HHS Public Access

Author manuscript

J Soc Psychol. Author manuscript; available in PMC 2022 October 09.

Published in final edited form as:

J Soc Psychol. ; : 1–12. doi:10.1080/00224545.2021.1909522.

Genetic Attributions and Perceptions of Naturalness Are Shaped by Evaluative Valence

Matthew S. Lebowitz[*,1], **Kathryn Tabb**[2], **Paul S. Appelbaum**[1]

[1]Department of Psychiatry, Columbia University; NY State Psychiatric Institute 1051 Riverside Drive, Unit 122, New York, NY 10032, USA

[2]Philosophy Program, Bard College, P.O. Box 5000, Annandale-on-Hudson, NY, USA

Abstract

Genetic influences on human behavior are increasingly well understood, but laypeople may endorse genetic attributions selectively; e.g., they appear to make stronger genetic attributions for prosocial than for antisocial behavior. We explored whether this could be accounted for by the relationship of genetic attributions to perceptions of naturalness. Participants read about positively or negatively valenced traits or behaviors and rated naturalness and genetic causation. Positively valenced phenotypes were rated significantly more natural and significantly more genetically influenced than negatively valenced phenotypes, and the former asymmetry significantly mediated the latter (Experiments 1 and 2). Participants' interpretation of what "natural" meant was not synonymous with valence or genetic attributions (Experiment 3). People ascribe differing degrees of genetic influence to the same phenotype depending on whether it is expressed in socially favored or disfavored ways, potentially representing a significant threat to public understanding of genetics.

Keywords

Genetics; Social Cognition; Causal Attribution; Motivated Reasoning

---

As knowledge of the human genome has accelerated in recent years, genetics has been increasingly invoked to explain an ever-widening range of phenotypes, from physical characteristics and health outcomes to behaviors, habits, and attitudes. Such genetic explanations have tended to capture the public imagination, with genomic research yielding provocative media headlines and metaphors involving genes and DNA finding their way into common speech (Heine, 2017). Individuals increasingly have access to their own health- and ancestry-related genetic information, thanks to direct-to-consumer genetic testing services used by tens of millions of consumers (National Academies of Sciences Engineering & Medicine, 2020). People's reactions to genetic information have, in turn, become the subject of a growing body of empirical scholarship.

[*]Corresponding author: Matthew S. Lebowitz, Department of Psychiatry, Columbia University, NY State Psychiatric Institute Unit 122, 1051 Riverside Drive, New York, NY 10032, USA, msl2207@cumc.columbia.edu.

Information about a person's DNA has the potential to alter the ways in which people conceptualize their identities (Klitzman, 2009; Nelson, 2008). Genetic explanations also have a notable social impact in that social perceptions can be affected by attributing a person's characteristics to genetic causes (Dar-Nimrod & Heine, 2011). For example, when a person's health status or behavior is explained genetically, this can lead others to view the individual as less responsible for the phenotype in question, and to view the phenotype as more likely to be permanent or immutable (Hoyt, Burnette, Auster-Gussman, Blodorn, & Major, 2017; Kvaale, Haslam, & Gottdiener, 2013). Indeed, genetic explanations are often interpreted in ways that have meaningful implications for intergroup relations, social reasoning, and health psychology.

While there is substantial evidence that genetic explanations can shape our thinking, it has also been suggested that the direction of the effect can operate in reverse: our willingness to endorse genetic explanations may be influenced by our motivations, moral convictions, and social attitudes (Lynch, Morandini, Dar-Nimrod, & Griffiths, 2019; Tabb, Lebowitz, & Appelbaum, 2019). Recent research has brought into view one apparent example of this sort of motivated reasoning: an asymmetry in which people were shown to be consistently more willing to attribute prosocial behavior to genetic causes, as compared to antisocial behavior (Lebowitz, Tabb, & Appelbaum, 2019). This recent research by Lebowitz and colleagues documented the existence of such asymmetrical reactions in six studies, across a range of stimuli describing widely varying types of prosocial and antisocial behavior (prosocial behavior varied from warning people not to trip on an uneven sidewalk to intervening to protect a victim of violent crime; antisocial behavior ranged from intentionally giving bad advice to assault motivated by ethnic bias) performed by a variety of actors (i.e., males and females with different occupations and in varied settings). The research also examined whether *blame validation processing*—a form of motivated reasoning in which people prefer "blame versus nonblame explanations for harmful events" (Alicke, 2000, p. 568)— might mediate the prosocial-antisocial asymmetry in genetic attributions (Lebowitz et al., 2019). In other words, it suggested that this asymmetry could be explained, at least in part, by a desire to hold wrongdoers accountable for their misdeeds; perhaps people discount the role of genetic influences in causing antisocial behavior because they prefer to view such behavior as freely chosen in order to justify blame and punishment (Clark et al., 2014), and they view genetic attributions as inconsistent with such free-will explanations. While evidence emerged to support this mechanistic hypothesis, showing that greater ascriptions of personal responsibility to perpetrators of antisocial (versus prosocial) acts was a significant mediator of the asymmetry in genetic attributions, the indirect effect that was observed was small, suggesting that other mediators are also likely involved (Lebowitz et al., 2019).

In the present work, we investigate a new potential mediator of the asymmetry in genetic attributions for prosocial and antisocial behavior: ascriptions of *naturalness*. A wide array of empirical studies have demonstrated that people associate naturalness with goodness. For example, people manifest a consistent preference for natural things, especially foods (Román, Sánchez-Siles, & Siegrist, 2017; Rozin, Fischler, & Shields-Argelès, 2012; Rozin et al., 2004). People have also been found to perceive "natural hazards," such as a severe sunburn caused by a day at the beach or temporary paralysis caused by the toxic secretions of an animal, to be preferable to, less frightening than, and less dangerous than analogous "unnatural" hazards, such as a severe sunburn caused by a tanning bed or temporary paralysis caused by a manmade gas (Rudski, Osei, Jacobson, & Lynch, 2011).

It has been argued that genetic explanations result in traits and characteristics being perceived as more natural, and that in some cases, this can lead people to view such characteristics more positively, because of people's tendencies to associate naturalness with goodness (Dar-Nimrod & Heine, 2011; Heine, 2017; Lynch et al., 2019). For example, there is some evidence that genetic explanations for sexual orientation can be associated with less negative attitudes and beliefs about homosexuality (Jayaratne et al., 2006; Joslyn & Haider-Markel, 2016), and it has been suggested that this may be due to genetic explanations causing homosexuality to be perceived as more natural (Dar-Nimrod & Heine, 2011; Lynch et al., 2019). Indeed, the presumption of naturalness has been identified as a key bias that is activated by genetic explanations (Dar-Nimrod & Heine, 2011; Heine, 2017; Lynch et al., 2019).

Here, we consider whether this effect might also operate in the opposite direction or be bidirectional. That is, given the well-documented link between perceptions of goodness and perceptions of naturalness, people might perceive prosocial behavior to be more natural than antisocial behavior, and this might help to explain their greater endorsement of genetic causality for prosocial (as compared to antisocial) actions. Moreover, while previous work has demonstrated that such an asymmetry consistently emerges between attributions for prosocial and antisocial behavior, it has remained unclear whether the asymmetry is specific to causal attributions for socially relevant behavior or whether it might instead be a more general asymmetry in genetic attributions for positively versus negatively valenced outcomes. Thus, in the present work we also explore whether this asymmetry in willingness to endorse genetic causes might extend beyond the realm of prosocial and antisocial behavior—that is, whether people might endorse genetic explanations more strongly for positively (versus negatively) valenced outcomes in other domains.

We report the results of three experiments. Experiment 1 extends earlier work examining asymmetrical genetic attributions for prosocial versus antisocial actions by exploring whether there is also an asymmetry in the perceived naturalness of these two types of behavior, as well as whether such a difference might mediate the asymmetry in genetic attributions. Experiment 2 extends the work further by investigating whether there are asymmetries in the perceived genetic etiology and perceived naturalness of positively versus negatively valenced phenotypes other than prosocial and antisocial behavior, and whether such differences in perceived naturalness might help to account for any observed asymmetries in genetic attributions. Experiment 3 explores what meanings people attach to the concept "natural" when they are rating the naturalness of positive and negatively valenced behaviors, and whether these meanings cast naturalness as sufficiently conceptually distinct from valence, on the one hand, and from genetic attributions, on the other, to conclude that naturalness plays a meaningful explanatory role in accounting for any observed relationship between positive valence and genetic attributions.

Experiment 1

Methods

Experiment 1 used nearly identical methods to those reported in prior work examining asymmetrical genetic attributions for prosocial versus antisocial behavior (Lebowitz et al., 2019), but introduced perceived naturalness as a new potential mediator of such an asymmetry.

Participants.—Participants were recruited by contracting with Qualtrics Research Services to disseminate an online survey (also administered using Qualtrics online data-collection software) to 249 U.S. adults.[1] The participants were 32.9% male, 66.7% female, and 0.4% unknown gender, with a mean reported age of 37.28 years (*SD* = 13.97). They received compensation consistent with standard pay rates used by Qualtrics Research Services, via Qualtrics Panels' e-reward system, which allows participants to redeem their compensation for a variety of goods or pool compensation across surveys for a larger reward.

Stimuli and Procedures.—The stimuli used in Experiment 1 were identical to stimuli in prior work (Lebowitz et al., 2019, Study 5). Participants were randomly assigned to either a prosocial condition ($n = 125$) or an antisocial condition ($n = 124$). After providing informed consent, all participants were presented with a short vignette describing a woman named Jane. In the prosocial condition, this read, "Jane has a strong tendency to be kind, generous, and caring toward others. She often goes out of her way to treat people well and help them." In the antisocial condition, this read, "Jane has a strong tendency to be mean, selfish, and uncaring toward others. She often goes out of her way to mistreat people and take advantage of them."

All participants provided a naturalness rating ("How natural do you think Jane's behavior is?"), on a scale from "1 (Not at all natural)" to "7 (Very natural)," and a genetic attribution rating ("How much of a role do you think genetics play in Jane's behavior?"), on a scale from "1 (No role or a very minor role)" to "7 (A very major role)." Participants then provided basic demographic information.

No custom code was used for data analysis. Data used for analysis are available at https://osf.io/ugfvp/ (DOI 10.17605/OSF.IO/UGFVP).

Results and Discussion

Replicating previous findings (Lebowitz et al., 2019), genetic attribution ratings were significantly higher in the prosocial condition ($M = 4.55$, 95% CI [4.24, 4.86], $SD = 1.75$) than in the antisocial condition ($M = 3.49$, 95% CI [3.16, 3.82], $SD = 1.87$), $t(247) = 4.62$, $p < .001$, $d = .59$. Naturalness ratings were also significantly higher in the prosocial condition ($M = 6.12$, 95% CI [5.93, 6.31], $SD = 1.07$) than in the antisocial condition ($M = 2.82$, 95% CI [2.47, 3.17], $SD = 1.96$), $t(247) = 16.51$, $p < .001$, $d = 2.10$.

[1]Previous research using the same stimuli (Lebowitz et al., 2019, Study 5) observed a difference in endorsement of genetic attributions between prosocial and antisocial behavior with an effect size of d=.49. We calculated that a sample size of 110 participants per condition (i.e., a total of 220) would be necessary to detect an effect of this size with 95% power, if using an alpha of .05. To be methodologically conservative, we thus sought a sample slightly larger than this.

We next examined whether the latter difference might mediate the former—that is, whether differences between prosocial and antisocial behavior in perceived naturalness might help to account for the assumption that genes play a greater role in prosocial than antisocial behavior—using the PROCESS (Hayes, 2018) procedure (version 3.4) for SPSS with 5,000 bootstrap samples. For this analysis, we used PROCESS model 4, designating condition (prosocial coded as 1, antisocial coded as 0) as the independent variable (X), genetic attribution ratings as the dependent variable (Y), and naturalness ratings as the mediator (M). The results are shown in Figure 1. Of note, there was a significant indirect effect of condition on genetic attributions through naturalness ratings, $B = 1.11$, $SE = 0.25$, 95% percentile bootstrap CI (0.61, 1.59).

These results indicate that compared to antisocial behavior, prosocial behavior is seen as significantly more natural. The results are also consistent with the mediational hypothesis that this asymmetry in ascriptions of naturalness helps to account for the greater extent to which prosocial behavior, as compared to antisocial behavior, is attributed to genetic causes. Unlike in previous work, which found only a small indirect effect when ratings of responsibility were considered as a mediator of the prosocial-antisocial asymmetry in genetic attributions (Lebowitz et al., 2019), in Experiment 1 the indirect effect through the proposed mediator (naturalness ratings) was large. This suggests that differences in the perceived naturalness of prosocial and antisocial behavior may be a particularly robust mediator of the asymmetry in genetic attributions reported in previous research (Lebowitz et al., 2019) and replicated here.

Experiment 2

In reporting the original finding of an asymmetry between endorsement of genetic attributions for prosocial and antisocial behavior, Lebowitz et al. (2019) noted that "future research could examine whether the asymmetry we observed in the endorsement of genetic explanations is unique to comparisons of prosocial and antisocial behavior, or whether there is a more general willingness to make genetic attributions for positively valenced phenotypes (for example, physical attractiveness) than for negatively valenced ones (for example, ugliness)" (p. 946). The findings of Experiment 1, reported above, provide further motivation for this question. If an asymmetry in willingness to attribute prosocial and antisocial behavior to genetic causes might be mediated by asymmetrical perceptions of naturalness, this raises the possibility that such an asymmetry might be present for a broad range of characteristics that differ in their perceived naturalness. That is, unlike blame validation processing, which was previously considered as a mediator of people's lesser willingness to attribute antisocial behavior to genetic causes (as opposed to prosocial behavior) (Lebowitz et al., 2019), asymmetrical perceptions of naturalness need not be limited to cases (such as that of prosocial and antisocial behavior) in which the two phenotypes in question differ in perceived blameworthiness. Therefore, in Experiment 2, we sought to examine whether asymmetries in genetic attributions might emerge between phenotypes that differ in their evaluative (i.e., positive versus negative) valence, but not necessarily in the extent to which they would elicit blame validation processing.

Methods

Participants.—Participants were 600 U.S. adults[2] recruited and compensated for their participation via the same approach used for Experiment 1. The participants were 32.7% male, 66.3% female, and 1% other or unknown gender, with a mean reported age of 39.61 years (*SD* = 14.50).

Stimuli and Procedures.—Participants were randomly assigned to one of two traits (attractiveness or organization) and one of two valences (positive or negative). Participants read a short vignette describing a woman named Jane. For participants assigned to attractiveness, those in the positive-valence condition read that Jane was highly attractive, while those in the negative-valence condition read that Jane was highly unattractive. Analogously, for participants assigned to organization, those in the positive-valence condition read that Jane was highly organized, while those in the negative-valence condition read that Jane was highly disorganized. Specifically, the wording of the vignette was as follows: "Jane is a young woman who lives in a major city. All her life, Jane has been very [attractive / unattractive / organized / disorganized]. Many people who meet her consider her to be one of the most [attractive / unattractive / organized / disorganized] people they have ever met."

As in Experiment 1, participants were asked to provide a naturalness ratings and a genetic attribution rating. For the naturalness measure, they were asked, "How natural do you think it is for Jane to be so [attractive / unattractive / organized / disorganized]?" and responded on a scale from "1 (Not at all)" to "7 (Very much)." For the genetic attribution rating, they were asked, "How much of a role do you think genetics play in causing Jane to be so [attractive / unattractive / organized / disorganized]?" and responded on a scale from "1 (No role or a very minor role)" to "7 (A very major role)." Participants then provided basic demographic information.

No custom code was used for data analysis. Data used for analysis are available at https://osf.io/ugfvp/ (DOI 10.17605/OSF.IO/UGFVP).

Results and Discussion

We first used 2 (trait: attractiveness vs. organization) × 2 (valence: positive vs. negative) ANOVAs to examine the effects of our experimental manipulations on naturalness ratings and genetic attributions. For naturalness, this revealed significant main effects of both trait, $F(1, 596) = 31.21$, $p < .001$, and valence, $F(1, 596) = 88.06$, $p < .001$; the two-way interaction was not significant, $F(1, 596) = 1.80$, $p = .180$. The same pattern of results emerged for genetic attributions: there were significant main effects of both trait, $F(1, 595) = 80.69$, $p < .001$, and valence, $F(1, 595) = 25.65$, $p < .001$, and the two-way interaction was not significant, $F(1, 595)=0.280$, $p = .597$.

[2]Because Experiment 2 used novel stimuli, we calculated what sample size would be necessary to detect a small-to-medium effect ($d = .3$) with 95% power, if using an alpha of .05, and determined that the necessary sample size would be 290 per condition (580 total). We thus sought a sample slightly larger than this in order to be methodologically conservative.

While the lack of significant two-way interactions indicated that trait was not a significant moderator of the effect of valence on either dependent variable, we nonetheless analyzed the effect of valence separately for each trait for illustrative purposes, given the significant main effect of trait reported above. This revealed that when Jane was described as highly attractive, participants perceived this as significantly more natural ($M = 5.31$, 95% CI [5.08, 5.54], $SD = 1.42$) than when she was described as highly unattractive ($M = 3.94$, 95% CI [3.65, 4.22], $SD = 1.75$), $t(292) = 7.35$, $p < .001$, $d = .86$. Similarly, when Jane was described as highly attractive, participants perceived this as significantly more genetically influenced ($M = 5.84$, 95% CI [5.64, 6.03], $SD = 1.17$) than when she was described as highly unattractive ($M = 5.10$, 95% CI [4.83, 5.37], $SD = 1.64$), $t(291) = 4.40$, $p < .001$, $d = .52$. When Jane was described as highly organized, participants perceived this as significantly more natural ($M = 5.85$, 95% CI [5.64, 6.06], $SD = 1.32$) than when she was described as highly disorganized ($M = 4.82$, 95% CI [4.55, 5.10], $SD = 1.72$), $t(304) = 5.87$, $p < .001$, $d = .67$, and significantly more genetically influenced ($M = 4.59$, 95% CI [4.33, 4.85], $SD = 1.64$) than when she was described as highly disorganized ($M = 3.99$, 95% CI [3.70, 4.29], SD=1.86), $t(304) = 2.96$, $p = .003$, $d = .34$.

Mirroring Experiment 1, we also examined whether the observed difference in perceived naturalness between positively valenced traits (being organized or attractive) and negatively valenced traits (being disorganized or unattractive) would mediate the observed main effect of valence on genetic attributions. Using the PROCESS (Hayes, 2018) procedure in the same way as in Experiment 1, we indeed observed an indirect effect of valence on genetic attributions through naturalness ratings, $B = .34$, $SE = 0.07$, 95% percentile bootstrap CI (0.21, 0.48). The full results of this analysis are shown in Figure 2.

The results of Experiment 2 suggest that asymmetrical willingness to endorse genetic attributions is not limited to comparisons of prosocial and antisocial behavior. Indeed, participants displayed the same asymmetry for other comparisons of positively valenced phenotypes (being organized or attractive) versus negatively valenced phenotypes (being disorganized or unattractive). Moreover, taken together, the results of Experiment 1 and 2 suggest that this asymmetry, across all phenotype comparisons examined, may be mediated by differences in perceived naturalness. That is, people appear inclined to perceive positively valenced phenotypes (prosocial behavior, being organized, being attractive) as more natural than negatively valenced ones (antisocial behavior, being disorganized, being unattractive), and this may help to explain their tendency to endorse genetic attributions for the former more strongly than for the latter.

Experiment 3

One important limitation to Experiment 1 and 2 is that the mediator variable, perceived naturalness, was measured by simply asking participants to rate “how natural” Jane’s behaviors or characteristics were. This approach did not provide any information about what meaning participants attached to the word “natural,” leaving some ambiguity as to what psychological process was being illuminated by the mediation findings. Moreover, given the diverse meanings people might intend when they use the word “natural” (Rozin 2005), it may be possible that participants simply understood it to be roughly synonymous with either positive valence or genetic causation, in which case naturalness ratings would not play a genuine explanatory role in accounting for the observed asymmetries in genetic attributions. Thus, experiment 3 aimed to produce an understanding of how participants interpreted the word “natural” when making their naturalness ratings, and to specifically investigate whether these ratings conceptually overlapped with genetic attributions or evaluative valence.

Methods

Participants.—Experiment 3 was completed by 150 U.S. adults recruited via Prolific, an online study pool for research participants (Palan & Schitter, 2018). The participants were 42.7% male, 53.3% female, and 4% other or unknown gender.

Stimuli and Procedures.—Participants were recruited in three subsamples and completed the procedures online. For prosocial/antisocial behavior subsample (n=48), the stimuli (vignettes) were the same as in Experiment 1. For the attractiveness subsample (n=50), the stimuli (vignettes) were the same as those used for the attractiveness trait in Experiment 2, and for the organization subsample (n=52), the stimuli (vignettes) were the same as those used for the organization trait in Experiment 2. All participants were randomly assigned either to a positive valence condition (in which Jane was described as prosocial, attractive, or organized, depending on the subsample) or to a negative valence condition (in which Jane was described as antisocial, unattractive, or disorganized, depending on the subsample). Participants viewed their assigned vignette and completed the same naturalness ratings as in Experiment 1 and 2. On the next page, participants were shown the naturalness rating they had just provided and were asked, “In selecting this rating, what meaning of the word ‘natural’ did you have in mind?”; they were prompted to “please write a few words (no more than one sentence) in the text box below to describe what meaning of ‘natural’” they had in mind when making their naturalness rating. After providing a free-text definition of naturalness, participants were asked demographic questions and debriefed as to the fictitiousness of the vignettes. Genetic attribution ratings were not measured, as the purpose of the study was solely to understand what meaning participants attached to the word “natural” when making their ratings.

Analysis of free-text responses.—To analyze the free-text responses, we compiled them from across the three subsamples, and each of the three authors read all of the responses separately to generate a preliminary list of thematic codes to capture the most common themes expressed in the definitions of naturalness provided by the participants. Next, all three authors met to discuss their respective preliminary lists of thematic codes and arrived through discussion at a consensus list of final codes.

Because part of the aim of Experiment 3 was to determine whether naturalness overlapped conceptually with valence or genetic attributions, we stipulated that there would be one code (“positive valence”) for instances in which participants defined natural as meaning good, praiseworthy, or the like, and one code (“genetic”) for instances in which participants mentioned genetics as part of the definition of natural. There were four other codes in the final list:

- “Typical” (for instances in which a respondent’s stated meaning of “natural” referred to something being probable, likely, typical, usual, ordinary, normal, common, average, or the like).
- “Effortless” (for instances in which a respondent’s stated meaning of “natural” referred to something being effortless or automatic; not requiring [special] thought, intention, effort, or work; or being instinctual or habitual or “second nature”).
- “Inborn” (for instances in which a respondent’s stated meaning of “natural” referred to something being present from birth, God-given, innate, intrinsic, or “human nature”).
- “Unaltered” (for instances in which a respondent’s stated meaning of “natural” referred to something being not influenced by external factors, not manipulated, unaltered, not enhanced, not artificial, authentic, or not fake).

When the six codes were finalized, the first and second authors each separately re-read each of the 150 free-text responses, indicating for each response whether or not each of the six codes was applicable (that is, one response was able to receive more than one code). For any discrepancies (i.e., instances in which the two initial raters did not agree on whether or not a particular code was applicable to a particular response), the third author rated which codes he found applicable to the response in question. Then, all three authors met together to come to a final decision through consensus as to which code(s) should be applied to the responses for which discrepancies had initially occurred. Responses to which no code applied were coded as “none.”

Data used for analysis are available at https://osf.io/ugfvp/ (DOI 10.17605/OSF.IO/UGFVP).

Results and Discussion

An initial independent-samples *t*-test revealed that in Experiment 3, broadly replicating Experiment 1 and 2, participants in the positive valence condition gave higher naturalness ratings overall (M=5.74, SD=1.22) than did those in the negative-valence condition (M=4.34, SD=1.85), $t(148)=-5.50$, $p<.001$, d=.90.

The final list of codes captured the great majority of participants’ naturalness definitions: of the 150 free-text responses, 23 (15.3%) received zero codes (“none”), 111 (74.0%) received one, and 16 (10.7%) received two; none received more than two. The most commonly applied code was “effortless,” which was applied to 55 (36.7%) of responses, followed by “typical” (n=33, 22.0%), “inborn” (n=28, 18.7%), and “unaltered” (n=22, 14.7%). Notably, none of the responses received the “positive valence” code, and only five (3.3%) received the “genetic” code, suggesting that in general the meaning that participants attached to “natural” did not overlap substantially with evaluative valence or genetic attributions. Of the 16 responses that received two codes, six received “effortless” and “inborn,” two received “effortless” and “unaltered,” one received “genetic” and “inborn,” one received “genetic” and “typical,” one received “genetic” and “unaltered,” two received “inborn” and “unaltered,” one received “typical” and “effortless,” and two received “typical” and “inborn.”

To analyze whether the definition of naturalness endorsed by a participant moderated the relationship between positive valence and naturalness rating, we created a categorical variable to indicate whether a response had received no code (n=23), the "genetic" code only (n=2), the "typical" code only (n=29), the "effortless" code only (n=46), the "inborn" code only (n=17), the "unaltered" code only (n=17), or more than one code (n=16), and conducted a 2 (valence: negative vs. positive) by 7 (coding category) univariate ANOVA with naturalness ratings as the dependent variable. This revealed that coding category was not a significant moderator of the effect of valence, $F(6, 136)=.64$, $p=.696$. This analysis continued to show that across the coding categories, participants in the positive valence condition gave significantly higher naturalness ratings than did those in the negative valence condition, $F(1, 136)=7.59$, $p=.007$.

The results of Experiment 3 suggest that when asked to rate the naturalness of traits or behaviors described in a vignette, the meaning that participants spontaneously attached to the term "natural" did not frequently overlap with evaluative valence or genetic attributions. Instead, the definitions of naturalness tended to correspond to the idea that a trait or behavior did not require special effort or work to manifest, was typical (not abnormal), was inborn, and/or was not altered by external influences. The boundaries among these categories of naturalness definitions, which accounted for more than 80% of the free-text responses in Experiment 3, are clearly somewhat fuzzy (e.g., an inborn trait may be thought of as inherently unaltered by external influences or not requiring effort on the part of the individual to develop). This may help to explain why we did not observe any evidence that the relationship between evaluative valence and naturalness ratings was dependent on the particular definition of naturalness endorsed. These notions of naturalness may serve as a sort of "bridging" concept between positive valence and genetic attributions (e.g., if people are more likely to view positive traits or behaviors as inborn characteristics that are normal among people and not a result of external influence or special effort, and this leads such traits or behaviors to be rated as more genetically influenced than their negatively valenced counterparts). This may help to explain why naturalness ratings mediated the relationship between valence and genetic attributions in Experiment 1 and 2.

General Discussion

The results of the present research both confirm and meaningfully build on previous work. Experiment 1 replicated the finding of prior research (Lebowitz et al., 2019) that people ascribe genetic causation to prosocial behavior significantly more strongly than to antisocial behavior. The prior research documented this asymmetry across a wide range of stimuli, describing different kinds of individuals engaging in a variety of prosocial and antisocial behaviors in an array of scenarios. Unlike previous research, however, Experiment 1 suggested that an asymmetry in perceived naturalness, which was also rated higher for prosocial behavior than for antisocial behavior, might mediate the difference in genetic attributions. Experiment 2 extended these findings, demonstrating for the first time to our knowledge that even outside the realm of social behavior, genetic attributions were stronger for positively valenced phenotypes (i.e., being organized or physically attractive) than for their negatively valenced counterparts (being disorganized or unattractive). This asymmetry also appeared to be significantly mediated by a corresponding difference in perceived naturalness.

Notably, the differences in perceived naturalness between positively valenced phenotypes (prosocial behavior, attractiveness, organization) and negatively valenced phenotypes (antisocial behavior, unattractiveness, disorganization) observed in the present experiments had large effect sizes. This confirms that experimentally varying valence—i.e., "goodness"—causes robust changes in perceptions of naturalness. That is, not only are natural things perceived as more reflective of goodness—i.e., preferred (Rozin et al., 2012; Rozin et al., 2004; Rudski et al., 2011)—good things are also perceived as inherently more natural. Naturalness ratings were also consistently positively associated with genetic attributions, supporting the notion of an association between genetic causation and perceptions of naturalness (Dar-Nimrod & Heine, 2011).

Moreover, the indirect effects of our experimentally manipulated independent variables (i.e., the phenotypes manifested in the vignettes) on endorsement of genetic attribution ratings through naturalness ratings were considerably larger than the indirect effect observed in previous work examining perceptions of responsibility as a mediator of the asymmetry in genetic attributions between prosocial and antisocial behavior (Lebowitz et al., 2019). This suggests that differences in perceived naturalness may play an especially robust role in accounting for these kinds of observed differences in willingness to ascribe a phenotype to genetic causes.

While the present research did not use the same stimuli as the mediation study of Lebowitz et al. (2019), it nonetheless seems clear that asymmetries in genetic attributions do not emerge only because of blame validation—i.e., motivated reasoning that favors explanations for objectionable behavior that allow for blame by centering the free will of the wrongdoer (Alicke, 2000; Clark et al., 2014). This conclusion is further supported by our finding, in Experiment 2, that asymmetrical genetic attributions extend beyond comparisons of prosocial versus antisocial behavior, for which blame validation is a fairly intuitive account, to other comparisons (i.e., attractiveness versus unattractiveness or organization versus disorganization) for which personal responsibility would seem less obviously relevant.

Experiment 3 built upon the results of Experiments 1 and 2 by providing an enhanced understanding of the meaning participants attached to their naturalness ratings. Because the measure of naturalness used in Experiments 1 and 2 merely prompted participants to indicate "how natural" they perceived a given phenotype to be, the results did not make clear what specific meaning of naturalness might have motivated participants to answer as they did. In particular, it was important to investigate whether participants understood "natural" to be merely synonymous with either "positively valenced" or "genetically caused," in which case the explanatory role of perceived naturalness as a potential mediator of the relationship between positive valence and genetic attributions would be of limited value. However, the results of Experiment 3 suggested that naturalness ratings did not merely reflect evaluative valence, or capture the same perceptions as those gauged by genetic attribution ratings. Instead, when participants were asked to rate how natural a behavior or trait was, they considered the extent to which the phenotype in question emerged without special effort or external influence, was present from birth, and/or was a normal or typical human characteristic. These perceptions appear to be more readily ascribed to positively valenced phenotypes than to the corresponding negatively valenced phenotypes, and this asymmetry may help to explain the observed asymmetry in genetic attributions.

One limitation of the present research is that, although it expanded the range of phenotypes for which the positive/negative valence asymmetry in genetic attributions has been observed, it still included only two additional phenotypes (attractiveness and organization) beyond the domain of prosocial and antisocial behavior. Moreover, one could argue that the selection of disorganization as one of the negatively valenced phenotypes may not have maximized conceptual distance from or dissimilarity to antisocial behavior, given that disorganization may negatively impact others and may provoke blame. Nevertheless, disorganization may be meaningfully distinguished from antisocial behavior in that it is not other-directed and is not deliberately intended to cause harm. Attractiveness and organization were selected such that we could examine one physical phenotype and one behavioral phenotype for evidence of a positive/negative valence asymmetry in genetic attributions. Among negatively valenced behavioral phenotypes, it is difficult to generate examples for which desert is entirely irrelevant. Nonetheless, future research could examine whether positive/negative valence asymmetries in genetic attributions apply to an even broader range of phenotypes.

Another potential limitation of the present experiments is that they used convenience samples recruited online. These samples may not be representative of the general population, and it is not inconceivable that demographic characteristics of the respondents, which were not a focus of the present research, could moderate the observed effects. Nonetheless, the present studies were designed to test the effects of our experimental manipulations (i.e., the descriptions of positively versus negatively valenced phenotypes) rather than to be nationally representative opinion surveys. They used random assignment, making it unlikely that the effects of our experimental manipulations were confounded by the influence of demographic variables. Future research could explore whether there are demographic characteristics that might serve as significant moderators of people's willingness to attribute positively and negatively valenced phenotypes to genetic causes.

Knowledge about the role of genes in human traits and behaviors has progressed rapidly in recent years, and in all likelihood this progress will only continue to accelerate. Human genetics research may aim simply to reveal objective scientific truths, but findings like those reported here make clear that in laypeople's minds, genetic attributions are bound up with evaluative judgments in complex ways. If people's understandings of the workings of the genome are informed by their pre-existing attitudes (such as evaluations of the desirability of a trait) rather than by empirical considerations, this may represent a threat to genetic literacy among the general public. Indeed, the present research documents an apparent misunderstanding of how genes operate: people appear to endorse genetic attributions to different extents for the same phenotype (e.g., physical attractiveness) depending on whether it is expressed in a socially favored way (e.g., when a person is highly attractive) or in a socially disfavored way (e.g., when a person is highly unattractive). As researchers continue to refine our understanding of the genome's role in shaping who we are and how we behave, it will be crucial to devote continued attention to how genetic explanations of human phenotypes are interpreted by members of the public.

Acknowledgments

This work was supported by funding from the Genetics & Human Agency Initiative of the John Templeton Foundation and from the National Human Genome Research Institute (grants RM1HG007257 and K99HG010084).

References

Alicke MD (2000). Culpable control and the psychology of blame. Psychol Bull, 126(4), 556–574. doi:10.1037/0033-2909.126.4.556 [PubMed: 10900996]

Clark CJ, Luguri JB, Ditto PH, Knobe J, Shariff AF, & Baumeister RF (2014). Free to punish: A motivated account of free will belief. J Pers Soc Psychol, 106(4), 501–513. doi:10.1037/a0035880 [PubMed: 24660989]

Dar-Nimrod I, & Heine SJ (2011). Genetic essentialism: On the deceptive determinism of DNA. Psychological Bulletin, 137(5), 800–818. doi:10.1037/a0021860 [PubMed: 21142350]

Hayes AF (2018). Introduction to mediation, moderation, and conditional process analysis : A regression-based approach (Second edition. ed.). New York: Guilford Press.

Heine SJ (2017). DNA is not destiny : The remarkable, completely misunderstood relationship between you and your genes (First edition. ed.). New York: W.W . Norton & Company.

Hoyt CL, Burnette JL, Auster-Gussman L, Blodorn A, & Major B (2017). The obesity stigma asymmetry model: The indirect and divergent effects of blame and changeability beliefs on antifat prejudice. Stigma and Health, 2, 53–65.

Jayaratne TE, Ybarra O, Sheldon JP, Brown TN, Feldbaum M, Pfeffer CA, & Petty EM (2006). White americans' genetic lay theories of race differences and sexual orientation: Their relationship with prejudice toward blacks, and gay men and lesbians. Group Processes & Intergroup Relations, 9(1), 77–94.

Joslyn MR, & Haider-Markel DP (2016). Genetic attributions, immutability, and stereotypical judgments: An analysis of homosexuality. Social science quarterly, 97(2), 376–390.

Klitzman R (2009). "Am i my genes?": Questions of identity among individuals confronting genetic disease. Genet Med, 11(12), 880–889. doi:10.1097/GIM.0b013e3181bfd212 [PubMed: 20010365]

Kvaale EP, Haslam N, & Gottdiener WH (2013). The 'side effects' of medicalization: A meta-analytic review of how biogenetic explanations affect stigma. Clinical psychology review, 33(6), 782–794. doi:10.1016/j.cpr.2013.06.002 [PubMed: 23831861]

Lebowitz MS, Tabb K, & Appelbaum PS (2019). Asymmetrical genetic attributions for prosocial versus antisocial behaviour. Nature Human Behaviour, 3(9), 940–949. doi:10.1038/s41562-019-0651-1

Lynch KE, Morandini JS, Dar-Nimrod I, & Griffiths PE (2019). Causal reasoning about human behavior genetics: Synthesis and future directions. Behavior Genetics, 49(2), 221–234. doi:10.1007/s10519-018-9909-z [PubMed: 29922986]

National Academies of Sciences Engineering & Medicine. (2020). Exploring the current landscape of consumer genomics: Proceedings of a workshop. Washington, DC: The National Academies Press.

Nelson A (2008). Bio science: Genetic genealogy testing and the pursuit of african ancestry. Soc Stud Sci, 38(5), 759–783. doi:10.1177/0306312708091929 [PubMed: 19227820]

Palan S, & Schitter C (2018). Prolific. Ac—a subject pool for online experiments. Journal of Behavioral and Experimental Finance, 17, 22–27.

Román S, Sánchez-Siles LM, & Siegrist M (2017). The importance of food naturalness for consumers: Results of a systematic review. Trends in Food Science & Technology, 67, 44–57. doi:10.1016/j.tifs.2017.06.010

Rozin P, Fischler C, & Shields-Argelès C (2012). European and american perspectives on the meaning of natural. Appetite, 59(2), 448–455. doi:10.1016/j.appet.2012.06.001 [PubMed: 22698976]

Rozin P, Spranca M, Krieger Z, Neuhaus R, Surillo D, Swerdlin A, & Wood K (2004). Preference for natural: Instrumental and ideational/moral motivations, and the contrast between foods and medicines. Appetite, 43(2), 147–154. doi:10.1016/j.appet.2004.03.005 [PubMed: 15458801]

Rudski JM, Osei W, Jacobson AR, & Lynch CR (2011). Would you rather be injured by lightning or a downed power line? Preference for natural hazards. Judgment and Decision Making, 6(4), 314.

Tabb K, Lebowitz MS, & Appelbaum PS (2019). Behavioral genetics and attributions of moral responsibility. Behavior Genetics, 49, 128–135. [PubMed: 30094665]

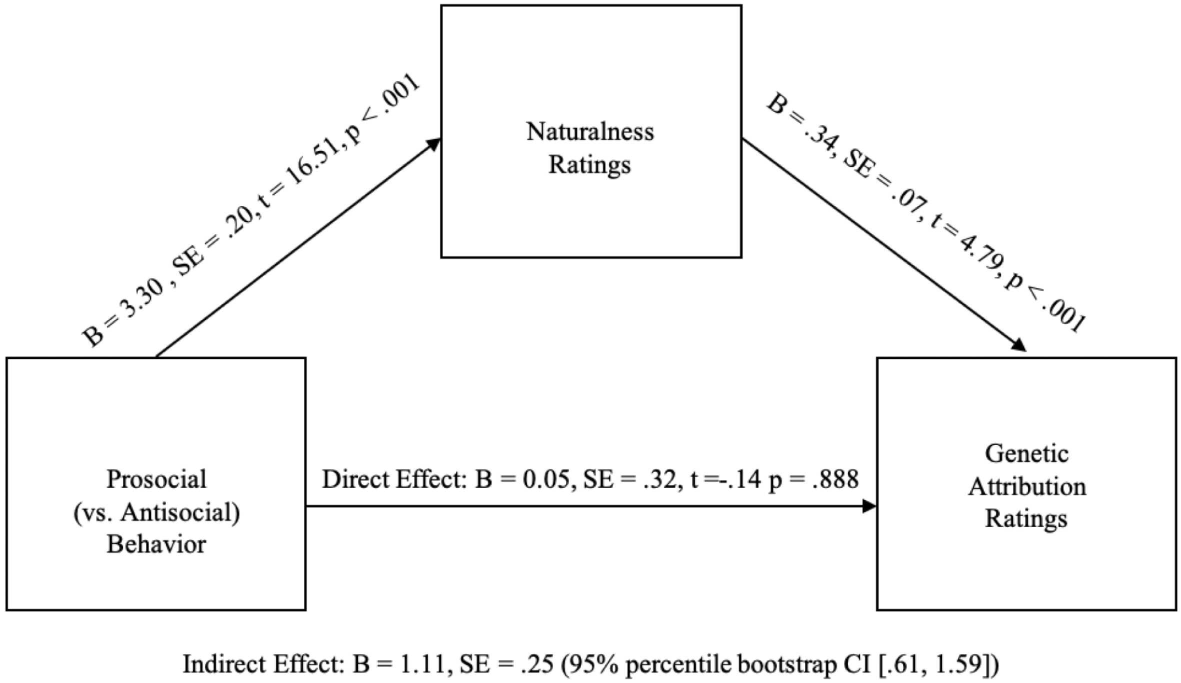

Figure 1.

Analysis of naturalness ratings as a mediator of the effect of prosocial (versus antisocial) behavior on genetic attribution ratings in Experiment 1.

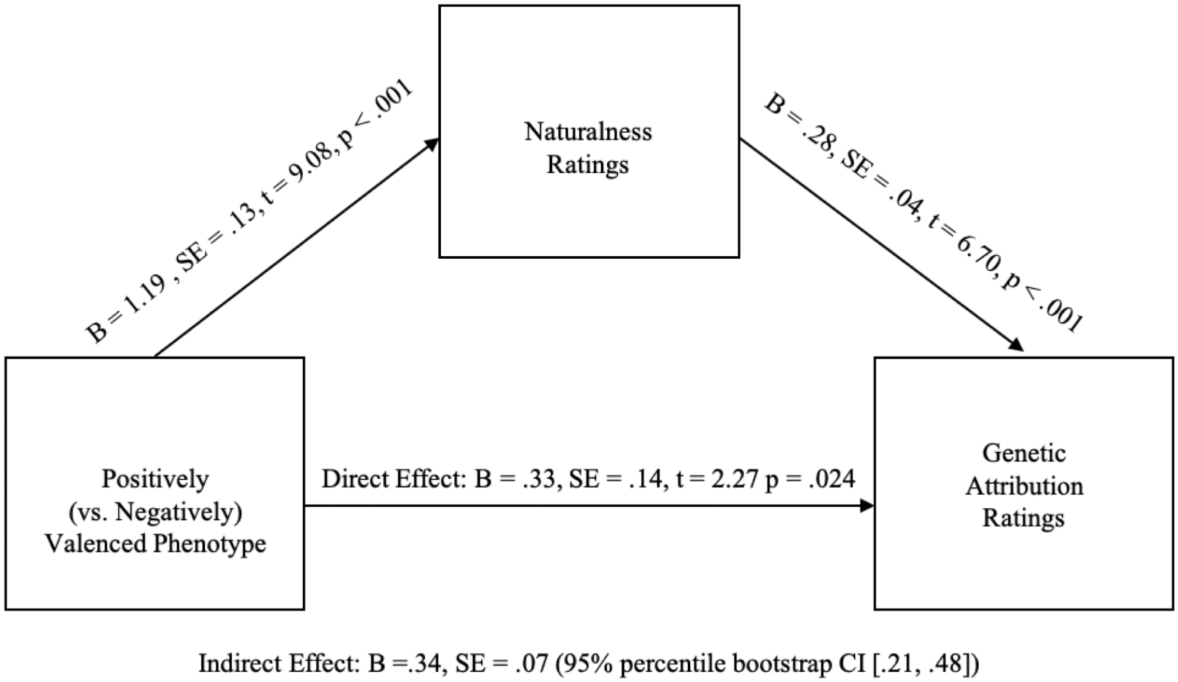

Figure 2.
Analysis of naturalness ratings as a mediator of the effect of positively (versus negatively) valenced phenotype on genetic attribution ratings in Experiment 2.