

Effect of being religious on wellbeing in a predominantly atheist country: Explorative study on wellbeing, fitness, physical and mental health

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Data Availability <https://osf.io/vusyf>

Abstract

Despite a large volume of research on the impact of religion on different aspects of life, there is still a lack of studies from post-communist countries. In the current study, we aimed to fill this gap by investigating the relationship between religion and wellbeing, physical and mental health, education, sexual behavior and biological fitness among the Czech population. We managed to collect responses from 31633 participants and divided the sample into seven categories based on the type of religious belief and denomination (nonbelievers, believers without denomination, Catholics, Evangelicals, Hussites, Buddhists, Jews). We focused on the wellbeing as our main factor, which we define as composed of a number of sub-variables: physical and mental health, economic situation, self-attractiveness and the quality of the romantic relationship. In contrast to previous studies, we found a negative correlation between religiosity and physical and mental health. On the other hand, religiosity was connected to higher fitness, higher self-rated honesty and altruism, and lower sexual activity, which is in accord with the data from the western countries. Our findings suggest that even though Czechs had experienced years of oppression during the Communist regime, religion and religious beliefs still have considerable impact on their quality of life.

Keywords: religiosity, post communism, wellbeing, health, fitness

Introduction

In recent years, religious and personal beliefs have been studied extensively as a possible physical and psychological health-protecting factor (Ellison, Levin 1998; Koenig, King & Carson, 2012; Miller & Thoresen, 2003; McCullough & Laurenceau, 2005). Although the research on religion as a factor of wellbeing is multidisciplinary and numerous there are methodological flaws and disagreements in interpretations of observed positive effects (Sloan & Bagiella, 2002; Maselko & Kubzansky, 2006).

In previous studies, different factors were identified as possible mediating mechanisms in the positive relationship found between religion and well-being (Ellison, Levin 1998; George, Larson, Koenig, & McCullough, 2000). One of the possible mechanisms is the regulation of individual lifestyles and health behavior (Rew & Wong, 2006). Religious commitment is correlated with self reported lower frequencies of moral transgressions (Atkinson & Bourrat, 2011) and unhealthy behaviors (Clark, Friedman & Martin, 1999) such as drinking and smoking, driving under the influence of alcohol, and drug use. Moreover, the religious control over sexuality in western society influenced the sexual lifestyle of believers and promoted monogamous high-fertility relationships (Weeden, Cohen & Kenrick, 2008; McCullough, Carter, DeWall & Corrales, 2012), decreased the number of sexual partners and increased the age of first sexual intercourse which is also more likely to happen with a fiancé or a spouse (Simons, Burt & Peterson, 2009 ; Rostosky, Wilcox, Wright & Randall, 2004). These kinds of behaviors are related to lower risk of sexually transmitted diseases and unwanted pregnancy with positive effects on physical health (Simons et al., 2009). On the other hand, the traditional religious approach towards sexuality is conservative (Simons et al., 2009) and, particularly in case of non-traditional personal tendencies (i.e. homosexuality), can cause stress and negative emotion, both important factors for the onset of some mental illnesses.

The second important mechanism presented in previous studies (George et al., 2000 ; Lim & Putnam, 2010; Brownfield & Sorenson, 1991; Krause & Wulff, 2005) is social support from the religious community. This can involve emotional support in daily life conveyed through a stable social network and relationships among like-minded people (Lim & Putnam, 2010; Hayward & Krause, 2014), but also specific forms of support such as charitable organizations which often are church related. Social support has previously been linked with wellbeing by many studies (Cohen & Wills, 1985; Helliwell & Putnam, 2004; Valkenburg, Peter & Schouten, 2006; Wang, 2016), whereas loneliness and social isolation are risk factors for health (Holt-Lunstad et al., 2015). Additionally, being part of a religious community with strong common identity and high number of shared activities, including ritual, has been linked to personal life satisfaction (Lim & Putnam, 2010).

Another important factor in the relationship between religion and wellbeing is the provision of specific coping resources (Abu-Raiya & Pargament, 2015). The coping mechanism emerge in case of personal and interpersonal stressful situations and can have a strong impact on their outcome (Lazarus & Folkman, 1984). In literature, there can be found specific examples of illness or disease in which religious coping mechanism plays a role. Praying and meditating is a common coping mechanism in case of anxiety or depression in religious people (Kasi et al., 2012), in case of infertility various religious coping mechanisms were found (Latifnejad Roudsari, Allan & Smith, 2014) including surrendering to God's will, belief in spiritual support and engagement in rituals. Other strong coping mechanisms are beliefs in justice or opportunity in the afterlife or reincarnation. Belief in the afterlife has previously been negatively related to mental illness and psychological distress and positively related to a sense of control (Hayward & Krause, 2014), both important for the personal well-being.

The impact of religiosity and spirituality on emotions and self-esteem is another mediating factor found between religion and well-being (Joshani & Daemi, 2015; Van Cappellen, Toth-Gauthier, Saroglou & Fredrickson, 2014). Previous studies showed that religion increased positive emotions, particularly when they are self-transcendent like gratitude, altruism and forgiveness, and through that improved general well-being (Sharma & Singh, 2018; Van Cappellen et al., 2014). Increase in this type of feelings in believers can partially explain increase in self-esteem, due to more positive self-judgment (Shariff, 2015), but it is important to note that different mechanisms could intervene. For instance, religion and spirituality were related to a positive body image (Tiggemann & Hage, 2019) and belief in divine support directly improved self-esteem (Schieman, Bierman, Upenieks & Ellison, 2017). Some religious practices, like meditation and prayer, could also affect self-esteem as was showed for mindfulness (Bajaj, Gupta & Pande, 2016), typically important for some religion like Buddhism.

The previously cited studies have certain limitations, of course. In particular, studies on this topic from post-communist countries are rare and mainly limited to Hungary (Thege, Székely & Kopp, 2012). Our present study aims to narrow this lacuna. This paper reports the results of an explorative study in the Czech Republic that examined how religious beliefs are related to quality of life, physical and mental health and biological fitness. The Czech Republic is a post-communist country in Central Europe and is predominantly atheist; indeed it is one of the most atheist countries in Europe (PEW, 2017).

It has been suggested by Stavrova (2015) that the benefits of religiosity are restricted to highly religious countries or regions. To test this hypothesis, the analysis of data from the Czech population, in which non-religiosity represents the social norm, could be very important. A cross European study (Nicholson, Rose & Bobak, 2009)

describing connection of attendance at religious services and self-reported health (in 22 countries) showed that lower attendance at religious services is connected with poorer health. However, in the Nicholson study there was no significant connection between health and religious attendance in the Czech population.

In this explorative study, we analysed various properties in a large sample of Czech volunteers (N = 31,633) which we divided into seven categories according to their beliefs – major denominations (catholics, evangelicals, hussites, buddhists, jews), believers without denomination, and nonbelievers. In the anonymous questionnaire that covered a variety of topics (effects of biological and social factors on human sexual behaviour) we asked the participants questions related to their sexual activity, wellbeing, subjective mental health, mental health disorders, physical health, biological fitness in the narrow and broad sense, and their honesty and altruism. We also asked them about how important is their faith in God for them and whether they believe in justice after death.

Methods

Subjects

The internet questionnaire was distributed as a Qualtrics survey. The subjects were invited to participate in the study using a Facebook-based snowball method (Kankova, Flegr & Calda, 2015) by posting an invitation to participate in a “study testing certain evolutionary psychological and parasitological hypotheses, containing many questions related to sexual life” on the wall of the Facebook page “Lab Bunnies” (“Pokusní králíci” in Czech) for Czech and Slovak nationals willing to take part in diverse evolutionary-psychological experiments (www.facebook.com/pokusnikralici). The participants were informed of the aims of the study on the first page of the electronic questionnaire. They were also provided with the following information: “The

questionnaire is anonymous and obtained data will be used exclusively for scientific purposes. Your cooperation in the project is voluntary and you can terminate it at any time by closing this web page. You can also skip any uncomfortable questions; however complete data are the most valuable for us. Only subjects above fifteen years of age are allowed to take the questionnaire. If you agree to participate in the research and are above 15, press the “Next” button". Some pages of the questionnaire contained the Facebook Share or Like buttons. These buttons were pressed by more than 1,200 participants, which resulted in obtaining data from 49,015 responders in total between 22nd January 2015 and 1st January 2018. The project, including the method of obtaining an electronic consent with a participation in the study, was approved by the IRB of the Faculty of Science, Charles University (Komise pro práci s lidmi a lidským materiálem Přírodovědecké Fakulty Univerzity Karlovy) - No. 2015/01.

Questionnaires

The main part of the electronic survey consisted of the Sexual Preference and Behavior Inventory 2015 (SPBI-2015) (Flegr & Kuba, 2016). However, it also contained an anamnestic questionnaire collecting various socioeconomic, demographic, health related, epidemiological and psychological data, as well as three projective psychological tests. Altogether, the survey consisted of approximately seven hundred questions and the mean time necessary to complete it was about 89 minutes (the mode was 72 minutes). In the present study, we used only the information about gender, age, population of the town where the responders spent most of their childhood rated on a 6 point scale, body height, body mass, education (eight-points ordinal scale from 1- basic to 8 PhD or equivalent). Three sexuality-related questions from the standard Sexual Attitude Scale SOI-R (Penke & Asendorpf, 2008) (overall number of sexual partners,

number of sexual partners in the past year, number of sexual intercours in past month) which were used to calculate the aggregate variable sexual activity (for the method of calculating the aggregate variables see below).

Three sexuality-related questions from the standard Sexual Attitude Scale SOI-R (Penke & Asendorpf, 2008) (overall number of sexual partners, number of sexual partners in the past year, number of sexual intercours in past month) which were used to calculate the aggregate variable *sexual activity* (for the method of calculating the aggregate variables see below).

Five questions closely related to wellbeing (quality of physical health, mental health, economic situation, self-attractiveness, and quality of current partnership, all rated on a 6-point Likert scale with 1- very poor and 6 - very good) were used to calculate the variable *wellbeing*.

Five questions on the presence and intensity of subjectively rated symptoms of impaired mental health (whether and how much the participant suffers from depressions, manias, anxieties, phobias, and obsessively compulsive thoughts and behaviors, all rated on scales 0-100 by moving graphic sliders) that were used to calculate the aggregate variable *symptoms of impaired mental health*.

Three questions related on variety of mental health problems (how much or how often does the subject suffer from mental health disorders that have been diagnosed by a physician, how much or how often the subject suffers from mental health disorders that have not been diagnosed by a physician, and the number of items checked on a list of 24 most frequent mental health disorders for which the subject has been diagnosed or self-diagnosed; the first two variables were rated on the scale 0-100 by moving graphic sliders) were used to calculate the aggregate variable *mental health problems*.

Five questions related to physical health (number of different drugs prescribed by a doctor currently consumed per day; number of drugs, food supplements and vitamins not prescribed by a doctor currently consumed per day; how many times the responder visited his general practitioner physician in the past 365 days; how many times he had to take antibiotics in the past; what number of specialized medical doctors the subject had to regularly attend (not for prevention) at least once in the past five years) were used to calculate the aggregate variable *physical health problems*.

Seven questions related to self reported honesty and altruism (probability of risking one's own life in order to save lives of three other people, probability of returning a found bag containing one million Czech crowns (about \$ 50 thousand), whether the responder has ever cheated during a school examination, whether the responder would prefer to be hit by a car rather than hit somebody else with a car, whether the responder has ever defended a bullied person, whether the responder has ever lied in an important matter, and whether the responder has ever lied in a non-important matter; all questions were responded using 6-point Likert scale, anchored with 1- surely no, and 6- surely yes) were used to calculate the aggregate variable *honesty and altruism*.

Four questions related to inclusive biological fitness (current number of biological children, preferred total number of children, number of biological siblings, total number of biological aunts and uncles) were used to calculate the aggregate variable *biological fitness*.

The responders also had to answer a question about the strength of their religiosity, namely, how strongly they agree with the statement: "My belief in God is extremely important for me." and the statement: "I believe that after death good people will be rewarded and bad people punished." using scale 0-100 anchored with 0- strongly

disagree and 100- strongly agree by moving a graphic slider. Later, in a separate question, they were asked to answer what is their denomination by choosing from the list of six items, atheist “I am not believer”, no denominations “I am believer but I am not adherent to any church”, the three most common denominations in Czechia (Catholic Church, Protestant Church of Czech Brethren, Czechoslovak Hussite Church) and “other, please specify”. From the people who selected “other”, we analyzed only the data of Buddhists and Jews in the present study as the other denominations (e.g. Islam, Satanists, or Pagans) were selected by relatively low number of responders. The responders could not return to previously answered questions.

Statistical analysis

Before any analyses, less than 1% of data (too high or too short body height, too low or too high body mass or age, too short duration of the test, suspicious combination of reported mental health disorders etc.) was filtered out as suspicious. Also, the aggregate variables for wellbeing, sexual activity, symptoms of impaired mental health, mental health problems, physical health problems, biological fitness, and honesty and altruism were calculated as the arithmetic means of the Z-scores of corresponding variables, see above. Also, the body mass index (BMI) was calculated for each participant as (body mass/squared body height)/10,000 before the analysis.

Statistica v. 10.0 was used for all statistical tests. ANCOVA (General Linear Models module) was used for the analyses of the association between the focal simple variables (e.g. number of children, education) or aggregate variables (e.g. biological fitness, wellbeing) and two categorical factors – sex and denomination. With the exception of the case of analysis of the association of these focal variables and the age of participants, the variable age was always included into the models as a covariate.

Associations between binary variables particular denominations and focal variables were analyzed by non-parametric partial Kendall's correlation test (Kaňková, Kodym & Flegr 2011; Siegel & Castellan, 1988). This test measures the strength and significance of the association between binary, ordinal and continuous data regardless of their distributions. The partial Kendall Tau reflects the probability that the value of a particular dependent variable for the subject A is higher than for a subject B when the value of an independent variable for a subject A is higher than for the subject B. This technique enabled us to control for one confounding variable, for example the age of a responder. The Excel sheet for computing partial Kendall's Tau and the significance between variables A and B after the variable C is controlled based on Kendall Tau's AB, AC and BC. It is available here: <http://web.natur.cuni.cz/flegr/programy.php>. For the purpose of this analysis, six new binary variables were computed for six denominations under study. Absence of belief (atheism) was always coded as 0 and adherence to particular denominations, including the adherence to no church, was coded with 1. Although we considered this study exploratory, we still checked whether some observed effects could be artefacts of performing multiple statistical tests with Benjamini-Hochberg procedure (Benjamini & Hochberg, 1995) with false discovery rate preset to a very stringent value 0.1.

Results

The final population included 31,633 subjects, 14,276 women and 17,357 men, who provided the necessary data, including the information about their religious denomination. Demographic and descriptive data are shown in Table 1.

Table 1. Descriptive statistic of the study population stratified for sex and denomination

Atheists	no denom.	Catholics	Evangelicals	Hussites	Buddhists	Jews
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	20,047				142	248	
N (31,633)	63.4%	7,252 22.9%	3,497 11.0%	392 1.24%	0.45%	0.78%	55 0.17%
					61	111	
N women (14,276)	8,546 59.9%	3,755 26.3%	1,599 11.2%	175 1.23%	0.43%	0.78%	29 0.20%
	11,501				81	137	
N men (17,357)	66.3%	3,497 20.1%	1,898 10.9%	217 1.25%	0.47%	0.80%	26 0.15%
census sum	3,604,095	705,368 6.76	1,082,463	51,858 0.5	39,229	6,101	1,474 0.01
(10,436,560)	34.53%	%	10,37 %	%	0.38 %	0.06 %	%
census women	1,765,197	388,674 7.3	614,970	29,644 0.56	24,079	2,373	621 0.01 %
(5,326,794)	33.14 %	%	11.54 %	%	0.45 %	0.04 %	
census men	1,838,898	316,694 6.2	467,493 9.15	22,214 0.43	15,150	3,728	853 0.02 %
(5,109,766)	35.99 %	%	%	%	0.3 %	0.07 %	
					37.6	30.0	
Age women	30.5 (11.1)	31.4 (11.1)	34.1 (13.3)	31.4 (12.7)	(15.8)	(10.7)	35.4 (10.7)
					40.7	35.2	
Age men	35.4 (12.4)	35.0 (11.5)	39.8 (14.4)	37.1 (13.7)	(15.6)	(12.1)	39.4 (15.1)
					1.36	0.59	
Children women	0.82 (1.06)	0.96 (1.12)	1.22 (1.22)	1.04 (1.12)	(1.25)	(0.93)	1.53 (0.99)
					1.47	0.88	
Children men	0.83 (1.10)	0.85 (1.14)	1.29 (1.37)	1.24 (1.44)	(1.93)	(1.18)	0.79 (0.98)
Education women	5.06	5.09	5.26	5.26	5.15	5.17	6.00
Education men	5.15	5.17	5.53	5.76	5.21	5.07	5.50
Urbanisation							
women	3.45	3.33	2.91	3.22	3.23	3.42	4.59
Urbanisation men	3.54	3.45	3.09	3.57	3.93	3.17	4.81
Economic sit.							
women	59.69	58.76	60.43	57.20	58.03	62.09	67.34
Economic sit. men	64.23	62.46	64.21	64.98	59.72	58.76	63.44
BMI women	23.70	23.80	24.20	23.07	26.32	23.02	24.15
BMI men	25.90	25.93	26.58	25.83	26.84	25.51	24.94

Note. The values in parentheses shows standard deviations. Data from census (Czech Statistical Office, 2016): numerous people did not fill religious belief, this question as well as, for example, nationality was not compulsory; 4,662,455 people (i.e. 45,67 %) were not identified. Number of “Buddhists” is a sum of two categories Buddhism and Diamond Way Buddhism - Karma Kagyu Lineage. “Jews” are a sum of Judaism and Federation of Jewish Communities in the Czech Republic.

The association between religion and focal variables, including the aggregate variables, was estimated with ANCOVA (general linear models) with sex and the religion of subjects as the fixed factors and the age as the covariate. The Table 2 and Fig. 1-8 show the results.

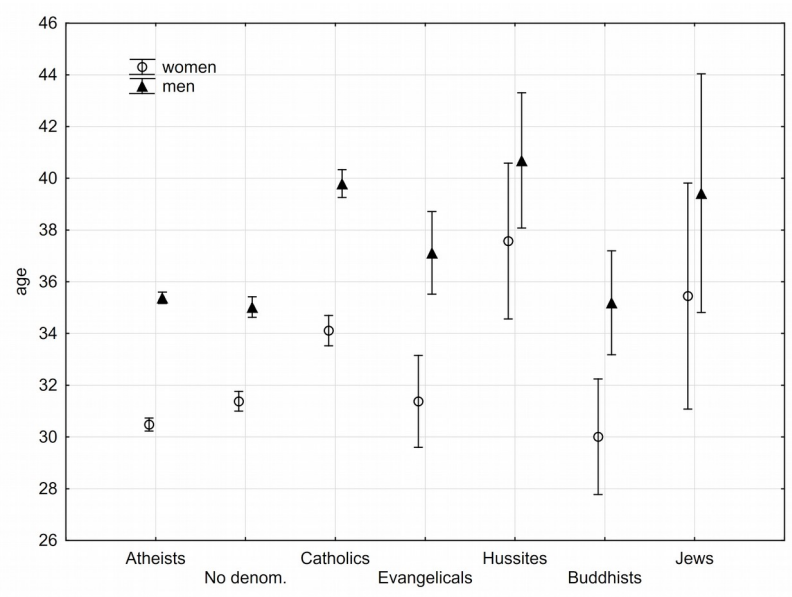
Many variables were measured on ordinal scales and some of them had highly asymmetric distribution that cannot be corrected to a symmetric one by any transformation. Therefore, in the post hoc testing, the associations between focal variables and religiosity (separately for particular denominations) were analyzed with nonparametric tests, specifically with the partial Kendall correlation tests with age as a covariate. The reported absence of belief (atheism) was always coded as 0, presence of particular religiosity as 1. The results for the aggregate variables as well as for some of their components, computed for all subjects of particular denomination and separately also for women and men are shown in the Table 3.

Table 2. Differences between men and women of different denomination

	sex		religion		sex-religion	
	p	Eta ²	p	Eta ²	p	Eta ²
Age	0.000	0.001	0.000	0.012	0.000	0.001
Children	0.027	0.000	0.000	0.005	0.013	0.001
Education	0.703	0.000	0.000	0.002	0.011	0.001
Childhood in large cities	0.047	0.000	0.000	0.010	0.075	0.000
Economic situation	0.224	0.000	0.000	0.001	0.036	0.000
BMI	0.000	0.001	0.005	0.001	0.357	0.000
Wellbeing	0.284	0.000	0.098	0.000	0.238	0.000
Physical health problems	0.039	0.000	0.000	0.001	0.513	0.000
Mental health problems	0.850	0.000	0.000	0.001	0.368	0.000
Symptoms of mental illness	0.002	0.000	0.000	0.008	0.287	0.000
Sexual activity	0.063	0.000	0.000	0.009	0.048	0.001
Biological fitness	0.728	0.000	0.000	0.025	0.072	0.000
Honesty	0.001	0.000	0.000	0.006	0.601	0.000
Importance of believe	0.000	0.001	0.000	0.539	0.000	0.001

Note. For the direction and size of the effects see also the figures 1-14. P values lower to 0.00005 are coded as 0.000.

Figure 1. Difference in age between men and women of different denomination



Note. Spreads show 95% confidence intervals.

Figure 2. Difference in the subjective symptoms of impaired mental health between men and women of different denomination

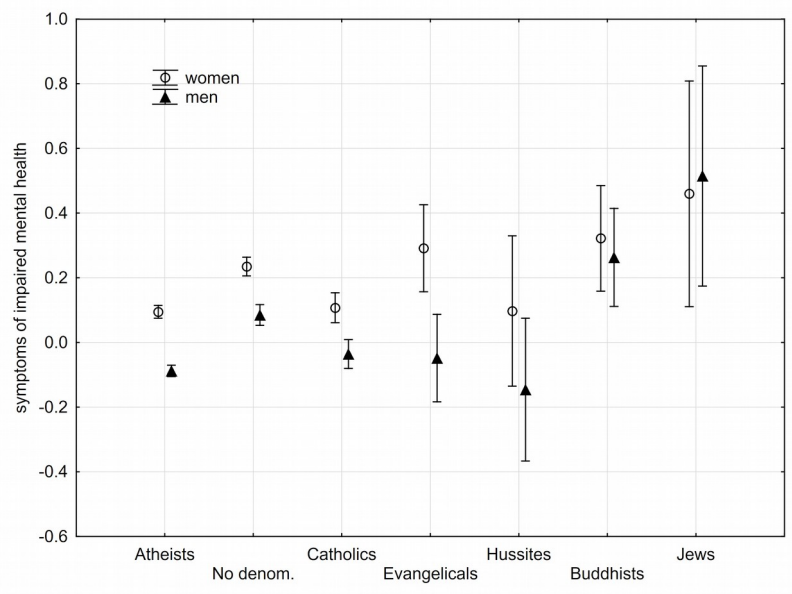


Figure 3. Difference in the wellbeing measured with WHOQOL between men and women of different denomination

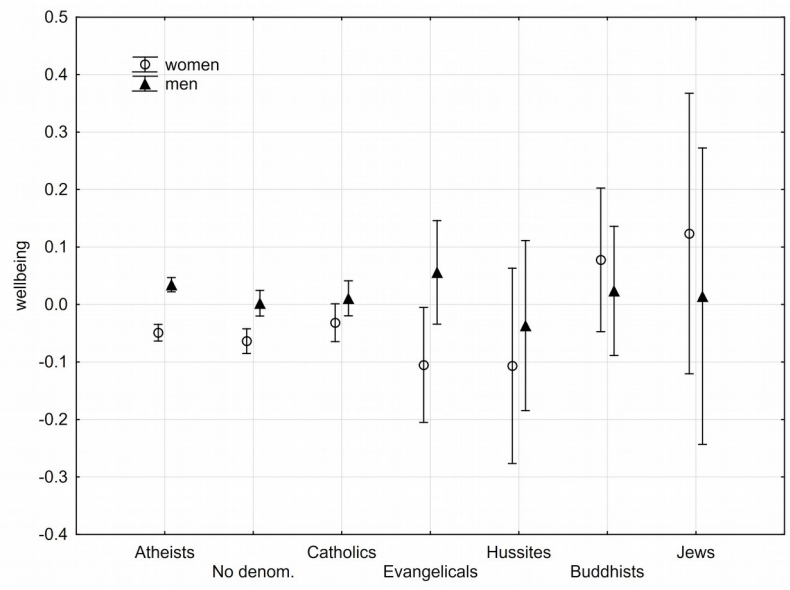


Figure 4. Difference in the physical health between men and women of different denomination

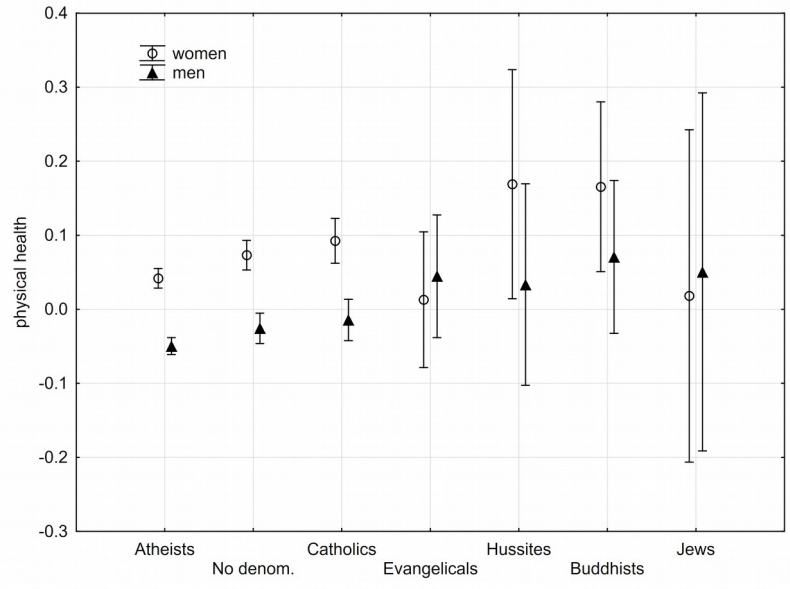


Figure 5. Difference in the mental health between men and women of different denomination

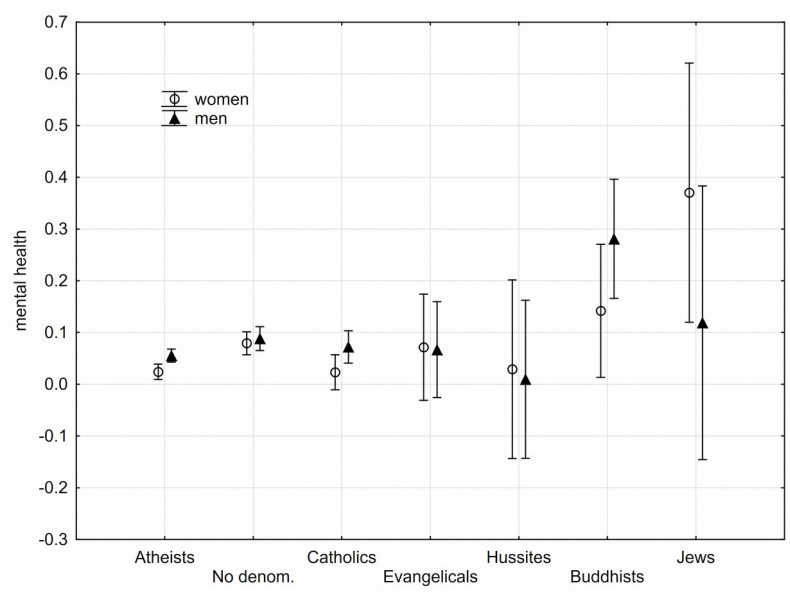


Figure 6. Difference in the honesty between men and women of different denomination

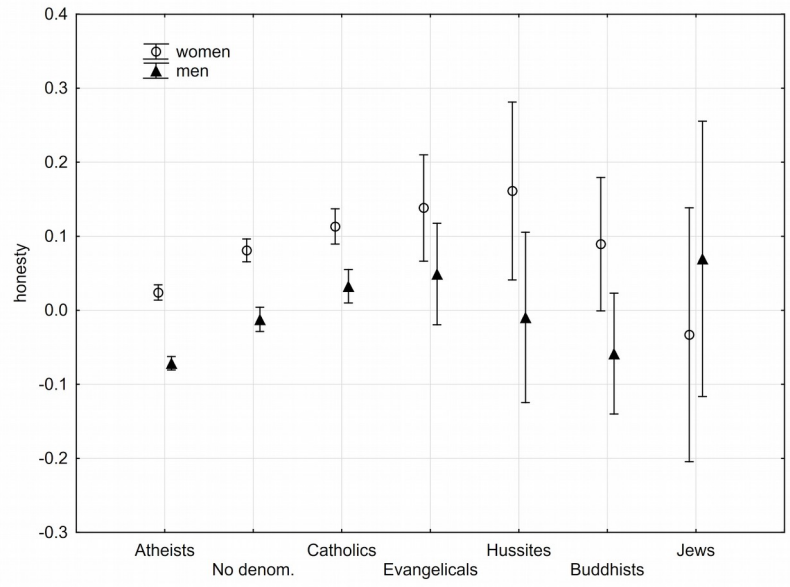


Figure 7. Difference in the biological fitness between men and women of different denomination

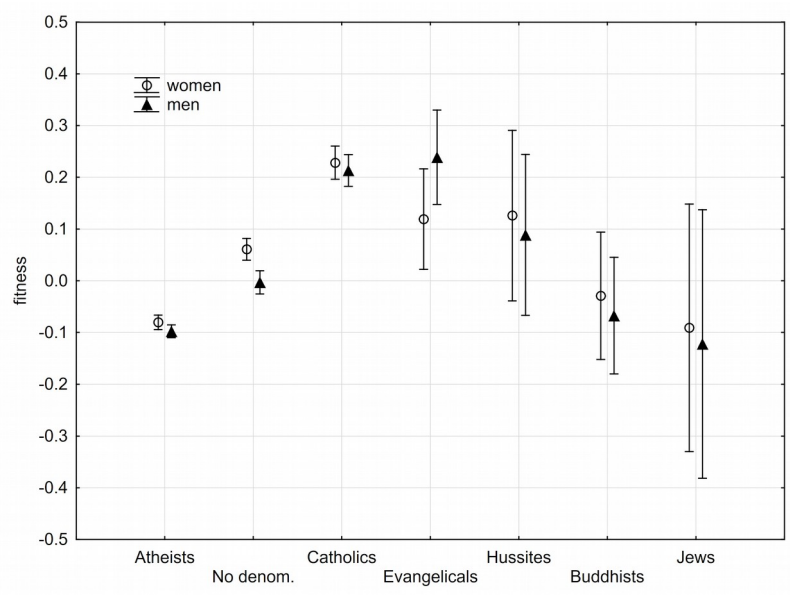


Figure 8. Difference in the intensity of sexual life between men and women of different denomination

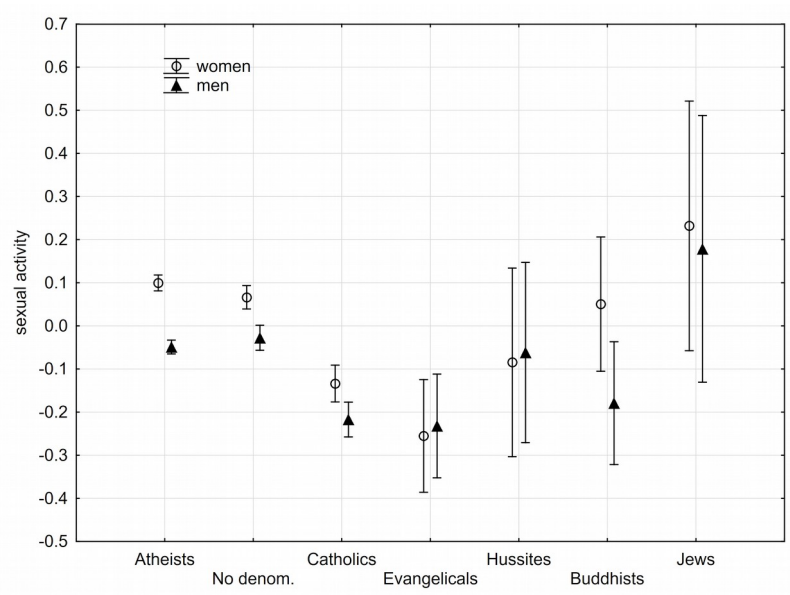


Figure 9. Difference in urbanization (size of place of living) between men and women of different denomination

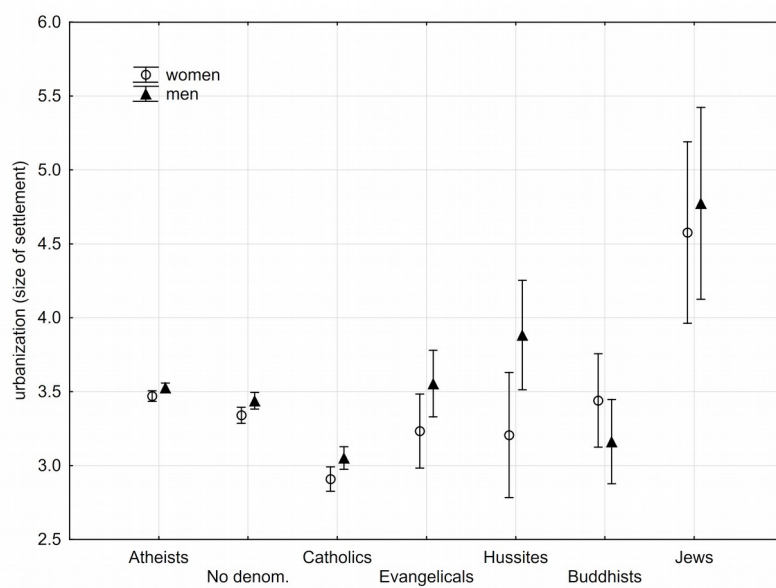


Figure 10. Difference in economic situation (wealth) between men and women of different denomination

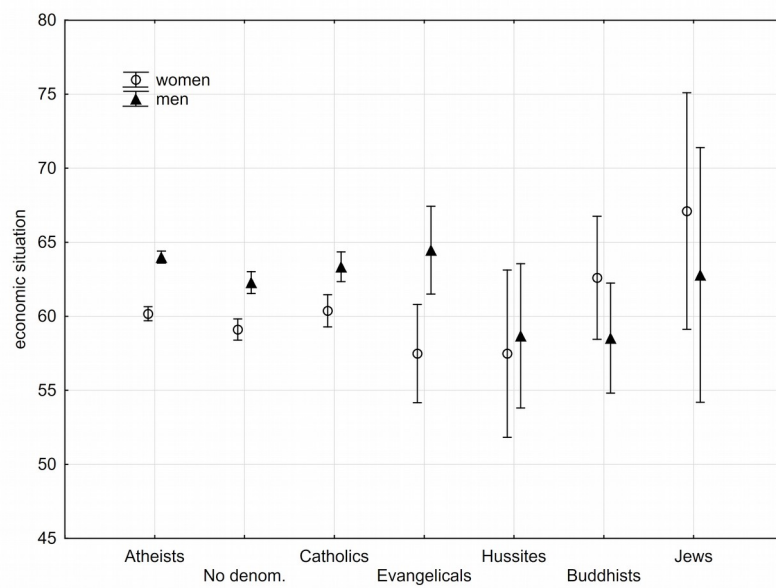


Figure 11. Difference in education between men and women of different denomination

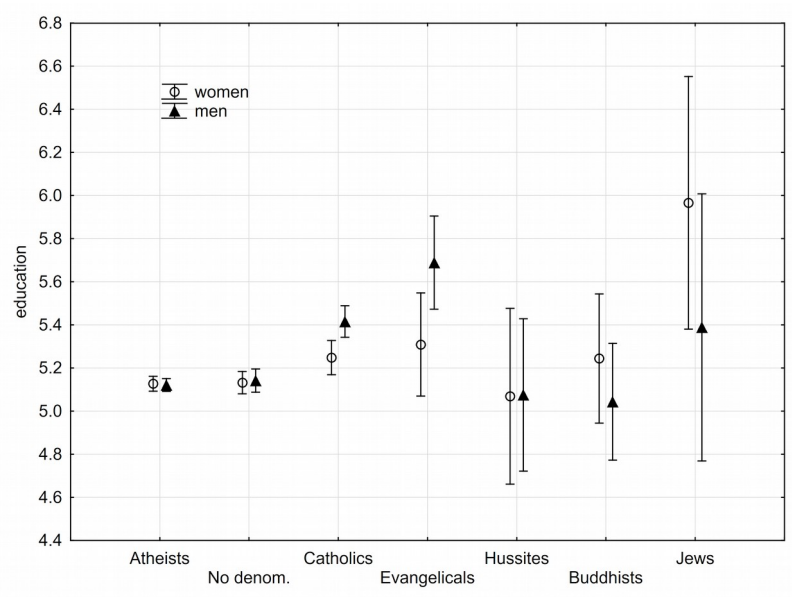


Figure 12. Difference in fecundity (number of children) between men and women of different denomination

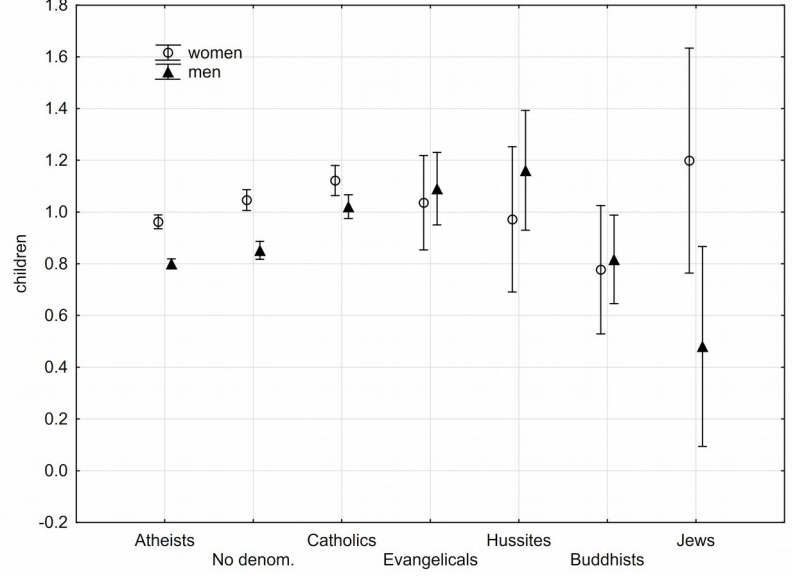


Figure 13. Difference in importance of religion in personal life between men and women of different denomination

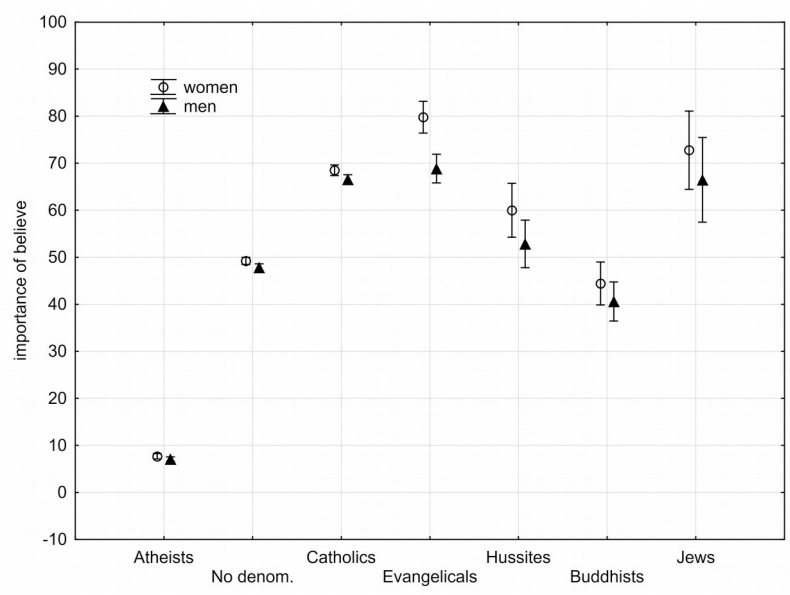


Figure 14. Difference in belief in afterlife reward and punishment between men and women of different denomination

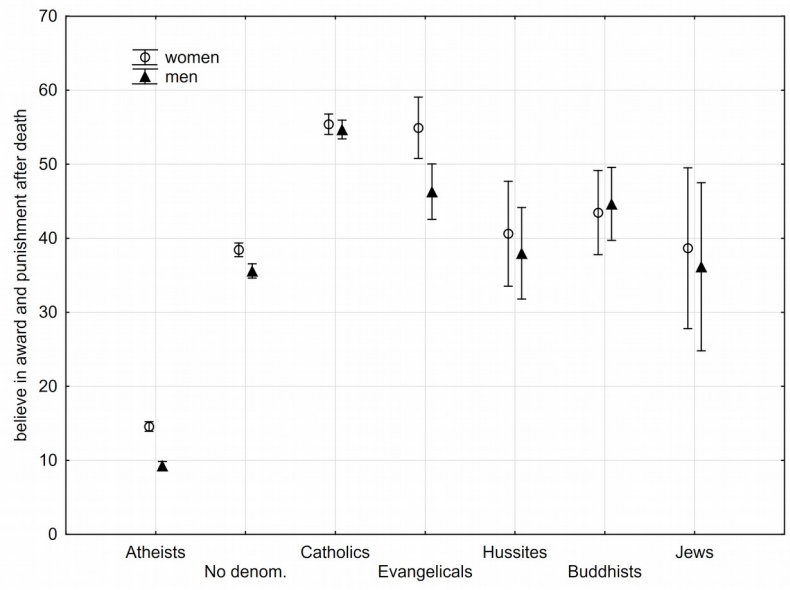


Table 3. Differences between atheists and religious subjects

		no denom.	Catholic s	Evangelical s	Hussites	Buddhists	Jews
Age	All	+0.00	+0.08**	+0.01	+0.03**	+0.00	+0.02*
	Women	+0.04**	+0.08**	+0.01	+0.03**	+0.00	+0.03**
	Men	+0.00	+0.09**	+0.01	+0.02**	+0.00	+0.01
Children	All	+0.03**	+0.09**	+0.03**	+0.03**	+0.00	+0.01
	Women	+0.04**	+0.09**	+0.03*	+0.03	-0.02	+0.03*
	Men	+0.01	+0.08**	+0.03**	+0.03*	+0.00	-0.01
Education	All	+0.00	+0.04**	+0.03**	+0.00	+0.00	+0.02**
	Women	+0.00	+0.02*	+0.02	-0.01	+0.01	+0.03**
	Men	+0.00	+0.06**	+0.04**	+0.00	+0.00	+0.01
Childhood in large cities	All	-0.03**	-0.10**	-0.01	+0.00	-0.01	+0.03**
	Women	-0.03**	-0.11**	-0.02	-0.01	+0.00	+0.03**
	Men	-0.02**	-0.09**	+0.00	+0.02	-0.02*	+0.03**
Economic situation	All	-0.03**	+0.00	+0.00	-0.01	+0.00	+0.01
	Women	-0.02*	+0.01	-0.01	+0.00	+0.01	+0.02
	Men	-0.02**	-0.01	+0.00	-0.02	-0.02	+0.00
BMI	All	-0.02**	+0.01	-0.01	+0.01*	-0.01*	-0.01*
	Women	-0.01	+0.01	-0.02	+0.03**	-0.02	-0.01
	Men	+0.00	+0.02**	+0.00	+0.01	-0.01	-0.01
wellbeing	All	-0.02**	+0.00	+0.00	-0.01	+0.01	+0.00
	Women	-0.01	+0.01	-0.01	+0.00	+0.02	+0.01
	Men	-0.02*	-0.01	+0.00	-0.01	+0.00	+0.00
physical health problems	All	+0.02**	+0.03**	+0.01	+0.01	+0.02**	+0.01
	Women	+0.02**	+0.03**	+0.00	+0.02	+0.02	+0.00
	Men	+0.02*	+0.03**	+0.02*	+0.01	+0.02*	+0.01
mental health problems	All	+0.03**	+0.01	+0.01	+0.00	+0.03**	+0.01
	Women	+0.04**	+0.01	+0.01	+0.00	+0.02*	+0.02*
	Men	+0.02**	+0.01	+0.01	-0.01	+0.03**	+0.00
symptoms of mental illness	All	+0.09**	+0.02**	+0.01	+0.00	+0.04**	+0.03**
	Women	+0.07**	+0.01	+0.02	+0.00	+0.03**	+0.02
	Men	+0.10**	+0.02*	+0.01	+0.00	+0.04**	+0.03**
sexual activity	All	+0.00	-0.08**	-0.04**	-0.01	-0.01	+0.01
	Women	-0.02	-0.10**	-0.05**	-0.02	-0.01	+0.01
	Men	+0.01	-0.07**	-0.03**	+0.00	-0.01	+0.01
biological fitness	All	+0.07**	+0.14**	+0.05**	+0.02*	+0.01	+0.00
	Women	+0.09**	+0.15**	+0.04**	+0.02*	+0.01	+0.01
	Men	+0.05**	+0.14**	+0.05**	+0.01	+0.00	+0.00
honesty	All	+0.05**	+0.07**	+0.03**	+0.02*	+0.01	+0.00
	Women	+0.05**	+0.06**	+0.03**	+0.02*	+0.02	-0.01
	Men	+0.04**	+0.06**	+0.03**	+0.01	+0.00	+0.01
importance of belief	All	+0.59**	+0.58**	+0.26**	+0.14**	+0.12**	+0.09**
	Women	+0.60**	+0.59**	+0.28**	+0.14**	+0.13**	+0.11**
	Men	+0.58**	+0.57**	+0.24**	+0.13**	+0.11**	+0.08**

Note. The table shows partial Kendall Tau (age of subjects controlled) for correlations between the binary variable religion and variables listed in the first column. The absence of any religion (reported atheism) was coded as 0, religiosity as 1; therefore the positive Tau means that religious people of particular denomination scored higher in this particular variable. Bold print denotes the associations significant at 0.05, one asterisk those with p value less than 0.005, and two asterisks those with p value less than 0.0005. All significant associations retained significance when the possible effect of multiple comparison was controlled with the Benjamini-Hochberg procedure.

Table 4. Effect of “importance of belief” on quality of life in two main denominations

importance of belief		Catholics	Evangelicals
Age	Women	-0.005	-0.100
	Men	-0.005	+0.029
Children	Women	+0.080 *	-0.105
	Men	+0.076 **	+0.125
Physical health problems	Women	+0.005	+0.002
	Men	+0.027	+0.020
Mental health problems	Women	+0.0047	+0.090
	Men	+0.046 *	+0.106
Honesty	Women	+0.117 **	+0.067
	Men	+0.123 **	+0.130
Symptoms of mental illness	Women	-0.015	-0.014
	Men	-0.019	-0.011
Wellbeing	Women	+0.067 **	+0.050
	Men	+0.088 **	+0.084
Sexual activity	Women	-0.108 **	-0.110
	Men	-0.107 **	-0.107
Fitness	Women	+0.094 **	-0.005
	Men	+0.094 **	+0.114

Note. The table shows partial Kendall Tau (age of subjects controlled) for correlations between the importance of belief (in Catholics or Evangelicals) and variables listed in the first column. The positive Tau means that religious people of particular denomination scored higher in this particular variable. Bold print denotes the associations significant at 0.05, one asterisk those with p value less than 0.005, and two asterisks those with p value less than 0.0005. All significant associations retained significance when the possible effect of multiple comparison was controlled with the Benjamini-Hochberg procedure.

Table 5. Effect of “frequency of religious meetings” on quality of life in two main denominations

frequency of religious meetings		Catholics	Evangelicals
Age	Women	-0.121 **	-0.132
	Men	-0.049	-0.051
Children	Women	+0.079 *	+0.015
	Men	+0.111 **	+0.14
Physical health problems	Women	-0.007	+0.019
	Men	+0.049 **	+0.043
Mental health problems	Women	+0.058 *	+0.068
	Men	+0.052 *	+0.043
Honesty	Women	+0.100 **	+0.036
	Men	+0.118 **	+0.173 *
Symptoms of mental illness	Women	+0.014	+0.058
	Men	+0.036	+0.002
Wellbeing	Women	+0.041	-0.025
	Men	+0.048	+0.099
Sexual activity	Women	-0.174 **	-0.172
	Men	-0.160 **	-0.186
Fitness	Women	+0.152 **	+0.06
	Men	+0.148 **	+0.144

Note. The table shows partial Kendall Tau (age of subjects controlled) for correlations between the frequency of religious meeting (in Catholics or Evangelicals) and variables listed in the first column. The positive Tau means that religious people of particular denomination scored higher

in this particular variable. Bold print denotes the associations significant at 0.05, one asterisk those with p value less than 0.005, and two asterisks those with p value less than 0.0005. All significant associations retained significance when the possible effect of multiple comparison was controlled with the Benjamini-Hochberg procedure.

Discussion

This study aims to explore the role of religion in the life of particular populations of the Czech Republic and to bring some insight to the social environment of a post-communist country regarding religiosity and beliefs. We examined the wellbeing, physical and mental health, education, sexual behavior, biological fitness, and certain attitudes that previous research showed as related to religious beliefs or religious practices (Powell, Shahabi & Thoresen, 2003; Seybold & Hill, 2001; Koenig, King & Carson, 2012). Many of the studies investigating these factors in relation with religious beliefs were conducted in western countries with different religious traditions and a different social-political history from post-communist countries. Based on data anonymously collected from 31,633 volunteers (14,276 women and 17,357 men), we were able to explore the above-mentioned factors in the different religious and nonreligious subgroups of inhabitants of the Czech Republic.

The most important factor explored in this study is wellbeing. We studied it as one factor composed of 5 different wellbeing-related variables, and also as its separate components, namely physical and mental health, economic situation, self-attractiveness and quality of the current partner. The finding in this part of the study that was particularly interesting, especially when compared to previous literature, was that physical health was negatively related to religiosity: atheists showed better physical health than religious subgroups, with or without denomination. Atheists also showed better mental health but this factor needs to be better defined and explored. Indeed,

previous studies found different results according to which types of symptoms and pathologies were measured. In general, the result we obtained can be explained by the theory of Stavrova (2015): being religious or a believer in the Czech Republic is a deviation from the norm. This represents a stress factor that can affect physical and mental health. In line with this theory social support was previously identified as a mediating factor for the positive relationship between religion and well-being (Oman & Thoresen, 2002 ; George, Larson, Koenig, & McCullough, 2000; Holt, Wang, Clark, Williams & Schulz, 2013). In a recent study engagement in a community or a supportive social group was highlighted as a factor with positive effect on wellbeing in religious people as well as in atheists (Galen, 2015). Our data confirmed this hypothesis in the case of Catholic, the frequencies of participation to church related activities and the importance of beliefs has positive correlation with the wellbeing. It can also be speculated whether the worse health of believers is a cause or an effect of their religiosity. Longitudinal studies are needed to clarify if actually the choice to join a church was made before the occurrence of the health problem or after, as a coping mechanism after learning about a disease. Another possibility is that religious people seek less medical help with their health problems (or search for it later) as a consequence of a more deterministic view of life, including relying on a divine plan or divine intervention in life and in illness (Green & Elliot, 2009).

From our results we found that believers considered or described themselves as more moral compared to non-believers. This is consistent with what has been found in previous studies on religion and prosocial behaviors and altruism (Shariff, 2015; Sharma & Singh, 2018; Van Cappellen et al., 2014). It is important to highlight the fact that religious people in our sample believed in reward and punishment in the afterlife and that this characteristic was a predictor of lower moral transgression across the globe

in self-report study (Atkinson & Bourrat, 2011). In Catholic subgroup the frequencies of the church related activities and the importance of beliefs are two factors with positive correlation with the self-rating honesty, suggesting that the higher commitment has influences on the self-judgment. However, Shariff (2015) showed that the self-reported measures of morality and moral decisions in religious people are not associated with prosocial and altruistic behavior. This notion could be supported by the theory that religious beliefs improve self-esteem and self-judgment, also through self-forgiveness (Krause, 2017), and as consequences increase the self-rating on morality and altruism. While individual religiosity seems to not be directly linked to selfless behavior (Shariff, Willard, Andersen & Norenzayan, 2016; Xygalatas et al., 2015), the use of religious priming increased prosocial attitudes and behaviors in different cultures (Shariff et al., 2016). Interestingly, this effect is maintained in a context of religious outgroup (Xygalatas et al., 2015), including the Czech Republic. Another possible explanation is the self-other overlap, a phenomenon especially probable when the bonding to the community is strong. In this case, when the subject answers in a questionnaire instead of thinking about themselves, they think of themselves as members of a community, which leads to their answers being biased by their perception of the members of a community and not by their perception of themselves.

A further finding of this study was that in our sample being religious increased fitness but decreased sexual activity. The results showed significantly higher biological fitness for representatives of official churches compared to atheists or even believers that reported no adherence to any official church. It could be just an historical accident but the number of adherents of particular Christian churches correlate with their biological fitness. Indeed, the frequencies of participation to church related activities correlated with lower sexual activities in Catholic and Evangelistic, in the case of

Catholic correlated also with higher number of children. We need to abstain from further speculation about the possible causal relationship between religion and biological fitness, however, until we obtain enough data from the less numerous Christian churches. At the same time most of the religions in our study are known to be very strict about the regulation of sexual activity. Previous work showed that the control exercised by religions over the sexual life of community members can affect sexual behavior and regulate it into reproduction (Weeden, Cohen & Kenrick, 2008; McCullough, Carter, DeWall & Corrales, 2012). Therefore, it was previously hypothesized that one of the main roles of religion in western society is to enhance reproductive fitness supporting high-fertility and monogamous sexual strategy (Weeden, Cohen & Kenrick, 2008). Furthermore, previous studies showed that women are more affected than men in developing conservative sexual attitude (Brelsford, Luquis & Murray-Swank, 2011) and this tendency is visible also in our data. In our sample, the women belonging to the subgroup of Jews, or the female believers without denomination, are also more affected by the religion in the number of children that they have than corresponding male believers.

Comparing the subgroups in our study, the atheists appeared to be healthier, both physically and mentally. They had higher sexual activity but lower fitness, and they considered themselves as less honest and altruistic (all in comparison with believers). They claimed not to believe in life after death, including eventual reward or punishment, and they did not consider beliefs and religion to be important factors in their life.

Catholics, in comparison to atheists, lived in smaller towns, showed worse mental but especially physical health, they had much lower sexual activity but higher biological fitness – number of children. They considered (or described) themselves as

more honest and altruistic. As could be expected, their religion and belief in God were much more important in their life than for atheists. A rather unexpected result was that the believers not affiliated with any specific religious church (the far largest group of Czech believers), expressed a profile that was very similar to that of Czech Catholics.

The unaffiliated believers were born in larger cities, achieved lower education, had a more intensive sexual life, expressed a slightly worse mental health and a much lower biological fitness, including number of children than Catholics. It is possible that this category of believers was the unintended product of 40 years of official communist oppression of religion, anti-religious indoctrination in school and informal and often unintended, in principle catholic, upbringing and education in families.

The other religious subgroups are harder to compare, due to the small number of respondents with such beliefs and the resulting presence of extremely large confidence intervals. The mental health of Buddhists was approximately as bad as that of the unaffiliated believers. Jews reported the highest intensity of symptoms of impaired mental health (anxieties, depression, etc.). This could be the result of transgenerational transfer of the Holocaust trauma that was reported frequently in European Jews and showed in previous studies (Niederlande, 1964; Klímová & Roubalová, 2014). Female Jews reported much higher while male Jews much lower number of children in comparison to atheists. Due to relatively low number of subjects, this observation must be considered only preliminary and should be retested in future independent studies.

In our sample, the percentages of members of major Czech religions were similar to the values showed in a recent national census in 2011 (Czech Statistical Office, 2016). We did not expect this consistent results because the questionnaire used for the study was primary focused on sexual behaviors and preferences, and many questions could be rather uncomfortable for the members of some churches. In our

sample the percentage of the believers who are adherent to a specific church or religious community is 13.64%, while in the national census in 2011 (Czech Statistical Office, 2016) it is 14.02%, with a strong match in the percentages of the main subcategories (Roman Catholic Church, Czechoslovak Hussite Church, Evangelical Church). The Buddhists and the Jews seem to be overrepresented in our sample. Higher number of Buddhists can be caused by relatively lower age of our responders. The higher representation of Jews can be the result of the fact that most of our participant were from Prague, in which the Jew community is larger in comparison to the rest of the Czech Republic. However, it can be also the result of anonymity of participants of our study. The Holocaust trauma is still alive in the Czech Jewish society and is being culturally or possibly epigenetically transferred to the 2nd, 3rd and even 4th generation of the Holocaust survivors (Klímová & Roubalová, 2014). Many Jews are still not willing to identify themselves as Jews in non-anonymous national surveys. The data regarding the amount of atheists and believers without denomination are difficult to compare to the national census because in the national survey the questions regarding religious beliefs were not compulsory. For this reason, only 34.53% of responders actively identify themselves as atheists, only 6.76% as believers without specific church or community, and the 44.67% decided not to identify themselves with any category. From the census results, we can estimate the percentage of unbelievers in the Czech Republic between 34.53% and 79.2%. Another relevant source for studies of religiosity in the Central and the Eastern Europe is the Pew Research Center (PEW, 2017). According to the results of the report from 2015, the 66% of Czech population do not believe in God. Our study, showing the 63.4% of unbelievers, fits well with these previous estimations of religiosity percentages in the population

Limitation of the present study

Possible limitation of the present study is the self-selection of its participants. Since the project was advertised as a study focused on “testing certain evolutionary psychological and parasitological hypotheses, containing many questions related to sexual life” or “studying the effects of various biological and non-biological factors on sexual preferences and behavior of Czech population”, it is possible that many religious people declined in advance to participate in such a study. However, the frequencies of unbelievers and of adherents of various churches roughly correspond to those obtained in national surveys (Czech Statistical Office, 2016; PEW, 2017), which suggests that this bias might be in fact relatively small. The bias could be actually larger and probably in the opposite direction, were the study advertised as focused on effects of various factors on religious beliefs or on effect of religious beliefs on various factors. The major advantage of the present setup was that it was absolutely anonymous and that it enabled us to obtain data from a large amount of subjects. This allowed us to analyze the associations between beliefs and health disorders and also to obtain data from Czech religious minorities, such as the Jews, adherents of the Czechoslovak Hussite Church or the Buddhists. It must be emphasized that the number of representatives of some interesting religious minorities such as of the Russian Orthodox Church is still rather low, therefore the research should continue for following years and perhaps specifically target members of the concerned minorities to get reliable statistics for these groups. The explorative aim of this study also brings limitations on the conclusions regarding the relationship between religion and mental health. To get more reliable data, it is necessary to analyze separately the different types of mental disorders, differently related to religion. In further studies, we will also include the type of religious practices, like prayer and meditation, and the frequency of attendance to rituals within the

religious community, because they could have strong mediator power in the relationship between religion and health. In this study, we analyzed the effect of religiosity on self-reported honesty and altruism. This effect seems to vary strongly among denominations and differs in the expected direction between believers and nonbelievers. It must be stressed, however, that the variable honesty and altruism reflects self-rated trait that could be significantly different from the real honesty and altruism of the subject.

Conclusion

The Czech Republic, now probably the most atheist country in Europe (PEW, 2017), represents an interesting product of about 50 years long large-scale social experiment. This explorative study suggests that there is negative relationship between religiosity and wellbeing in Czech population. Before the communists took power in 1948, most Czechs were at least formally religious, mostly Catholics (Czech Statistical Office, 2016). Religion was a subject of an oppression and strict regulation until the fall of communism in 1989. Despite this, the latent religiosity survived in a large part of the population and continue to influence the quality of life of individual people even after two generations in persecution. The study of current Czech population could help to disentangle direct and indirect effects of religiosity, spirituality, formal religiousness, and religious behavior on various aspects of human life.

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