows the correlations between dependent variables and predictors for three groups separately.[4] Income below the 'at-risk-of-poverty threshold' correlates negatively with all three correlates of well-being. In the case of the unemployed, the correlations are highly significant and higher than .14; among the employees working full-time and retirees correlations are low; in the case of the mean score of satisfaction with three aspects of life they are insignificant and in the case of total life satisfaction and affect they are significant but lower than .07.

Table 2 *Bivariate correlations (Spearman's rho) between dependent variables and predictors for each group separately*

Dependent variables	*n*	Income	Gender	Age	Education	MStatus	Health
Employees working full-time (n = 5156)							
Overall life satisfaction	4935	-.07**	.02	-.13**	.18**	.02	.25**
Mean score of satisfaction with three aspects of life	4375	-.02	.02	.05**	.09**	-.13**	.14**
Affect	4588	-.04**	-.02	-.13**	.08**	.06**	.26**
Unemployed (n = 845)							
Overall life satisfaction	775	-.23**	.17**	-.11**	.14**	-.00	.21**
Mean score of satisfaction with three aspects of life	633	-.27**	.17**	.01	.12**	-.15**	.14**
Affect	713	-.14**	.14**	-.22**	.08*	.08*	.28**
Retirees (n = 1850)							
Overall life satisfaction	1755	-.05*	.03	-.07**	.07**	-.04	.37**
Mean score of satisfaction with three aspects of life	1476	-.02	-.01	-.04	.02	-.06*	.23**
Affect	1593	-.05*	.01	-.04	.05*	-.03	.33**

Notes. Overall life satisfaction, and Mean score of satisfaction with three aspects of life range from 0 to 10, Affect and Subjective health ratings range from 1 ("very bad") to 5 ("very good"), with a high value indicating strong endorsement of the construct. For Income below the 'at-risk-of-poverty threshold' 1 signifies "yes" and 0 "no", for Gender, 1 signifies "female" and 0 "male." Age is given in years. For Education, 1 signifies "high", 0 "low", for Marital status 1 signifies "married" and 0 "never married".

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

[4] On the reviewer's suggestion regarding the different sample sizes used for dependent variables, we have tested differences in bivariate correlations between dependent variables and predictors for each group after excluding people with missing values across whole sample. Differences between correlation coefficients were marginal and non-significant.

Employees Working Full-Time

Sequential regression was used to determine if income improves the prediction of three well-being variables in the group of employees working full-time separately. The dummy variables for income below and above the 'at-risk-of-poverty threshold' were entered stepwise in the first block. The three dummy variables, i.e. gender, education, marital status, were entered stepwise in the second block together with age; subjectively assessed health state was entered stepwise in the third block. Table 3 presents *R*, *R*-squared change, the unstandardized regression coefficients (*B*) and intercept, after entering all predictors in three blocks for the group of employees working full-time. The table contains only significant predictors.

The stepwise multiple regression analysis with overall life satisfaction as a criterion revealed that income below the 'at-risk-of-poverty threshold' explained 1% of the variance, higher education explained 3% of the variance, and better subjectively rated health explained an additional 5% of the variance in the final step.

A comparable stepwise multiple regression analysis with mean score of satisfaction with three aspects of life and affect as criteria, revealed that income was not a significant predictor and other predictors tested explained a low percentage of variance: marital status 2% and education 3% of variance, mean score of satisfaction with three aspects of life and education 1% and health 6% of variance. This pattern of results suggests that the variability of the well-being variables in case of employees

Table 3 *Regression models for income, gender, age, education, marital status, and health as predictors of overall life satisfaction, mean score of satisfaction with three aspects of life, and affect in group of employees working full-time (accepted models; $p < .05$)*

Predictors	*R*	*R²-change*	*B*	*t*	*p*
Overall life satisfaction (F_{total} (3, 4931) = 166.800; $p < .000$)					
Income below	.09	.01***	-.78	-5.196	.000
Education	.20	.03***	.61	10.761	.000
Health	.30	.05***	.64	17.019	.000
(Constant)			4.722		
Mean score of satisfaction with three aspects of life (F_{total} (2, 4374) = 116.661; $p < .000$)					
Marital status	.14	.02***	-.59	-12.379	.000
Health	.23	.03***	.39	11.902	.000
(Constant)			6.488		
Affect (F_{total} (2, 4585) = 176.243; $p < .000$)					
Education	.08	.01***	.07	3.577	.000
Health	.27	.06***	.22	17.836	.000
(Constant)			3.032		

Note. Overall life satisfaction, and Mean score of satisfaction with three aspects of life range from 0 to 10, Affect and Subjective health ratings range from 1 ("very bad") to 5 ("very good"), with a high value indicating strong endorsement of the construct. For Income below the 'at-risk-of-poverty threshold' 1 signifies "yes" and 0 "no". For Education, 1 signifies "high", 0 "low", and for Marital status, 1 signifies "married" and 0 "never married."

*** $p < .001$

working full-time is predicted by income only marginally. Note: equivalized disposable income among employees working full-time, who were below the 'at-risk-of-poverty threshold', was almost three times lower than the income of full-time employees, who were above the risk of poverty: 3267.09 Euro vs. 9055.15 Euro.

The Unemployed

The stepwise multiple regression analysis in the group of the unemployed (Table 4) with overall life satisfaction as a criterion revealed that income explained 5%, gender 2% of the variance, and better subjectively rated health explained additional 4% of the variance in the final step. Regression analysis of the mean score of satisfaction with three aspects of life as a criterion revealed that income explained 8%, gender 2% and health 2% of the variance. Affect as a criterion was predicted with the same three predictors: income below the 'at-risk-of-poverty threshold' explained 2%, gender 1% and better subjectively rated health explained an additional 10% of the variance in the final step. These results suggest that the variability of the well-being variables among the unemployed is predicted significantly by income. Note: equivalized disposable income of the unemployed below the 'at-risk-of-poverty threshold' was also almost three times lower than the income of the unemployed above the risk of poverty: 2594.17 Euro vs. 7155.17 Euro.

Table 4 *Regression models for income, gender, age, education, marital status, and health as predictors of overall life satisfaction, mean score of satisfaction with three aspects of life, and affect in group of the unemployed (accepted models; $p < .05$)*

Predictors	*R*	*R²-change*	*B*	*t*	*p*
Overall life satisfaction (F_{total} (3, 771) = 32.651; $p < .000$)					
Income below	.23	.05***	-1.01	-5.704	.000
Gender	.27	.02***	.83	4.932	.000
Health	.34	.04***	.60	5.951	.000
(Constant)			2.863		
Mean score of satisfaction with three aspects of life (F_{total} (3, 629) = 28.196; $p < .000$)					
Income below	.28	.08***	-1.02	-6.880	.000
Gender	.32	.02***	.60	4.287	.000
Health	.34	.02***	.31	3.691	.000
(Constant)			5.669		
Affect (F_{total} (3, 709) = 35.319; $p < .000$)					
Income below	.13	.02***	-.13	-2.381	.018
Gender	.18	.01***	.25	4.659	.000
Health	.36	.10***	.30	8.986	.000
(Constant)			2.216		

Note. Overall life satisfaction, and Mean score of satisfaction with three aspects of life range from 0 to 10, Affect and Subjective health ratings range from 1 ("very bad") to 5 ("very good"), with a high value indicating strong endorsement of the construct. For Income below the 'at-risk-of-poverty threshold', 1 signifies "yes" and 0 "no". For Gender, 1 signifies "female" and 0 "male".

*** $p < .001$

Retirees

The stepwise multiple regression analysis in the group of retirees (Table 5) revealed that income did not have a significant relationship to any of the three variables of well-being. Subjectively rated health explained 15% of overall life satisfaction, 6% of the mean score of satisfaction with three aspects of life and 13% of affect. Marital status had a marginal relationship to the mean score of satisfaction with three aspects of life (1% variance). This pattern of results suggests that the variability of well-being variables in case of retirees is predicted completely differently from the other two groups. Of the tested variables, only health appears to be a factor of well-being variables among retirees. Note: equivalized disposable income of retirees below the 'at-risk-of-poverty threshold' was twice as low as the income of retirees above the risk of poverty: 3401.95 Euro vs. 7085.42 Euro.

Discussion

In terms of equivalized person's disposable income, the three groups, employees working full-time, the unemployed and retirees, were statistically significantly different: the lowest income was that of the unemployed (M = 5606.05 Euro), which was followed by the income of retirees (M = 6950.03 Euro) and by the income of the employed (8884.52 Euro), which was the highest. The stepwise multiple regression revealed that the relationship of income to well-being variables in each of these three groups was different. In the group of employees, income was related only to overall life satisfaction; employees with an income below the 'at-risk-of-poverty threshold' had a lower score, but this relationship was weak. Of the three significant predictors within the group of the unemployed, income below the 'at-risk-of-poverty threshold' had the greatest effect on two psychological variables – the

Table 5 *Regression models for income, gender, age, education, marital status, and health as predictors of overall life satisfaction, mean score of satisfaction with three aspects of life, and affect in group of retirees (accepted models; $p < .05$)*

Predictors	*R*	*R²-change*	*B*	*t*	*p*
Overall life satisfaction (F_{total} (1, 1753) = 316.315; $p < .000$)					
Health	.39	.15***	.96	17.785	.000
(Constant)			3.999		
Mean score of satisfaction with three aspects of life (F_{total} (2, 1473) = 47.785; $p < .000$)					
Marital status	.08	.01**	-.42	-2.896	.004
Health	.25	.06***	.39	9.278	.000
(Constant)			6.906		
Affect (F_{total} (1, 1591) = 240.237; $p < .000$)					
Health	.36	.13***	.28	15.500	.010
(Constant)			2.984		

Note. Overall life satisfaction, and Mean score of satisfaction with three aspects of life range from 0 to 10, Affect and Subjective health ratings range from 1 ("very bad") to 5 ("very good"), with a high value indicating strong endorsement of the construct. For Marital status, 1 signifies "married" and 0 "never married."

** $p < .01$; *** $p < .001$

unemployed with an income below the 'at-risk-of-poverty threshold' had lower scores in overall life satisfaction and in mean score of satisfaction with three aspects of life. A significant relationship was also found in the case of affect but its effect was small. In the group of retirees, the income effect on psychological variables was absent, and the most powerful predictor was the perception of one's own health. With the exception of the mean score of satisfaction with three aspects of life, where one percent of the variance was explained by marital status, health of retirees was the only significant predictor from among the six tested predictors. Perception of one's own health had a different significance for the psychological variables of the employed and the unemployed: while in the group of the employed, occupational health[5] explained the largest percentage of variance in relation to all three variables, in the group of the unemployed this was only in the case of affect. Gender stands out among the remaining significant predictors: its effect, although small, has only been shown in the group of the unemployed – the unemployed women achieved higher scores in all three cases than the unemployed men. Finally, the significant effect of education was identified among the employees working full-time, higher education meant higher overall life satisfaction and affect scores.

Differentiated Income Effect below the 'At-Risk-of-Poverty Threshold' in Relation to Well-Being Variables Depending on Self-Defined Economic Status

While earlier (e.g., Campbell, Converse, & Rodgers, 1976) as well as more recent research (e.g., Diener et al., 1999) concludes that personal income exerts little influence on subjective well-being, Cummins (2000) states, in accordance with his Homeostatic Theory of Subjective Well-Being, that "there is an intimate relationship between personal wealth and SWB" (p. 133). However, at the level of a particular individual this relationship is masked by the effect of other variables, which are of internal (personality) and external nature. As examples, the author provides objective health or unemployment which, due to their persistence, may reduce SWB; therefore, in these two specific cases it is difficult to identify the specific contribution of low income. In order to reduce this uncertainty in our analysis, we included income below the 'at-risk-of-poverty threshold' as an objective variable in the first step of sequential regression, sociodemographic variables in the second and perceived health as a subjective variable in the last step. Using this procedure, it was possible to control the overlap of the income variance with the subjective variable and to identify its effect on psychological criteria of subjective nature. Of course, as Cummins (2000) states, money alone cannot have a direct impact on SWB, and since other simultaneous variables (personality and specific conditions at the time of doing the questionnaire) were not controlled in our analysis, our multiple regression does not reveal, what in fact had an impact on SWB in case of the significant effect of income below the 'at-risk-of-poverty threshold'. Nevertheless, it appears that the results obtained partly

[5] A common definition of occupational health has been adopted by the Joint ILO/WHO Committee on Occupational Health at its first session in 1950. The definition reads: "Occupational health should aim at: the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations; the prevention amongst workers of departures from health caused by their working conditions; the protection of workers in their employment from risks resulting from factors adverse to health; the placing and maintenance of the worker in an occupational environment adapted to his physiological and psychological capabilities; and, to summarize, the adaptation of work to man and of each man to his job" (Eurostat, 2013b).

support Cummins' (2000) conclusion that the poor are more sensitive to their circumstances of living both as a direct and indirect consequence of poverty. The income below the 'at-risk-of-poverty threshold' was a significant predictor of low scores among employees working full-time in relation to overall life satisfaction and among the unemployed in relation to all three well-being variables. However, hypothetical sources of low scores are likely to be different in both groups: full-time employees can be frustrated by their low income even though they have a job. Thanks to the opportunity to work they can be in touch with society, they have relative certainty regarding their housing and covering their basic needs and, even if they have a low score in total life satisfaction, their low income does not have an effect on their satisfaction with the examined areas of life and on their affect.

The situation for the unemployed is less favorable; not only does their income not usually satisfy their needs – hence the low score in satisfaction with areas of life – but due to their unemployment their expectations of the future have decreased, along with their affect score. As stated by Cummins (2000), they cannot "buy happiness to the extent that external resources allow the optimal functioning of the SWB homeostatic system" (p. 133). In the group of retirees, the assumption about the existence of the relationship of income to SWB was not supported: low income did not have a significant relationship to any of the psychological variables, i.e. overall life satisfaction, mean score of satisfaction with three aspects of life and affect. The explanation that the data come from Slovaks and thus may differ from those obtained from Western societies is implausible because similar results regarding the relationship between low income and socio-demographic characteristics to life satisfaction was identified by Smith et al. (2004) among persons over 60 years of age from three English cities. For the time being, it can be assumed that Cummins' theory is not universal and that the lack of low-income effect in this particular group of people is not a matter of its being masked by other variables; rather than that, it may be a support for the hypothesis that among Slovak retirees, low income is not a predictor of overall life satisfaction, mean score of satisfaction with three aspects of life, and affect.

Different Effect Size of Subjectively Assessed Health in Relation to Well-Being Variables Depending on Self-Defined Economic Status

In all three groups of persons, subjective health rating was a significant predictor of all three well-being variables. If in the interpretation of this result we did not take into account the volume of the effect, then a simple explanation of the universality of the effect of this variable might be that it was a predictor of the same nature as the criteria tested (subjective variables), despite the fact that the predictor was inserted in the last block in the regression. However, if we take into account the volume of the effect of subjectively assessed health, then for the two groups of people, i.e. the unemployed and the retirees, the effect of health was the highest; the result was different in the category of the unemployed. Only in relation to affect was health the strongest predictor; for overall life satisfaction and mean score of satisfaction with three aspects of life, the strongest predictor was income. The negativistic explanation that the life situation of the unemployed reduces their subjective sensitivity to the assessment of their own health and that a lack of income worsens overall life satisfaction and mean score of satisfaction with three aspects of life cannot be ruled out. An alternative explanation may also be considered: a strong dependence of the high score in affect on subjectively assessed health is related to the fact that, for this group, income or the socio-demographic factors tested

have no significance and the only thing these people value is their subjectively assessed current state of health.

A Differentiated Effect of Gender and Education Depending on Self-Defined Economic Status

A missing effect of gender differences on well-being variables among employees and retirees supports some well-known findings (cf. Diener et al., 1999) that gender is not a SWB predictor. The fact that the effect of gender was evident in only one group of people, i.e. only among unemployed women, requires a separate analysis. It may be assumed that it results from social expectations of securing one's finances, which put higher pressure on men than on women, and that the men questioned subjectively perceived this pressure negatively. As for the positive effect of education among employees on overall life satisfaction and affect and the absence of this effect in the remaining two groups of persons, the results obtained partly correspond to the analysis by Diener et al. (1999), who explained the existence of a weakly significant relationship of education and SWB by referring to correlation of income and occupational status. The lack of relationship between education and psychological variables among retirees and the unemployed corresponds with this explanation, since neither of the two groups experience the effect of occupational status.

Limitations

The significant advantage, which rests in the quality and size of the sample, is weakened by the fact that the analysis of secondary data has been subject to several constraints. The first constraint is that the choice of analyzed variables was determined by the existing data. For example, the distribution of respondents to never married and married does not take into account those living with spouse that did not belong to any of the interviewed categories, as the unknown reviewer pointed out. The second is related to the fact that well-being variables were operationalized inadequately with regard to the dominant approach to their theoretical definition in the literature. In other words, the data analyzed were not aimed at verifying income and well-being variables and the instruments for the assessment of well-being variables were developed ad-hoc. The results obtained are, therefore, difficult to compare with other similar surveys, in which these variables are usually operationalized differently and the results of the data thus obtained provide only a rough estimate of the trends of the relations among statistically tested variables. Improving the understanding of these relationships would be possible by using the established scales with verified psychometric properties, and more accurately understanding of these relationships in specific groups would involve checking the effect of the known predictors of well-being variables, such as the effect of personality variables. Other limitations are related to how independent variables were defined and measured. The problematic use of the 'at-risk-of-poverty threshold' as an indicator of income poverty has been pointed to by authors of several studies. For example, Nygård et al. (2017, p. 684) states: "The fact that an individual or a household earns less than 50/60% of the median income does not necessarily mean that the individual/household is going to lack resources or suffer individual deprivation." Another source of potential imprecisions was pointed to by Angel, Heuberger, and Lamei (2017), who compared two data sources available in parallel for the same households: register-based and survey-based income data. Based on the social desirability argument, it is expected that households with low incomes tend to report a higher income than they actually have. On the other

hand, households with a higher income are expected to make themselves 'poorer' in the interview situation. A certain understatement of income usually grows with the amount of the actual income (Večerník & Mysíková, 2016). This also applies to incomes flowing from several sources, e.g. multiple jobs. It has thus been confirmed that while earnings tend to be skewed in income reporting by household respondents, old age or other types of pension benefits do not suffer from such distortion. As a result, the income poverty of persons in households with wage earners may be overestimated in comparison with persons living in households with retirees. Several specific issues related to EU-SILC were pointed to by Maestri (2014). Of these, we consider the fact that "Income refers to the previous year, while housing information to the current year" (p. 693) is the most serious and one which has significantly influenced the results of our analysis. Detection of psychological experiencing in the analyzed data was carried out with a considerable time delay after the assessed reference income period: the detection was held 4-5 months (April-May 2013) after the surveyed reference income period – the persons quoted their income for the previous calendar year of 2012. This time shift could have been a source of unidentified factors of reciprocal relationship of below the poverty risk and well-being variables. For example, during the assessment of subjective well-being, a person may not have had an income below the poverty risk threshold for several months, and their financial situation may have been radically improved, or even made worse. The same applies to subjective assessment of one's own health.

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'I Will Help but not Everybody' – Donating to Charity in a Deficit vs. Growth Condition: The Importance of Well-Being

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This study examined how the reason for donating influences the likelihood of charitable giving and whether well-being and happiness shape this relation. Students (N = 85) were asked to donate to either children struggling with learning (to reduce a deficit) or gifted children (to support growth). We expected that although generally people are more likely to offer money to reduce a deficit than to support growth, with an increase in happiness and well-being the difference in the odds of helping, resulting from these two motivations, would be diminished. The results showed that more people opted to help struggling children than gifted ones. Well-being and happiness were not related to willingness to help. They predicted the amount of support given, although the pattern of results was different for each psychological construct. The results are discussed with reference to a revised cost-reward model of intervention and concepts of well-being.

Key words: deficit vs. growth, prosocial behavior, well-being, happiness, prosocial spending, donating

Introduction

Charitable giving has been increasing worldwide, with more people prepared to donate to various causes (The Ultimate List of Charitable Giving, 2019). Nowadays, with the development of modern technologies and social media, helping has become as easy as it has ever been. One can easily donate to any cause in a few clicks. Thanks to these opportunities, it is now possible to support individuals, who did not have a chance to obtain funds easily (living in small towns or the countryside, citizens of less affluent countries). The Internet provides plenty of examples of how successful crowdfunding activities have helped individuals all over the world. One of the spectacular accomplishments in this field is the cause of Eliza O'Neill, a four-year-old girl diagnosed with Sanfilippo syndrome, an incurable neurological disorder that destroys brain cells. Her parents have managed to raise over $2 million via online donations to launch a clinical trial that could help save her

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life (Saving Eliza, 2019). This example shows that human generosity may help to save lives even in potentially hopeless cases. Hence, recognizing factors that determine charitable giving appears to be an important undertaking.

Charity is a type of indirect help involving giving, which can be contrasted with direct help, which involves doing something to help in person (Smithson, Amato, & Pearce, 1983). According to Batson and Powell (2003), helping is a broad term that describes actions that can have several motivations, including egoistic benefits or external pressure. However, donating to charity is a type of helping that could also be categorized as prosocial behavior (prosocial spending) because it is a voluntary action conducted without external reinforcement, that aims to improve the situation of a person in need (Bierhoff, 2002). Some charitable donations may even be altruistic, when the ultimate goal of the donation is to improve the situation of another and the feeling of being a good person, sensitive to others' needs, is merely an unintended consequence (Batson & Powell, 2003). From this point of view, we were interested in prosocial behavior in the form of donating to charity, which is a type of indirect helping as mentioned above.

Prosocial spending can be analyzed on various dimensions. The concepts developed by behavioral economists appear to be consistent with psychological theories of helping, as both underlie the importance of internal self-benefits of helping. For example, according to the negative state relief hypothesis (Cialdini, Darby, & Vincent, 1973), people are more likely to help when they feel bad because prosocial behavior is a form of mood-enhancing reward. Andreoni (1989, 1990) proposed a model of impure altruism, in which he depicts the act of giving as a source of satisfaction described as a warm glow; hence, people make charitable donations because they gain utility from it and do not need any external rewards. Imas (2014) found that when incentives are low, individuals work harder for charity than for themselves; however, this effect disappears when the monetary rewards increase, suggesting that external incentives may diminish the warm glow effect. Studies in this area have also considered the positive influence of public visibility of an act of donating to charity (Ariely, Bracha, & Meier, 2009) and the interplay of psychological costs and rewards on helping in critical situations (Piliavin, Dovidio, Gaertner, & Clark, 1981).

Although they do so differently, both the abovementioned economic and psychological models refer to the costs and benefits of helping. Therefore, we based our predictions on a revised arousal: cost-reward model of intervention (Piliavin et al., 1981). According to this model, decisions about helping are determined by cost-reward calculations and the attribution of arousal, which are affected by several factors such as the situation, the person's individual traits and the characteristics of the person or group in need. As well as arousal, the costs and benefits for the helper and the target of the help are also important. Help is offered more often when the cost of not helping is high, but only when the cost of helping remains low. Engaging in charitable giving could be considered low-cost helping, when small amounts of money are involved. Research confirms that a higher cost of not helping is related to more helping when the cost of such action is low. In one study, for example, when people were convinced that the message on an unsent and lost postcard that they found was important, they were more likely to send it than when they felt the message was less important (Deaux, 1974). In another study (Bickman & Kamzan, 1973), women in a supermarket were more likely to give money to another woman who approached them saying that she was short of money to purchase milk than frozen cookie dough. In this study, the researchers assumed that milk was a high-need item, while cookie dough was a low-need item. Helping was more common in the case of a

high-need item. This might be interpreted as an effect of the higher cost of not helping. A similar effect of the cost of not helping, although not for the frequency of donation but for the amount of money donated, was indicated in Harris and Samerotte's (1996) study. They showed that men 'were more willing to donate money to someone who intended to use it to purchase nutritious, highly needed items [a glass of milk and a sandwich], than to one who would buy items of low nutrition, low need [a coke and a piece of cake]' (Harris & Samerotte, 1996, p. 198). Finally, people were more in favor of donating towards tetanus vaccinations when the risk of illness was high than when the risk was low (West & Brown, 1975).

The cost-reward model also takes into account the individual characteristics of the helper. In high-cost helping situations, supposedly only the most brave and confident people will help (Batson & Powell, 2003). On the other hand, since charitable actions are not considered high cost but refusal to help might have more or less serious consequences, various individual characteristics should play an important role. Some scholars propose that the effect of individual characteristics manifests best when there is no situational pressure (Carlo, Eisenberg, Troyer, Switzer, & Speer, 1991; Snyder & Ickes, 1985), that is when the situation does not create high negative arousal that would lead to more universal behavioral reactions (withdrawing when the cost of helping is very high or helping when the cost of helping is low). Therefore, it seems important to take into consideration the emotional well-being of potential helpers before asking them for a donation. In recent years, correlates of well-being have received a lot of attention from researchers in various fields of science (such as psychology, economics, sociology and philosophy). One of the key terms in this area is happiness. It refers to the dominance of positive emotions over negative states and is often treated as a hedonic indicator of subjective well-being (Diener, Suh, Lucas, & Smith, 1999). As a vast number of studies indicate, mood can greatly influence behavior in various social contexts (Lyubomirsky, King, & Diener, 2005). Therefore, it seems highly relevant to scrutinize the empirical data on the links between subjective happiness and willingness to help.

A considerable number of studies confirm the existence of *the glow of goodwill* (Batson et al., 1979), which states that helping others is associated with positive mood. Happy people volunteer for charity more than their unhappy peers do in various types of organizations, including religious, political, educational and health-related (Thoits & Hewitt, 2001). They also report having more interest in prosocial behavior, spending a greater percentage of their time helping others, performing more good deeds (such as stopping to help a stranger) and expressing greater intentions to perform such deeds in the future (Jasielska, 2018; Lyubomirsky et al., 2005). Moreover, Isen and Levin (1972) indicated that experimentally induced positive affect predicts doing kind things for others (for example, individuals were more likely to help to pick up papers dropped in front of them if they had 'found' a coin placed in a telephone booth by an experimenter, than if they had not). What is more, several studies show that *prosocial spending,* which refers to using one's own financial resources to help others, is associated with greater happiness (Aknin et al., 2013; Dunn, Aknin, & Norton, 2014) in the majority of cultures.

Several theoretical frameworks have been proposed to explain this relationship between happiness and prosocial behavior. In a model proposed by Lyubomirsky et al. (2005), happiness (defined as a long-term propensity to experience positive emotions) is a state that frequently leads to successful (valued by society) outcomes. As these authors noted, the state of happiness signals to the person experiencing it

that he or she is free from immediate danger and hence can seek new goals. This is consistent with the broaden-and-build theory (Fredrickson, 2001), which states that the major function of positive emotions is to produce the tendency to approach rather than to avoid and to prepare individuals to seek new experiences. As a result, positive emotions lead people to think and act in ways that promote resource building. Given the findings on the links between positive mood and helping (Batson et al., 1979; Isen & Levin, 1972; Thoits & Hewitt, 2001), it is possible that acting prosocially could be considered resource-building behavior. By being more helpful, people believe they are liked more (because, as the concept of image motivation states, they have a tendency to be motivated by others' perceptions – Ariely, Bracha, & Meier, 2009) and hence may profit more from social interactions in the future (for example, through the norm of reciprocity), furnishing them with stronger and more supportive social networks. Therefore, it might be presumed that a happier person will be more likely to help a stranger because a positive mood encourages such behavior as a form of 'social investment'. In addition, it has been proposed that positive mood leads to helping by increasing positive thoughts and favorable views of other people (Baron, 1987). What is more, happy individuals might have a more favorable picture of themselves, including viewing themselves as being more generous and in control (Baumeister et al., 2003; Lyubomirsky et al., 2005), which may render readiness to help as something consistent with their self-image.

However, well-being may also interact with situational conditions influencing charitable actions. If individual characteristics manifest best in less critical situations, then we might assume that well-being would matter most in a situation of low cost of either not helping or helping. The positive effects of well-being would be more visible in a situation of low rather than high cost of not helping, because in the latter situation people would help anyway irrespective of their personal well-being.

The Present Study

The motivation behind charitable donations can have different origins. As various psychological and economic concepts indicate, it can be driven by empathic concern (Batson & Powell, 2003), cost-reward calculations (Piliavin et al., 1981), the social context of helping (donating privately vs. publicly), the presence of material benefits, building a positive self-image or deriving satisfaction from giving (Andreoni, 1989; Ariely et al., 2009). However, to date little attention has been devoted to the purpose of giving. Our study focuses on two possible predictors of giving to charity – the goal of the charitable donation and the individual's well-being. We were specifically interested in whether the likelihood of donating would differ depending on whether the money was to be used to help children struggling with learning or to support those who are gifted. According to the arousal: cost-reward model, being presented with a situation in which a child is facing adversity, struggling or suffering, people readily experience discomfort and empathic arousal. Such children are not able to cope with the situation themselves, and so it represents a situation with a high cost of not helping and one that requires immediate action in order to reduce tension. Thus, helping can lead to a sense of relief as a result alleviating personal distress. This is even more plausible when helping is of low cost, as in the case of monetary donations. In contrast, presenting a story of an intelligent and capable child does not provoke discomfort because it does not involve coping with suffering. The aim is to increase the skills and fulfil the potential of a child, who is doing very well without any help. It requires a focus on strengths and future positive outcomes

rather than on adversity. In this situation, helping is not based on the experience of negative arousal (Piliavin et al., 1981). Therefore, we expected (hypothesis 1) that people would be more likely to help struggling children than gifted ones by donating more often and more money to the former.

The second goal of our study concerned the relationship between happiness and willingness to donate to charity. As the concepts discussed above imply, if being happy is a sign that the ego is not threatened, one would be more likely to express concern for others than for the self. What is more, if positive emotions lead to resource building, people will construct positive views of others and engage in actions that promote building relationships, including prosocial behavior. However, the positive relationship between well-being and the likelihood of donating would be more visible in cases where there is no situational pressure inducing negative arousal, such as when donating to gifted children. We therefore expected (hypothesis 2) that with an increase in happiness level, differences between helping disadvantaged children and talented ones should be diminished. Based on the broaden-and-build theory (Fredrickson, 2001), we predicted that experiencing a positive mood would encourage this situation as it produces a tendency to approach and enhances the availability of positive constructs about the world and others, making it easier to imagine the positive outcomes of supporting gifted children. Moreover, this situation is more likely to invoke helping behavior in the case of happier individuals as it addresses the three consequences of being happy verbalized in Fredrickson's (2001) and Lyubomirsky et al.'s (2005) conceptualizations: 1) individuals' need to focus on others rather than benefits to the self; 2) helping perceived as a long-term investment; 3) helping motivated by empathy rather than by personal distress stemming from aversive arousal. All the measures and manipulations applied in this study are presented below. The graphical design of the model is presented in Figure 1.

Method

Participants

Participants were 85 students (59 women) of sociology, philosophy, social work and pedagogy, aged 19-46 years (M=24.36, SD=5.10). The sample size was decided based on power analysis before data collection. In order to achieve a power of 0.80 (alpha level of .05, effect size of

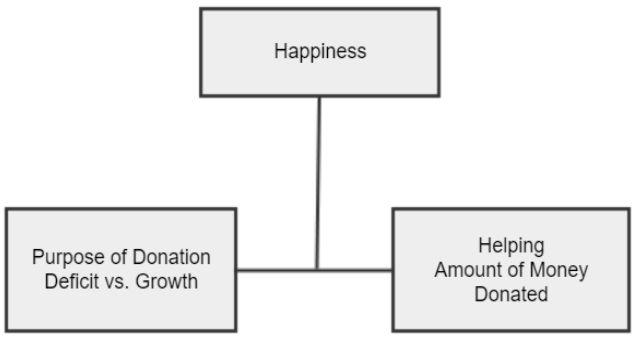

Figure 1 Graphical design of the model

f2 = 0.15, and a medium effect size) with planned logistic regression analysis (with one or two predictors), the number of participants should be at least 25 for one predictor and 68 for two predictors analysis (based on Faul et al., 2008). The participants volunteered for the study (there were posters informing about the study in different places on the university campus) and were entered into a lottery for a bookstore gift voucher. The study was carried out in accordance with the recommendations of the Academic Ethical Review Board. All subjects gave written informed consent in accordance with the Declaration of Helsinki. None of the observations were excluded from the analyses.

Measures

Researchers on well-being recommend using multiple measures of this broad construct in order to compare results from different instruments and measure it more reliably (Biswas-Diener, Kashdan & King, 2009). Subjective well-being is often analyzed with a reference to its two, interrelated dimensions – emotional (expressed in the dominance of positive emotions over negative emotions) and cognitive (described as a quality of life judged by an individual as good – Diener et al., 1999). Therefore, in the current study we decided to apply two different measures focusing on diverse aspects of well-being. In this study happiness was considered an indicator of hedonic well-being and measured with *Subjective Happiness Scale* (SHS, Lyubomirsky & Lepper, 1999). This scale focuses on subjective feelings about one's own happiness and consists of four items with a 7-point response scale (such as "In general, I consider myself…", 1 – not a very happy person to 7 – a very happy person). The scale had good reliability, $\alpha = .80$ and $\omega = .82$. Additionally, we measured eudaimonic well-being using the *Psychological Wellbeing Scale* (PWB, Ryff & Keyes, 1995). The scale assesses the following key aspects determining psychological quality of life: autonomy (a sense of self-determination), environmental mastery (the capacity to manage effectively one's life and surrounding world), personal growth (a sense of continued growth and development as a person), positive relations with others (the possession of quality relations with others), purpose in life (the belief that one's life is purposeful and meaningful), and self-acceptance (positive evaluations of oneself and one's past life). Participants responded to 18 statements indicating the extent to which they agreed with each of them on a 5-point scale. The measure had a satisfactory internal consistency, $\alpha = .73$ and $\omega = .73$.

Procedure

Participants were individually invited to a lab where they completed the SHS and PWB, were thanked and informed that the study was finished, and thus they left the room. At this point their willingness to help was measured. Shortly after leaving the lab a research assistant dressed as a volunteer for a fictitious foundation came to them and asked them to support a charity action by a donation in the form of money placed into a nearby box. There were two conditions related to the purpose of the donation: the money was to be collected for children with learning disabilities (deficits condition, $n = 42$) or for gifted children to support their talents (growth condition, $n = 43$)[1]. The scripts for both conditions are provided in the Appendix. After the participants made the decision whether to donate or not and how much money they were

[1] This type of manipulation (fundraising for struggling vs. gifted children) was earlier used in a paper-pencil study reported by Maison (2012), where participants had to evaluate the foundation and the importance of a charity action in the two conditions with different purposes of the fundraising. However, neither declaration about donating nor actual helping were assessed.

willing to give, they were debriefed and informed of the purpose of the study. All the money was immediately returned to the participants. The indicators of helping were the decision whether to donate or not and the amount of donated money.

Results

The verification of the hypotheses was preceded by an investigation of the relationship between the studied constructs and fulfilment of necessary assumptions for logistic regression and regression for zero-inflated models. Our dependent variables were not normally distributed for obvious reasons: one of them "willingness to help" was coded binary, the other one "the amount of money donated" had a number of excessive zeros. Both our happiness/well-being measurements in the form of SHS and PWB were normally distributed, which was assumed, given the graphical distribution and criteria for kurtosis and skewness (Tabachnick & Fidell, 2007). The requirements for parametric correlational analysis were met also for more advanced regression analysis. The average level of SHS was $M = 4.86$ ($SD = 1.04$) and the average level of PWB was $M = 3.96$ ($SD = 0.36$). The variables were moderately correlated, $r = .52$, $p < .01$. This supports the idea of diverse measurement of happiness, as both measures probably grasp slightly different aspects of happiness/well-being constructs. Since gender did not differentiate the levels of SHS, $t(83) = 1.08$, $p = .285$, PWB, $t(83) = -0.07$, $p = .948$, and was also not related to willingness to help, $\chi^2(1) = 0.76$, $p = .384$, $phi = -.09$, $p = .384$, we decided not to include it in further analyses as a controlled variable.

Logistic Regression

The independent variable in the study was the purpose of the donation: contributing to programs for children with learning disabilities (i.e., helping children with a deficit) vs. contributing to programs for gifted children (i.e., helping unusually intelligent children fulfil their potential for intellectual growth). The dependent variables were 1) donating or not (a dichotomous variable) and 2) the amount of money donated (a continuous count variable). A logistic regression was performed to ascertain the effects of children's level of intellectual ability on the likelihood that participants would help. The logistic regression model was statistically significant, $\chi^2(1) = 6.31$, $p = .012$, which suggests that the model with the purpose of donation included predicts data better than a model without independent variables (null model). The model explained 9.5% (Nagelkerke R^2) of the variance in readiness to help and correctly classified 63.5% of cases. In the deficits condition, the odds of participants being willing to help were higher by a factor of 3.04 than in the growth condition. In the deficit condition, 27 (64.29%) out of 42 people agreed to help, whereas in the growth condition, 16 (37.21%) out of 43 participants in the study offered support. The purpose of donation turned out to be an important factor in willingness to help/donate. This also confirms our first hypothesis.

In order to test whether levels of happiness and psychological well-being are also related to readiness to help in the growth and deficit conditions, a series of logistic regression analyses were conducted with a purpose of donation, happiness and psychological well-being scales, and their interactions as independent variables. Both general models were at the level of statistical tendency ($p = .063$ for SHS, $p = .069$ for PWB). Results showed that none of the tested interactive effects were significant. Also, the donation was not related to happiness or psychological well-being. Only the purpose of donation predicted the likelihood of donations in every tested model ($p = .013 – .018$). The re-

Table 1 *Logistic regression coefficients. Willing to donate regressed on happiness and psychological well-being after controlling for an experimental condition.*

Model	*B*	*SE*	OR	95 % CI	Wald Statistic	*p*	χ^2	*df*	*p*
Model 1 – Happiness (SHS)							7.29	3	.063
SHS	0.21	0.32	1.24	[0.67, 2.30]	0.46	.498			
Condition	-1.10	0.45	0.33	[0.14, 0.81]	5.93	.015			
SHS x Condition	0.00	0.44	1.00	[0.43, 2.36]	0.00	.996			
Model 2 – Psychological well-being (PWB)							7.09	3	.069
PWB	0.70	0.89	2.02	[0.35, 11.52]	0.62	.431			
Condition	-1.12	0.45	0.33	[0.14, 0.80]	6.06	.014			
PWB x Condition	-1.05	1.27	0.35	[0.03, 4.24]	0.68	.410			

sults of a series of logistic regression analyses are reported in Table 1.

Zero-Inflated Poisson Regression Models

We also examined whether excess zero (0 donation) in the growth and deficit conditions was related to the constructs of well-being (SHS & PWB) and their subscales, as well as whether the amount of money differed between the two conditions. Our suspicion, based on the graphical inspection, that the amount of money donated had a form of either Poisson or negative binomial distribution, was supported by the results of the Anderson Darling test. It was confirmed that our dependent variable had a Poisson distribution (*Statistics* = 190.21, $p > .05$), but did not have a negative binomial distribution ($p < .05$). The excess zeros constituted 49.4% of the distribution. As for the count model (including data from participants who offered money) the average donation was $M = 476.05$ ($SD = 375.96$) with minimum donation of 80 to maximum donation of 2000 pennies.

That is why we decided to test our hypotheses by employing Zero-Inflated Poisson regression (ZIP) models. ZIP methodology is widely discussed in various sources (e.g., He, Tang, Wang, & Crits-Christoph, 2014). The outcomes of the series of ZIP analyses including the interaction terms are presented in Table 2.

According to the results, the purpose of donation was related both to excess zero (0 donation) as well as to the amount of donation. The variable purpose of donation increased the probability of being in the zero-donation group but it was also related to the amount of the donation. The probability for being in the zero-donation group was significantly higher for the "growth" condition. The amount of donation was significantly higher in the "deficit" condition for every model tested. This again confirms our first hypothesis. However, excess zeros were not related to SHS, PWB, and their subscales. On the contrary, happiness and psychological well-being were related to the amount of donation. Higher levels of SHS, but lower levels of PWB, were related to higher donation. Also, interactions for the count model were statistically significant and they are presented in Figures 2–3.

Table 2 *Zero-Inflated Poisson regression coefficients with interaction terms. The frequency of donation regressed on happiness (SHS) and psychological well-being (PWB) after controlling for an experimental condition*

	Count Model Coefficients				Zero-Inflation Model Coefficients				AIC	Log-likelihood
Model	*Estimate*	*SE*	*z*	*p*	*Estimate*	*SE*	*z*	*p*		
Model 1 – SHS										
Block 1									11050.45	-5519.23
SHS	0.02*	0.01	2.17	.030	-0.22	0.22	-0.98	.325		
Condition	-0.05**	0.02	-3.11	.002	1.10*	0.45	2.44	.015		
Block 2									10984.51	-5484.26[a]
SHS	0.06***	0.01	6.61	< .001	-0.21	0.32	-0.68	.497		
Condition	0.58***	0.08	7.63	< .001	1.12	2.18	0.51	.608		
SHS x				< .001						
Condition	-0.13***	0.02	-8.34		0.00	0.44	-0.01	.996		
Model 2 – PWB										
Block 1									10593.26	-5290.63
PWB	-0.40***	0.02	-21.75	< .001	-0.19	0.63	-0.30	.765		
Condition	-0.08***	0.02	-5.40	< .001	1.11*	0.45	2.45	.014		
Block 2									10187.18	-5085.59[a]
PWB	-0.64***	0.02	-30.01	< .001	-0.70	0.89	-0.79	.431		
Condition	-3.13***	0.15	-20.73	< .001	-3.04	5.03	-0.60	.546		
PWB x				< .001						
Condition	0.78***	0.04	20.39		1.05	1.27	0.83	.410		

Note. [a] – based on LTR there was a significant improvement in a model by addition of interaction term (compared to the 0.05 critical-value from the Chi-square distribution with 2 *df*, which is 5.99).
*$p < .05$, **$p < .01$, ***$p < .001$

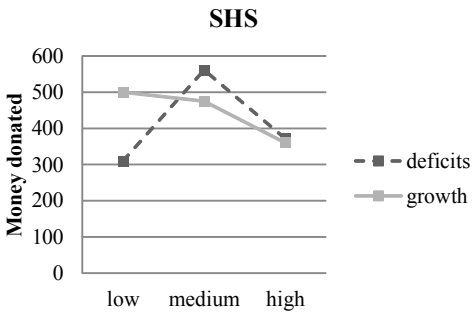

Figure 2 Interaction effect of SHS and experimental condition on money donation.

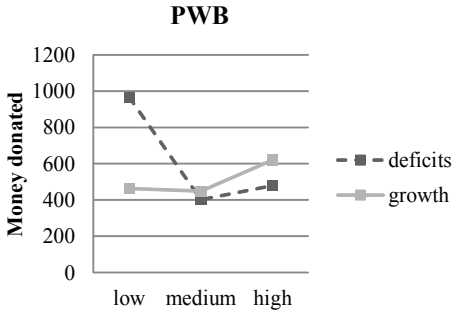

Figure 3 Interaction effect of PWB and experimental condition on money donation.

A closer examination of the interaction effect for SHS and Condition showed that at low levels of SHS higher donations were made in the "growth" condition (*Estimate* = 0.48, *SE* = 0.06, $p < .001$), but at medium levels of SHS that higher donations were typical in the "deficits" condition (*Estimate* = -0.17, *SE* = 0.16, $p < .001$). There was no such difference for high levels of SHS regarding the type of condition (*Estimate* = -0.03, *SE* = 0.42, $p = .458$). Overall, higher SHS was related to higher donations in the "deficits" condition (*Estimate* = 0.06, *SE* = 0.01, $p < .001$) and lower donations in the "growth" condition (*Estimate* = -0.07, *SE* = 0.01, $p < .001$).

In relation to psychological well-being, at low levels of PWB, donations were higher in the "deficits" condition (*Estimate* = -0.74, *SE* = 0.03, $p < .001$), while at medium (*Estimate* = 0.11, *SE* = 0.02, $p < .001$) and high levels (*Estimate* = 0.26, *SE* = 0.04, $p < .001$) of PWB donations were higher in the "growth" condition. In general, the increase in PWB was related to smaller donations in the "deficits" condition (*Estimate* = -0.64, *SE* = 0.02, $p < .001$), and higher donations in the "growth" condition (*Estimate* = 0.14, *SE* = 0.03, $p < .001$).

Discussion

The aim of our study was to investigate whether focus on deficits vs. growth and the level of happiness predict prosocial behavior. We hypothesized that the purpose of the charity action would affect the willingness to help, with a generally bigger propensity to support children who struggle with learning rather than those who are particularly gifted and need support in the development of their talents. We also expected that this difference would be diminished with an increase in happiness level, since happiness promotes prosocial behavior.

Results confirmed that the purpose of the donation was an important factor influencing not only whether a person would help or not but also the amount of help. Participants were more likely to offer money for struggling children than for gifted ones. Moreover, in general they were willing to give more money to children in "deficit" condition than to children in "growth" condition. This result supports our first hypothesis and the revised cost-reward model of intervention (Piliavin et al., 1981), suggesting that helping may be a result of a willingness to diminish negative arousal elicited by a confrontation with suffering. Participants might have experienced discomfort while hearing about children who struggle with learning, but that discomfort could easily be reduced by donating. In this situation, helping offered a reward (a relief from distress) at a relatively small cost. On the other hand, the growth condition did not elicit an unpleasant state, so there was no reward coming from experiencing relief. These differences can also be explained with reference to theories about different evaluative standards for processing information related to deprivation of needs and development of values (Jarymowicz & Imbir, 2014) and to the concept of negative bias (Ito, Larsen, Smith, & Cacioppo, 1998), which imply that information about deficits is processed differently from information about growth, with the former evoking an automatic emotional response and the latter requiring deliberation and cognitive activity in order to predict the future positive outcomes of helping (such as enhancing the success of a gifted individual).

Our second hypothesis stated that, with a higher happiness level, differences in helping in the deficit and growth conditions would be diminished. Our prediction did not receive empirical support regarding the frequency of helping, as there was no relationship between happiness and the frequency of acts of prosocial behavior, irrespective of the condition of the study. There are several possible explanations for this result. Firstly, prosocial behavior may be more likely to happen in a situation in which

positive emotions are elicited, because the person experiences arousal that facilitates positive thoughts about others (Baron, 1987). This produces a tendency to approach, which leads to acting in ways that promote resource building (i.e., helping others). In fact, the design of the previous studies involved experiencing a positive affect first and then giving participants the opportunity to help (Isen & Levin, 1972). In our study, we wanted to check whether similar effects would be obtained for the general level of well-being, not only for the experimentally induced state. Since the measures of happiness and PWB refer to the global positive evaluation of the subject's life (or several aspects of it), which is based on the frequency rather than on the intensity of experienced emotions (Diener, Sandvik, & Pavot, 2009), it is possible that due to the lack of strong affect, the benefits of a positive state described by the broaden-and-build theory (Fredrickson, 2001) were less prominent in the current study. Moreover, there is evidence that the effect of 'feel good, do good' holds only when the requested help is not costly to the helper (Bartlett & DeSteno, 2006). Donating money from personal resources could have been perceived by participants as a relatively big cost. Therefore, to address this issue in future studies, it would be beneficial to compare the relationship of happiness with different types of helping (including donating).

However, it is important to note that in the group of participants who helped, both happiness and psychological well-being were related to the amount of donations, yet, for each construct, different patterns of results were obtained. Higher levels of subjective happiness were associated with higher amounts of money given in the deficit condition, but lower amounts in the growth condition. In the case of psychological well-being, the effect was reversed: higher levels of PWB were related to higher donations in the growth condition but lower donations in the deficit condition. Those results are contradictory to our assumptions. Therefore, the interpretation of the results can be only speculative in nature, because, without measuring motivation and arousal, we are not able to verify the mechanism underlying the obtained effects. There are several ways of explaining these results, which we present below.

For participants with high levels of subjective happiness, no difference was observed regarding the type of manipulation; amounts of money given were similar in both conditions. This effect supports our expectations based on the theory of Lyubomirsky et al. (2005) about the benefits of happiness, which claims that at high levels of this state the differences between donating money in deficit and growth conditions would be diminished. Higher levels of subjective happiness were also related to a greater amount of money donated in the deficit condition. This result is consistent with findings from studies on prosocial spending that indicate a positive relationship between happiness and donating money (Aknin et al., 2013; Dunn, Aknin, & Norton, 2014). The question remains why a positive relationship between happiness and the amount of money donated was observed only in the deficit condition, and why higher donations were made at low levels of happiness in the growth condition. Perhaps these differences can be explained by the revised cost–reward model of intervention (Piliavin et al., 1981), in which a decision about helping is a result of cost–reward calculations that are affected by several situational and personal factors, which might involve a complex interplay between happiness and the type of donation. However, since in the present study we did not investigate the participants' motivation, such supposition remains a speculation, and further research is required in order to verify it.

Unlike the level of subjective happiness, lower levels of psychological well-being were related to bigger donations. Yet again, different pat-

terns were obtained for the deficits condition (negative relation between well-being and amount of donation) and the growth condition (positive relation between well-being and amount of money donated). Apparently, those two scales, both aimed at measuring well-being but only moderately correlated, capture a slightly different phenomenon. Whereas SHS provides a global, subjective assessment of whether one is a happy or an unhappy person (Lyubomirsky & Lepper, 1999), PWB measures well-being as a multidimensional construct consisting of autonomy, environmental mastery, personal growth, positive relations with others, purpose in life, and self-acceptance. Most importantly, none of the components of PWB refer to positive affect. They encompass positive qualities or attributes of a person rather than pleasant experiences, which qualifies this scale as an indicator of eudaimonic well-being, focused on the realization of human potential, based on personal dispositions and talents (Ryff, 2017). Personal development, achieving important goals and life purposes, are central criteria for psychological well-being. People high on PWB are described as having big potential, talents, and other positive propensities (Ryff, 2017). Hence, it is possible that they were willing to offer more money in this condition because they saw the benefits from such investment. Moreover, research shows that giving help to others who are similar is more probable (Batson et al., 1997; Dovidio et al., 1997; Karylowski, 1976; Sole, Marton, & Horstein, 1975). This can explain why, in the growth condition, the more the participants experienced psychological well-being the more money they offered for gifted children; they most likely identified with the value of personal development. On the contrary, in the deficit condition, with the increase of the PWB, the amounts of money given declined. Perhaps for the participants high on psychological well-being, it was harder to identify with the needs of struggling children (contrary to participants low on PWB), and hence they offered less money. In the future, it would be advisable to verify this supposition by asking participants about their motivation for donating.

There are a number of limitations in the current study that warrant mention. First of all, we did not control for the level of positive affect. It is possible that some participants had unpleasant experiences just before entering the laboratory and despite a global positive evaluation of life, their current affective state was negative and that had an impact on helping. Hence, it would be useful to add an assessment of positive and negative affect (and its intensity) just before asking for a donation. Future studies would also benefit from controlling the level of empathic concern. That would allow for checking as to how this variable affects the relationship between happiness and prosocial behavior. Finally, it would be beneficial to check for the participant's motivation regarding the donation (or choosing not to donate). Since participants' interpretations of the given situation, their values, or previous experiences might have affected helping, having an insight into such data could have shed some light on the apparently complex relationship between happiness and donating. Nevertheless, it is important to note that our study was partially a field experiment. This approach is considered important in the arena of social psychology, as it examines a real behavior (Grzyb, 2016). Since field experiments aim to reflect the natural settings, it is difficult to measure all intermediate variables. Moreover, examining the same effect in a more controlled settings may result in obtaining completely different results, because participants might want to leave a good impression (Grzyb, 2016, 2017). The question remains: which data would be better predictors of the actual behavior of participants?

Despite these limitations, the results reported in this paper lead to interesting conclusions

regarding the determinants of prosocial behavior. First, as predicted, it was easier to encourage somebody to offer money to charity when the purpose of the action was dealing with deficits rather than promoting growth. Contrary to our expectations, well-being was not related to the willingness to help either in the deficit or in the growth condition. This result might be due to the design of the study (measuring happiness and PWB, not positive affect) or the beneficiaries of the help (strangers, with whom there was no direct interaction). Yet, both subjective happiness and psychological well-being were related to the amount of money donated, with higher levels of subjective happiness but lower levels of psychological well-being related to higher donations. This effect, confirmed for the two separate measures of happiness, implies that the act of helping and the amount of money donated are two diverse behaviors that capture different aspects of helping. A better understanding of the differences between them and factors underlying various aspects of prosocial spending is needed and should be a goal for future studies.

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Appendix

Scripts used in the study

Script used in the deficit condition:

According to Centre for Public Opinion Research every fifth child in Polish schools **struggles with learning**. This month our foundation runs an action "Students and scientists for helping children" at Warsaw universities. The action is intended to help primary school children **who have learning difficulties**. The foundation wants to provide these children with the possibility of additional tutoring, **which will allow them to level up their educational opportunities**.

As a part of the campaign, there will be fundraising at Warsaw universities for schools that cannot afford remuneration for teachers for conducting additional classes.

Please help the children with learning difficulties!

Script used in the growth condition:

According to Centre for Public Opinion Research every fifth child in Polish schools **is exceptionally gifted**. This month our foundation runs an action "Students and scientists for helping children" at Warsaw universities. The action is intended to help primary school children **who have outstanding learning achievements**. The foundation wants to provide these children with the possibility of additional tutoring, **which will allow them to develop their talents**.

As a part of the campaign, there will be fundraising at Warsaw universities for schools that cannot afford remuneration for teachers for conducting additional classes.

Please help exceptionally gifted children to develop their talents!

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Mine is Bigger than Yours! Narcissism Predicts Biases in Perceived Head Size

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The expression *big headed* is often used to describe narcissists, however is it possible that this term signals a bias in how narcissists perceive themselves? We tested whether narcissistic traits predicted biases in the estimated size and weight of specific body parts, including head circumference and brain weight. In two questionnaire-based studies, participants estimated the size or weight of parts of their body. In Study 1 (n = 316), we found that the Leadership/Authority facet of narcissism significantly predicted greater estimates of head circumference in men, but lower estimates of head circumference in women. In Study 2 (n = 275), we found that when a sex-specific average head circumference was not provided, Leadership/Authority predicted greater estimates of head circumference overall. We present evidence that narcissism predicts biases in estimated head size and brain weight, but that the precise nature of these biases is dependent on the provided frame of reference for body size. These results are discussed with reference to within-sex competitive strategies, perceived intelligence and stereotypes for male and female attractiveness.

Key words: narcissism, body perception, head size, competitive strategies, sex differences

Introduction

Narcissism is a well-researched personality trait that relates to persistent illusions of one's superiority in comparison to other people. Individuals with high levels of narcissism have the tendency to over-estimate and self-enhance their characteristics in multiple different domains (Grijalva & Zhang, 2016). For example, narcissism is associated with perceiving oneself as dominant (Grijalva & Zhang, 2016; Rauthmann, 2012), creative (Goncalo, Flynn, & Kim, 2010), attractive (Gabriel, Critelli, & Ee, 1994), and intelligent (Campbell, Rudich, & Sedikides, 2002). In addition, narcissistic individuals engage in constant downward social comparison (Krizan & Bushman, 2011), thinking that they are better than other people around them. It is possible that the self-enhancement and social comparison tendencies are also represented in the way that narcissistic individuals view their bodies. Indeed, the body can act as a powerful vessel for a person's conception of the "self" and influence the manner in which people interact with others (Tsakiris, 2017). The human body has tremendous historical and cultural significance. Many of our emotions, experiences, and behaviours are based on embodied cognition, which is reflected in the linguistic

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metaphors that link to different body parts (Alberti, 2016; Gibbs, 2003). In this study, we were interested in exploring how narcissism related to people's perceptions of the size of various parts of their bodies.

The relationship between narcissism and body perceptions has been investigated in several studies, indicating that maladaptive aspects of narcissism have a connection with negative body image in both sexes (Purton et al., 2018; Swami, Cass, Waseem, & Furham, 2015), whereas more adaptive aspects of narcissism are associated with a positive body image (Carrotte & Anderson, 2019; Lipowska & Lipowski, 2019). In the present study, our primary interest was not body image, but the perception of the size of socially and culturally relevant body parts, such as the heart, brains, head circumference, lungs, and hands. We often use body parts as a metaphor for something else (e.g., "Maria has a big heart" means that Maria is a kind person), and people are harnessed with an intuitive knowledge about the meaning of these metaphors (Gibbs, 2003).

There are reasons to expect that people with high levels of narcissism think that their brains and heads are bigger than those of others. For instance, brain volume (Nave et al., 2019; Pietschnig et al., 2015) and head circumference (Bakhiet et al., 2017) have been related to better performance on intelligence tasks and it seems reasonable to suggest that narcissistic individuals may overestimate the size of these body parts as a reflection of their perceived greater intelligence. Furthermore, in colloquial English, talking about a person as "big brained" is a reference to their intelligence, and referring to someone as being "big headed" is denoting how overconfident they are. As narcissistic individuals think they are intelligent (Campbell et al., 2012; Grijalva & Zhang, 2016), and happy to admit their over confidence (Konrath, Meier, & Bushman, 2014), we would expect that they have inflated estimations of their brain weight and head circumference. Interestingly, research has shown that people consistently over-estimate the size of their head compared to the head of other individuals (Bianchi, Savardi, & Bertamini, 2008). The authors suggested that it could be due to a self-serving bias, as it is possible that people use head size as a proxy for intelligence (Bianchi et al., 2008).

Although brain size and head circumference were our primary interest, we also explored the relationship between narcissism and size estimations of other body parts. For example, lung size has been associated with good health and exercise, something that narcissistic individuals are known to be concerned about (Bruno et al., 2014). Thus, we expected a positive correlation between narcissism and estimated lung size. However, heart metaphors based around kindness and empathy (Alberti, 2016), are characteristics not typical in narcissistic individuals (e.g., Jonason, Lyons, Bethell, & Ross, 2013). One of the few domains where narcissists do not show an overestimation bias is in communal traits, behaviours that benefit other people (Grijalva & Zhang, 2016), indicating a "big heart". For this reason, we did not expect a relationship between narcissism and estimations of heart weight.

In addition to exploring the relationship between narcissism and perceptions of size of different body parts, we were interested in whether narcissism also influences these perceptions differently in men and women. Research has suggested that in comparison to women, narcissism predicts a greater self-enhancement of attractiveness and intelligence in men (Gabriel, Critelli, & Ee, 1994). Thus, it is reasonable to propose that any associations will be of larger magnitude in men. Furthermore, we intended to investigate different aspects of narcissism, as identified in the Narcissistic Personality Inventory (NPI; Raskin & Terry, 1988). Ackerman et al. (2011) suggested that the NPI contains three factors; adaptive facet of Leadership/Authority (e.g., assertiveness, self-enhancement), and

maladaptive facets of Grandiose Exhibitionism (e.g., attention seeking) and Entitlement/ Exploitativeness (e.g., devaluating and exploiting others). We expected that the self-enhancing Leadership/Authority facet would have the strongest relationship with inflated size estimations of body parts.

Study 1

In Study 1, we tested whether narcissism predicted biases in estimates of the size and weight of specific body parts, when given an average value for a typical man or a woman. Providing participants with an average value allowed us to ensure that all participants were making their estimate with some frame of reference and were therefore less likely to wildly guess, while simultaneously allowing us to check whether narcissism would predict an over or underestimation relative to the average. Since we were unable to measure the actual size and weight of the specified body parts, we instead considered the average as being a baseline value that was consistent across all participants.

Method

Participants

The sample consisted of 316 participants (mean age = 26.80, *SD* = 11.30; 23.10% male). Participants were recruited by advertising an online questionnaire to students at a university in North-West of England, who could participate for course credit. The questionnaire was also shared with the wider community via social media. Participants were mostly of British, Northern American or European nationality.

Materials

To measure perceived body size and weight of specific parts of their bodies, participants provided numerical estimates of either the weight or size of five chosen body parts. The five chosen measurements, in order of presentation in the study, were: head circumference (circumference around the forehead just above the eyes, in cm), hand size (length from the tip of the middle finger to the beginning of the wrist, in mm), heart weight (in oz), brain weight (in g) and lung capacity (in l). We specified the units for head circumference, hand size, brain weight, heart weight and lung capacity in order to ensure that all participants made their estimates using the same metric. For each measurement, participants were given the actual average value for both men and women (for example, "The average head circumference for men is 56 cm, and for women, 50 cm. Please estimate (without measuring it) your own head circumference"). They were asked to use a slider to estimate their own body metrics. The default position of the slider was the centre of the scale and a wide range above and below the stated average was displayed. The chosen values were based on our search in medical and anatomical literature, and can be found in Appendix 1.

Narcissism was measured using the 40-item alternate forced choice Narcissistic Personality Inventory (NPI; Raskin & Terry, 1988). For each item, participants were shown two statements and chose the one which applied most to them. One statement indicated high narcissism (e.g., "I know I am good because everybody keeps telling me so") and the other indicated low narcissism (e.g., "When people compliment me I sometimes get embarrassed"). One point was given for each high narcissism statement a participant chose (no points were given for selecting a low narcissism statement) and the sum of all points given measured overall narcissism (range = 1-33, Cronbach's $\alpha = .84$). In this study, we used the three factor structure (Ackerman et al., 2011) which gives three sub-scales of narcissism: Leadership/Authority (Cronbach's $\alpha = .76$), Grandiose Exhibitionism (Cronbach's

α = .75) and Entitlement/Exploitativeness (Cronbach's α = .47). The lower level of internal consistency for the Entitlement/Exploitativeness subscale is not unusual (Ackerman et al., 2011) and is in line with other research (e.g., Blinkhorn, Lyons, & Almond, 2015, 2016, 2018; Vonk, Zeigler-Hill, Mayhew, & Mercer, 2013).

Procedure

The first page of the online survey contained the participant information sheet, which outlined the relevant ethical information and the procedure of the study. Participants were told that we were interested in personality and how people perceive their own bodies. After clicking "Continue" to give informed consent to begin the study, participants completed a series of demographic questions (sex, age, nationality, current country of residence and occupation). Succeeding this they estimated either the size or weight of the five chosen body parts, and then completed the NPI. They were then thanked and presented with a full debrief.

Results and Discussion

Table 1 presents the descriptive statistics and sex differences for all measures. Men estimated all five body parts as greater than women (this was unsurprising since the provided average was always greater for males). Interestingly, there were no sex differences in total narcissism, or any of the NPI subscales.

To find whether participants estimated their body parts as greater or smaller than the average, we subtracted from their estimate the average stated for their sex (estimated size – relevant average), so that positive values represented estimates above the average and negative values represented estimates below the average. One-sample *t*-tests revealed that women significantly overestimated the circumference of their head in comparison to the average [$t(242) = 3.71$, $p < .001$], whereas men did not [$t(72) = 1.34$, $p = .20$]. Both men [$t(72) = -2.41$, $p = .02$], and women [$t(242) = 4.00$, $p < .001$] estimated their hand size below the stated average. For women, heart weight was estimated

Table 1 *Descriptive statistics and sex differences for all measures in Study 1*

	Mean (*SD*)			*t*
	Overall *n* = 316	Males *n* = 73	Females *n* = 243	
Head circumference (cm)	52.57 (5.81)	56.96 (5.41)	52.25 (5.26)	8.07**
Hand size (mm)	171.80 (17.04)	184.56 (15.74)	168.02 (15.52)	7.96**
Heart weight (oz)	9.51 (1.36)	10.64 (1.23)	9.17 (1.20)	9.09**
Brain weight (g)	1222.58 (151.33)	1327.96 (143.94)	1119.53 (138.88)	7.33**
Lung capacity (l)	4.61 (1.12)	5.58 (0.89)	4.31 (1.00)	9.75**
Total NPI	12.72 (6.73)	12.81 (6.46)	12.69 (6.82)	0.13
Leadership/Authority	4.22 (2.80)	4.37 (2.60)	4.18 (2.86)	0.51
Grandiose Exhibitionism	2.62 (2.35)	2.49 (2.28)	2.69 (2.37)	-0.62
Entitlement/Exploitativeness	0.84 (1.01)	0.88 (0.99)	0.83 (0.83)	0.37

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

as significantly greater than average, [$t(242) = 2.16$, $p < .001$]. No other estimates were significantly different to the stated average (see Table 2).

The relationships between the estimations of body size and the NPI (both total, and subscales) are presented in Table 3. We present correlations (r) and unstandardized beta val-

Table 2 *Mean difference between the stated average and estimated body size in Study 1. Positive values represent an average estimate above the average, negative values represent an average estimate below the average*

	Mean (*SD*)		
	Overall *n* = 316	Males *n* = 73	Females *n* = 243
Head circumference (cm)	2.57 (5.81)	0.96 (5.41)	1.25 (5.26)
Hand size (mm)	-4.08 (15.54)	-4.44 (15.74)	-3.98 (15.52)
Heart weight (oz)	-0.16 (1.21)	0.14 (1.27)	0.17 (1.17)
Brain weight (g)	-7.30 (139.83)	-8.04 (143.93)	-7.07 (138.87)
Lung capacity (l)	0.04 (0.99)	-0.22 (0.90)	0.11 (1.00)

Table 3 *Zero-order correlations and standardised regression coefficients for NPI subscales and estimated body size in Study 1: presented as: r (β)*

	Leadership / Authority *r (β)*	Grandiose Exhibitionism *r (β)*	Entitlement / Exploitativenes *r (β)*	Total NPI *r*
Overall (*n* = 316)				
1. Head circumference (cm)	.03 (-.04)	.06 (.04)	.15** (.16)***	.09
2. Hand size (mm)	.05 (.09)	-.03 (-.08)	.02 (.02)	.02
3. Heart weight (oz)	.03 (.05)	-.01 (-.02)	-.02 (-.03)	.05
4. Brain weight (g)	.12** (.17)**	.01 (-.06)	-.02 (.05)	.08
5. Lung capacity (l)	.13** (.06)	.14** (.09)	.11 (.07)	.17**
Males (*n* = 73)				
1. Head circumference (cm)	.28* (.26)*	.21 (.03)	.21 (.223)	.33**
2. Hand size (mm)	.17 (.27)	-.04 (-.13)	-.06 (-.03)	.11
3. Heart weight (oz)	.12 (.18)	-.07 (-.14)	-.05 (-.02)	.08
4. Brain weight (g)	.30** (.35)***	.02 (-.10)	-.10 (-.08)	.25*
5. Lung capacity (l)	.10 (.07)	.10 (.07)	.01 (-.02)	.10
Females (*n* = 243)				
1. Head circumference (cm)	-.06 (-.16)*	.04 (.09)	.13* (.16)	.03
2. Hand size (mm)	-.01 (.01)	.04 (-.03)	-.03 (.04)	.04
3. Heart weight (oz)	.01 (-.04)	-.02 (.07)	.04 (-.03)	-.01
4. Brain weight (g)	.06 (.08)	.03 (-.010)	-.01 (-.03)	.04
5. Lung capacity (l)	.14** (.02)	.20*** (.17)***	.14** (.10)	.21***

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

ues (β) for the overall data, and then separately for men and women. Overall, estimated head circumference was positively associated with Entitlement/Exploitativeness, estimated brain weight was positively associated with Leadership/Authority, and estimated lung capacity was positively associated with overall narcissism, Leadership/Authority and Grandiose Exhibitionism. In men, estimated head circumference was positively correlated with overall narcissism, Leadership/Authority, Entitlement/Exploitativeness, and brain weight was positively correlated with overall narcissism and Leadership/Authority. In women, estimated head circumference was positively correlated with Entitlement/Exploitativeness and negatively correlated with Leadership/Authority. In addition, perceived lung capacity in women was positively correlated with overall narcissism and all three sub-scales.

When shared variance between the subscales of the NPI were controlled for using simultaneous linear multiple regressions, in the total sample, Entitlement/Exploitativeness predicted greater estimates of head circumference, Leadership/Authority predicted greater estimates of brain weight, and Grandiose Exhibitionism predicted greater estimated lung capacity. In men, Leadership/Authority predicted greater estimates of head circumference and estimated brain weight. In women, Leadership/Authority negatively predicted estimated head circumference and Entitlement/Exploitativeness positively predicted estimated head circumference.

Using Fisher's *r*-to-*z* transformation, we found that the effect of Leadership/Authority on estimated head circumference differed between the sexes [$z = 2.57$, $p = .01$]. This shows that men who scored higher on Leadership/Authority estimated their heads as bigger, whereas women who scored higher on the same trait estimated their heads as smaller. No other sex differences were found.

The results of Study 1 showed that especially the Leadership/Authority facet of narcissism predicted sex-specific biases in estimates of body size – specifically greater estimates of head circumference and brain weight. Men (but not women) with higher levels of the adaptive subcomponent of narcissism overestimated their brain weight and head circumference. This could be related to the tendency of narcissistic men to over-enhance their intelligence (Gabriel et al., 1994). Our results suggest that this tendency could be localised to the Leadership/Authority facet. The Leadership/Authority facet was, interestingly, marginally negatively correlated with estimated head circumference in women.

These sex differences could be linked to the association between perceived intelligence and head circumference, and sex differences in the importance of intelligence when choosing a partner. Rather than an asset, intelligence could be a handicap for women in initial dating situations (Karbowski, Deja, & Zawisza, 2016). In contrast, intelligence could be beneficial for men, as women are attracted to men they perceive as intelligent (Karbowski et al., 2016). It is possible (although not yet investigated) that individuals subconsciously infer intelligence of others from their head size. Perceptions of intelligence (Kleisner, Chvátalová, & Flegr, 2014; Lee et al., 2017), and actual intelligence (Lee et al., 2017) is related to larger distance between the eyes and this distance is positively correlated with head size (Fledelius, 1982). Perhaps individuals with high levels of the adaptive facet of narcissism have stronger intuition about what the opposite sex finds attractive, and tune their head size estimations to reflect this.

Since sex-specific averages were given, it is possible that the opposite directions in estimated head circumference reflect differences in within-sex competitive strategies. For example, due to a general tendency in current Western society for female attractiveness to be centred on thinness and petiteness (Hesse-Biber, 1996), narcissistic

females may infer that smaller head size is considered more attractive. This desire to be viewed as more attractive and superior to other females may have led them to estimate below the stated average. This finding generally agrees with other research that has found a relationship between narcissism and sexual competitiveness in women (Carter et al., 2015). For men, evidence has suggested that there exists a powerful stereotype of the physical appearance of a male leader. This stereotypical male leader is tall (Gladwell, 2005), has a deep voice (Klofstad, Anderson, & Peters, 2012; Mayew, Parsons, & Venkatachalam, 2013) and is physically fit (Limbach & Sonnenburg, 2014). Our results suggest that men who scored higher on the Leadership/Authority facet may have been inferring an ideal head size from, and therefore conforming with, this widely held stereotype.

Study 2

In Study 1 we provided participants with sex-specific average values for each body part. If the opposing influence of scoring higher on the Leadership/Authority facet of the NPI on estimates of head size for males and females was due to differences in within-sex competitive strategies, then we might expect this effect to disappear if no differentiation is made between the sexes. Specifically, if sex-specific averages are not provided, we may find that both sexes scoring higher on Leadership/Authority estimate their head circumference as greater due to general tendency for individuals scoring high on this facet being driven to be seen as superior to others.

Method

Participants

The sample consisted of 275 participants (mean age = 23.40, *SD* = 7.10; 22.18% male). Participants were recruited by advertising an online questionnaire to students at a university in North-West of England, who could participate for course credit. The questionnaire was also shared with the wider community via social media.

Materials

Narcissism was measured in the same way as in Study 1, using the NPI (Raskin & Terry, 1988). One point was given for each high narcissism statement a participant chose (no points were given for selecting a low narcissism statement) and the sum of all points given indicates overall narcissism (range = 2-39, Cronbach's α = .86). We used the three factor structure (Ackerman et al., 2011), which gives three sub-scales of narcissism: Leadership/Authority (Cronbach's α = .77), Grandiose Exhibitionism (Cronbach's α = .77), and Entitlement/Exploitativeness (Cronbach's α = .47). The lower level of internal consistency for the Entitlement/Exploitativeness subscale is not unusual (Ackerman et al., 2011) and is in line with other research (e.g., Vonk et al., 2013).

To measure perceived body size and weight of specific parts of their body, participants provided numerical estimates of either the weight or size of the same five body parts as in Study 1. However, instead of being provided with a single specific average value, participants were given a range of values (for example, "The average head circumference varies between 48 and 60 cm. Please estimate (without measuring it) your own head circumference"). Participants moved a slider to make their estimate as in Study 1, and the given ranges for each body part were the same as in Study 1. The chosen values were based on our search in medical and anatomical literature, and can be found in Appendix 1.

Procedure

The procedure was identical to Study 1.

Results and Discussion

Table 4 summarises the descriptive statistics and sex differences for all measures. Men estimated all five body parts as significantly greater than women. This suggests that the tendency for men to estimate their body parts as greater than women was not due to the presence of separate sex-specific average values in Study 1. In terms of narcissism, men scored significantly higher on Grandiose Exhibitionism than women, but no other sex differences were found.

The relationships between the estimations of body size and the sub-scales of the NPI are presented in Table 5. We present correlations (r) and unstandardized beta values (β) for the overall data, and then separately for the sexes. Overall, estimated head circumference and lung capacity were positively associated with Leadership/Authority, Entitlement/Exploitation, and overall narcissism. For men, estimated heart weight was positively associated with Leadership/Authority. For women, estimated head circumference was positively associated with Leadership/Authority and Entitlement/Exploitativeness, and estimated lung capacity was positively associated with Entitlement/Exploitativeness. When the shared variance between the sub-scales of the NPI were controlled for using multiple regressions, overall, Leadership/Authority and Entitlement/Exploitativeness predicted greater estimates of head circumference and lung capacity. For men, Leadership/Authority predicted greater estimates of heart weight. For women, Entitlement/Exploitativeness significantly predicted greater estimates of head circumference and lung capacity, and Grandiose Exhibitionism predicted lower estimates of heart weight. However, when we tested the differences in the strength of the correlations between the sexes using Fisher's r-to-z transformation, none of them were significantly different.

The results of Study 2 indicate that the presence or absence of a frame of reference affected the relationship between narcissism and body perception. As we suspected, the opposing effect of Leadership/Authority for estimates of head size in males and females disappeared in Study 2, and instead we found that this facet predicted greater estimates of head circumfer-

Table 4 *Descriptive statistics and sex differences for all measures in Study 2*

	Mean (*SD*)			*t*
	Overall $n = 275$	Males $n = 61$	Females $n = 212$	
Head circumference (cm)	55.33 (9.18)	60.16 (9.76)	53.95 (8.56)	4.85***
Hand size (mm)	171.08 (20.59)	180.71 (18.17)	168.33 (20.46)	4.27***
Heart weight (oz)	9.91 (1.79)	10.6 (1.89)	9.71 (1.73)	3.50***
Brain weight (g)	1302.21 (172.82)	1367.49 (179.71)	1283.60 (66.60)	3.41***
Lung capacity (l)	5.44 (1.93)	6.30 (2.71)	5.19 (1.56)	4.06***
Total NPI	14.31 (7.05)	15.61 (7.04)	13.94 (7.03)	1.63
Leadership/Authority	5.21 (2.79)	5.75 (2.84)	5.05 (2.76)	1.74
Grandiose Exhibitionism	2.84 (2.47)	3.51 (2.35)	2.65 (2.47)	2.42**
Entitlement/Exploitativeness	0.83 (1.00)	1.00 (1.05)	0.78 (0.98)	1.55

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

Table 5 *Zero-order correlations and standardised regression coefficients for NPI subscales and estimated body size in Study 2: presented as: r (β)*

	Leadership / Authority *r (β)*	Grandiose Exhibitionism *r (β)*	Entitlement / Exploitativenes *r (β)*	Total NPI *r*
Overall (*n* = 275)				
1. Head circumference (cm)	.12*** (.17**)	.12 (.02)	.13** (.06)	.20***
2. Hand size (cm)	-03 (.04)	-.02 (-.05)	.04 (.05)	.01
3. Heart weight (oz)	.11 (.19***)	-.07 (-.13)	.04 (-.06)	.02
4. Brain weight (kg)	.07 (.03)	.08 (.04)	.09 (.07)	.12**
5. Lung capacity (l)	.18*** (.17**)	.07 (-.03)	.12** (.07)	.17**
Males (*n* = 61)				
1. Head circumference (cm)	.20 (.23)	.15 (.16)	-.10 (-.22)	.18
2. Hand size (cm)	.23 (.26)	-.06 (-.13)	.05 (.02)	.15
3. Heart weight (oz)	.36*** (.40***)	-.01 (-.07)	-.01 (-.10)	.25
4. Brain weight (kg)	.07 (.07)	.06 (.06)	-.02 (-.07)	.09
5. Lung capacity (l)	.25 (.25)	.10 (.06)	.04 (-.05)	.21
Females (*n* = 212)				
1. Head circumference (cm)	17* (.15)	.06 (-.07)	.18*** (.15)	.17*
2. Hand size (cm)	-.05 (-.05)	-.05 (-.05)	.01 (.05)	-.05
3. Heart weight (oz)	.01 (.10)	-.13 (-.16**)	-.07 (-.05)	-.08
4. Brain weight (kg)	.05 (.01)	.05 (.01)	.11 (.10)	.11
5. Lung capacity (l)	.13 (.12)	.01 (-.10)	.14** (.13)	.13

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

ence overall. These results indirectly suggest that the results of Study 1 reflected a difference in within-sex competitive strategies, and that when the pressure associated with being given a sex-specific average is removed, Leadership/ Authority predicts greater estimates of head circumference overall. To further test whether this is indeed the case, it would be useful to have the same participants estimate head size both with and without a reference and also assess the extent to which they experience social pressure to conform to beauty standards however this was not done here due to the exploratory nature of the present work. Interestingly, this facet Leadership/Authority also predicted greater estimates of heart weight and lung capacity. The relationship between estimating a bigger heart is surprising and contrary to what we expected. Although narcissists self-enhance agentic rather than communal traits (Grijalva & Zhang, 2016), they also sometimes engage in public pro-social behaviour (Konrath, Ho, & Zarins, 2016). Perhaps the self-estimated heart weight is a result of self-perceived altruism that narcissists could have as a result of their explicit, rather than genuinely implicit, occasional tendency to help others.

General Discussion

In two studies, we investigated whether narcissism predicts biases in perceived size of different body parts, depending on the sex of the individual. In Study 1, we gave participants es-

timates of average sizes within their own sex, and found that Leadership/Authority predicted greater estimates of head circumference in men but lower estimates in women. This difference could signal differences in within-sex competitive strategies and a desire to be seen in a particular way relative to other members of the same sex. Specifically, we suggested that, for females, attractiveness in current Western society is largely based on striving for thinness and petiteness (Hesse-Biber, 1996), narcissistic females may estimate their heads as smaller so that they might be considered more attractive. Evidence that shows a positive relationship between narcissism and sexual competitiveness in women (Carter et al., 2015) supports this suggestion. There is a vast literature on physical attractiveness for females, and factors identified as indicating attractiveness include small foot size, for example (Fessler et al., 2012). Women are on average smaller than men, and it is plausible that narcissistic females estimated their heads as smaller to be considered more attractive.

In contrast, men who scored higher on the Leadership/Authority facet may have been inferring an ideal head size from a powerful stereotype of a male leader (e.g., Gladwell, 2005), and therefore inflated their estimates of their own head size in order to conform to this stereotype. In addition, being taller is also considered more attractive in men (Pawlowski, Dunbar, & Lipowicz, 2000), and height is associated with both larger head circumference and intelligence (Lynn, 1989). Thus, men who scored high on the Leadership/Authority facet engaged in self-enhancement of a body size that related to other evolutionarily relevant mating-related variables. Our assertion that the opposing effect of Leadership/Authority on male and female estimates reflected within-sex competitive strategies was supported by the results of Study 2. In Study 2, we did not provide sex-specific averages for body part size, there was no overt within-sex competition, and we found that the sex difference in Study 1 was not present. Instead, we found that Leadership/Authority predicted greater estimates of head circumference overall.

Taken together, our results suggest a relationship between narcissism and self-enhancement in body parts that are relevant in sexual selection. Our results suggest that narcissism predicts biases in perceived head size, but that the exact nature of this relationship is dependent on the frame of reference estimates of head size are made in. Future work should note the effect of framing questions in ways that may induce a sense of competitiveness in respondents on the outcomes of studies, in particular when investigating narcissism.

Although these studies provide interesting preliminary results in an under-investigated aspect of narcissism and perception of size of body parts, the results should be treated with caution. First, it is possible that the relationship between narcissism and perceived size of specific body parts is mediated by lifestyle factors such as exercise and diet choices. Perhaps lung size estimations made by highly narcissistic individuals are larger because they associate lung size with cardiovascular fitness. Future work in this area should consider measuring lifestyle factors that could be related to narcissism in order to investigate such possible mediation further. Second, we gathered participants primarily using social media and this gave us wide and varied samples in terms of age and nationality, but both studies contained more females than males. However, it is noteworthy that we found Leadership/Authority predicted opposing effects on estimated head circumference in males and females, despite this sex imbalance in Study 1. The fact that this difference was not only statistically significant, but also predicted opposing effects, suggests that the sex imbalance may not have been problematic here. We also tested only self-reported head

size. We suggest that actual head size should be measured in future work (see Bianchi et al., 2008). This would provide an opportunity to test whether narcissistic individuals overestimate their head size relative to their own true head size as well as to a given average. Since narcissism is characterised by favourable self-evaluations we suspect that the relationship between narcissism and estimated head size found in these studies may reflect a drive to appear superior to others, and therefore may not be found when estimates are compared to true head size.

There were some discrepancies between the findings of Studies 1 and 2 that should be discussed further. Although some of these differences are explained by our idea that removing sex-specific average values for body size induced within-sex competition strategies in Study 1, there are some differences which may be more peculiar. For example, we found that greater Leadership/Authority predicted greater estimated brain weight overall and in males in Study 1, but this was not replicated in Study 2. This provides some support for the argument that our results broadly show that the reported relationships between narcissism and perceived body size relate primarily to attractiveness and a desire to be perceived as attractive, rather than intelligence. However, future research is required to fully understand the relationships between narcissism and perceived body size, in particular for body parts which may carry more subtle social messages. Furthermore, although we attempted to recruit a broad sample, a large portion of the sample were young university students and so the generalisability of our results is not certain. This is a widely discussed issue in psychological research, notable from the idea of WEIRD (Western, educated, industrialised, rich, and democratic, in Henrich, Heine, & Norenzayan, 2010) samples and should be considered more generally in psychological research.

Overall, the results of the present studies suggest that narcissism predicts biases in self-reported perceived head size, although the precise nature of these biases is dependent on the frame of reference in which head size estimates are made. The influence of the frame of reference highlights an interesting interaction between personality, perceived body size and social expectation.

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Appendix

Average values given for head circumference, hand length, brain weight, heart weight and lung capacity in Studies 1 and 2

Study 1

Measure	Given male average	Given female average	Given range on slider
Head circumference (cm)	56	50	30 – 100
Hand length (mm)	189	172	100 – 220
Heart weight (oz)	10.5	9	0 – 20
Brain weight (g)	1336	1198	0 – 2000
Lung capacity (l)	5.8	4.2	1 – 20

Study 2

Measure	Given average range	Given range on slider
Head circumference (cm)	48 – 60	30 – 100
Hand length (mm)	170 – 192	100 – 220
Heart weight (oz)	8 – 12	0 – 20
Brain weight (g)	1170 – 1429	0 – 2000
Lung capacity (l)	4 – 6.5	1 – 20

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Subjective Health Complaints in Fifteen-Year-Old Czech Adolescents: The Role of Self-Esteem, Interparental Conflict, and Gender

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This cross-sectional study aims to 1) investigate the factor structure and measurement invariance of subjective health complaints inventory in terms of gender, 2) examine the role of self-esteem, interparental conflict and gender in Czech adolescents' subjective health complaints, and 3) examine a possible moderating effect of gender in these relationships. Czech adolescents (N = 1602, 51% girls) from an epidemiological part of the European Longitudinal Study of Pregnancy and Childhood (ELSPAC) completed questionnaires at home and a psychological sub-sample of ELSPAC (n = 343, 46% girls) completed questionnaires during individual psychological examinations in the years 2006 and 2007. The subjective health complaints inventory used in this study is a unidimensional and scalar invariant for sex. Girls reported more subjective health symptoms than boys. Self-esteem may play a protective role for the adolescents' subjective health symptoms, especially in boys, whereas self-blame and threat in an interparental conflict may serve as a risk factor similarly for both sexes.

Key words: subjective health complaints, self-esteem, interparental conflict, Czech adolescents

Introduction

Subjective health complaints are symptoms that an individual feels on an almost everyday basis with or without any specific medical diagnosis. These include subjective physical health complaints such as headache, backache, muscle or bone pain, gastrointestinal pain, colds, allergies, as well as psychological complaints or pseudo-neurological disorders, such as fatigue, malaise, anxiety, and depression, sleeping problems, reddening of skin or heart palpitations (Haugland, Wold, Stevenson, Aaroe, & Woynarowska, 2001). A question remains whether these complaints are better empirically reflected by being divided into psychological and somatic symptoms (e.g., Haugland et al., 2001; Hetland, Torsheim, & Aarø, 2002) or by a shared common factor of subjective health complaints (e.g., Takata & Sakata, 2004).

Some studies have labelled these complaints as psychosomatic (e.g., Kinnunen, Laukkanen, & Kylmä, 2010) or somatic complaints (Torsheim & Wold, 2001). However, it is to be noted that despite the use of different terms for the concept being measured (psychosomatic, somatic, or subjective health complaints), the frequently

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used measuring tools are very similar to each other, including identical items for particular complaints. In psychosomatic complaints, there is an underlying assumption about the cause of these complaints – i.e., that the person has no medical diagnosis. This is usually not reflected in the studies that have called these complaints psychosomatic. On the other hand, in cases of somatic or subjective health complaints, there is no assumption about the etiology and the term is only descriptive (Torsheim & Wold, 2001). Therefore, we chose to use the term subjective health complaints in our study.

Subjective health complaints have personal and economic impacts and are associated with health care utilization in adults and adolescence (e.g., Belmaker, Espinoza, & Pogrund, 1985; Fink, Sørensen, Engberg, Holm, & Munk-Jørgensen, 1999). Subjective health complaints are common among adolescents with an increasing occurrence from childhood to adulthood (Berntsson & Köhler, 2001; Haugland et al., 2001). It has been repeatedly confirmed that these subjective health complaints are negatively related to the lives of adolescents in many aspects; these include a reduction in daily activities, school absence, eating disorders, inability to meet friends and to pursue hobbies, etc. (Torsheim & Wold, 2001; Roth-Isigkeit, Thyen, Stöven, Schwarzenberger, & Schmucker, 2005). It was also found that adolescents with multiple health complaints exhibit more somatization and anxiety symptoms in early adulthood (Kinnunen, Laukkanen, & Kylmä, 2010) and are at an increased risk of chronic pain in adulthood (Jones, Silman, Power, & Macfarlane, 2007).

The occurrence of subjective health complaints in adolescence is well documented in European and North American samples. The most common somatic and psychological symptoms in adolescents from Finnish, Scottish or US samples are headache, stomach ache, back pain, morning fatigue, nervousness, irritability, difficulty sleeping and depression (e.g., Ghandour, Overpeck, Huang, Kogan, & Scheidt, 2004; Kinnunen, Laukkanen, & Kylmä, 2010; Sweeting & West, 2003). In recent years, findings have also been reported from Central European countries. A study by Gecková et al. (2001) found that in Slovak adolescents, the most frequent physical health complaints are headaches and back pain, which is comparable to other Western European countries. In the Health Behaviour in School-aged Children Study (HBSC; Inchley et al., 2016), results from the Czech Republic show that among 15-year-old adolescents, frequent health symptoms include feeling nervous, sleep difficulties, feeling low or headache. In total, 48% of girls and 28% of boys suffer from multiple health complaints more than once a week.

According to previous studies, girls reported more symptoms compared to boys and the prevalence of symptoms increased with age (e.g., Hetland, Torsheim, & Aarø, 2002; Inchley et al., 2016; Ravens-Sieberer et al., 2009). These results have also been reported in Czech adolescents (Inchley et al., 2016; Osecká, Macek, & Řehulková, 1999). The reasons for the difference in occurrence between girls and boys probably lie in biological, social and psychological factors. For girls, it is more socially acceptable to report symptoms than for boys due to the process of gender socialization (Ruble & Martin, 1998). Adolescent girls are more focused on their own body and on bodily changes than boys (Strandbu & Kvalem, 2014). In addition, biological factors play a role because of different pubertal bodily changes in girls and boys (Aro & Taipale, 1987).

Subjective Health Complaints, Interparental Conflict, and Self-Esteem in Adolescence

Subjective health complaints are associated with environmental factors such as school-related stress (Torsheim & Wold, 2001) or family-related stress (Repetti, Taylor, & Seeman, 2002;

Ghandour et al., 2004). It was repeatedly found that interparental conflicts, being an inevitable characteristic of family relations, adversely affect child and adolescent health, and represents one of the most stressful events in the children's lives (Cummings & Davies, 2002). Låftman and Östberg (2006) found that the quality of social relationships with parents and peers as perceived by a cross-sectional Swedish sample of 10- to 18-year-olds ($n = 5\,137$) is connected with their health complaints. Michael, Torres, and Seemann (2007) confirmed that a high family conflict had a negative impact on health habits, resulting in e.g., less sleep and lowered well-being in late adolescents. Higher anxiety, depressive and somatic symptoms were reported by early adolescents from families with a higher conflict between parents (Mechanic & Hansell, 1989).

Interparental conflict and its subjective perception and evaluation by children and especially by adolescents affects the domain of self-related characteristics such as self-esteem. Self-esteem can be characterized as the global subjective evaluation of how individuals feel about themselves. It is related to an individual's general feelings of worth and competence and implies being aware of one's value and overall self-satisfaction (Alsaker & Kroger, 2006). Amato and Afifi (2006) documented negative relations between interparental conflict, self-esteem, and well-being. In early adolescents (aged 11 to 14 years), higher levels of family conflict were found to be related to lower self-esteem (Shelton & Harold, 2007). In a study by Macek, Bouša, Vančura, Sokoliová, and Neusar (2011), adolescents with slightly decreasing self-esteem (over the period from 13 to 19), and adolescents with permanently low self-esteem demonstrate lower trust and higher alienation in relationships with parents, a higher frequency of problems with parents, and higher self-blame for interparental conflicts.

In recent years, researchers have been increasingly pointing out a link between self-esteem and the mental and physical aspects of adolescent health (Byrne, 2000; Erol & Orth, 2011; Piko, Varga, & Mellor, 2016). Erol and Orth (2011) found a positive relationship between self-esteem and physical health in adolescence, where adolescents with higher self-esteem showed better health. In particular, it has been shown that the higher the self-esteem, the lower the number of somatic complaints such as abdominal (stomach) pain and malaise (Robinson, Mitchell, Kirkeby, & Meier, 2006) and depression and anxiety (Byrne, 2000; De Jong, Sportel, De Hullu, & Nauta, 2012). According to Piko et al. (2016), self-esteem has been found to provide protection against stress and it is related to lower levels of psychosomatic symptoms and mental health problems in both sexes.

Some authors suggest possible gender differences in self-esteem and perception of family conflict, and consequently, a different impact on various outcomes in adolescents' development (e.g., David & Murphy, 2004; Josephs, Markus, & Tafarodi, 1992). It has been found that females are more aware of and sensitive to interparental conflict consequences than males, whereas males are more focused on themselves and their own agency compared to females in the context of interparental conflicts (David & Murphy, 2004; Davies & Lindsay, 2001; Davies, Myers, Cummings, & Heindel, 1999). Therefore, adolescent girls may be more reactive on interparental conflict than boys because they are more concerned about the maintenance of interpersonal relationships, while being more aware of the impact of conflict on the whole family, including themselves. These differences may lie also in different gender socialization that may cause different perceptions of the importance of relationships in the family in general (Ruble & Martin, 1998). It is also assumed that for females, the quality of relationships is more relevant for the feeling of their self-esteem compared to males for whom the quality of relationships may be less essential.

Males are assumed to have more autonomous or individualistic self-schema compared to females. Because of these differences in self-definitions, some authors suggest that males and females may have different correlates of self-esteem as a result of different gender socialization (Josephs, Markus, & Tafarodi, 1992). Feeling good about themselves may be more important for boys than for girls and therefore it can be assumed that the impact of low self-esteem on health may be stronger for boys, as well.

A better understanding of factors that may be positively associated with the perception of subjective health complaints is needed. Therefore, the main aim of this study was threefold: 1) to examine the factor structure and measurement invariance for gender of the subjective health complaints scale used in this study; 2) to examine the relationship between perceived interparental conflicts, self-esteem, and subjective health complaints in a sample of 15-year-old Czech adolescents; and 3) to examine gender as a moderator of these relationships. We supposed that higher levels of perceived conflicts and lower self-esteem contributed to a higher level of subjective health complaints of adolescents. Next, we expected that gender could moderate the relationship between the variables. We supposed that in girls, the association between perceived interparental conflict and subjective health complaints would be stronger than in boys. On the other hand, we supposed that in boys, the association between self-esteem and subjective health complaints would be stronger than in girls.

Method

Research Sample

To achieve objective 1, secondary analysis of the data from the epidemiological study ELSPAC (European Longitudinal Study of Pregnancy and Childhood; for details, see Piler et al., 2017) was used; to reach aims 2 and 3, we analyzed the data from respondents participating simultaneously in an additional psychological part of this study (for details, see Ježek, Lacinová, Širůček, & Michalčáková, 2008). Informed consent was obtained from all individual participants included in the study.

The ELSPAC is a longitudinal epidemiological study that was conducted in five countries including the Czech Republic. All the families of children domiciled and born between March 1991 and June 1992 in medical institutions in the city of Brno and in the town of Znojmo were recruited. The Brno original sample included 5549 families, of which 3859 families had been surveyed following the prenatal period (Ježek, Lacinová, Širůček, & Michalčáková, 2008). Data used in this study were collected in 2006 and 2007 when the children reached 15 years of age. The sets of questionnaires for parents and children were distributed to the families via post approximately one day after the children's birthdays. The collection of psychological data through individual psychological examinations was conducted from 1999 to 2000 at the children's age of 8 on a quasi-randomly selected subsample of 883 children and their parents. At the age of 15, a total number of 554 adolescents took part, with 343 (62%) of them completing questionnaires in both the epidemiological and the psychological part of the study. In all age groups, the individual examination was quite long-lasting, about 2 hours (Ježek et al., 2008).

The "epidemiological sample" under our investigation was composed of 1602 fifteen-year-old adolescents (*mean age* = 15.38, *SD* = 0.35; 51% girls) from the Czech city of Brno (400 000 inhabitants). Regarding family structure, 80.9% of participants reported that they were living with both parents; 5.5% with one parent only and 13.6% with one parent and a stepparent.

The "psychological sub-sample" was composed of 343 fifteen-year-old adolescents (*mean age* = 15.36, *SD* = 0.34; 46% girls), who also

participated in the epidemiological part of the study. Regarding family structure, 85.3% of participants reported that they were living with both parents; 4.7% with one parent only and 10.0% with one parent and a stepparent.

According to sub-sample selection, the psychological sub-sample did not differ from the epidemiological sample in terms of subjective health complaints ($t(1604) = -1.39$, $p = .16$, $d = 0.08$), gender ($\chi^2(1) = 3.86$, $p = .05$, $\phi = .05$), age ($t(1550) = 1.00$, $p = .32$, $d = 0.06$) or family structure ($\chi^2(2) = 6.16$, $p = .05$, $\phi_c = .04$). Although some of these results are at the border of statistical significance, differences between both samples are only small.

Measures

Subjective Health Complaints

Subjective health complaints were measured by 15 items designed for the ELSPAC. Each item was aimed at a self-reported health symptom (indeterminate anxiety, unjustified fear, pessimism, inflammability, difficulty sleeping, nausea, intestinal problems, headaches, pain in the neck, long-lasting fatigue, loss of appetite, excessive sweet craving, states of malady, unpleasant feelings as if in a dream, intrusive thoughts); adolescent respondents were asked whether they had experienced any of these symptoms and if so, how often since they turned 11. Responses were measured on a 4-point Likert scale ranging from 0 (*never*) to 3 (*often*). The item "excessive sweet craving" was removed from the scale due to both low factor loading of this item and its poor content validity for the health complaints scale in adolescence. The total score was computed as a sum of 14 items. In the present sample, Cronbach alpha is .88 in the epidemiological dataset and .86 in the psychological dataset. This scale was included in the larger set of questionnaires sent to the families during the epidemiological data gathering and was filled out by the adolescents at their homes in pen and paper form.

Interparental Conflict Appraisal

The Children's Perceptions of Interparental Conflict Scale (CPIC) is an instrument for measuring important dimensions of the interparental conflict from the child's perspective in 51 items (Grych, Seid, & Fincham, 1992). The CPIC was developed to assess the objective characteristics of the conflict (frequency, intensity, and resolution – subscale conflict properties), as well as the adolescent's subjective evaluation of the conflict (subscales threat and self-blame). This evaluation includes the level of threat perceived by the adolescent when exposed to a conflict, and also the evaluation of his/her coping abilities in such context, how uneasy he/she feels about the conflict and to what extent he/she feels to be involved in the conflict, and finally, if he/she feels responsible for the conflict of his/her parents. The Czech shortened version (Lacinová, Michalčáková, & Ježek, 2009) includes 34 items in three subscales as in the original Grych et al.'s study (conflict properties: 13 items, e.g. "*I often saw my parents fighting*", "*When my parents have an argument they yell a lot*", Cronbach's alpha = .93; threat: 14 items, e.g. "*When my parents argue I worry about what will happen to me*", Cronbach's alpha = .77; self-blame: 7 items, e.g. "*Even if they don't say it, I know I'm to blame for my parents' arguing*", Cronbach's alpha = .80). The participants evaluate each statement on a three-point scale as true, partly true, or not true. The Czech CPIC has good psychometric properties and was found to be suitable for research purposes (Lacinová, Michalčáková, & Ježek, 2009).

Self-Esteem

The 10-item Rosenberg Self-Esteem Scale (RSES) was used (Rosenberg, 1979). The Czech

translation of this scale was repeatedly used in the ELSPAC (e.g., Macek et al., 2011) and other studies (e.g., Osecká & Blatný, 1997). Responses were measured on a 4-point Likert format ranging from 1 (*strongly disagree*) to 4 (*strongly agree*). Cronbach's alpha of the RSES was .86.

Interparental conflict appraisal and self-esteem measures were filled out by the adolescents in pen and paper form during individual psychological examinations. The average time difference between measuring these variables and measuring subjective health complaints in the epidemiological part of the study was about 3 months.

Data Analysis

An ordinal multiple-groups confirmatory factor analysis with a robust WLSMV estimator (*mean- and variance-adjusted weighted least squares*) and delta parametrization was performed in Mplus version 7.2 to assess measurement invariance of the subjective health complaints inventory for gender. In model 1 we tested a one-factor solution regardless of gender; in models 2, 3, and 4 we tested configural (same factor structure), metric (same factor loadings), and scalar invariance (same intercepts and thresholds), respectively. The differences between models were tested by chi-square difference test adjusted for WLSMV estimator (DIFFTEST function in Mplus). As the sensitivity of chi-square difference is too high and increases with the sample size (e.g., Brannic, 1995), we also used difference fit indices according to Chen's (2007) recommendation. The residuals of the items 'nausea' and 'intestinal problems' were allowed to correlate due to the probable similarity in the meaning of the items for adolescents.

The differences between study variables in girls and boys were tested using *t*-test. A hierarchical regression analysis with CFA derived factor score of the subjective health complaints inventory as a dependent variable and gender, self-esteem, conflict properties, threat, and self-blame as independent variables were conducted. In the second step of the analysis, interaction terms for all predictors with gender were included to assess possible moderator effects of gender. Due to the inclusion of interaction terms, all variables were standardized to *z*-scores before the analysis. The assumptions of the regression analysis were checked before the analysis and these assumptions were met.

Results

Subjective Health Complaints Inventory: Factor Structure and Gender Invariance ("epidemiological sample")

Confirmatory factor analysis revealed that configural, metric and scalar models provide an acceptable fit to the data (see Table 1). The metric model did not significantly degrade the fit relative to the configural model ($\chi^2_{diff}(13) = 19.543$, $p = .107$), both the chi-square test and the other fit indexes provided support for metric invariance. The scalar model resulted in significant degradation of the fit relative to the metric model ($\chi^2_{diff}(27) = 98.096, p < .000$). Changes in RMSEA and CFI indexes were small and below the cut-offs recommended by Chen (2007). Suggested modification indexes for the model were also small and therefore we considered the scale as a scalar invariant for girls and boys.

Subjective Health Complaints, Self-Esteem and Interparental Conflict ("psychological sub-sample")

Descriptive statistics and correlations of study variables are presented in Table 2. According to our results, girls reported a higher level of subjective health complaints ($t(341) = -5.715, p < .001, d = 0.62$) and had a higher score

Table 1 *Fit indexes for tested models*

Model	*N*	*χ2*	*df*	*p*	CFI	RMSEA	WRMR
Model 1 - total	1602	770.86	76	.000	.951	.075	1.944
Model 2 - configural	1602	863.47	152	.000	.945	.076	2.095
Model 3 - metric	1602	685.00	165	.000	.960	.063	2.175
Model 4 - scalar	1602	853.41	192	.000	.949	.065	2.304

Note. df – degrees of freedom; *CFI* – comparative fit index; RMSEA – root mean square error of approximation, WRMR – weighted root-mean-square residual.

Table 2 *Descriptive statistics and correlations of study variables for girls and boys*

	Girls *M*(*SD*)	Boys *M*(*SD*)	1.	2.	3.	4.	5.
1. Subjective health complaints	16.44(7.19)	12.11(6.85)		-.517**	.150*	.249**	.102
2. Self-esteem	2.88(0.49)	3.04(0.45)	-.399**		-.212**	-.260**	-.149*
3. Conflict properties	1.64(0.47)	1.53(0.44)	.173*	-.241**		.458**	.221**
4. Threat	1.61(0.33)	1.55(0.30)	.271**	-.173*	.554**		.104
5. Self-blame	1.17(0.29)	1.22(0.28)	.276**	-.109	.071	.207**	

Note. Correlations of study variables for girls are below diagonal, for boys above diagonal.

in conflict properties than boys ($t(340) = -2.226$, $p = .027$, $d = 0.24$). Boys reported higher self-esteem than girls ($t(341) = 3.119$, $p = .002$, $d = 0.34$). In the threat and self-blame scale of the interparental conflict there was no difference between girls and boys (threat: $t(340) = -1.865$, $p = .063$, $d = 0.20$; self-blame: $t(341) = 1.529$, $p = .127$, $d = 0.17$). Age did not differ between girls and boys ($t(326) = 0.816$, $p = .42$, $d = 0.09$) and also did not correlate with any study variable (subjective health complaints: $r = -.037$, *ns*; self-esteem: $r = .075$, *ns*; conflict properties: $r = .043$, *ns*; threat: $r = .051$, *ns*; self-blame: $r = .145$, *ns*). Therefore, age was not entered into the regression analysis.

In the first step of the hierarchical regression analysis, gender, self-esteem, conflict properties, threat and self-blame accounts for 31.8% of the variation in subjective health complaints ($F(5, 341) = 31.35$, $p < .001$). Adding interaction terms increased explained variation in subjective health complaints to 33.0%; this change in R^2 was not significant ($F(4, 332) = 1.51$, $p = .20$).

Table 3 shows that as self-esteem increased, the level of subjective health complaints decreased ($b = -0.37$, $p < .001$). Conflict properties were not significantly associated with the level of subjective health complaints ($b = -0.03$, $p = .49$). As threat and self-blame increased, the level of subjective health complaints also increased ($b = 0.14$, $p = .01$; $b = 0.10$, $p = .02$, respectively).

Except for the interaction term for self-esteem, all interaction terms were nonsignificant, which means that gender did not moderate the relationships between conflict properties, threat and self-blame and subjective health complaints. In the case of self-esteem, there was a

significant interaction term with gender (b = 0.18, p = .048). This means that in boys, as self-esteem increased by one unit, the level of health complaints decreased by 0.46 unit, and in girls, this relationship was also negative, but weaker in magnitude – one unit increase in self-esteem meant 0.28 unit decrease in health complaints (see Figure 1).

Table 3 *Linear regression models of predictors of subjective health complaints*

Variable	Step 1			Step 2		
	B	*SE B*	95% CI	*B*	*SE B*	95% CI
(Constant)	-0.15**	0.06	[-0.27;-0.04]	-0.14*	0.06	[-0.25;-0.02]
Gender (1 = female)	0.47**	0.09	[0.30;0.64]	0.47**	0.09	[0.30;0.64]
Self-esteem	-0.37**	0.04	[-0.46;-0.28]	-0.46**	0.06	[-0.59;-0.34]
Conflict properties	-0.03	0.05	[-0.13;0.06]	-0.02	0.07	[-0.16;0.11]
Threat	0.14**	0.05	[0.04;0.24]	0.10	0.07	[-0.03;0.24]
Self-blame	0.10*	0.04	[0.01;0.18]	0.03	0.06	[-0.09;0.15]
Self-esteem*Gender				0.18*	0.09	[0.00;0.35]
Conflict properties*Gender				0.00	0.10	[-0.19;0.20]
Threat*Gender				0.04	0.10	[-0.15;0.24]
Self-blame*Gender				0.14	0.09	[-0.03;0.31]

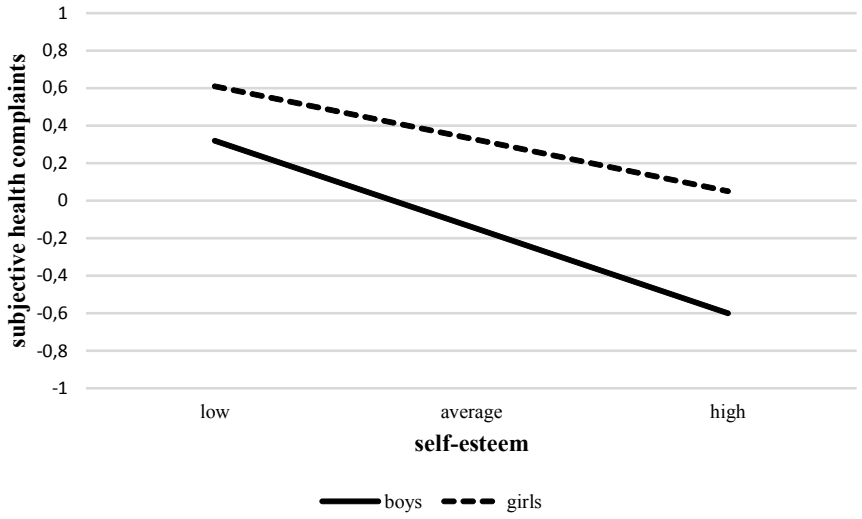

Figure 1 Interaction plot for subjective health complaints and self-esteem by gender

Discussion

Our study was primarily focused on subjective health complaints in a sample of 15-year-old Czech adolescents from the ELSPAC and also on examination of relationships between subjective health complaints, self-esteem, and interparental conflict in a smaller subsample of adolescents from the psychological part of the ELSPAC.

The first aim of our study was to examine the factor structure and measurement invariance of the subjective health complaint inventory for gender. This was a necessary step for group comparison because if the scale did not measure the same construct in the same way, the comparisons across groups would not be valid. Subjective health complaints were measured by the inventory designed for the ELSPAC including somatic as well as psychological health complaints (e.g., indeterminate anxiety, pessimism, inflammability, difficulty sleeping, nausea, intestinal problems, headaches). According to our analysis, the inventory used in the current study for measuring subjective health complaints in adolescence is unidimensional, which is similar to the results of Takata and Sakata (2004) and is invariant for gender.

Girls reported a higher level of subjective health complaints compared to boys. Higher occurrence of subjective health complaints in girls has been reported in many previous studies including an earlier study from the Czech Republic (Osecká et al., 1999; Hetland et al., 2002; Inchley et al., 2016; Ravens-Sieberer et al., 2009). There are more possible explanations for these sex differences. First, it is possible that girls are more willing to report health complaints than boys due to the process of gender socialization (Ruble & Martin, 1998). Second, the biological changes in adolescence are different for girls and boys and it is possible that many complaints are associated with the occurrence of menstrual cycles and the related pain in girls (Aro & Taipale, 1987). Third, adolescent girls may be more focused on their own body and bodily changes than boys (Strandbu & Kvalem, 2014). Therefore, it is possible that girls actually experienced more symptoms than boys did, but it is also possible that girls are more focused on these symptoms and are more open in symptoms reporting.

Next, we found differences between boys and girls in the level of self-esteem and in the conflict properties appraisal. In line with previous studies, boys usually report higher self-esteem than girls (e.g., Kling, Hyde, Showers, & Buswell, 1999). Next, our results showed that girls achieved higher scores in conflict properties than boys, but there was no difference in the level of perceived self-blame and threat in the perception of the interparental conflict. It is possible that girls report more frequent, more intensive and poorly resolved interparental conflicts due to their higher sensitivity to more subtle markers of interpersonal discomfort in the family context. It can be assumed that, through a gender-differentiated way of socializing, a greater focus on the perception of the finer nuances in close interpersonal relationships has been stimulated in girls from an early age (Ruble & Martin, 1998).

Previous studies have pointed out that family stress may influence the mental health of family members (e.g., Repetti et al., 2002) and that destructive interparental conflicts represent one of the most stressful events in children's lives (Cummings & Davies, 2002). Our results showed that the higher the level of subjective interparental conflict evaluation, specifically, a higher self-blame for the interparental conflict and a higher perceived threat in the conflict, the higher the level of subjective health complaints. These associations were of small effect sizes and were similar for girls and boys, which is in contrast with our expectations. We hypothesized that because of females' higher sensitiv-

ity to relationship maintenance and conflict outcomes and consequences, and the males' greater focus on themselves and their own agency (David & Murphy, 2004; Davies & Lindsay, 2001; Davies et al., 1999), adolescent girls would be more reactive on interparental conflict than boys. However, our results show that the perceived threat and the feeling of personal responsibility for conflicts between parents are similarly related to subjective health complaints in girls and boys. We can hypothesize that another variable could influence this relationship more than gender itself or in conjunction with gender, e.g. emotional functioning (e.g., David & Murphy, 2004). For instance, we can hypothesize that girls with low emotional functioning may be more affected by an interparental conflict than boys with low emotional functioning, but girls and boys with high emotional functioning will not differ. Conflict properties such as frequency or intensity are not related to subjective health complaints. It is likely that for subjectively perceived health, the frequency or intensity of conflict is not as important as how much the adolescents feel threatened by the conflict or how much they feel responsible for the cause of conflicts between their parents.

Next, according to our results, the higher the self-esteem, the lower level of self-reported subjective health complaints. Our results are in line with many previous studies that documented the relationship between lower self-esteem and lower physical and psychological health, including somatic complaints, anxiety, depression, etc. (Byrne, 2000; De Jong, Sportel, De Hullu, & Nauta, 2012). Our results show a significant interaction between sex and self-esteem indicating that self-esteem could play a more important role in subjective health complaints for boys than for girls. Although this result is at the border of statistical significance and therefore must be interpreted with caution, this finding is in line with our expectation. Males are assumed to have more autonomous or individualistic self-schema compared to females and feeling good about themselves is likely more important for them. This could lead to greater relatedness with other aspects of their development including subjective health. Some other authors also suggest that males and females may have different correlates of self-esteem because of different gender socialization (Josephs, Markus, & Tafarodi, 1992).

Our results offer several possible implications. It is important to point out that destructive interparental conflicts can be considered as a highly distressing factor in adolescence. However, these conflicts are often resistant to interventions. On the other hand, adolescents' self-esteem could be used as an available target of school counselors' interventions.

As for the limitations of our study, it must first be noted that the results ought to be interpreted in light of the fact that the sample was low-risk, i.e. coming from largely intact families. In addition, the rate of families with both biological parents in this study is higher than in the general population in the Czech Republic, in which about 76% of families with dependent children were complete families and 24% were incomplete families in 2001 (Český statistický úřad, 2001), and about 78% of families with dependent children were complete families and 22% were incomplete families in 2011 (Český statistický úřad, 2011).

Next, the data are more than a decade old, which is one of the limitations of our study. However, is possible to assume that the relationships between the study variables are constant over time, with our results being comparable to older as well as newer studies (e.g., De Jong, Sportel, De Hullu, & Nauta, 2012; Mechanic & Hansell, 1989).

Furthermore, the participants in our psychological sub-sample filled out our questionnaires in addition to the required testing in the larger epidemiological study. Therefore, it is reasonable to assume that the sub-sample consists in

highly motivated families. This further testing can often be stressful for the participating families and consequently, families with high levels of interparental conflict might be underrepresented in the sub-sample due to their unwillingness to undergo further stress. In a similar vein, we are concerned about the effects of filling out the epidemiological paper questionnaires and the duration of the psychological individual testing, therefore, we have to take into account some effect of fatigue.

Given that self-reported measures were used, there is a possibility of social desirability or response style in the answers. However, the current study has the advantage of having the dependent variable of subjective health complaints measured independently from the predictors used, since it was included as a part of the larger epidemiological study. The impact of actual mood or response style on answers in questionnaires would not be so pronounced in timely divided administration. In the case of interparental conflict perception, the use of a self-report questionnaire is relevant for this domain at that age. It has been repeatedly documented that in adolescents, as predictors of outcomes, the accuracy or other objective characteristics of a conflict are not as important as the individual subjective perceptions of the conflict (e.g., Harold, Fincham, Osborne, & Conger, 1997).

Next, some of the questionnaires were filled out by adolescents at their homes without the direct presence of an administrator. This could be seen both as a benefit and disadvantage. Home administration offers to adolescents more discrete space for answering sensitive questions. On the other hand, we cannot be sure of who filled out the questionnaires.

Despite the aforementioned limitations, this study is to the best of our knowledge the first one to include, besides the perception of a parental conflict, the relationship between self-esteem and the level of subjective health complaints in fifteen-year-old Czech adolescents, and to take into account the possible effect of gender. Finally, we must emphasize that this study provides further evidence of the importance of family environment for the well-being in middle adolescence.

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