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Regional Variation in Grooming: Exposure to Pathogens Predicts Increased Motivation to Coif

Kilian James Garvey

Department of Psychology, University of Louisiana Monroe

ABSTRACT

Previous research has found that people in geographical areas characterized by higher pathogen prevalence value a mate's physical attractiveness more than people living in geographical areas with lower pathogen prevalence. In this study, the corollary was explored: because people living in high pathogen regions tend to choose mates possessing a physical appearance associated with stronger pathogen resistance, people living in high pathogen regions versus low pathogen regions should also be expected to expend more time and effort grooming so as to make *themselves* appear more pathogen resistant. To test this hypothesis average time spent (in hours per day) grooming (showering, shaving, applying deodorant or perfume) was obtained for both men and women from all 50 US states as well as state levels of pathogen prevalence. In addition, state levels measures related to health and mate suitability (life expectancy, overall physical well-being, poverty, and economic disparity) were also explored. A multiple regression revealed that the model was able to account for 35.7% of the variance in men's daily grooming (R^2_{adj} = .357, $F(1, 47) = 6.62$, $p = .013$), and 33.1% of the variance in female's daily grooming (R^2_{adj} = .331, $F(1, 48) = 5.03$, $p < .001$). The bivariate correlations in both groups indicate that pathogen prevalence is the strongest predictor of regional differences in grooming. It is suggested that because the physical attractiveness of potential mates is more valued in high versus low pathogen regions, individuals in high pathogen regions will attend to their own physical attractiveness in response.

KEYWORDS

Grooming; Physical Attractiveness; Pathogen Prevalence; Life History Theory; Evolutionary Psychology

INTRODUCTION

Humans have been in contact with pathogens since *homo* split from *pan* 13 million years ago (Ewald, 1994; Thomas, Daoust, & Raymond, 2012). The concept of the pathogen prevalence theory of human values (Schaller & Murray, 2008) describes certain patterns of emotional and cognitive behaviors selected to navigate

these microscopic but virulent biological threats, including, but not limited to, political orientation (Thornhill, Fincher, Murray, & Schaller, 2010; Murray, Schaller, & Suedfeld, 2013), culinary practices (Nakatani, 1994; Sherman & Hash, 2001), homicide (Thornhill & Fincher, 2011), religion (Fincher & Thornhill, 2008) creativity (Murray, 2014), and moral sensitivity (van Leewan, Park, Koening, & Graham, 2012).

Analyses of mate choice based on superficial cues of pathogen resilience have abounded, consistently finding that greater pathogen prevalence is associated with higher valuation of physical attraction in potential mates (Gangestad & Buss, 1993; Lee, Mitchem, Wright, Martin, Keller, & Zietsch, 2014; Little, DeBruine, & Jones, 2010; Maestripieri, Klimczuk, Traficonte, & Wilson, 2014; Penton-Voak, Jacobson, & Trivers, 2004). However, very little, if any, research has been carried out exploring the possible effects of pathogen prevalence on individual self-grooming behaviors. In this study I investigated regional differences in grooming behaviors as a product of environmental pathogen load.

Very early in the pathogen prevalence theory of human values research Gangestad and Buss (1993) explored the link between parasite load and opposite sex mate choice. Essentially, the higher the pathogen load the greater the value place on physical attractiveness. While both men and women value physical attractiveness in a potential mate there are differences, due to the different contributions and responsibilities which are characteristic of human reproduction. Because “female fertility is steeply age graded, such that younger women have much higher reproductive value than older women” (Meltzer, McNulty, Jackson, & Karney, 2014, p. 435) men tend to value external cues of youth; full lips, smooth skin, and long lustrous hair, traits often described as “beauty” (Jones, Russell, & Ward, 2015). Women, on the other hand, tend to value, at least for long term relationships, male characteristics which signal ability and willingness to provide resources to support childrearing (Meltzer et al., 2014), which are more likely to be physical strength than physical beauty, and signs of maturity and ambition rather than signs of youth (Cashdan, 1996), as well as non-physical characteristics such as intelligence (Marlow, 2004) and social status (Geary, Vigil, & Byrd-Craven, 2004; Irons, 1983). While physical attractiveness many seem subjective, there is some consistency of findings that look to symmetry in the face and body (Shackelford & Larsen, 1997) as well as the health of skin (Samson, Fink, & Matts, 2010), hair (Hinsz, Stosser, & Matz, 2013), eyes (Bradley, Miccoli, Escrig, & Lang, 2008; Fernandez, Keyes, Pencina, D’Agostino, O’Donnell, & Thompson, 2009; Peshek, Semmaknejad, Hoffman, & Foley, 2011), and absence of body odor (Oberzaucher & Grammer, 2009) and bad breath (Service, 1998). These characteristics are all consistent with genetic health and a stronger immune system which would be especially valued in a high pathogen region. Gangestad, Haselton, and Buss (2006) replicated and extended their own and other’s pervious research and continued to find considerable evidence for humans expressing increased valuation for physical attraction in the presence of elevated pathogen loads. Thornhill and Fincher (2014) explain this as part of the *behavioral immune system*: “As parasite stress increases across regions men and women place increased importance on obtaining a mate that is physically attractive because physical attractiveness is a marker of high

phenotypic and genetic quality pertaining, in part, to the ability to resist local infectious diseases." (p. 174).

The corollary of seeking out more attractive mates in high pathogen regions would be to expend more effort on one's own looks in those same regions. That is, if males and females value physical attractiveness in others in the presence of increased pathogen load, they should also work harder to increase their own attractiveness in high pathogen regions.

To test this I analyzed the American Time Use Survey (Bureau of Labor Statistics, 2014) data on daily grooming (bathing, showering, shaving, applying make-up, combing/brushing/blow drying hair, applying deodorant, brushing teeth, using mouth wash, etc.) as well as measures of pathogen prevalence for all 50 states (Fincher & Thornhill, 2012), and measures of percent of each states population living below the poverty level (U S Census Bureau, 2013), economic disparity (Gini Index: US Census Bureau, 2014), general physical health (Gallup, 2014), and life expectancy (CDC, 2014).

Because males tend to value physical beauty more in women, as a sign of fecundity, than women do in men, it was predicted that women would spend more time grooming per day than men in all 50 US states. It was also predicted that both men and women would spend more time each day grooming in higher pathogen regions of the US than men and women in lower pathogen regions. It was further predicted that particular pressures that would have historically affected the sexes differently would also produce noticeably more grooming behavior. Specifically, I predicted that lower life expectancy would produce more grooming in females than in males, consistent with the life history theory that women will hasten reproductive strategy in a threatening environment (i.e., marry and have children at a younger age) (Griskevicius, Tybur, Delton, & Robertson, 2011; Kruger & Nesse, 2006). In addition, I predicted that because females, more than males, value ability to provide resources in a potential reproductive partner, regions characterized by economic inequality (the Gini index) will be characterized by increased male, but not female, grooming. This is based on the obverse concept of *compensation*: when male's physical attributes are lacking, they can compensate with material resources (Cashdan, 1996; Maestripieri, Klimczuk, Traficonte, & Wilson, 2014), however, in this case, if males cannot provide material resources, they should compensate with greater physical attractiveness, and thus, attend to grooming more.

Lastly, I predicted that because males, more than females, have historically been judged on their ability to provide resources, male grooming should increase more than female grooming in the face of higher economic disparity (the Gini Index) where some men make much more than others (contrasted with over all rates of poverty where most people in the region are poor).

MATERIALS AND METHOD

This study took advantage of open source data pools. Male and female personal grooming measures were obtained from the American Time Use Survey from the Bureau of Labor Statistics (http://www.bls.gov/tus/), two economic measures; Gini (OECD, 2015) and percentage of each state's population living

below the poverty level (US Census Bureau, 2013), state level pathogen prevalence (Fincher & Thornhill, 2012), and life expectancy (CDC, 2014) were obtained.

Grooming

The American Time Use Survey (ATUS) measures the amount of time people spend doing various activities, from mowing lawns and doing dishes to praying and sleeping. A representative sample of the population of each of the 50 US states was taken between the years 2008 and 2012 and averaged. For grooming activities, respondents were asked how many hours per day did they spend washing, showering, dressing, and any activity they considered grooming including but not limited to applying cosmetics, deodorant, perfume or cologne, shaving (presumably legs for women and face for men, but could include other body parts as well), brushing teeth and using mouthwash, brushing/combing/blow drying/coloring hair, and trimming or cutting finger and toe nails.

Percent Living Below Poverty

Data for the percentage of each state's population living below poverty was obtained from the American Community Survey (US Census Bureau, 2013). In 2013 approximately 48.8 million people, or 15.8% of the US population, had an income below the poverty level ($11,490 for an individual, $23,550 for a family of four). This measure ranged from a high of 24% in Mississippi to a low of 8.7% in New Hampshire.

Economic Disparity

Economic disparity was measured by the Gini index, a statistical measure of income distribution within a country or a region (Gini, 1912). A Gini score of 0 would represent perfect equality (every person would have the exact same income) and a score of 1 would represent perfect inequality (one person would have all of the wealth and no one else would have any). The overall Gini index of the United States is .469, which is relatively high: the US is ranked 29th out of 31 OECD countries (OECD, 2015). The within country Gini index in the United States varies from a high of .499 in New York to a low of .419 in Utah.

General Physical Health

The general physical health measure was taken from the Gallup-Healthways Well-Being Index (Gallup, 2013). This measure is composed of six subscales: life evaluation, emotional health, work environment, physical health, healthy behaviors, and basic access to medical care.
While the United States is considered a healthy country, there is a range from the most healthy (North Dakota) to the least healthy (Louisiana).

LIFE EXPECTANCY

The overall life expectancy in the United States is relatively high. According to the World Health Organization (WHO, 2015) in 2013 the US ranked 34th overall with an average age of 79 compared with Japan, ranked 1st with an average age of 84 and Sierra Leone ranked 194th with an average age of 45.
However, there is considerable variance within the United States, depending on a number of economic and environmental conditions, from a high of 81.3 in Hawaii to a low of 75 in Mississippi (Measure of America, 2015).

PATHOGEN PREVALENCE

Pathogen prevalence for the 50 US states was obtained from Fincher and Thornhill (2012) which used data from the US Center for Disease Control's set of infectious diseases for all states between the years 1993 and 2007. While the set of reported diseases varied from 47 in 1993 to 22 in 1998, all years included diagnoses of AIDS, haemophilus influenzae, malaria, measles, meningococcal disease, pertussis, salmonellosis, shigellosis, syphilis, tuberculosis, and typhoid fever.

These data were entered into SPSS v20 (IBM 2011) and analyzed with simple correlational and multiple regressions.

RESULTS

Pathogen prevalence, levels of poverty, economic disparity, and life expectancy from all 50 states predicted regional variation in both male and female grooming behaviors. While all variables (except life expectancy and overall well-being for males) were correlated with grooming, regional pathogen prevalence accounted for the majority of the variance in both male and female grooming.

The first prediction was that, overall, women would groom more than men (measured in hours). An independent samples t-test was conducted and found significant differences between men's daily grooming averages (M = .53, SD = .07) and women's (M = .77, SD = .07), $t(98)$= -17.55, p < .001.

BIVARIATE CORRELATIONS

All bivariate correlations between the predictor variables and the criterion variable for men's grooming are displayed in Table 1, and for women's grooming in Table 2. An investigation of the bivariate correlations in the male grooming data revealed no significant correlations between life expectancy and grooming behavior, $r(48)$ = -.187, p = .096, or between overall wellbeing and grooming behavior, $r(48)$ =-.189, p =.094. All other predictor variables showed a statistically significant correlation with the criterion variable, state level pathogen prevalence: $r(48)$ = .545, p < .001; state level Gini index: $r(48)$ = .542, p < .001; and percent of the state population living below poverty: $r(48)$ = .31, p = .014.

The bivariate correlations in the female grooming data revealed significant correlations between all predictor variables and the criterion variable: life expectancy and grooming behavior, $r(48) = -.401$, $p = .002$, state level pathogen prevalence: $r(48) = .587$, $p < .001$; overall wellbeing and grooming behavior, $r(48) = -.388$, $p = .003$; state level Gini index: $r(48) = .401$, $p = .002$; and percent of the state population living below poverty: $r(48) = .516$, $p < .001$.

Table 1: Males

Table 1
Bivariate Correlations Between Each Predictor Variable and the Criterion Variable

Variable	2	3	4	5	6
1 Men's Grooming	-.187	.545***	-.189	.542***	.31*
2 Life Expectancy		-.505***	.811***	-.188	-.722***
3 Pathogen Load			-.422**	.538***	.588***
4 Wellbeing				-.429**	-.716***
5 GINI					.491***
6 Below Poverty					

* <.05 ** <.01 *** <.001

Table 2: Females

Table 2
Bivariate Correlations Between Each Predictor Variable and the Criterion Variable

Variable	2	3	4	5	6
1 Women's Grooming	-.401**	.587***	-.388**	.401**	.516***
2 Life Expectancy		-.505***	.811***	-.188	-.722***
3 Pathogen Load			-.422**	.538***	.588***
4 Wellbeing				-.429**	-.716***
5 GINI					.491***
6 Below Poverty					

* <.05 ** <.01 *** <.001

INFERENTIAL STATISTICS

A standard multiple regression was used to assess the ability of the five predictor variables (life expectancy, pathogen prevalence, overall well-being, Gini index, and percent living below poverty) to account for the variance of time both men and women spend grooming.

Because an examination of the bivariate correlations of each predictor variable with the criterion variable in the male data showed that neither life expectancy nor overall well-being were sufficiently correlated with grooming, $r(48) = -.187$, $p = .096$ and $r(48) = -.189$, $p = .094$ respectively (see Table 1), these

variables were excluded from the analysis. After the exclusion of these variables, results of the standard multiple regression (see Table 3) revealed that the model as a whole (including pathogen prevalence and the Gini index) was able to predict 35.7% of the variance in male's daily grooming (R^2_{adj} = .357, $F(1, 47) = 6.62$, p = .013).

An examination of the bivariate correlations of each predictor variable with the criterion variable in the female data showed that all predictor variables were sufficiently correlated with grooming, but the results of the standard multiple regression (see Table 4) revealed that the model as a whole was able to account for 33.1% of the variance in female's daily grooming (R^2_{adj} = .331, $F(1, 48) = 5.03$, p < .001).

Table 3: Standard Multiple Regression (Men's Grooming)

Table 3 (men's)
Beta Value, Signifi cance level, t Value, and Standard Error of the Final Predictor Variables

Variable	Standardized Beta	Signifi cance	t value	Standard error
Pathogen Prevalence	.357	.012	2.63	.01
Gini ratio	.35	.013	2.57	.524

Table 4: Standard Multiple Regression (Women's Grooming)

Table 4 (women's)
Beta Value, Signifi cance level, t Value, and Standard Error of the Final Predictor Variables

Variable	Standardized Beta	Signifi cance	t value	Standard error
Pathogen Prevalence	.587	.0001	5.03	.009

CONCLUSIONS

As predicted, pathogen prevalence explained regional variation in personal grooming, for both men and women. All factors in the analysis of female grooming reached statistical significance. The only correlations that did not reach statistical significance for men's grooming were life expectancy and overall well-being. This is hypothesized as a "black widow effect" in that men, for the most part, do not

necessarily have to factor in life span or future health when pursuing reproductive opportunities; while the chances of survival are better for children with two parents, the simple fact is that men can "contribute" at the bare minimum, very little time or physical effort, and still father a child whereas women will not only spend 9 months pregnant and upwards of 15 years caring for her altricial offspring (Konner, 2010), she will have to contribute a significant amount of her own calories during pregnancy and lactation afterwards, which, in ancestral times, could be as long as 5 years (Hrdy, 2009).

The economic factor of percentage of the population living below poverty was hypothesized to effect women's grooming as women tend to be more aware of resource acquisition than men in potential mate selection, and would thus engage in more grooming behavior either to attract high resource men or to compete with other women for those resources (Buss, 1998). While men would not necessarily be interested in a women's wealth, intrasexual competition (Buss, 1998) might motivate men in regions of more economic disparity (the Gini index) to groom more.

The finding that regional differences in economic disparity would account for grooming in men more than regional differences in poverty might also be explained with the framing effect (Tversky & Kahneman, 1981). In mate selection women tend to look to men who have a better than average ability to acquire resources, but, what is average? In a very low Gini region there is very little deviation in income. High Gini regions are characterized by larger deviations in income. In an absolute sense, an income of $100,000 would seem much better than an income of $20,000, but, it might depend on how that $100,000 is framed. If the first income is surrounded by a number of rivals making $500,000 he would almost certainly be seen as below average, and might seem relatively poor. If the second income is surrounded by other incomes not perceptibly higher or lower, then the ability to acquire resources might not be a question, since no one around seems any better. Referring back to the "reverse compensation" hypothesis, men in high Gini regions, even those making well above the national average, might react to this comparison by attending to looks. An alternative to the indirect compensating low ability to acquire resources with enhanced physical attractiveness would be a more direct attempt to improve or enhance one's ability to acquire resources, but, a high Gini economy is quite often the result of a monopoly on resources or market practices (Manning, 2005), which would make working harder to earn more very difficult, if not impossible.

DISCUSSION

The evolutionary analysis of individual differences in mate choice is very nearly as old as evolutionary theory itself (Darwin, 1871), and mate choice is consistently predicted by assessments of physical attractiveness, because physical attractiveness is a proximate cue to an individual's health in general, and reproductive potential in particular (Shackelford & Larson, 1997). It was predicted that when challenges to human health are more relevant, in this case by looking at populations living in regions of higher versus lower pathogen prevalence, then behaviors concerning mate choice would vary accordingly. While previous studies have found that valuation of physical attractiveness increases in high pathogen

prevalent regions this study looked for, and found, the corollary: both men and women seek to improve or accentuate their own physical attractiveness in regions of higher pathogen prevalence as that is more valued by potential mates.

There are a few possible limitations to this analysis that could be addressed in follow up studies. As defined, the measure of grooming is largely hair brushing, make up, brushing teeth, and applying deodorant and perfume. These practices are going to largely address matters of beauty which tend to be valued by men more than by women. A follow up study could look for possible regional differences in male attempts to appear taller or stronger, perhaps by wearing boots or clothing indicating that the wearer is a hunter or competitive athlete, if not actual behaviors meant to increase musculature (i.e., lifting weights).

Another limitation to this study is that the measures of region were US states which are defined by historical and political borders, not necessarily by environmental criteria. It is possible that different regions within the same state would have higher or lower pathogen loads. It is also possible that there could be an urban/rural distinction, which was not controlled for in this study.

An alternative explanation for increased male grooming in high pathogen regions would be that a faster life history strategy tends to be pursued in a dangerous environment. Women pursuing a short-term mating strategy "would have benefited to the extent that they also prioritized physically attractive features" (Meltzer et al., 2014, p. 436). This could explain female grooming as well, since men do, at least superficially, look to cues for a responsible, caring, and intelligent mother for their long term family plans (Buss, 1989; Kendrick, Sadalla, Groth, & Trost, 1990; Li, Bailey, Kendrick, & Linsenmeier 2002), but, in a high pathogen region, would switch to a faster life strategy, forgoing cues of long term investment and putting more value solely on the physical beauty traits of high fecundity and sexual receptivity. Either way, this may be the first analysis of individuals making an effort to match the assumed mating strategy of their potential partners, by highlighting their own physical characteristics.

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