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Conservatism negatively predicts creativity: A study across 28 countries

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Abstract:

Previous studies have reported creativity to be negatively correlated with conservatism but, because these have mostly been conducted in samples of homogenous nationality, the generalizability of the effect across cultures is unknown. We addressed this gap by conducting a study in 28 countries. Building on the notion that attitudes can be shaped by ecological factors, we hypothesized that individual history of parasitic disease will affect creativity indirectly – through conservatism. Results from multilevel analyses showed that, as expected, conservatism significantly predicted lower creativity, while controlling for economic status, age, sex, level of education, history of parasitic disease, subjective vulnerability to diseases and county-level parasite stress. Additionally, the vast share of variability in creativity was attributable to individual-, rather than to country-level variance. We also found conservatism to be mediating the relationship between parasitic disease and creativity. Our study provides evidence for a weak but significant interdependence between these variables which is in line with previously established knowledge about the behavioral immune system in humans.

Key words: creativity, TCT-DP, behavioral immune system, parasite stress, conservatism

Introduction

The individual and situational conditions that affect creativity – the ability to produce products that are original, novel and useful (Amabile, 1983) - has been tackled by researchers for decades. They have looked not only for cognitive (Finke et al., 1992) or personality-related (Batey & Furnham, 2006; Feist, 1998) individual differences in creativity, but also those related to ideology (Dollinger, 2007). Here, we examine the relationship between creativity and conservatism, the latter being understood as a psychological construct depicting attitude toward socially relevant issues. We will also consider in this relationship the role of parasite stress, a variable that is rarely examined yet potentially relevant in the study of creativity.

Creativity and conservatism

The crucial cognitive mechanism of creativity is divergent thinking: the capacity to generate multiple alternative solutions to open questions (Guilford, 1967). Previous research has shown that divergent thinking is promoted by thinking "outside of the box", breaking schemata and experiencing unexpected events (Gocłowska & Crisp, 2013; Ritter et al., 2012). At the same time, conservative thinking entails need for order, structure, certainty, tradition and predictability (Thórisdóttir & Jost, 2011), as opposed to liberal cognitive styles with higher tolerance for ambiguity and openness to experience (Jost et al., 2003). Considering the essence and correlates of creativity and conservatism, it seems plausible that these two variables are negatively related.

Some studies have been conducted in order to address this issue, using various methodological approaches. For example, DiMaggio (1996) in his study on characteristics of arts audience, found that art-museum visitors were politically more liberal compared to non-visitors. Moreover, they were more secular, trusting, racially tolerant, and open to other cultures and lifestyles (DiMaggio, 1996). Rubinstein (2003) looked at authoritarian personality, specifically Right Wing Authoritarianism (RWA) (Altemeyer & Altemeyer, 1996), an

individual difference related to conservatism (yet not synonymous with it, see Crowson, Thoma, & Hestevold, 2005), and examined its level in relation to career choice. He found that students of product design were more creative (scored higher in divergent thinking test) and were less authoritarian than behavioral science or law students (Rubinstein, 2003). In another study, individual level of creativity, measured as the number of creative accomplishments and creative quality of photo essays and drawings, was found to be lower in more conservative undergraduates (Dollinger, 2007). Moreover, Dollinger, Burke and Gump (2007) also showed that creative accomplishments assessed by three different measures were correlated negatively with the value composed of tradition, security and power (conservatism related notions) from Schwartz's (1992) model of values. Finally, a slightly different operationalization of both conservatism and creativity was proposed by McCann (2011). His analyses were run on a state level (in the United States of America) with conservatism represented by a joint measure composed of an average self-assessment score and the percentage of popular votes cast in each state for G.W. Bush in the 2004 presidential election. In this case, creativity was represented by the number of patents per state population. McCann's results confirmed the pattern obtained in previous studies (see also Runco, Acar, & Cayirdag, 2017). The studies mentioned above provide convincing evidence for the depicted relationship, however, they were all conducted in highly industrialized and relatively rich societies. To date, data from other countries is missing.

The role of parasites

Conservatism as a function of parasite stress

Conservatism is also related to human functioning on a biological level. According to the Parasite Model of Democratization (Thornhill et al., 2009), the variation in values concerning autocracy-democracy arises out of psychological adaptation developed in human evolutionary history to cope with local levels of infectious diseases. In fact, not only cellular

and tissue-based, but also behavioral immune systems are responsible for defense against parasites (Schaller & Duncan, 2007) - one of the major origins of morbidity and mortality (Wolfe et al., 2007). Conservatism, entailing out-group distrust and in-group favoritism, reduces potentially risky contact with members of out-groups and hence decreases likelihood of infection; both chronic and short-term concern about exposure to disease transmission triggers xenophobic responses (Navarrete et al., 2007; Navarrete & Fessler, 2006). Furthermore, sexual restrictiveness, which also serves as a defence mechanism against infection, has been shown to be positively correlated with parasite stress (Schaller & Murray, 2008). Based on a large-scale study, Thornhill et al. (2008) showed that collectivism, autocracy, women's subordination relative to men's status, and women's sexual restrictiveness, are values that both positively covary and correspond with high prevalence of infectious disease. Historical data also suggests a relationship between high latitudes (and hence reduced parasite stress) or enhancement in sanitation, vaccinations and antibiotics, with increased liberalization of social values (Thornhill et al., 2008). This hypothesis has also earned empirical support in experiments. For example, experimentally elevated awareness of disease threat increased xenophobia (Faulkner et al., 2004), while manipulated salience of disease threat produced - to some extent - stronger conformist attitudes and behavior compared to either control conditions or other types of threat (Murray & Schaller, 2012).

The Sars-Cov-19 pandemic presented another opportunity to observe how pathogens can shape attitudes, as populations all over the globe became unexpectedly exposed to an unknown virus. This unusual situation evoked higher prejudice toward outgroups (Lu et al., 2021; Sorokowski et al., 2020; Valtorta et al., 2022). For example, in regions of high case prevalence in the UK, disgust predicted outgroup distancing, suggesting higher pathogen avoidance under parasite stress (Meleady et al., 2021). Even more relevant to our study, Covid-related threat increased adherence to conservative values in France, Poland and the USA, and

increased the tendency to choose conservative political parties in elections (Adam-Troian et al., 2022; Karwowski et al., 2020). Although findings about parasite stress and conservatism are relatively consistent across studies that implement diverse measures of conformity (Murray et al., 2011), little is known about effects these may have on other related socially relevant issues, including creativity.

Parasites and creativity

Although previous studies are scarce, some creativity-related outcomes have already been explained by ecological factors. For example, variation in scientific and technological innovation (driven by creativity) has been attributed to pathogen prevalence. Besides having a negative direct effect on technological enhancement, parasite stress has been shown to affect creativity indirectly through cultural value systems, namely collectivism and conformity (Murray, 2014). Murray (2014) analysed, at a country level, five different measures of innovation – Nobel Prize laureates, Global Innovation Index, Technology Achievement Index, Innovative capacity and patent applications. He further utilized two measures of conformity (effect size on Asch-style experiments and reported effects of obedience) and two measures of nonconformity (within country personality variation and percentage of left-handed people within a country), as well as historical disease prevalence. The results clearly indicate both-direct and mediated effects of parasitic disease prevalence on innovation, and highlight the role of conformist attitudes as a buffer against disease transmission. However, it remains unknown how parasites, conservatism and creativity are related on an individual level. Moreover, the outcome variables used can only be high in highly developed, rich countries, as opposed to individual-level creativity (Dai et al., 2012). Also, the hypothesis that conservatism mediates the links between parasites and creative outcomes by parasites is based solely on one study using aggregated national-level data and clearly requires further evidence, utilizing different operationalization of the variables of interest.

Current study

To address the questions arising from previous research, our study had two main goals. Firstly, we wanted to examine the predictive role of conservatism on creativity, while controlling for other potential influencing factors, on a large cross-cultural sample. This would include non-Western countries, which are oftentimes neglected in psychological science, including studies of the conditions that influence creativity. Existing evidence does not allow us to generalize previous findings regarding the link between creativity and conservatism across countries. Secondly, for the first time, we aimed to test the hypothesis of a mediational role for conservatism between parasitic disease contagion and creativity, thus providing a novel approach to explaining variability in individual level of creativity throughout the world.

Method

Participants

The study comprised 6865 adult participants (3100 male, 3765 female) with a mean age of 28.25 (SD=10.92). They inhabited 28 countries (Austria, Algeria, Australia, Belgium, Brazil, Chile, China, Colombia, Germany, Greece, Estonia, Georgia, Croatia, Indonesia, Italy, Mexico, Peru, Poland, Portugal, Romania, Russia, South Korea, Sweden, Slovenia, The Netherlands, Turkey, Ukraine and the United States). The detailed descriptive statistics of all demographic measures can be found in the supplementary materials (Table S1). We collected data also in nine other countries (Costa Rica, Cuba, India, Iran, Jordan, Malaysia, Pakistan, El Salvador and Uganda), but their psychometric properties were not satisfactory (alphas below 0.5, see Table S3) or some questions from the main scales of interest were not asked because of cultural taboos (questions about gay rights and legalized prostitution in Iran). The study was a part of a bigger research project (--- blind for peer review ---) but in this article we analyzed only data from countries where participants completed measures that were of interest to our stated aims. Participants were recruited by authors in each country through advertisements, personal contact, in public places or during vocational courses at the Universities. Participants were not compensated for their participation. All subjects were blind to the study hypotheses.

Measures

Creativity

To assess participants' level of creativity, we used the Test for Creative Thinking – Drawing Production (TCT-DP, Urban & Jellen, 1996). Participants were asked to complete an unfinished drawing, that had ostensibly been started by another person and consisted of a few shapes. They were not restricted to any rules regarding the drawing. TCT-DP does include verbal expressions

of creativity and involves drawings – a way of expressing creativity common throughout the world. Therefore, this test is described as "culturally fair" (Urban, 2005). Participants were given a general creativity score based on 13 criteria: continuations, completions, new elements, connections made with a line, connections made to produce a theme, boundary breaking/fragment dependent, boundary breaking/fragment independent, perspective, humor and affectivity, unconventional manipulation, surreal abstract drawings, use of signs and symbols and nonstereotypical drawings (Urban, 2005). Participants were not rated for the speed of drawing. The TCT-DP was scored by 7 raters blind to the study hypotheses. The global creativity score was assessed by averaging the 13 subscales. Reliabilities of the scale were satisfactory (alphas = 0.56-0.79, M = 0.68). Descriptive statistics of all crucial measures of interest as well as reliabilities of these measures can be found in supplementary materials (Table S2 and Table S3, respectively).

Conservatism

We used the 10-item version of Henningham's conservatism scale (1996). Participants were asked to assess whether they support certain phenomena, i.e., death penalty, multiculturalism, stiffer jail terms, voluntary euthanasia, gay rights, premarital virginity, new immigration to one's country, legalized abortion, legalized euthanasia and religious authority (1 = yes, 2 = no). We excluded two items from the original scale (condom vending machines, Bible truth) because they were inapplicable in some of the samples. Four items (death penalty, stiffer jail terms, premarital virginity, church authority) were recoded so that always a higher score indicated higher conservatism. The scores were obtained by averaging scores across items. Due to the binary nature of our data, we assessed the reliabilities of the scale using tetrachoric correlations (Zumbo et al., 2007). We limited our study to countries where the reliability of this scale

exceeded 0.50. All remaining reliabilities of the scale were satisfactory (alphas = 0.51-0.87, M = 0.72).

Parasite stress

History of parasitic disease

Participants were asked whether they have ever (*1 = never, 2 = once, 3 = a few times*) suffered from any of the listed infectious diseases (dengue, filaria, leishmania, leprosy, malaria, schistosoma, trypanosoma, tuberculosis, and typhoid fever, a similar set of diseases was used in other studies on parasite stress (Murray, 2014)). The individual level of parasitic disease history was assessed by summing the scores, with 9 being the lowest possible, and 27 the highest possible, scores.

Country-level parasite stress

In addition, we assessed country-level parasite stress by utilizing zoonotic (transmitted to humans by contact with animals and livestock) and non-zoonotic (transmitted from human to human) parasite prevalence across countries (Fincher & Thornhill, 2012). These indices were positively correlated with the measure obtained from participants, aggregated on a country level ($r = .61$ and $r = .45$ for non-zoonotic and zoonotic parasite stress, respectively, both $ps < .001$)

Perceived vulnerability to disease

We also assessed participant's subjective level of vulnerability to infectious disease by using the subscale "Perceived Infectability" from the Perceived Vulnerability to Disease Questionnaire (Duncan et al., 2009). It comprised of seven items (for example "If an illness is 'going around', I will get it.") with a 7-point Likert Scale (*1 = strongly disagree, 7 = strongly agree*). Three items were reverse-scored so that higher score indicated higher vulnerability.

Reliabilities of the scale are presented in supplementary material (Table S3). We excluded countries with alphas below 0.5, all remaining reliabilities were satisfactory (alphas = 0.55-0.92, M = 0.80).

Demographics

In addition, participants were asked to provide some demographic data: age, sex, education (*1 = no formal education, 2 = primary school, 3 = secondary school, 4 = high school or technical college, 5 = bachelor, masters or higher degree*), economic situation (*1 = much lower than in my country, 3 = average; 5 = much higher than in my country*). See Table S1 in supplementary materials for details.

Procedure

The study was conducted following the guidelines from the Declaration of Helsinki. The study protocol was approved by the Institutional Review Board at the Institution of the leading authors and in all countries where it was required. All participants provided written, informed consent prior to participation and responses were anonymous.

The data were collected by the co-authors and respective research teams. After receiving instructions, participants individually and independently completed a paper-and-pencil questionnaire. The survey included demographic questions, the measures of interest as well as other measures collected for purposes of other studies (see for example [covered for blind peer review]). The original version of the questionnaire was in English, but in all non-English speaking countries, authors translated the measures into participants' native language by researchers fluent in both languages using the back-translation procedure) (Brislin, 1970).

Statistical analyses

We ran a series of multilevel regression analyses (Linear Mixed Model) with 2-level data structure (individuals nested within countries). We examined the relationship between conservatism and creativity controlling for parasite stress and other potential demographic predictors. See Table 1 for correlations between all considered variables (ignoring hierarchical data structure). In the first step, we performed a baseline (empty) model to assess the variability of creative performance across countries. The second (random intercept and fixed slope) model included potential individual level predictors of creative performance: conservatism, sex, level of education, age, economic status, history of parasitic decease (log-transformed to reduce skewness) and perceived vulnerability to parasitic disease and country level predictors: zoonotic and nonzoonotic parasite prevalence. All variables except sex and country-level parasite stress were grand-mean centered. Next, we ran the third model including conservatism as a random variable, i.e., allowing the slope to vary (random intercept, random slope model). We compared the models using -2 log likelihood (-2LL) statistic with lower value indicating better fit (Burnham & Anderson, 2004). Models were estimated using restricted maximum likelihood estimator (REML). We interpreted the model with best fit. In the last step, we ran a multilevel mediation analysis, investigating the mediational role of conservatism between history of parasitic decease (log-transformed) and creativity. We were interested in within-countries (1-1-1) multilevel mediation, with all predictors being assessed on an individual level. In mediation analysis, we included only data from countries where the variation in history of parasitic disease was different from zero (on this basis, we excluded Germany, Portugal, Romania and the United States). All analyses were performed using SPSS v. 28 software (SPSS Inc. Chicago, Ill., USA) and R Studio (R Core Team, 2013). We used packages: lme4 (Bates et al., 2015) for multilevel regression models, lavaan (Rosseel, 2012) for multilevel mediation, psych (Revelle & Revelle, 2015) to compute tetrachoric correlation matrices and merTools

(Knowles et al., 2016) to create a figure. Data and R codes can be found here: https://osf.io/adfr7/?view_only=340bdf7d07fd40dd9e357797b66aa483.

Results

The baseline model showed that there was significant variability in creativity at both individual and country levels. Intra-class correlation coefficients (ICC) demonstrated that the proportion of creativity variation that lies between countries is 10.77%, while 89.23% of variability in creativity is related to individual differences. The second model provided a significantly better fit than the baseline model ($\Delta -2LL = 101.56$, $\Delta df = 9$, $p < 0.001$) and the third model provided an improvement as compared to the second model ($\Delta -2LL = 16.14$, $\Delta df = 2$, $p > .05$). This implies that the relationship between conservatism and creativity differed across countries. Therefore, we decided to focus on the third model (random intercept, random slope model). The model explained 1.66 % of individual level variance as compared to the baseline. All estimates are presented in Table 3. As expected, conservatism negatively and significantly predicted creativity ($p = .002$), as did the history of parasitic diseases ($p = .03$). Level of education was positively related to creativity ($p = .001$) while age was negatively related ($p < .001$). Finally, perceived vulnerability to infectious disease was not meaningfully related to creativity ($p = .18$) and neither was any of the country level predictors (p = .78 for zoonotic and p = .35 for nonzoonotic parasite stress), nor the remaining control variables, sex and economic situation (p = .19 and p = .22, respectively). See Figure 1 for effect ranges (for both intercepts and slopes).

The mediation analyses revealed that there was a significant indirect effect of parasitic disease history through conservatism on creativity, $b = -0.730$, SE = 0.245, p = .003. The total effect of parasitic disease on creativity was $b = -6.68$, p = .005. Path coefficients are presented in Figure 2. The indirect effect accounted for 11% of the total effect.

Table 1. Correlations between variables of interest on an individual level.

		Creativity	Conservatism	Age	Education	Economic status	Parasites(ln)	Vulnerability to disease
Creativity	r	1.00	-.031**	-.090**	.026*	.034**	-.051**	-0.015
	Sig.	<.001	0.01	<.001	0.029	0.005	<.001	0.204
Conservatism	r		1.00	-.034**	-.085**	-.072**	.029*	.043**
	Sig.		<.001	0.005	<.001	<.001	0.015	<.001
Age	r			1.00	-0.021	.038**	0.002	-.057**
	Sig.			<.001	0.084	0.001	0.836	<.001
Education	r				1.00	.082**	0.005	.035**
	Sig.				<.001	<.001	0.706	0.003
Economic status	r					1.00	-.079**	-.037**
	Sig.					<.001	<.001	0.002
Parasites(ln)	r						1.00	.067**
	Sig.						<.001	<.001
Vulnerability to disease	r							1.00
	Sig.							<.001

Note. **p<.01

Table 1. Correlations between variables aggregated on a country level.

		Creativity	Conservatism	Age	Education	Economic status	Parasites(ln)	Vulnerability to disease	Zoonotic parasite stress	Non zoonotic parasite stress
Creativity	r	1	.327**	-.315**	-.169**	.191**	-.280**	-0.012	-.094**	.043**
	Sig.	<.001	<.001	<.001	<.001	<.001	<.001	0.33	<.001	<.001
Conservatism	r		1	-.379**	.076**	-.125**	-.037**	.494**	-0.011	.307**
	Sig.		<.001	<.001	<.001	<.001	0.002	<.001	0.353	<.001
Age	r			1	-.288**	.040**	-.142**	-.245**	-.330**	-.437**
	Sig.			<.001	<.001	<.001	<.001	<.001	<.001	<.001
Education	r				1	-.192**	.319**	.429**	.068**	.361**
	Sig.				<.001	<.001	<.001	<.001	<.001	<.001
Economic status	r					1	-.116**	0.013	-.430**	-.320**
	Sig.					<.001	<.001	0.299	<.001	<.001
Parasites(ln)	r						1	.291**	.545**	.689**
	Sig.						<.001	<.001	<.001	<.001
Vulnerability to disease	r							1	.078**	.495**
	Sig.							<.001	<.001	<.001
Zoonotic parasite stress	r								1	.626**
	Sig.								<.001	<.001
Non zoonotic parasite stress	r									1
	Sig.									<.001

*Note. **p<.01*

Table 3. Multilevel Regression Models with creativity being predicted by conservatism, sex, age, education, economic situation, history of parasitic disease (log transformed), perceived vulnerability to disease and parasite stress.

Predictors	Model 1 (baseline) B (SE)			Model 2 (random intercept. fixed slope)			Model 3 (random intercept. random slope)		
Fixed effects	B	SE	p	B	SE	p	B	SE	p
Individual level predictors									
Intercept	22.148	0.598	<.001	22.148	0.973	< 0.001	21.902	0.946	< 0.001
Conservatism				-3.602	0.566	0.162	-3.354	0.960	0.002
Sex (0-F. 1-M)				-0.306	0.219	< 0.001	-0.288	0.219	0.188
Age				-0.064	0.010	< 0.001	-0.065	0.010	< 0.001
Education				0.607	0.175	0.229	0.578	0.176	0.001
Economic situation				0.176	0.146	0.027	0.179	0.146	0.221
History of disease (ln)				-5.374	2.423	0.188	-5.395	2.421	0.026
Vulnerability to disease				-0.126	0.096	< 0.001	-0.129	0.096	0.177
Country level predictors									
Zoonotic parasite stress				0.019	0.832	0.982	0.222	0.799	0.784
Non-zoonotic parasite stress				-0.196	0.460	0.673	-0.422	0.441	0.348
Random effects				Var	SD		Var	SD	corr.
Intercept	9.879	3.143		9.747	3.122		9.753	3.123	
Conservatism							14.810	3.848	0.32
Residuals	81.827	9.046		80.605	8.978		80.172	8.954	
-2LL	50832.96			50729.98			50713.84		

Note: All predictors but sex were mean-centered.

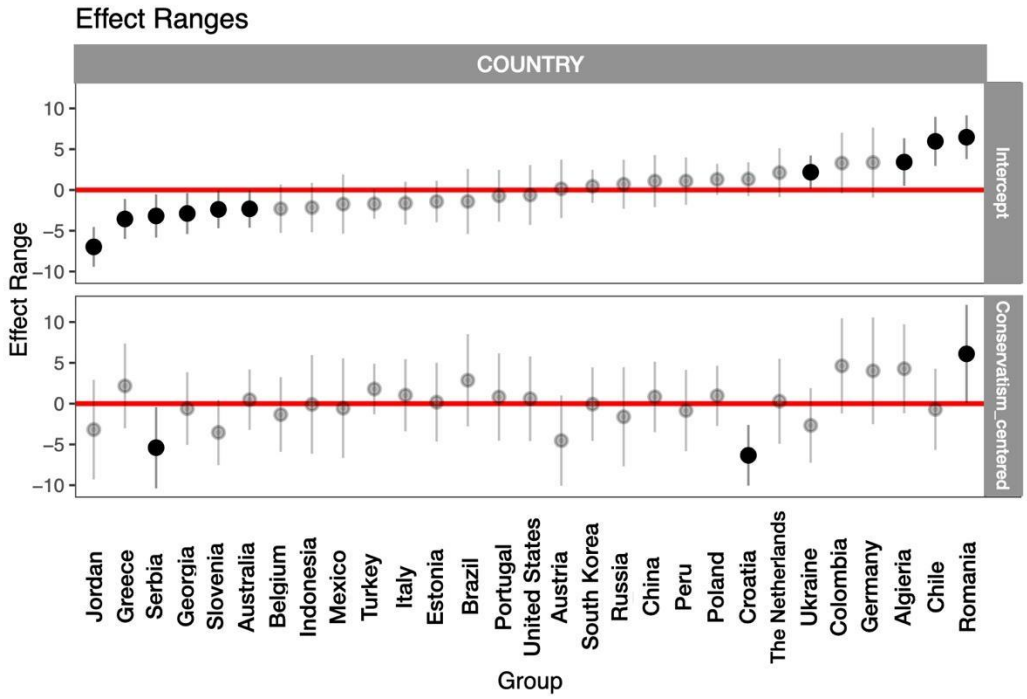
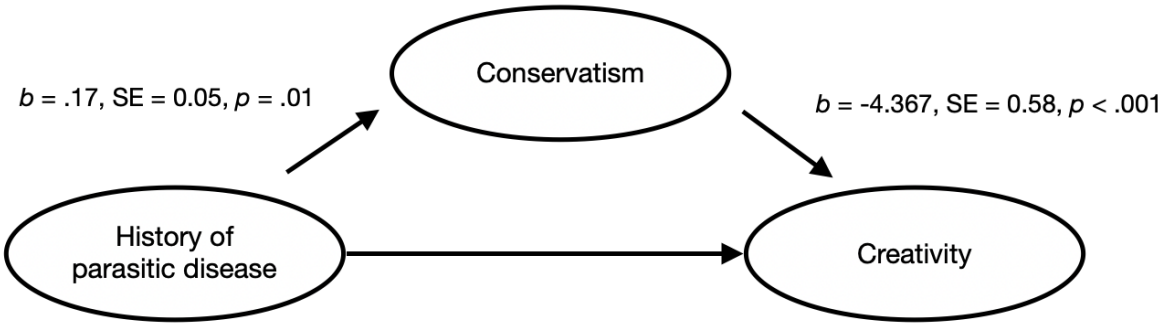


Figure 1. Effect ranges for intercepts and slopes in random intercept – random slope multilevel regression model. Outcome variable: creativity.



Direct effect, b = -6.096, SE = 2.40, p = .01
Indirect effect, b = -0.738 , SE = 0.245, p = .003
Total effect, b = -6.6834, SE = 2.411, p = .005

Figure 2. Model of parasitic disease as a predictor of creativity mediated by conservatism. All variables are estimated at individual level.

Discussion

The study was designed to examine the role of conservatism in predicting creative abilities, utilizing a large sample that includes countries rarely represented in published psychological research. The link between creativity and conservatism has been previously explored in research providing consistent results (DiMaggio, 1996; Dollinger, 2007; Runco et al., 2017). We expanded the evidence from these studies by analyzing data from 28 countries. We also considered the role of parasite stress, subjectively assessed vulnerability to infectious disease, and individual history of parasitic disease, on one's level of creativity. The possibility that conservatism mediates the relationship between parasite stress and creativity is theoretically justified, but it has only been tested on aggregated country-level data in one single study (Murray, 2014); our individual-level approach was therefore novel and needed.

Multilevel analyses confirmed that the negative relationship between creativity and conservatism was significant, after controlling for education, economic situation, sex, age, history of disease and infection vulnerability. The analyses also indicated that, although there is significant variation in creativity that is attributable to countries, a much higher proportion is explained at the individual level. Only individual (rather than country-) level of parasites prevalence predicted creative performance. Subjective ratings of vulnerability to disease was not meaningfully related to creativity. The comparisons of subsequent models indicated that the relationship between creativity and conservatism vary across countries. Additionally, we also confirmed our hypotheses regarding a mediational role of conservatism between parasitic disease and creativity.

Creativity's relation to conservatism was significant, but very weak as compared to results from previous studies (Dollinger, 2007; McCann, 2011). Models where conservatism predicted creativity were only slightly better in explaining the variation of individual level creativity. One reason that may contribute to this is that conservatism has been typically

described through the liberal lens of social sciences, making our understanding of this construct substantially biased (Proulx & Brandt, 2017). The debate on liberal bias in social science has begun recently (see Duarte et al., 2017) and it has been shown, for example, that both conservatives and liberals are similarly intolerant toward ideologically dissimilar target groups (Brandt et al., 2014; Brandt & Crawford, 2019). Other studies have shown no differences between liberals and conservatives in aversion to ideologically opponent statements (Frimer et al., 2017) or in general complexity (Conway et al., 2016). This, together with our results, suggests a need for a deeper reflection on how we understand the cognitive and motivational antecedents of conservatism, as some previously reported effects may have been overestimated. Nevertheless, higher conservatism should indicate, for example, lower preference for diversity and novelty (in our measure expressed as lower support for "new immigration to one's country" or "multiculturalism"), and therefore should tend to inhibit invention of novel (and therefore creative) ideas.

The effect of conservatism was unstable across countries. In fact, it was close to zero in most of them. Exploring the cross-country or cross-cultural factors that shape these differences was beyond the scope of this study, but it is an interesting question to be explored in future research. It is, however, important to note that, although the main analysis revealed a significant effect of conservatism on creativity, this effect seems not to be universal. Some potentially moderating factors here might include political climate in a certain country, the emphasis/value related to creativity and originality, migration policies, or others (Rudowicz, 2003; Simonton, 1990).

Our analyses demonstrated a significant indirect effect of history of parasitic decease on creativity through conservatism. It suggests that a pathway in which pathogens shape attitudes (Murray & Schaller, 2012), which further translates to creativity (Murray, 2014), is possible. The design of our study does not, however, allow us to draw conclusions regarding the causality

of the observed relationship. All measures were collected at one point in time and do not allow us to conclude with certainty whether people unexposed to parasites are therefore more creative or whether people who are more creative can (thanks to that creativity) invent ways to avoid parasites. However, in a previous study, Murray and colleagues (2011) have examined conservatism in relation to both historical and current levels of parasite stress. They observed stronger effects for the latter relationship, suggesting that parasitic disease is rather a cause than a result of creativity. Nevertheless, a scenario in which high creativity (together with intelligence) results in higher innovation and therefore better healthcare, leading to lower parasitic disease prevalence, is not impossible, and the two processes are even likely to occur simultaneously. A large-scale experimental manipulation of creativity would be needed in order to examine whether elevated creativity can prevent someone from being infected. Although creativity can be successfully enhanced (Scott et al., 2004b, 2004a), such a study would require controlling for all other potential predictors of infection, making it significantly challenging from the methodological point of view.

Strengths and Limitations

The key strength of this investigation is that we utilize a much more diverse sample in comparison to previous studies. We managed to reach subjects from countries that are very underrepresented in empirical research and our sample is relatively large. Moreover, although our hypotheses were already present in the literature, our approach to testing them is novel.

Nevertheless, the study is not free of limitations. First of all, the samples were reached by experimenters and were not representative within each country. Also, although the sample was consistent of various countries, the majority of them are highly developed. This can account for relatively low variability of prevalence of parasitic disease in this study. Yet, the diversity of cultural, economic and religious backgrounds, as well as diverse age, still makes the sample of our current study more representative of the world's population than students in western

countries (e.g. Dollinger, 2007). Future studies should, however, reach not only diverse countries but also more diverse populations within these countries, for example by sampling also in rural, remote sites.

Secondly, the measure of creativity, although being described as culturally fair (Urban, 2005), is definitely not perfect (Glăveanu, 2019). Thanks to the use of figural material the risk of task misinterpretation is minimized, but one has to keep in mind that creativity does not have to mean the same in all cultures (see Karwowski, 2016). For example, while novelty seems to be of highest importance for Westerners, Easterners value appropriateness more (Niu & Kaufman, 2013). Despite the fact that the drawings used as our DV may be differently judged (in terms of creativity) by people in different cultures, TCP-DP values both originality and schema-breaking, as well as continuation and compositional theme. Therefore, despite the western origin of the measure, some of its sub-scores favor either individualistic or collectivistic values. Nevertheless, studies utilizing different measures of creativity, or products of creativity evaluated by members of each country, would contribute to a better understanding of the relationship between ideologies and creativity, and its link to parasitic stress.

Summing up, we observed significant but weak associations between creativity, conservatism and parasitic disease. The study addressed a clear gap in the field of creativity psychology, which has mainly focused on American and, to a lesser extent, Chinese samples, but largely neglecting other nations (Wang & Leung, 2016). We show that when an international sample is considered, the demographics, prevalence of parasitic disease and ideologies account only for a small share of variation in creativity. Individual differences remain far more influential, and we hope that future studies will make attempts to explain it to a higher degree.

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