

# Blue hair and the blues: Dying your hair unnatural colours is associated with depression

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A number of lines of evidence, such as studies of religious converts and members of conspicuous subcultures, have found a relationship between holding and expressing a strong counter-cultural identity and mental instability. Here we test whether dying your hair an unnatural colour – something which conspicuously expresses non-conformity – is related to mental instability, using a large dataset of online daters (OKCupid dataset, about n=14k used in this study). We find the expected pattern, which was moderate in size ( $\beta = -0.33$  to  $-0.23$ , depending on controls). This pattern persisted even when controls for age, race, sex, sexual orientation, body type, intelligence, polyamory, vegetarianism, and political beliefs were included.

Keywords: culture; identity; mental instability; political beliefs; religious converts

A number of studies have explored the relationship between pronounced expressions of identity or non-conformity and mental instability. It has been found that extreme and pronounced religiosity is associated with periods of depression and anxiety, as it appears to act to alleviate these symptoms by providing the sufferer with a clear structure and sense of identity (Hills et al., 2004; Koenig, 2012). Borderline Personality Disorder is underpinned by intense anxiety and is often marked by extreme expressions of strong identity, though unstable and dramatically changing (see Fox, 2020). Related to this, it has been found that "Geek Culture", a clear counter-culture marked by unconventional appearance, is associated with borderline personality, specifically with narcissism, and also with depression (McCain et al., 2015). Many other subcultures involving a conspicuous identity, as expressed in unusual and individualistic appearance, are also associated with suffering from depression (e.g. O'Connor & Portzsky, 2015). One means of expressing a strong and counter-cultural identity is by dyeing your hair an unnatural colour, especially green, blue, red, or purple. As such, we would predict that this would be associated with mental instability. The purpose of the present study was to examine whether such a relationship exists.

## METHODS

We used archival data from the OKCupid dataset (Kirkegaard & Bjerrekær, 2016). This is a public dataset of about 68,000 dating site profiles scraped (downloaded with a script) in 2014-2015. The data are very rich, spanning 2,620 variables. Users on the website created and sometimes filled out over 1000 questions to be better matched with other users (the mean number was 568). Each question had between 2 and 4 answer options.

There was essentially no quality control of the questions, except that a small fraction of the questions were initially made by site staff. Thus, the questions are very diverse and quite different from the questions normally asked by academic psychologists. This has both advantages and disadvantages. Among the advantages is that they cover topics that academics would not necessarily think to explore. Given that the website's purpose is dating, there is an abundance of questions of relevance to this issue, at least as perceived by the users asking them. The main disadvantage is that the results may be hard to compare to other studies using standard scales since the questions used here are essentially unique and have not been asked in any academic study. Since users were filling out questions at their will and leisure, many questions have missing data. This is because the users did not fill out so many questions to reach that question in the default queue or because the user specifically skipped that question. Users may skip items for different reasons, perhaps because they perceived them as ambiguous, irrelevant to dating purposes, may force the user to lie to avoid a negative self-presentation or some other reason.

In terms of sampling representativeness, the mean age is 31.7 with a standard deviation (SD) of 7.8 (range 18-100). 60.6% of users were male, 39.1% female, and 0.3% "Other". In terms of country, 66.3% were from the United States, 12.7% United Kingdom, 2.9% from Canada, 2.5% from Australia, 1.5% from Germany, 1.4% from the Netherlands, 1.3% from Denmark, and the remaining countries less than 1%. 87% were from the Anglophone world, and 94% were from the Western world. The average age for the United States is about 37, and considering the dataset does not have anyone below 18 (per self-report), the dataset is substantially younger than the general population, though older than typical student samples (Henrich et al., 2010).

Since users fill out these questions, and the answers are mostly visible to other users, one might wonder whether the self-presentation biases are so strong as to make the data useless for analysis. It should be noted here, though, that the usernames were pseudonyms and not generally traceable to a real person. A number of prior studies have thus looked at well-known findings using the dataset and found that the usual findings can be confirmed and with fairly typical effect sizes. This holds for the association between intelligence (measured using a set of 14 items) and political participation (Kirkegaard & Bjerrekær, 2016), with self-reported criminal and antisocial behaviour (Kirkegaard, 2018) and with (lack of) religious beliefs (Kirkegaard & Lasker, 2020). Consequently, these data seem normal in terms of their patterns and are suitable for novel analyses.

## RESULTS

We searched the question bank for modifiable self-presentation and other mental health indicators, such as non-traditional dating style and vegetarianism, as these have previously been shown to correlate with poor mental health in Western samples (e.g. Baines et al., 2007). For mental health, we searched for items that indicated mental health issues using search terms such as "mental", "illness", "depress", "therapy", and "disorder". We furthermore included a question about self-described political ideology, another known

correlate of mental health (left-wing views relating to worse mental health) (Kirkegaard, 2020; Bernadi, 2020). Table 1 gives the summaries of the included questions.

**Table 1**  
**Questions Relating to Mental Health in OKCupid**

| Item   | Text   | Option 1   | Option 2  | Option 3                                 | Option 4                              | N     | Indicator of  |
|--------|--|--|---|--|---------------------------------------|-------|---------------|
| q50    | Have you ever seen a therapist?  | Yes (59.8%)  | No (40.2%)  |  |                                       | 9507  | Mental health |
| q1552  | Do you get depressed much?   | Almost never, I'm happy! (32.7%)                   | Sometimes, when it's a bad day (63.2%)                | Yeah, despair is my life (4.0%)          |                                       | 9958  | Mental health |
| q6021  | How would you describe your emotional diversity?   | I get extremely happy but rarely depressed (32.7%) | I get extremely depressed and I'm rarely happy (4.6%) | I don't feel much of either (16.7%)      | I feel both often (45.9%)             | 4367  | Mental health |
| q4018  | Are you happy with your life?  | Yes (92.5%)  | No (7.5%)   |  |                                       | 53625 | Mental health |
| q1287  | Have you experienced mental illness?   | Yes - severely (5.9%)                              | Yes - low grade (21.4%)                               | No (58.5%)                               | I'm not sure (14.2%)                  | 17945 | Mental health |
| q48278 | Would you consider dating someone who is already involved in an open or polyamorous relationship?                                | Yes. (42.0%)                                       | No. (58.0%)   |  |                                       | 15242 | Polyamory     |
| q33107 | Would you consider being part of a committed polyamorous relationship (i.e., three or more people but no sex outside the group)? | Yes, I like that type of polygamy. (6.2%)          | I could be convinced by the right people (41.5%)      | I am committed to total monogamy (48.3%) | I have open relationships only (4.1%) | 12788 | Polyamory     |
| q37772 | If you had to choose one for the rest of your life, which would you pick?  | Monogamy (75.2%)                                   | An open relationship (12.6%)                          | Polyamory (9.4%)                         | Playing the field (2.8%)              | 12646 | Polyamory     |

|         |  |                                      |   |                                  |               |       |                   |
|---------|--|--------------------------------------|---|----------------------------------|---------------|-------|-------------------|
| q513    | Have you ever dyed your hair a real crazy, unnatural colour? | Yes (41.0%)                          | No (59.0%)                              |                                  |               | 18045 | Self-presentation |
| q128    | Do you have any tattoos?                                     | I have 1 or more BIG tattoos (15.5%) | I have 1 or more LITTLE tattoos (20.7%) | I have no tattoos (63.8%)        |               | 40450 | Self-presentation |
| q179268 | Are you either vegetarian or vegan?                          | Yes (8.7%)                           | No (91.3%)                              |                                  |               | 54202 | Covariate         |
| q212813 | Which best describes your political beliefs?                 | Liberal / Left-wing (44.4%)          | Centrist (17.4%)                        | Conservative / Right-wing (6.9%) | Other (31.3%) | 45107 | Covariate         |

Furthermore, we included as covariates some demographic variables given in the profiles themselves. These include sex, sexual orientation, polyamory (multiple simultaneous love interests), age, and race. There are well-known associations for most of these. polyamory is a relative newcomer. There are informal reports of high rates of mental illness for this group (Mahler, 2015), though one very small existing study found mental health to be superior to the monogamous control group (Bali, 2020). The five mental health questions had a lot of missing data, and individually, they were not strong indicators. To improve our outcome variable, we factor analysed the five variables using item response theory analysis, as implemented in the mirt package for R (Chalmers et al., 2020). Three items were modelled as nominal variables and two as binary (using the logistic function). The results showed a general factor as expected, which accounted for 37% of the variance. Factors loadings were: seen therapist (.48), much depression (.88), emotional diversity (.51), happy with life (.63), and experienced mental illness (.43). We saved the scores from this analysis and standardised them. This score is intended to measure the general factor of psychopathology, called the P factor (Caspi et al., 2014). For the three polyamory items, we proceeded in the same way. The general factor was not surprisingly stronger here, 82%, and the scores were likewise saved and standardised. Finally, we included a measure of intelligence based on 14 items (not given above, see Kirkegaard & Lasker, 2020, for the questions). Intelligence has been consistently reported to be a small to moderate (around  $r = .20$ ) correlate of mental health (Caspi et al., 2014; Martel et al., 2017), and this is also true for the brain volume, a conceptually related variable (Durham et al., 2021).

In terms of reliability, our measures were mediocre. The estimated empirical reliabilities for the main analytic sample were: .64 (mental health), .64 (intelligence), and .67 (polyamorousness). The main analytical sample consists of every subject who answered at least 2 of the five mental health items. The reliabilities were computed using the `empirical_rxx()` function from the mirt package.

Our main analysis concerns the prediction of this mental health variable coded such that higher values indicate greater mental health, and lower values indicate mental illness—our main list of models used ordinary least squares (OLS) linear models. Table 2 shows our modelling results for our main data subset (at least two mental health items answered), while Figure 1 provides a visual summary.

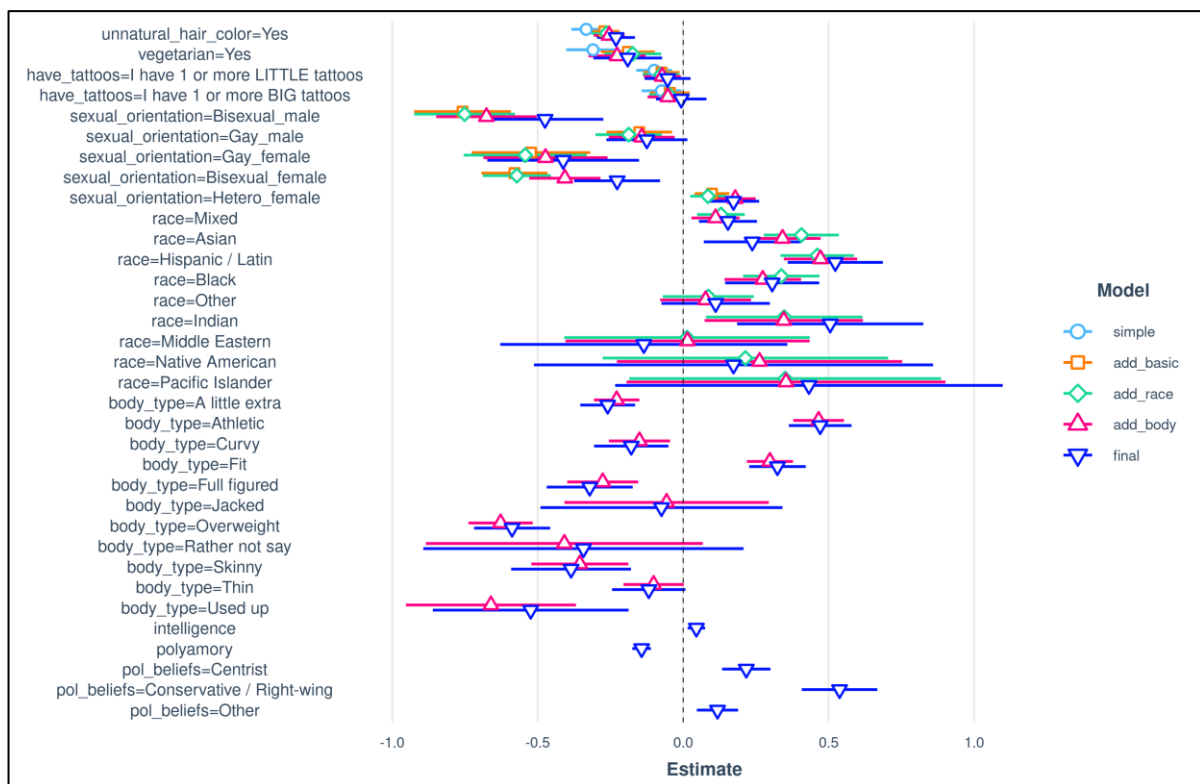
**Table 2**  
**Main regression results**

| Predictor/Model                                | Simple           | Add basic        | Add race         | Add body         | Final            |
|--|------------------|------------------|------------------|------------------|------------------|
| Intercept                                      | 0.10 (0.017***)  | -1.09 (0.270***) | -1.21 (0.276***) | -1.19 (0.277***) | -1.43 (0.357***) |
| unnatural hair color = Yes                     | -0.33 (0.026***) | -0.27 (0.026***) | -0.26 (0.027***) | -0.25 (0.027***) | -0.23 (0.033***) |
| vegetarian = Yes                               | -0.31 (0.047***) | -0.19 (0.047***) | -0.17 (0.050***) | -0.23 (0.050***) | -0.19 (0.060**)  |
| have tattoos = I have no tattoos               | (0, base)        | (0, base)        | (0, base)        | (0, base)        | (0, base)        |
| have tattoos = I have 1 or more LITTLE tattoos | -0.10 (0.031**)  | -0.07 (0.032)    | -0.08 (0.032)    | -0.07 (0.032)    | -0.05 (0.040)    |
| have tattoos = I have 1 or more BIG tattoos    | -0.07 (0.035)    | -0.05 (0.035)    | -0.05 (0.036)    | -0.05 (0.036)    | -0.01 (0.044)    |
| Age  |                  | (nonlinear)      | (nonlinear)      | (nonlinear)      | (nonlinear)      |
| sexual orientation = Hetero male               |                  | (0, base)        | (0, base)        | (0, base)        | (0, base)        |
| sexual orientation = Bisexual male             |                  | -0.76 (0.085***) | -0.75 (0.088***) | -0.68 (0.088***) | -0.47 (0.102***) |
| sexual orientation = Gay male                  |                  | -0.15 (0.058*)   | -0.19 (0.058**)  | -0.14 (0.058)    | -0.12 (0.071)    |
| sexual orientation = Gay female                |                  | -0.52 (0.104***) | -0.54 (0.108***) | -0.47 (0.109***) | -0.41 (0.133**)  |
| sexual orientation = Bisexual female           |                  | -0.58 (0.058***) | -0.57 (0.060***) | -0.41 (0.062***) | -0.23 (0.075**)  |
| sexual orientation = Hetero female             |                  | 0.10 (0.030**)   | 0.09 (0.031*)    | 0.18 (0.036***)  | 0.17 (0.045***)  |
| race = White                                   |                  |                  |                  |                  | (0, base)        |
| race = Mixed                                   |                  |                  | 0.13 (0.042**)   | 0.11 (0.042*)    | 0.15 (0.051**)   |
| race = Asian                                   |                  |                  | 0.41 (0.066***)  | 0.34 (0.067***)  | 0.24 (0.085*)    |
| race = Hispanic / Latin                        |                  |                  | 0.46 (0.064***)  | 0.47 (0.064***)  | 0.52 (0.083***)  |
| race = Black                                   |                  |                  | 0.34 (0.067***)  | 0.27 (0.067***)  | 0.31 (0.082***)  |
| race = Other                                   |                  |                  | 0.09 (0.080)     | 0.08 (0.080)     | 0.11 (0.095)     |
| race = Indian                                  |                  |                  | 0.35 (0.137)     | 0.35 (0.139)     | 0.51 (0.163**)   |
| race = Middle Eastern                          |                  |                  | 0.01 (0.215)     | 0.01 (0.214)     | -0.14 (0.252)    |
| race = Native American                         |                  |                  | 0.21 (0.250)     | 0.26 (0.250)     | 0.17 (0.350)     |
| race = Pacific Islander                        |                  |                  | 0.35 (0.273)     | 0.35 (0.280)     | 0.43 (0.340)     |
| body type = Average                            |                  |                  |                  | (0, base)        | (0, base)        |
| body type = A little extra                     |                  |                  |                  | -0.23 (0.040***) | -0.26 (0.048***) |
| body type = Athletic                           |                  |                  |                  | 0.47 (0.044***)  | 0.47 (0.055***)  |
| body type = Curvy                              |                  |                  |                  | -0.15 (0.054*)   | -0.18 (0.065*)   |
| body type = Fit                                |                  |                  |                  | 0.30 (0.040***)  | 0.32 (0.050***)  |
| body type = Full figured                       |                  |                  |                  | -0.28 (0.062***) | -0.32 (0.075***) |
| body type = Jacked                             |                  |                  |                  | -0.06 (0.179)    | -0.07 (0.212)    |
| body type = Overweight                         |                  |                  |                  | -0.63 (0.056***) | -0.59 (0.067***) |
| body type = Rather not say                     |                  |                  |                  | -0.41 (0.243)    | -0.34 (0.281)    |

|   |       |       |       |                  |                  |
|---|-------|-------|-------|------------------|------------------|
| body type = Skinny                            |       |       |       | -0.36 (0.085***) | -0.39 (0.105***) |
| body type = Thin                              |       |       |       | -0.10 (0.053)    | -0.12 (0.064)    |
| body type = Used up                           |       |       |       | -0.66 (0.149***) | -0.52 (0.172**)  |
| intelligence                                  |       |       |       |                  | 0.05 (0.015**)   |
| polyamory                                     |       |       |       |                  | -0.14 (0.016***) |
| political beliefs = Liberal / Left-wing       |       |       |       |                  | (0, base)        |
| political beliefs = Centrist                  |       |       |       |                  | 0.22 (0.042***)  |
| political beliefs = Conservative / Right-wing |       |       |       |                  | 0.54 (0.066***)  |
| political beliefs = Other                     |       |       |       |                  | 0.12 (0.036**)   |
| R2 adj.                                       | 0.019 | 0.057 | 0.064 | 0.099            | 0.116            |
| N   | 13905 | 13439 | 12753 | 12306            | 8710             |

\*  $p < .01$ , \*\* =  $p < .005$ , \*\*\* =  $p < .001$ . Results based on the subset of data with answers to at least 2 of the 5 mental health items. Values in parentheses are analytic standard errors. For categorical predictors, set the most common factor level as the baseline. Age was modelled using a natural spline to account for any nonlinear effects.

**Figure 1**  
Visual summary of model coefficients



NB: Error bars show 95% confidence intervals.

Results show many points of interest. First, in the simplest models that include only our key variables of self-presentation, we see that unnatural hair colour predicts mental illness with a moderately large effect size,  $\beta = -0.33$ , and there is also a notable effect size for vegetarianism,  $\beta = -0.31$ . This relationship may exist due to

vegetarianism being an expression of a need for a strong identity or perhaps because a high level of anxiety extends to anxiety about harm to animals. Having tattoos is comparatively a much weaker signal, with effect sizes estimated around -0.10. Across the models, we add progressively more potential confounders, such as age, sex and sexual orientation, political ideology and so on. However, we see that despite the inclusion of so many controls, unnatural hair colour remains a fairly potent predictor of mental illness, with an effect size in the final model of  $\beta = -0.23$ . Vegetarianism also retains most of its validity, ending in the final model with -0.19. For the covariates, we see familiar findings, with negative effects for non-heterosexuals compared with the reference group of heterosexual females. Somewhat strangely, we find that heterosexual men are higher in mental illness in this sample, perhaps reflecting self-selection of men who resort to dating sites as opposed to finding dates in physical settings such as bars. For race, we see that most non-whites have better mental health, at least insofar as self-report is concerned (see Rushton, 1995). This is in line with much evidence on European-descended people's relatively poor mental health in Western countries.

For body type, we see that deviation from the baseline category of "average" is associated with expected effects: better mental health for people who are relatively fit (e.g., athletic,  $\beta = 0.47$ ), and worse for those who are unhealthy (e.g., full-figured,  $\beta = -0.32$ ). Intelligence shows a weak positive effect ( $\beta = 0.05$ ), in line with research on the general factor of psychopathology (Caspi et al., 2014), though weaker than expected. The non-traditional dating pattern of polyamory shows a moderate negative effect of -0.14, contrary to a very small study (Bali, 2020). Finally, political ideology shows negative effects of non-conservative views, especially left-wing/liberal ( $\beta = -0.54$ , opposite that of the conservative reference), also in line with recent work (Bernardi, 2020; Kirkegaard, 2020). Essentially all the covariates had some detectable effect given our large sample size (most p values were  $p < .001$ ).

One notable weakness of this study is that our outcome variable is not measured well. This would have the effect of *weakening* the patterns we see since all betas would be biased towards 0 (Hunter and Schmidt, 2015). Thus, it is a strength of the study that we see clear evidence of association despite the weakness of the measures. The results in Table 2 above are based on the subset of data ( $n = 22.2k$ ) where subjects answered at least 2 of the five mental health items. If we desire higher quality measurement in the outcome measure, we can subset subjects with at least three items answered ( $n = 10.8k$ ). How does this change the results? Per the above statistical considerations, the associations should become stronger across the board, and they do. For our primary interest in unnatural hair colour, the initial and final betas change to -0.38 and -0.24, from -0.33 and -0.23, respectively. Reversely, if we use the full dataset, i.e., including users who answered at least one mental health item, the betas become somewhat weaker: -0.28 and -0.20, respectively. In the same vein, the model R2 becomes weaker as the quality of the outcome variable decreases: from 10.8% to 11.6% and ending with 12.8%, for models based on data with at least 1, 2, or 3 mental health items answered.

One problem with the models presented in Table 2 is that the causality we hypothesise is the reverse of that we model, i.e., we hypothesise that mental illness causes people to change their self-presentation, while our model uses self-presentation as a predictor of mental health. We used this specification since this allowed us to use simpler linear models instead of logistic regressions needed to model unnatural hair colour's binary outcome. A reviewer suggested that we also run the forward-causation models. We did this, and the results show that mental health is a consistent negative predictor of reporting having unnaturally coloured hair. The beta for mental health is fairly consistent models: -.16 (self-presentation variables only), -.14 (basic controls), -.13 (race), -.13 (body type), and -.12 (final). Thus, reversing the models did not change our conclusions. Figure 2 shows the model predictions across models.

Finally, potentially, our mental health indicators have different relationships to unnatural hair colour. To examine this question, we ran a logistic regression for each separately (without controls). This can be seen in Table 3.

**Table 3**  
Individual mental health indicators predicted by unnatural hair coloration.

| Predictor           | Coefficient | R <sup>2</sup> | AUC  | p     |
|---------------------|-------------|----------------|------|-------|
| seen therapist      | 0.60        | 0.03           | 0.57 | < .01 |
| much depression     | 0.55        | 0.01           | 0.53 | < .01 |
| emotional diversity | 0.40        | 0.02           | 0.56 | < .01 |
| happy with life     | 0.03        | 0.00           | 0.50 | 0.52  |
| exp mental illness  | 1.05        | 0.04           | 0.59 | < .01 |
| mental health score | -0.17       | 0.02           | 0.57 | < .01 |

Results show that the composite score and 4 of the five indicators show a relationship with reporting having had an unnatural hair colour, though each is quite a weak (AUCs all < .60, R<sup>2</sup>s below 5%). Only the life happiness indicator did not show this pattern. This suggests that it is primarily or exclusively variation in the psychopathological range of mental health-related to hair colouration, not variation in happiness among non-pathological persons. Additionally, we fit a model using each mental health indicator jointly in a model. This starkly reduced our sample size to 2,000 subjects. While each indicator retained its direction of effect, we lacked the power to detect their effects. Only the item about having experienced mental illness had p < .01. We do not put much weight on this analysis, as including different measures of the same latent construct in a regression model separately causes high multicollinearity and thus statistical imprecision.

## DISCUSSION

It can be seen that even adjusting for multiple covariates, people who have at some point had, or still have, unnatural coloured hair score 0.20 to 0.30 of an SD higher than those who do not. This is congruous with other lines of evidence that indicate that those who have a pronounced, counter-cultural and conspicuously expressed identity are high in mental instability.

We would submit that the simplest explanation for this relationship can be garnered from the known relationship between borderline personality disorder and extreme, though changeable, expressions of identity. A large study found that the P factor, which we attempted to approximate here, seemed to perfectly correlate with a latent borderline personality disorder factor (Gluschkoff et al., 2021.). Those who score high in neuroticism are plagued by worry and doubt, including about themselves and even about who they are. Being high in neuroticism strongly correlates with suffering from depression and anxiety (see Nettle, 2007). The world appears to them as a frightening place, beyond their control, meaning that even their sense of "self" can be unclear. In periods of extreme concern, they deal with this by creating – and expressing – a clear and strong identity (Fox, 2020). This ameliorates their negative feelings, at least for a period of time, meaning, as this has been found with religion, that their identity may even become less extreme and conspicuous as they enter a period of relatively mental stability (see Hills et al., 2004). Thus, unnatural coloured hair can be regarded as an expression of, and way of negotiating, high levels of neuroticism.

It might be argued that it has further benefits, potentially even in terms of fitness. It would be a conspicuous means of attracting people like oneself, with people tending to be attracted to sexual partners and even friends who are optimally genetically similar to themselves as means of indirectly elevating their fitness (Rushton, 2005; Salter, 2007). In this regard, for example, it has been found that a sociosexual orientation is weakly associated both with certain physical characteristics and with being attracted to these same physical characteristics of the opposite sex. Thus, it can be suggested that they permit people who are genetically similar or who follow the same sexual strategy to find each other (Steiner, 1980). In addition, such hair, to the extent that it evokes dysphoria or disgust, could be regarded as an honesty signal of genetic quality: a handicap, like a peacock's tail, where one draws attention to have attractive one is by asserting that one is still attractive even with such handicap (see Miller, 2000). For a person high in neuroticism, for whom the world appears frightening and unpredictable, such hair might be a means of scaring or at least confusing potential threats, thus persuading them to "stay away." In this sense, it can be compared to using bright colours or strikingly contrasting patterns displayed by poisonous insects or amphibians. These so-called "aposematic signals" have evolved as honesty indicators that the prey is toxic and dangerous and should be avoided (Poulton, 1890). In this sense, unnatural hair colour will be an attractive and even empowering option for those high in neuroticism. But these are highly speculative. We would submit that the need for a strong identity and structure for a person with identity difficulties due to neuroticism would be the most obvious explanation for the relationship we have found.



## LIMITATIONS

The study had a number of limitations. First, our outcome variable was not measured well. In our robustness tests, we examined to which degree this affected our results. Generally speaking, higher random measurement in the outcome variable weakens the associations with all the predictors, though it does not bias their relative effect sizes. When we varied the quality of the outcome by sub-setting to subjects who filled out more relevant questions, we find that this improved the associations of interest, as would be expected. It would be preferable if a future study used stronger outcome data. We used the available data such as they are.

Second, our measure of unnatural hair colour was likewise suboptimal. It does not measure how unnatural the fissure was in general (green spikes more unusual than slightly unnatural red hair) or how long this hairstyle was kept. Presumably, persons who have such hairstyles for longer periods, especially in adulthood, are higher in their non-conformity than persons who merely had an unnatural hair colour once in their teenage years. This is also seen in the high rate of affirming this question, 41%. Future studies should ask more in-depth questions about hairstyles or rely on photographic data, e.g. scraped from Twitter.

Third, the data were gathered from dating profiles linked to the persons' real names. Insofar as people fill out such questions with less honesty than in a typical anonymous psychology questionnaire, this may impact the results. However, prior research using the same dataset has not found such biases to be large (Kirkegaard, 2018).

Fourth, the present dataset used mostly data from Western countries, where presumably artificial, the unnatural colouration of hair is the most common. Indeed, natural hair colour variation is also the highest in this region of the world, probably related to the higher average individualism. This worldwide variation may induce differential associations between hairstyle non-conformity and mental illness. We could not investigate associations outside the Western world, so this should be investigated in future work.

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