Biological Essentialism Correlates with (But Doesn't Cause?) Intergroup Bias

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Abstract

People with biological essentialist beliefs about social groups also tend to endorse biased beliefs about individuals in those groups, including intensified emphasis on the group, stereotypes, and prejudices. These correlations could be due to biological essentialism causing bias, and some experimental studies support this causal direction. Given this prior work, we expected to find that biological essentialism would lead to increased bias compared to a control condition and set out to extend this prior work in a new direction (regarding “value-based” essentialism). But although the manipulation affected essentialist beliefs and essentialist beliefs were correlated with group emphasis (Study 1), stereotyping (Studies 2, 3a, 3b, and 3c), prejudice (Studies 3a), there was no evidence that biological essentialism caused these outcomes ($N_{\text{Total}} = 1,903$). Given these findings, our initial research question became moot. We thus focus on reexamining the relationship between essentialism and bias.

Keywords: essentialism, intergroup processes, prejudice/stereotyping

Describing someone as a Hispanic woman who lives in the Midwest draws on three distinct social groups based on ethnicity, gender, and region. But while all of these are social groups, they differ in a key respect. Certain social groups are thought of as having an underlying biological *essence*, while others are regarded as looser collections of individuals (Allport, 1954; Atran, 1998; Dar-Nimrod & Heine, 2011; Gil-White, 2001; Rothbart & Taylor, 1992). For instance, Hispanic individuals tend to be thought of as having more of a biological essence (naturalness) and being more cohesive (entitativity) than Midwesterners (Haslam et al., 2000). Biological essentialism about a group involves believing that members of that group have an underlying, deep, biological similarity (e.g., a gene in their DNA), which outweighs variability in the superficial appearance within groups and which explains differences between groups (Medin & Ortony, 1989; Gelman, 2003).

Biological essentialism appears to be intuitive and early-emerging (Gelman, 2003; Rhodes & Moty, 2020). Both children and adults use biological essentialism to explain differences that they observe around them, including differences among social groups. For instance, young children tend to think that girls will inevitably prefer to play dress-up from birth over playing with baseball cards (Taylor et al., 2009). People appeal to such biological essentialist explanations even when they have only rudimentary understanding of biology, as is the case among young children. People's idea of a biological essence about a social group is often a vague "placeholder" that they elaborate later in life (e.g., as a gene) once they have a better grasp of biology (Medin & Ortony, 1989; Gelman, 2003). Sometimes biological essentialism thus involves knowledge deference, or believing that experts (e.g., biologists) know the true essence of a group even if everyday people do not. In addition to biological explanations, emerging literatures also suggest that people may sometimes elaborate a placeholder essence in

other ways—as an abstract value (value-based essentialism; Bailey et al., 2021), as internal but socially determined (Rangel & Keller, 2011), or as a true purpose (teleological essentialism; Rose & Nichols, 2019).

Existing research finds a correlation between relative biological essentialist beliefs about social groups and intergroup bias. The more people believe that a social group has a biological essence, the more they tend to endorse biased beliefs about members of that group, including intensified importance placed on a group, stereotypes, and prejudice (Haslam et al., 2000; Keller, 2005; Mandalaywala et al., 2018; Martin & Parker, 1995; Pauker et al., 2010; Peretz-Lange et al., 2021; Prentice & Miller, 2006; Suhay et al., 2017; Williams & Eberhardt, 2008; Yzerbyt et al., 2001; for reviews see Prentice & Miller, 2007; Haslam et al., 2006). This relationship between essentialism and bias has been investigated across a wide range of social groups, including religious groups (e.g., Jews), race/ethnicity groups (e.g., Black people), gender groups (e.g., men), and political groups (e.g., left-leaning people), as well novel (made-up) groups. For instance, for group importance, biological essentialist beliefs about race are associated with placing emphasis on the group by spontaneously grouping people according to their race over other shared characteristics (Chao et al., 2013). For stereotyping, endorsement of different aspects of essentialism is associated with overgeneralized, generic beliefs across a range of real social groups, including Jews and women (Bastian & Haslam, 2006). Finally, essentialist beliefs about race have been connected to prejudice and specifically, more negative explicit and implicit evaluations of Black compared to White individuals (Chen & Ratliff, 2018; Keller, 2005; see also Williams & Eberhardt, 2008). The relationship between essentialism and prejudice is more varied, and for certain real social groups, certain dimensions of essentialism are associated with *less* prejudice, such as the belief that being gay is fixed at birth (Haslam & Levy, 2006; Hodson

& Skorska, 2015). Overall, this prior work points to a correlation between essentialism and a range of intergroup beliefs and biases.

These correlations raise a question about the direction of causation. Does essentialism cause intergroup bias? Does intergroup bias cause essentialism? Is causation bidirectional? Or is there some other factor that explains these correlations?

Although much of the work in this area has been correlational, there have also been a more limited number of studies that directly manipulated essentialism and looked at its downstream intergroup effects (Andreychik & Gill, 2015; Brescoll & LaFrance, 2004; Chao et al., 2013; Diesendruck & Menahem, 2015; Mandalaywala et al., 2018; Williams & Eberhardt, 2008). These studies manipulated biological essentialism and found downstream effects on intergroup beliefs and bias, including group importance, stereotyping, and prejudice. For instance, reading about gender as biological versus socially constructed increased gender stereotyping (Brescoll & LaFrance, 2004). Such results seem to suggest that the correlational relationships are explained by essentialism causing intergroup bias.

There are also theoretical reasons to assume that essentialism might cause bias. First, biological essentialist explanations are one example of a type of explanation that emphasizes intrinsic rather than extrinsic aspects of a system. For instance, anything (e.g., why people give roses on Valentine's day) can be explained in terms of intrinsic properties (e.g., roses are beautiful) or extrinsic properties (e.g., multimillion dollar advertising campaigns; Cimpian & Salomon, 2014; Sutherland & Cimpian, 2019). Several investigations find that compared to more extrinsic and structural explanations, intrinsic explanations for negative outcomes can increase negative attitudes and towards individuals and groups who experience those outcomes (Hussak & Cimpian, 2015; Yang et al., 2022). For instance, children and adults told that an incarcerated

individual was incarcerated because of an intrinsic reason (“bad person”) reported more negative attitudes toward that person relative to when they were given an extrinsic, structural reason (“did not have very much money growing up;” Dunlea & Heiphetz, 2021). Although the benefits of such extrinsic explanations may depend on the specific group (e.g., incarcerated individuals vs. overweight individuals, Carvalho et al., 2021), this work suggests that biological essentialist explanations may foster negative attitudes towards social groups because such explanations deemphasize extrinsic, structural factors.

Second and related, by emphasizing intrinsic rather than extrinsic, structural factors, biological essentialism may serve as a system-justifying ideology (Hussak & Cimpian, 2015). System-justifying ideologies cause people to legitimize the status quo and view the existing social order as stable and (morally) right (Jost et al., 2004). When the existing system is inequitable, biological essentialism thus may reinforce existing social hierarchies and foster intergroup bias. For example, explaining class inequality between groups in terms of the biological superiority of high-class groups over low-class groups might maintain status quo class disparities while fostering negative attitudes towards low-class individuals. Consistent with this possibility, higher-class individuals tend to endorse biological essentialist views of class differences and report greater commitments to the status quo (i.e., belief in a just world; Furnham, 2003) compared to lower-class individuals (Kraus & Keltner, 2013).

A third theoretical reason for why biological essentialism might be expected to foster intergroup conflict comes from classic theory on social groups. Social groups are an important source of identity and positive self-construal (social identity theory; Tajfel & Turner, 1979). People tend to like groups they belong to more than groups they do not, even when those groups reflect trivial distinctions (e.g., arbitrarily assigned shirt colors; Brewer, 1979; Brown, 2020;

Dunham et al., 2011). The common ingroup identity model proposes that intergroup conflict can thus be reduced by encouraging people to recognize their shared group memberships (Gaertner et al., 1993; Gaertner & Dovidio, 2000). This often involves recategorizing a subgroup as belonging to a shared, overarching group—recognizing that high-class and low-class groups are all part of the American economy, for instance. Because biological essentialism emphasizes fundamental group differences, biological essentialism may make it difficult for people to recognize overarching and shared group identities. By making it difficult to recategorize subgroups as part of an overarching group, biological essentialism might thus foster intergroup bias and conflict.

In light of this theorizing and (more limited) prior experimental research, we assumed that the causal direction was indeed that biological essentialism causes intergroup bias, and we conducted studies intended to extend those findings in a new direction. To our surprise, none of those studies came out as expected. We found consistent correlations between essentialism and measures related to intergroup bias, but we did not find evidence for the expected causal direction. Instead, manipulations of biological essentialism had no downstream effect on bias. These unexpected findings necessarily changed the focus of the present work to now reexamine the relationship between biological essentialism and intergroup bias.

The Present Studies

To understand the studies reported here, it is necessary to have some understanding of our original goals. We assumed that intergroup bias would depend on whether participants were told that a social group had a biological essence (biological essence condition) or no essence (control condition). Our question was what would happen when participants were told that the group had an essence defined by shared values. As discussed, emerging literatures find that

essences about social groups can sometimes be elaborated as a shared value (e.g., Jewish values) instead of as something biological (e.g., a Jewish gene; Bailey et al., 2021; Newman & Knobe, 2019). On this view, a value-based essence about a social group is something deep and relatively stable that makes someone a “true” member of the group. We set out to test whether bias in our novel value-based essence condition would be more like our biological essence condition or the control condition. However, we did not find differences between the biological essence condition and the control condition. This result renders our original research question moot. (If there is no difference between the biological essence condition and the control condition, it is not feasible to ask which of those two conditions our value-based condition would most resemble.) Thus, although we report the results of all pre-registered analyses and conditions, we focus especially on the comparison between the biological essence condition and the control condition.

The present studies investigated the importance placed on social group (Study 1), stereotyping (Studies 2, 3a, 3b, and 3c), and prejudice (Studies 3a, 3b, and 3c)—including in an internal meta-analysis. As in prior research, we investigated beliefs about both real social groups, specifically Jews (Study 1; e.g., as in Diesendruck & Menahem, 2015; Haslam et al., 2000), and novel social groups (Studies 2 and 3; e.g., as in Peretz-Lange et al., 2021). Although using novel (i.e., made-up) groups is less ecologically valid, novel groups have a long tradition in social psychology (Brewer, 1979; Levy et al., 1998), including in research on essentialism (Andreychik & Gill, 2015; Rhodes et al., 2012; Rhodes et al., 2018). Novel groups offer greater control, allowing us to isolate the processes of interest from confounds, in this case, allowing us to isolate a group’s essentialism from, for instance, its status and history. Beliefs about novel groups might also be more susceptible to change and thus more responsive to manipulations compared to beliefs about real social groups. Thus while investigating real social group would be a good test

of existing correlations between essentialism and bias—coming into the study, participants will already vary in both of these factors—novel social groups provide a particularly good test of possible experimental effects because beliefs about novel social groups are not already well-established by definition.

Across studies we found evidence for a correlational relationship between essentialism and intergroup bias, but there was no evidence for an experimental effect in 1,903 participants. Given the unexpected results, the focus of the present research necessarily shifted to reexamining the relationship between biological essentialism and intergroup bias. All manipulations, measures, and exclusion criteria are reported. Preregistrations, materials, anonymized datafiles, and analysis code are available online (https://osf.io/fh2s7/?view_only=4dceb8a713944bde9c17eb834f9729ac).

Study 1

Biological essentialism about social groups has been connected to the importance placed on a group relative to other social groups and identities (Chao et al., 2013; Diesendruck & Menaham, 2015; Martin & Parker, 1995; Prentice & Miller, 2006). Examining the emphasis placed on a group is important because shared identities can foster common ingroup identification and decrease intergroup conflict (Gaertner & Dovidio, 2000; Dovidio et al., 2010, but also discourage collective action; Ufkes et al., 2016). The present study investigated the experimental and correlational relationship between essentialism about Jews and the importance placed on Jewish identity. We focused on Jews because previous research found that people can think of Jews as having more of a biological essence, more like a race or ethnicity, or as having a value-based essence, more like a religion or philosophy (Bailey et al., 2021). Thus, given the

initial focus of our research, Jews were a particularly fitting real social group that have also been studied in previous work on essentialism (Haslam et al., 2000).

Methods

Initially, 387 respondents completed the online survey using Amazon's Mechanical Turk platform; 86 were excluded due to the preregistered criteria. This resulted in 301 participants (300 was preregistered): all were over 18 and U.S. residents, $M_{age} = 37.37$, 52% women, 47% men, and $\leq 1\%$ gender non-binary or unspecified, 70% White, 10% Asian, 8% Black, 7% Hispanic/Latino, 2% multi-racial, and $\leq 1\%$ either Native American, Middle Eastern, or unspecified. This sample size was sensitive to detect a small effect ($\eta^2 = 0.03$) of condition on group importance ($1-\beta = 80\%$, $\alpha = 0.05$, groups = 3). Median completion time was 6.47 minutes and participants were compensated \$0.40.

Similar to prior work on real social groups (e.g., Williams & Eberhardt, 2008), participants read articles about Jews designed to increase essentialist beliefs relative to the control condition. We adapted real articles, shortened for brevity, but we did not use deception, and none of the information was fabricated (adapted from Bailey et al., 2021). In the biological essence condition, participants read information that highlighted biological aspects of Jewish identity, e.g., "Jewish genetic screening." In the control condition, the biological diversity among Jews was highlighted, e.g., "The Jewish world is more ethnically and racially diverse than many people realize." In the value-based essence condition, participants read information about shared Jewish values.

Next, participants indicated their essentialist beliefs about Jews. There were three general essentialist items that were found to cohere in prior work—capturing: deep similarity among category members, appearance/reality distinction, and knowledge deference (Bailey et al., 2021).

These items were designed to map onto aspects of psychological essentialism from Medin and Ortony (1989). For instance, for the deep similarity item, participants indicated their agreement with the statement, “There is an essential quality or characteristic that makes Jews similar in some deep way,” from 1 (*strongly disagree*) to 9 (*strongly agree*). There were also two items—biological essence and scientific cause—that captured the belief that the essence was something specifically biological (and two about it being specifically value-based). For instance for the biological essence item, participants responded to the statement, “The essence of being Jewish is something biological” from 1 (*strongly disagree*) to 9 (*strongly agree*). For complete items see SI.1.1.1.

For the measure of group importance, participants were asked to evaluate statements that compared Jewish identity to five other identities: a nationality group, a generation cohort, a political affiliation, a zodiac sign, and an occupational group. For instance, for the nationality group, participants were asked to “consider Jews who live in Canada and have Canadian citizenship,” and then asked to rate whether it makes more sense to describe these people as “Jewish people who just happen to be Canadian” or as “Canadian people who just happen to be Jewish” on a bipolar 6-point scale from *definitely this one* to *definitely [the other] one*. Four other statements had the same setup but asked about Millennials, Republicans, Leos, and high school teachers instead of Canadians. Responses were coded such that higher scores indicated intensified importance placed on Jewish (vs. the other) identity. This measure of group importance was created for this study and has some conceptual similarity to that used in prior work, which assessed the importance placed on others’ race by testing whether participants spontaneously grouped people according to their race over other possible shared identities (Chao et al., 2013).

Results

Following the preregistered plan, the deep similarity, appearance/reality distinction, and knowledge deference items were averaged to create a general essentialism index (Cronbach's $\alpha = .77$). To capture belief in the essence being something specifically biological, the scientific cause and biological essence items were averaged, $r(294) = .72, p < .001, 95\% \text{ CI } [.66, .77]$. The two value-based essence items were also averaged to create a value-based essentialism index, $r(295) = .47, p < .001, 95\% \text{ CI } [.38, .55]$ (for correlations among indices see SI.1.2). Finally, we also created a combined index for group importance (Cronbach's $\alpha = .85$).

Manipulation Check

Before testing the causal effect of essentialism, we assessed the effectiveness of the manipulation. We ran three separate preregistered one-way ANOVAs with condition predicting each essentialism index. For significant main effects, we followed with preregistered plan and conducted independent samples t-tests using a Bonferroni correction ($\alpha = .017$). For statistics see Table 1. The manipulation worked as designed to (a) directionally increase general essentialist beliefs in the two essentialism conditions compared to the control condition and (b) create beliefs in biological essentialism and value-based essentialism in the biological essence condition and value-based essence condition, respectively. The effect of the manipulation on general essentialism in the biological essence condition compared to the control condition was non-significant, but overall, the manipulation was generally effective.

Table 1*Effect of the Manipulation on Essentialist Beliefs in One-way ANOVAs with Follow-up t-tests in Study 1*

	<i>M (SD)</i>			<i>Statistic (df)</i>	<i>Effect size</i>	<i>p</i>
	<i>C^a</i>	<i>B^b</i>	<i>V^c</i>			
General	5.33	5.76	6.19	$F(2, 297) = 5.88$	$\eta^2 = 0.04 [0.01, 0.08]$	.003*
essentialism	(1.88)	(1.81)	(1.54)			
B vs. C				$t(203) = 1.65$	$d = 0.23 [-0.04, 0.51]$	.100
V vs. C				$t(196) = 3.48$	$d = 0.50 [0.21, 0.78]$	< .001*
B vs. V				$t(195) = 1.79$	$d = 0.26 [-0.02, 0.54]$	.075
Biological	3.35	5.50	3.79	$F(2, 297) = 29.16$	$\eta^2 = 0.16 [0.10, 0.22]$	< .001*
essentialism	(2.23)	(2.13)	(2.00)			
B vs. C				$t(203) = 7.06$	$d = 0.99 [0.69, 1.28]$	< .001*
V vs. C				$t(196) = 1.44$	$d = 0.21 [-0.07, 0.48]$	.151
B vs. V				$t(195) = 5.82$	$d = 0.83 [0.54, 1.12]$	< .001*
Value-based	4.18	4.62	5.73	$F(2, 297) = 18.60$	$\eta^2 = 0.11 [0.06, 0.17]$	< .001*
essentialism	(2.00)	(1.82)	(1.66)			
B vs. C				$t(203) = 1.64$	$d = 0.23 [-0.05, 0.51]$	.102
V vs. C				$t(196) = 5.91$	$d = 0.84 [0.56, 1.13]$	< .001*
B vs. V				$t(195) = -4.48$	$d = -0.64 [-0.92, -0.35]$	< .001*

Note. Effect sizes are reported in brackets with 90% (η^2) and 95% (d) confidence intervals (Lakens, 2014).

^aC = control condition; ^bB = biological essence condition; ^cV = value-based essence condition

*Statistically significant (at $p < .05$ for the one-way ANOVAs and $p < .017$ for the Bonferroni corrected follow-up t-tests)

Essentialism and Group Importance

Beliefs about group importance were correlated with general essentialism, $r(298) = .27, p < .001$, 95% CI [.16, .37], and biological essentialism, $r(298) = .20, p < .001$, 95% CI [.09, .30] (as well as value-based essentialism, $r(298) = .18, p = .002$, 95% CI [.07, .29]). This is consistent with prior work showing a correlational relationship between essentialism and bias.

To test for experimental effects, we conducted the preregistered one-way ANOVA with follow-up Bonferonni corrected t-tests. There was no evidence for experimental effects, including the crucial comparison between the biological essence condition and the control condition, $t(203) = 0.78, d = 0.11, p = .433$ (Figure 1). For complete statistics see Table 2.

Table 2*Effect of the Manipulation on Group Importance in One-way ANOVAs with Follow-up t-tests in Study 1*

	<i>M (SD)</i>			<i>Statistic (df)</i>	<i>Effect size</i>	<i>p</i>
	<i>C^a</i>	<i>B^b</i>	<i>V^c</i>			
Group importance	3.23	3.38	3.28	$F(2, 297) = 0.33$	$\eta^2 < 0.01$ [0.00, 0.01]	.721
	1.39	1.46	1.34			
B vs. C				$t(203) = 0.78$	$d = 0.11$ [-0.17, 0.39]	.433
V vs. C				$t(196) = 0.28$	$d = 0.04$ [-0.24, 0.32]	.779
B vs. V				$t(195) = 0.51$	$d = 0.07$ [-0.21, 0.35]	.613

Note. Effect sizes are reported in brackets with 90% (η^2) and 95% (d) confidence intervals (Lakens, 2014).

^aC = control condition; ^bB = biological essence condition; ^cV = value-based essence condition

*Statistically significant (at $p < .05$ for the one-way ANOVAs and $p < .017$ for the Bonferroni corrected follow-up t-tests)

Figure 1

Effect of the Manipulation on Group Importance in Study 1

Note. Means are depicted with 95% CI and raw data overlaid.

Discussion

Similar to previous studies (Chao et al., 2013), we found a correlation between essentialism and group importance. But we did not find any evidence that this correlation was due to an underlying causal effect of essentialism on group importance. That is, although we were able to successfully manipulate essentialism, the manipulation did not affect group importance.

Study 2

Study 1 found a correlation between biological essentialism about a group and intensified importance placed on that group identity about a real social group (Jews). However, we did not find evidence for an underlying experimental effect. We note two limitations that may have prevented us from observing an experimental effect. First, although group importance has been studied in previous work on essentialism (Chao et al., 2013), our measure was not adapted directly from previous work and group importance may be a less paradigmatic example of intergroup bias. Second, although beliefs about Jews have been investigated in previous work on essentialism (Bailey et al., 2019; Haslam et al., 2000) and essentialist beliefs about Jews were successfully manipulated in Study 1, because they are a real social group, participants likely came into our study with well-established beliefs about whether or not Jews share a biological essence and the importance of Jewish identity relative to other identities. Although these established beliefs appeared to have resulted in the expected correlation, they might have limited the effect sizes of our manipulation. All the more so because people can be hesitant to report negative beliefs about a real social group due to social desirability concerns (Dovidio & Gartner, 2004; Plant & Devine, 1998). In Study 2 we addressed these limitations. We measured stereotyping, a more paradigmatic example of intergroup bias, and manipulated essentialism

about a novel social group about whom we expected the manipulation to be even more effective. We also measured stereotyping using blank (made-up) properties to further assuage social-desirability concerns and participants' potential unwillingness to endorse negative statements about a social group.

Methods

Initially, 331 respondents completed the survey through Amazon's Mechanical Turk platform, and 30 were excluded for failing preregistered attention checks. This resulted in 301 participants (300 was preregistered) with the following characteristics: all were over 18 and U.S. residents, $M_{age} = 34.71$, 44% women, 55% men, and < 1% gender non-binary or unspecified, 73% White, 10% Asian, 7% Black, 5% Hispanic/Latino, 3% multi-racial, and < 2% either Native American, Middle Eastern, or unspecified. This sample size is sensitive to a small effect ($\eta^2 = 0.03$) of condition on stereotyping ($1-\beta = 80\%$, $\alpha = 0.05$, groups = 3; Faul et al., 2007). Median completion time was 3.65 minutes and participants were compensated \$0.40.

Participants read information about a novel group called the Daxes (adapted from Bailey et al., 2021). In the biological essence condition, participants read information designed to create biological essentialist beliefs about the Daxes, including: “all Daxes share the same unique biological marker” and “there is something fundamentally similar about them, which is found even in their DNA.” In the control condition participants instead read information such as “scientists have...**not** found evidence that Daxes share a unique biological marker.” Note that in the value-based essence condition, the description was designed to instead create belief in value-based essentialism. Participants indicated their essentialist beliefs as in Study 1.

We then measured stereotyping. Stereotypes are beliefs about a group (Allport, 1954; Brewer, 1988; Fiske et al., 2002), and specifically tend to be generic rather than quantified

beliefs (e.g., “men are strong” vs. “some men are strong;” Hammond & Cimpian, 2017). Here, we measured stereotyping as participants’ endorsement of a generic statement about the Daxes and a made-up (i.e., blank) property. That is, using “mishinit” as an example property, we told participants that “mishinit describes a certain characteristic of people” (e.g., Diesendruck & haLevi, 2006) and that some Daxes are “mishinit”—specifically, that 60% of Daxes are “mishinit” to convey that it is common but not universal property among Daxes (Cimpian et al., 2010). We then asked, “Does it make sense to say: ‘Daxes are mishinit’” on a 7-point scale from *does NOT make sense* to *makes sense*. Higher values thus indicated greater willingness to endorse generic statements about the Daxes and thus greater stereotyping. Finally, participants indicated whether they thought “being mishinit” was a good thing or a bad thing from -3 (*bad*) to 3 (*good*). This item was included for exploratory purposes, as reflected in our preregistration, and responses to this item did not change the interpretation of the experimental results reported below (for details, see SI.2.2).

Results

As in Study 1 and as preregistered, we created combined indices of general essentialism (Cronbach’s $\alpha = .85$), biological essentialism, $r(294) = .77, p < .001, 95\% \text{ CI } [.72, .81]$, and value-based essentialism, $r(291) = .62, p < .001, 95\% \text{ CI } [.54, .68]$ (for correlations among indices see SI.1.2).

Using the same analytic approach in Study 1, we again found that the manipulation was effective (Figure 2; for statistics see Table 3). It (a) increased general essentialist beliefs in the two essentialism conditions and (b) created beliefs a biological essence and value-based essence in the biological essence condition and value-based essence condition, respectively. Furthermore, as suspected, effect sizes of the manipulation were directionally larger for this novel group than

for the real group in Study 1 (general essentialism: $\eta^2 = 0.43$ vs. $\eta^2 = 0.04$, biological essentialism: $\eta^2 = 0.39$ vs. $\eta^2 = 0.16$, and value-based essentialism: $\eta^2 = 0.23$; $\eta^2 = 0.11$).

Table 3*Effect of the Manipulation on Essentialist Beliefs in One-Way ANOVAs with Follow-up t-tests in Study 2*

	<i>M (SD)</i>			<i>Statistic (df)</i>	<i>Effect size</i>	<i>p</i>
	<i>C^a</i>	<i>B^b</i>	<i>V^c</i>			
General	3.97	7.00	6.89	$F(2, 293) = 111.12$	$\eta^2 = 0.43 [0.36, 0.49]$	$< .001^*$
essentialism	(2.16)	(1.34)	(1.18)			
B vs. C				$t(196) = 11.82$	$d = 1.68 [1.36, 2.01]$	$< .001^*$
V vs. C				$t(196) = 11.76$	$d = 1.68 [1.35, 1.99]$	$< .001^*$
B vs. V				$t(194) = 0.60$	$d = 0.09 [-0.19, 0.36]$	.547
Biological	3.37	7.09	5.11	$F(2, 293) = 91.91$	$\eta^2 = 0.39 [0.31, 0.44]$	$< .001^*$
essentialism	(2.18)	(1.57)	(1.96)			
B vs. C				$t(193) = 13.70$	$d = 1.96 [1.62, 2.30]$	$< .001^*$
V vs. C				$t(196) = 5.94$	$d = 0.84 [0.56, 1.13]$	$< .001^*$
B vs. V				$t(197) = 7.84$	$d = 1.11 [0.81, 1.41]$	$< .001^*$
Value-based	3.78	4.92	6.40	$F(2, 290) = 43.81$	$\eta^2 = 0.23 [0.16, 0.29]$	$< .001^*$
essentialism	(2.35)	(1.99)	(1.47)			
B vs. C				$t(193) = 3.63$	$d = 0.52 [0.24, 0.80]$	$< .001^*$
V vs. C				$t(195) = 9.37$	$d = 1.34 [1.03, 1.64]$	$< .001^*$
B vs. V				$t(192) = -5.93$	$d = -0.85 [-1.14, 0.56]$	$< .001^*$

Note. Effect sizes are reported in brackets with 90% (η^2) and 95% (d) confidence intervals (Lakens, 2014).

^aC = control condition; ^bB = biological essence condition; ^cV = value-based essence condition

*Statistically significant (at $p < .05$ for the one-way ANOVAs and $p < .017$ for the Bonferroni corrected follow-up t-tests)

Figure 2

Effect of the Manipulation on Essentialist Beliefs in Study 2

Note. Means are depicted with 95% CI and raw data underlaid.

Essentialism and Stereotyping

Like Study 1, stereotyping about the Daxes was correlated with general essentialism, $r(294) = .15$, $p = .009$, 95% CI [.04, .26] and biological essentialism, $r(294) = .12$, $p = .032$, 95% CI [.01, .24] (as well as value-based essentialism, $r(291) = .23$, $p < .001$, 95% CI [.12, .33]). To test for experimental effects, we used a similar preregistered analytic approach to Study 1. We conducted a one-way ANOVA with follow-up Bonferonni corrected t-tests. There was no evidence for experimental effects, including the crucial comparison between the biological essence condition and the control condition, $t(197) = -0.11$, $d = -0.02$, $p = .915$ (Figure 3), where the difference was notably small ($d = -0.02$). For complete statistics see Table 4.

Table 4*Effect of the Manipulation on Stereotyping in a One-Way ANOVA with Follow-up t-tests in Study 2*

	<i>M (SD)</i>			<i>Statistic (df)</i>	<i>Effect size</i>	<i>p</i>
	<i>C^a</i>	<i>B^b</i>	<i>V^c</i>			
Stereotyping	3.80 (1.83)	3.78 (1.67)	4.01 (1.73)	$F(2, 298) = 0.55$	$\eta^2 < 0.01$ [0.00, 0.02]	.580
B vs. C				$t(197) = -0.11$	$d = -0.02$ [-0.29, 0.26]	.915
V vs. C				$t(201) = 0.83$	$d = 0.12$ [-0.16, 0.39]	.407
B vs. V				$t(198) = -0.97$	$d = -0.14$ [-0.42, 0.14]	.331

Note. Effect sizes are reported in brackets with 90% (η^2) and 95% (d) confidence intervals (Lakens, 2014).

^aC = control condition; ^bB = biological essence condition; ^cV = value-based essence condition

Figure 3

Effect of the Manipulation on Stereotyping in Study 2 (left), Study 3a (center left), Study 3b (center right), and Study 3c (right)

Note. Means are depicted with 95% CI and raw data underlaid.

Discussion

Like many previous studies, we find a correlation between essentialism and stereotyping (Bastian & Haslam, 2006). Although our manipulation again worked as designed, there was no evidence that biological essentialism causally affected stereotyping.

Study 3a

Study 2 used made-up properties to assess stereotyping to assuage social desirability concerns, but this may also have decreased engagement. Thus, the present study exposed participants to negative morally-relevant information and assessed negative stereotypes about morality. Morality is a key dimension of stereotyping with strong influences on liking (Landy et al., 2016). This evaluative aspect of morality was fitting because the second goal of the present study was to also examine prejudice, or negative attitudes. The present study again used novel groups because the direction of the effect sizes from Studies 1 and 2 suggested that the essentialism manipulation had a stronger effect on beliefs about a novel group as opposed to a real social group and thus might be particularly likely to result in an experimental effect.

Methods

Initially, 351 respondents completed the online survey using Amazon's Mechanical Turk platform, but 51 were excluded due to the preregistered criteria. This resulted in 301 participants (300 was preregistered): all were over 18 and U.S. residents, $M_{age} = 35.08$, 49% women, 50% men, and < 1% either gender non-binary or unspecified, 75% White, 8% Black, 8% Asian, 5% Hispanic/Latino, 5% multi-racial, and $\leq 2\%$ either Native American, Middle Eastern, or unspecified. This sample size was used because it was sensitive detect a small effect ($\eta^2 = 0.03$) of condition on stereotyping or prejudice ($1-\beta = 80\%$, $\alpha = 0.05$, groups = 3). Median completion time was 4.75 minutes, and participants were compensated \$0.50.

The manipulation and measures of essentialism were identical to Study 2. In addition, participants also read six statements about negative, morally-relevant behavior (similar to Chen & Ratliff, 2018) such as “Beth is a Dax, and she yells at baristas when they make a mistake.” There were seven additional exemplars—Marcia, Sara, Laurel, Greg, Mark, Scott, and Brian (taken from Rudman et al., 2001)—and five additional morally relevant behaviors—“has a habit of lying,” “cheats on her boyfriend,” “expects her friends to cover the bill when they all go out for dinner,” “often forgets to pick up her kids from school,” “badmouths her coworkers when competing for a promotion.” For each participant, each name (e.g., Beth) was randomly paired with each behavior (e.g., “...she yells...”) and each resulting sentence was presented one at a time in a randomized order. We also included two additional neutral-to-positive behaviors: “usually arrives to appointments on time” and “avoids littering.”

Participants then completed measures of stereotyping and prejudice in a counterbalanced order. For stereotyping, participants indicated their agreement with five statements about morality in a randomized order such as “Daxes are dishonest” on a scale from 1 (*strongly disagree*) to 9 (*strongly agree*). In addition to “dishonest,” participants were asked about the following morally-relevant attributes: “unkind,” “irritable,” “unreliable,” and “irresponsible.” This measure of stereotyping is similar to that used in prior work, which also assessed participants’ agreement that a given attribute was true of a given social group (Bastian & Haslam, 2006). To measure prejudice, participants indicated their feelings toward the Daxes using a feeling thermometer on a scale from 1 (*very cold or unfavorable feeling*) to 11 (*very warm or favorable feeling*) accompanied by a depiction of a thermometer from 0° to 100°. This measure of prejudice was taken from prior work (Dasgupta & Greenwald, 2001). We scored both measures such that higher scores indicated more negative stereotyping and more prejudice.

Results

As in Studies 1 and 2 and as preregistered, we created combined indices of general essentialism (Cronbach's $\alpha = .86$), biological essentialism, $r(296) = .71, p < .001$, 95% CI [.64, .76], and value-based essentialism, $r(295) = .66, p < .001$, 95% CI [.59, .72] (for correlations among indices see SI.1.2). The items designed to capture negative stereotypes about the Daxes' morality were also combined into a single index (Cronbach's $\alpha = .94$).

Using the same analytic approach in Studies 1 and 2, we again found that the manipulation was effective. It (a) increased general essentialist beliefs in the two essentialism conditions and (b) created beliefs in a biological essence and value-based essence in the biological essence condition and value-based essence condition, respectively. See Table 5.

Table 5*Effect of the Manipulation on Essentialist Beliefs in One-way ANOVAs with Follow-up t-tests in Study 3a*

	<i>M (SD)</i>			<i>Statistic (df)</i>	<i>Effect size</i>	<i>p</i>
	<i>C^a</i>	<i>B^b</i>	<i>V^c</i>			
General	3.67	6.92	6.95	$F(2, 287) = 141.07$	$\eta^2 = 0.50 [0.43, 0.55]$	$< .001^*$
essentialism	2.06	1.16	1.31			
B vs. C				$t(195) = 13.68$	$d = 1.94 [1.60, 2.27]$	$< .001^*$
V vs. C				$t(188) = 13.03$	$d = 1.90 [1.56, 2.23]$	$< .001^*$
B vs. V				$t(191) = -0.19$	$d = -0.03 [-0.31, 0.25]$	.852
Biological	3.33	7.09	5.09	$F(2, 295) = 111.19$	$\eta^2 = 0.43 [0.36, 0.49]$	$< .001^*$
essentialism	1.98	1.33	1.96			
B vs. C				$t(197) = 15.77$	$d = 2.23 [1.87, 2.58]$	$< .001^*$
V vs. C				$t(198) = 8.47$	$d = 1.20 [0.90, 1.49]$	$< .001^*$
B vs. V				$t(195) = 6.25$	$d = 0.89 [0.60, 1.18]$	$< .001^*$
Value-based	3.16	4.43	6.48	$F(2, 294) = 83.90$	$\eta^2 = 0.36 [0.29, 0.42]$	$< .001^*$
essentialism	1.98	1.66	1.76			
B vs. C				$t(195) = 4.88$	$d = 0.69 [0.40, 0.98]$	$< .001^*$
V vs. C				$t(192) = 12.32$	$d = 1.77 [1.44, 2.09]$	$< .001^*$
B vs. V				$t(201) = -8.51$	$d = -1.19 [-1.49, 0.89]$	$< .001^*$

Note. Effect sizes are reported in brackets with 90% (η^2) and 95% (d) confidence intervals (Lakens, 2014).

^aC = control condition; ^bB = biological essence condition; ^cV = value-based essence condition

*Statistically significant (at $p < .05$ for the one-way ANOVAs and $p < .017$ for the Bonferroni corrected follow-up t-tests)

Essentialism, Stereotyping, and Prejudice

Like Study 2, stereotyping about the Daxes was correlated with general essentialism, $r(279) = .31, p < .001$, 95% CI [.20, .41], biological essentialism, $r(287) = .19, p = .001$, 95% CI [.08, .30] (as well as value-based essentialism, $r(285) = .37, p < .001$, 95% CI [.27, .46]).

Concerning prejudice, negative feelings toward the Daxes was correlated with general essentialism, $r(288) = .13, p = .031$, 95% CI [.01, .24] (and value-based essentialism, $r(295) = .17, p = .004$, 95% CI [.06, .27]), although not biological essentialism, $r(296) = -.03, p = .650$, 95% CI [-.14, .09].

To test experimental effects, we analyzed stereotyping and prejudice using separate preregistered one-way ANOVAs with follow-up Bonferroni corrected t-tests ($\alpha = .017$). There was a significant main effect of the manipulation on stereotyping, but crucially and as in Study 2, we did not find evidence that the biological essence condition increased stereotyping compared to the control condition, $t(193) = 1.71, d = 0.25, p = .088$. Instead, the main effect on stereotyping was driven by the value-based essence condition—a novel finding in the present work (Figure 3). Concerning prejudice, there was no evidence for experimental effects, including the crucial comparison between biological essentialism and the control condition, $t(299) = 0.33, d = 0.05, p = .741$ (Figure 4). For complete statistics see Table 6.

Table 6

Effect of the Manipulation on Stereotyping and Prejudice in One-way ANOVAs with Follow-up t-tests in Study 3a

	<i>M (SD)</i>			<i>Statistic (df)</i>	<i>Effect size</i>	<i>p</i>
	<i>C^a</i>	<i>B^b</i>	<i>V^c</i>			
Stereotyping	5.33 (1.86)	5.77 (1.67)	6.23 (1.72)	$F(2, 288) = 6.24$	$\eta^2 = 0.04 [0.01, 0.08]$	.002*
B vs. C				$t(193) = 1.71$	$d = 0.25 [-0.04, 0.53]$	.088
V vs. C				$t(189) = 3.45$	$d = 0.50 [0.22, 0.78]$	<.001*
B vs. V				$t(194) = -1.91$	$d = -0.27 [-0.55, 0.00]$	.058
Prejudice	6.81 1.85	6.89 1.88	7.45 2.26	$F(2, 298) = 3.03$	$\eta^2 = 0.02 [0.00, 0.05]$	.050
B vs. C				$t(199) = 0.33$	$d = 0.05 [-0.24, 0.33]$	.741
V vs. C				$t(196) = 2.19$	$d = 0.31 [0.03, 0.59]$	.030
B vs. V				$t(201) = -1.91$	$d = -0.27 [-0.54, 0.01]$	.058

Note. Effect sizes are reported in brackets with 90% (η^2) and 95% (d) confidence intervals (Lakens, 2014).

^aC = control condition; ^bB = biological essence condition; ^cV = value-based essence condition

*Statistically significant (at $p < .05$ for the one-way ANOVAs and $p < .017$ for the Bonferroni corrected follow-up t-tests).

Figure 4

Effect of the Manipulation on Prejudice in Study 3a (left), Study 3b (center), and 3c (right)

Note. Means are depicted with 95% CI and raw data overlaid.

Discussion

As in prior work, we found that essentialism was correlated with stereotyping and prejudice. Although our manipulation again worked as designed, there was no evidence that biological essentialism causally affected stereotyping or prejudice. Taken together with Studies 1 and 2, these results begin to raise doubts about whether the correlation between essentialism and intergroup bias is due to an underlying causal effect of essentialism.

Study 3b

In the studies so far we did not find evidence that the correlation between biological essentialism and intergroup bias is due to an underlying causal effect. However, the size of the (non-significant) causal effect of biological essentialism on stereotyping was not as small in Study 3a ($d = 0.25$) as it was in Study 2 ($d = -0.02$). This may raise some possibility that there *is* a causal relationship, but Study 3a did not include enough participants to observe it. We address this in Study 3b by conducting a close replication with double the sample size.

Methods

Initially, 746 respondents completed the online survey using Amazon's Mechanical Turk platform, and 146 were excluded due to the preregistered criteria. This resulted in the preregistered 600 participants: all were over 18 and U.S. residents, $M_{age} = 34.85$, 49% women, 50% men, and < 1% gender non-binary or unspecified, 71% White, 9% Black, 9% Asian, 8% Hispanic/Latino, 2% multi-racial, and $\leq 1\%$ either Native American, Middle Eastern, or unspecified. This sample size was sensitive to detect a small effect ($\eta^2 = 0.02$) of condition on bias ($1-\beta = 80\%$, $\alpha = 0.05$, groups = 3). Median completion time was 5.08 minutes and participants were compensated \$0.50.

The materials and procedure were identical to Study 3a with one exception. In the present study the introductory information about the Daxes was accompanied by cartoon images of the Daxes to further increase engagement. These images showed the Daxes as relatively lighter-skinned and White-looking because we reasoned that participants might be less willing to report negative beliefs about the Daxes if they were darker-skinned out of a desire to be or to appear non-racist against a group of people resembling disadvantaged racial groups in U.S. society (Dovidio & Gartner, 2004; Plant & Devine, 1998).

Results

As preregistered, we created combined indices of general essentialism (Cronbach's $\alpha = .83$), biological essentialism, $r(594) = .74, p < .001, 95\% \text{ CI } [.70, .77]$, and value-based essentialism, $r(590) = .57, p < .001, 95\% \text{ CI } [.51, .62]$ (for correlations among indices see SI.1.2). The five items designed to capture negative stereotypes about the Daxes' morality were also again combined into a single index (Cronbach's $\alpha = .94$). We also again found that the manipulation worked as designed. For statistics see Table 7.

Table 7*Effect of the Manipulation on Essentialist Beliefs in One-way ANOVAs with Follow-up t-tests in Study 3b*

	<i>M (SD)</i>			<i>Statistic (df)</i>	<i>Effect size</i>	<i>p</i>
	<i>C^a</i>	<i>B^b</i>	<i>V^c</i>			
General	3.89	6.96	6.97	$F(2, 580) = 255.02$	$\eta^2 = 0.47 [0.42, 0.51]$	$< .001^*$
essentialism	(2.10)	(1.24)	(1.14)			
B vs. C				$t(389) = 18.06$	$d = 1.83 [1.59, 2.06]$	$< .001^*$
V vs. C				$t(386) = 17.52$	$d = 1.78 [1.55, 2.01]$	$< .001^*$
B vs. V				$t(385) = -0.09$	$d = -0.01 [-0.21, 0.19]$	.928
Biological	2.99	7.30	4.50	$F(2, 593) = 287.68$	$\eta^2 = 0.49 [0.45, 0.53]$	$< .001^*$
essentialism	(2.00)	(1.45)	(1.95)			
B vs. C				$t(387) = 24.59$	$d = 2.46 [2.02, 2.72]$	$< .001^*$
V vs. C				$t(396) = 7.64$	$d = 0.77 [0.56, 0.97]$	$< .001^*$
B vs. V				$t(393) = 16.17$	$d = 1.63 [1.40, 1.85]$	$< .001^*$
Value-based	3.64	4.66	6.22	$F(2, 589) = 90.48$	$\eta^2 = 0.24 [0.19, 0.28]$	$< .001^*$
essentialism	(2.17)	(1.90)	(1.63)			
B vs. C				$t(397) = 5.04$	$d = 0.50 [0.31, 0.70]$	$< .001^*$
V vs. C				$t(391) = 13.32$	$d = 1.35 [1.13, 1.56]$	$< .001^*$
B vs. V				$t(390) = -8.69$	$d = -0.88 [-1.08, -0.67]$	$< .001^*$

Note. Effect sizes are reported in brackets with 90% (η^2) and 95% (d) confidence intervals (Lakens, 2014).

^aC = control condition; ^bB = biological essence condition; ^cV = value-based essence condition

*Statistically significant (at $p < .05$ for the one-way ANOVAs and $p < .017$ for the Bonferroni corrected follow-up t-tests)

Essentialism, Stereotyping, and Prejudice

Stereotyping about the Daxes was correlated with general essentialism, $r(566) = .12$, $p = .006$, 95% CI [.03, .20] (and value-based essentialism, $r(575) = .22$, $p < .001$, 95% CI [.14, .30]), but not biological essentialism, $r(580) = .07$, $p = .116$, 95% CI [−.02, .15]. Unlike in Study 3a, biological essentialist beliefs were correlated with *less* negative feelings toward the Daxes, $r(594) = -.11$, $p = .006$, 95% CI [−.19, −.03], and there was no evidence for a correlation with general essentialist beliefs, $r(581) = -.06$, $p = .128$, 95% CI [−.14, .02] (or value-based essentialist beliefs, $r(590) = .04$, $p = .358$, 95% CI [−.04, .12]).

There was no evidence for experimental effects on stereotyping, including the crucial comparison between the biological essence condition and the control condition as in Study 3a and with double the sample size, $t(388) = -0.81$, $d = -0.08$, $p = .421$ (Figure 3). For prejudice, there was a main effect of condition, but crucially and as in Study 3a, we did not find evidence that the biological essence condition causally affected prejudice compared to the control condition after the Bonferroni correction ($\alpha = .017$), $t(401) = 2.18$, $d = -0.22$, $p = .030$ (Figure 4). Instead, the main effect on prejudice appeared to be driven by the value-based essence condition. For complete statistics see Table 8.

Table 8

Effect of the Manipulation on Stereotyping and Prejudice in One-way ANOVAs with Follow-up t-tests in Study 3b

	<i>M (SD)</i>			<i>Statistic (df)</i>	<i>Effect size</i>	<i>p</i>
	<i>C^a</i>	<i>B^b</i>	<i>V^c</i>			
Stereotyping	5.88	5.74	6.02	$F(2, 582) = 1.32$	$\eta^2 < 0.01 [0.00, 0.02]$	.267
	1.61	1.78	1.71			
B vs. C				$t(388) = -0.81$	$d = -0.08 [-0.28, 0.11]$	.421
V vs. C				$t(387) = 0.84$	$d = 0.08 [-0.11, 0.28]$	.403
B vs. V				$t(389) = -1.59$	$d = -0.16 [-0.36, 0.04]$	.113
Prejudice	7.31	6.91	7.36	$F(2, 597) = 3.62$	$\eta^2 = 0.01 [0.00, 0.03]$	.027*
	1.86	1.88	1.84			
B vs. C				$t(401) = 2.18$	$d = -0.22 [-0.41, -0.02]$	.030
V vs. C				$t(397) = 0.26$	$d = 0.03 [-0.17, 0.22]$	.793
B vs. V				$t(396) = -2.44$	$d = -0.24 [-0.44, -0.05]$	.015*

Note. Effect sizes are reported in brackets with 90% (η^2) and 95% (d) confidence intervals (Lakens, 2014).

^aC = control condition; ^bB = biological essence condition; ^cV = value-based essence condition

*Statistically significant (at $p < .05$ for the one-way ANOVAs and $p < .017$ for the Bonferroni corrected follow-up t-tests)

Discussion

Replicating Study 3a with double the sample size, there was no evidence for an experimental effect of the manipulation on intergroup bias. Further, Study 3b found an inconsistent pattern of correlational relationships. Essentialism was correlated with increased stereotyping but decreased prejudice.

Study 3c

Because we reasoned that out of a desire to appear non-prejudiced participants might be more willing to report negative beliefs about White-looking individuals who less obviously resemble disadvantaged racial groups in the U.S. (Dovidio & Gartner, 2004; Plant & Devine, 1998), Study 3b introduced participants to a novel social group accompanied by images of lighter-skinned cartoon images. However, it is possible that this decision had the opposite effect than intended. That is, essentialism might be most effective in increasing negative beliefs about groups who are already socially disadvantaged, including those resembling disadvantaged racial groups in U.S. society who experience ongoing racism and colorism (Dixon & Telles, 2017; Roberts & Rizzo, 2021). The present study tested this possibility. We ran another close replication of Studies 3a and 3b but in the present study we instead described the Daxes as a low status, disadvantaged social group accompanied by images of darker-skinned individuals. We also removed the value-based essence condition to focus only on the comparison between the biological essence condition and the control condition.

Methods

Initially, 445 respondents completed the online survey using the Prolific platform, and 45 were excluded due to the preregistered criteria. This resulted in the preregistered 400 participants, or 200 participants per condition as in Study 3b: all were over 18 and U.S. residents,

$M_{age} = 36.95$, 51% women, 48% men, and $< 1\%$ gender non-binary or unspecified, 67% White, 5% Black, 10% Asian, 10% Hispanic/Latino, 4% multi-racial, and $\leq 1\%$ either Native American, Middle Eastern, or unspecified. This sample size was sensitive to detect a small effect ($d = 0.28$) of condition on bias ($1-\beta = 80\%$, $\alpha = 0.05$, groups = 3). Median completion time was 5.08 minutes and participants were compensated \$0.50.

The materials and procedure were similar to Study 3b with two exceptions. First, in the present study the introductory information about the Daxes indicated that (a) Daxes were low status—meaning, they tended to make less money, be less educated, and hold lower power positions in society, (b) Daxes were a numerical minority in the population, and (c) Daxes were recognizable by their physical appearance. The cartoon images of the Daxes were extremely similar in Study 3b except that they depicted individuals with darker skin, thus resembling real disadvantaged racial groups in U.S. society. Second, we removed the value-based essence condition and the two value-based essentialism questions to focus on biological essentialism.

Results

As preregistered, we created combined indices of general essentialism (Cronbach's $\alpha = .80$) and biological essentialism, $r(397) = .78$, $p < .001$, 95% CI [.74, .82] (for correlations among indices see SI.1.2). The five items designed to capture negative stereotypes about the Daxes' morality were also again combined into a single index (Cronbach's $\alpha = .96$). We also again found that the manipulation worked as designed. For statistics see Table 9.

Table 9*Effect of the Manipulation on Essentialist Beliefs in t-tests in Study 3c*

	<i>M (SD)</i>		<i>Statistic (df)</i>	<i>Effect size</i>	<i>p</i>
	<i>C^a</i>	<i>B^b</i>			
General essentialism	4.06 (1.92)	6.69 (1.39)	$t(395) = 15.69$	$d = 1.57 [1.34, 1.79]$	$< .001^*$
Biological essentialism	3.06 (2.08)	6.81 (1.62)	$t(397) = 20.12$	$d = 2.01 [1.77, 2.25]$	$< .001^*$

Note. Effect sizes are reported in brackets with 95% (*d*) confidence intervals (Lakens, 2014).

^aC = control condition; ^bB = biological essence condition.

*Statistically significant (at $p < .05$)

Essentialism, Stereotyping, and Prejudice

Stereotyping about the Daxes was again correlated with general essentialism, $r(392) = .16, p = .002$, 95% CI [.06, .25], but not biological essentialism, $r(394) = .09, p = .067$, 95% CI [−.01, .19]. There was no evidence for a correlation between negative feelings toward the Daxes and general essentialism, $r(394) = .05, p = .306$, 95% CI [−.05, .15], or biological essentialism, $r(581) = −.01, p = .913$, 95% CI [−.10, .09].

There was no evidence for an experimental difference between the biological essence condition and the control condition for stereotyping ($M_{biological} = 5.18, SD = 1.83$ vs. $M_{control} = 5.12, SD = 1.79$), $t(395) = 0.35, d = 0.03, p = .730$, 95% CI [−.17, .23] (Figure 3), or prejudice ($M_{biological} = 6.43, SD = 1.85$ vs. $M_{control} = 6.49, SD = 1.68$), $t(401) = −0.34, d = −0.03, p = .030$, 95% CI [−.23, .17] (Figure 4).

Discussion

Study 3c investigated beliefs about an explicitly low status, disadvantaged social group. We reasoned that the possible link between essentialism and intergroup bias might be most pronounced, or might even only emerge, about low status social groups that resemble real disadvantaged social groups for whom biological essentialist arguments have been used to justify unfair treatment and racism (Cravens 2010). Even in this group context, there was no evidence for an experimental effect of the manipulation on intergroup bias. Further, Study 3c found an inconsistent pattern of correlational relationships. Essentialism was correlated with increased stereotyping but not correlated with prejudice.

Internal Meta-analysis of Studies 2, 3a, 3b, and 3c

Studies 2, 3a, 3b, and 3c found that essentialism was positively correlated with stereotyping and, to some extent, prejudice (i.e., Study 3a but not Studies 3b or 3c) but did not find consistent evidence for experimental effects. To provide a more complete understanding of the present findings we conducted an internal meta-analysis of the correlational and experimental findings following procedures in Goh and colleagues (2016). Note that we did not meta-analyze group importance from Study 1 because we only conducted one study with this outcome variable.

We examined the fixed effects meta-analytic correlational relationships of general essentialism and, separately, biological essentialism with stereotyping (Studies 2, 3a, 3b, and 3c) and prejudice (Studies 3a, 3b, and 3c). The same was done for value-based beliefs (Studies 2, 3a, and 3b). First, we Fisher z transformed the Pearson's correlations and computed the average correlation across studies for each effect weighted by sample size. These average correlations were converted back into Pearson's r for presentation. To obtain p values, we applied the Stouffer formula to the standard normal deviate of each raw Pearson's correlation.

We examined the experimental differences between the control condition and the biological essence condition for stereotyping (Studies 2, 3a, 3b, and 3c) and, separately, prejudice (Studies 3a, 3b, and 3c)—the same was done for the value-based essence condition (Studies 2, 3a, and 3b). We converted the Cohen d effect size for these differences into Pearson's r for ease in comparison with the correlational findings, and then followed identical meta-analytic procedures described for the correlational relationships.

Correlational Relationships

We found meta-analytic evidence that stereotyping was positively correlated with general essentialism, $Mr = .18$, $Z = 7.59$, $p < .001$, and biological essentialism, $Mr = .11$, $Z = 4.38$, $p < .001$ (as well as value-based essentialism, $Mr = .25$, $Z = 8.93$, $p < .001$). Prejudice was negatively related to biological essentialism $Mr = -.06$, $Z = -2.01$, $p = .044$ (as in Haslam & Levy, 2006, but see Chen & Ratliff, 2018), although not general essentialism, $Mr = .02$, $Z = 1.01$, $p = .312$, or value-based essentialism, $Mr = .03$, $Z = 1.38$, $p = .168$.

Experimental Effects

Notably, there was no evidence for an experimental effect of biological essentialism (vs. the control condition) on stereotyping, $Mr = .01$, $Z = 0.63$, $p = .529$, or prejudice, $Mr = -.05$, $Z = -1.35$, $p = .177$ (or of value-based essentialism on prejudice, $Mr = .06$, $Z = 1.63$, $p = .103$). Instead, the only statistically significant meta-analytic experimental finding was that value-based essentialism increased stereotyping, $Mr = .10$, $Z = 2.86$, $p = .004$ —novel to the present work.

General Discussion

The present studies examined the relationship between biological essentialism and intergroup bias. As in prior work, we found that essentialist beliefs were correlated positively with stereotyping, as well as intensified group importance. This positive relationship was found for essentialist thinking more generally (Studies 1, 2, 3a, 3b, and 3c) as well as specific beliefs in a biological essence (Studies 1, 2, and 3a). The internal meta-analysis for stereotyping confirmed a small but consistent positive correlational relationship. Findings for prejudice were more mixed across studies, consistent with more mixed findings in the prior literature even for correlational effects. The internal meta-analysis indicated a small negative relationship between biological essentialism and prejudice (as in, e.g., Haslam & Levy, 2006; but see, Chen & Ratliff, 2018).

New to this research, we also found positive correlations between value-based essentialism and bias.

Before conducting these studies and based on the previous literature and theorizing, we assumed that the correlational relationships would be due to biological essentialism causing intergroup bias. But although our experimental manipulations worked as designed to shift essentialist beliefs in all studies, there was no evidence that biological essentialism caused bias.¹ Together, our findings suggest that the correlations between essentialism and intergroup bias may not be because of a straightforward causal effect of essentialism on bias.

Essentialism May Cause Intergroup Bias

Of course, it is possible that biological essentialism *does* cause intergroup bias. There may have been flaws in our studies that prevented us from observing straightforward causal effects, or, more interesting, causal effects may only emerge for certain groups or for certain types of outcomes relevant to intergroup bias.

If there really is a straightforward causal effect of essentialism on intergroup bias, flaws in our studies may have prevented us from observing experimental effects. First, there may have been flaws in how we measured group importance, stereotyping, and prejudice. However, if this was correct, then those flaws would have also impacted our ability to observe correlational relationships. Instead, we found the usual correlations between essentialism and intergroup bias. Second, we may have failed to manipulate essentialism as intended in Studies 1-3. But across studies, there was evidence that the manipulations of essentialist beliefs worked as designed.

¹ The only experimental effect that survived meta-analytic scrutiny was a novel finding to the present work; that is, the value-based essence condition increased stereotyping compared to the no essence control condition.

Finally, it may have been the case that although our manipulations shifted essentialist beliefs, the manipulations were not strong enough to also have an effect on more downstream intergroup biases. This is possible. But we find this explanation somewhat unsatisfying because the present manipulations were adapted from Bailey and colleagues (2021), which did find that the manipulations impacted downstream judgments about, for instance, moral blame. Thus, we are less persuaded by the idea that these reasons can explain the lack of experimental evidence in Studies 1-3 for a straightforward causal effect of essentialism on bias.

A more interesting possibility is that essentialism does really does cause bias *for certain groups*. The present studies investigated Jews (Study 1) and novel groups (Studies 2 and 3), but bias about certain stigmatized social groups may be particularly relevant to essentialism. The mere existence of certain social groups is challenged more than others. To consider one example, some lay stakeholders and philosophers alike question whether non-binary and transgender people legitimately exist, sometimes claiming that they are actually either cisgender women or men. For these groups in particular, greater essentialist beliefs about gender as biological, fixed at birth, and binary—i.e., only women or men—may cause greater intergroup biases directed at non-binary and transgender people. There has been a recent flurry of correlational evidence showing that essentialism and bias about transgender people are connected (e.g., Gallagher & Bodenhausen, 2021; Saguy et al., 2021). Future research could take an experimental approach to observe possible causal consequences for bias.

It is also possible that there is casual effect of essentialism on bias *for certain intergroup outcomes*, just not for the outcomes measured here (i.e., group importance, stereotyping, and prejudice). To continue with the example of transgender and non-binary people, it may be that essentialism has a causal effect only on certain intergroup-relevant beliefs about transgender

people. Essentializing gender as biological, fixed at birth, and binary may, for instance, cause people to think that only binary sex assigned at birth should be recognized in contexts where biology is salient (e.g., medical care and sports). But biological essentialism may not cause people to be less accepting in other contexts or to have more global negative attitudes toward trans and non-binary people. Future research on essentialism about social groups would benefit from systematically investigating multiple intergroup-relevant outcomes to better understand if biological essentialism causally increases certain intergroup outcomes but not others.

Other Possible Relationships Between Essentialism and Intergroup Bias

Our findings also raise the possibility that the correlation between biological essentialism and intergroup bias may not be due to an underlying causal effect of essentialism on bias. Indeed, newer evidence and a reexamination of older evidence suggests that the causal link between essentialism and bias is at least weaker or more qualified than sometimes described. For instance, recent developmental research reveals no causal relationship between essentialism and intergroup prejudice, and inconsistent effects on resource allocation. Researchers were able to successfully manipulate children's (4.5- to 8-year-old) essentialist beliefs about a novel social group but did not find experimental evidence for a corresponding increase in how much children disliked, or had prejudice toward, that group (Rhodes et al., 2018; Yang & Dunham, 2019). Recent political science research similarly revealed no causal relationship between biological explanations and prejudice toward gay individuals (Suhay & Garretson, 2018). Other work finds that experimental effects only occur for certain types of biological essentialism (Andreychik & Gill, 2015) or only for participants who are already quite high in essentialism (Keller, 2005; Rangel & Keller, 2011). Taken together with the present studies, this work is suggestive of more

complex relationships between essentialism and intergroup bias (see also Mandalaywala, 2020; Peretz-Lange, 2021; Tabb et al., 2019).

First, it could be that essentialism exacerbates already biased beliefs about social groups, but it does not straightforwardly cause this bias. Ho and colleagues (2015) manipulated essentialism and found that it increased group boundary intensification for a disadvantaged racial group (i.e., categorizing biracial individuals as Black)—but only among individuals who already held negative attitudes towards the group. Conversely, Chen and Ratliff (2018) manipulated negative information about a group and found that it increased negative attitudes towards the group—but only among individuals already high in biological essentialism. Thus, biological essentialism may be an exacerbating factor, but it may not on its own be sufficient to cause intergroup bias. This could explain why certain investigations have found that manipulating essentialism causes increased bias against certain groups (e.g., disadvantaged racial outgroups; Mandalaywala et al., 2018; Williams & Eberhardt, 2008). Perhaps a sufficient number of participants in these previous investigations already held quite negative beliefs about the group, and the essentialism manipulation exacerbated this bias (as in Ho et al., 2015). This possibility also highlights the strength of using novel groups to study essentialism and bias to isolate essentialism from other factors (e.g., a group's history and status).

A second possibility is that rather than biological essentialism causing or exacerbating intergroup bias, bias may instead cause people to be more essentialist. The logic for this reverse-causal direction—i.e., that bias causes essentialism rather than essentialism causing bias—is that biological essentialism may provide individuals with an appealing justification for their already biased beliefs about a group. For instance, people who endorse the negative stereotype “women are melodramatic” (Prentice & Carranza, 2002) may be motivated to legitimize this belief by

linking it to perceived essential, biological differences among gender groups. Doing so may allow people to arrive at positive self-perceptions (e.g., “I’m not sexist”) while simultaneously endorsing biased beliefs (e.g., Dunning 1999; Kunda, 1990).

A third possibility is that the correlation between essentialism and intergroup bias may be explained by another factor: socio-historical processes. Narratives in society may have created associations between essentialism and bias, rather than these beliefs being correlated due to cognitive mechanisms. This explanation could also account for the inconsistent pattern in the literature for prejudice where essentialism can be correlated with both more and less prejudice, often depending on the group. Different arguments about essentialism have taken different forms depending on the groups in question. For disadvantaged racial groups, biological essentialist arguments about race-based differences have been leveraged to promote racial hierarchy (Cravens, 2010). In contrast, claims about the biological reality and naturalness of sexual orientation have been used to promote LGB rights, particularly in the U.S. (Conrad & Markens, 2001; Neary, 2019). These socio-historical arguments may have created different sets of associated beliefs, further contingent on the social group in question. Thus, for instance, accepting LGB people and embracing the idea that sexual orientation is innate may merely both be part of a single set of associated beliefs (for this latter possibility, see Garreston & Suhay, 2016). Consistent with this account, Suhay and Jayaratne (2013) found that biological explanations for social groups are highly politicized and idiosyncratic based on the specific social group in question. People higher in political conservatism endorsed biological explanations more for racial inequality, less for sexual orientation, and showed no difference for individual differences in intelligence (see also Garreston & Suhay, 2016; Morgan et al., 2010).

According to this third possibility, a broader socio-historical process may have led to the development of a set of associated beliefs that is specific to different social groups. This set of beliefs could include biased stereotypes and prejudices, as well as other ancillary ideas about the group. Among these other ideas could be biological essentialism, a belief that might otherwise seem to be a straightforward scientific issue about the group's biology and whether group membership has a genetic basis (Harden & Koellinger, 2020). When people decide to buy into a larger pro-bias narrative about a particular group, depending on the group, they might come to adopt either biological beliefs (e.g., about Black individuals) or anti-biological beliefs (e.g., about gay individuals). However, on this account, the biological beliefs about the group would not be the primary factor drawing people toward the set of associated beliefs. Thus, as we find here, manipulations that change participants' biological beliefs will not necessarily have a downstream effect on intergroup bias. In a supplementary study (for complete study see SI.4.1), we found some tentative, preliminary evidence for these ideas. We found that brief exposure to a narrative about a novel social group that associated essentialism and bias in opposite directions—instead of associating them together—was sufficient to disrupt even the usual positive correlations between essentialism and bias.

Conclusion

The present studies found that essentialism correlated with intergroup bias, including: intensified importance placed on the group, greater stereotyping, sometimes greater prejudice, and sometimes less prejudice. However, there was no evidence that biological essentialism causally impacted these outcomes, including in an internal meta-analysis. Taken together, the present work calls for a reexamination of the relationship between biological essentialism and downstream consequences for intergroup bias. One assumption is that essentialism and

intergroup bias are correlated because essentialism causes bias. The present studies call for a reexamination of this assumption and a consideration of alternative mechanisms.

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**Supplementary Information to the article:
“Biological essentialism correlates with (but doesn’t cause?) intergroup bias”**

Study 1

SI.1.1

Participants indicated their essentialist beliefs on seven key dimensions reported in detail here. These were directly adapted from Bailey and colleagues (2021) and measure aspects of psychological essentialism described in Medin and Ortony (1989).

Deep Similarity

To what extent do you agree with the following: “There is an essential quality or characteristic that makes [category member]s similar in some deep way.”

1=Strongly Disagree, 9=Strongly Agree

Appearance/Reality Distinction

To what extent do you agree with the following: “Though [category member]s have similarities and differences on the surface, ultimately what it means to be a [category member] is to have a deeper characteristic that all [category member]s possess.”

1=Strongly Disagree, 9=Strongly Agree

Knowledge Deference

To what extent do you think it makes sense to say the following: “People have a certain view about what makes someone/something a [category member], but philosophers and scientists have thought a lot about this and concluded that ultimately, there is something much more fundamental which makes someone/something a [category member].” *1=Sounds weird, 9=Sounds Natural*

Biological Essence

To what extent do you agree with the following: “The essence of being a [category member] is something biological.”

1=Strongly Disagree, 9=Strongly Agree

Scientific Cause

To what extent do you agree with the following: “It would be possible for scientists to identify the unique biological characteristic that causes [someone, something] to be a [category member].”

1=Strongly Disagree, 9=Strongly Agree

Value-based Essence

To what extent do you agree with the following: “The essence of being a [category member] is embodying a certain kind of value.”

1=Strongly Disagree, 9=Strongly Agree

True Category Member

To what extent do you think it is okay to say the following: “If [person] does not embody the right kind of values, then there is a sense in which they are not even a true [category member].”

1=Sounds weird, 9=Sounds Natural

SI.1.2

We set out to test novel hypotheses about value-based essentialism. However, we did not find evidence for expected differences between the biological essence condition and a control condition. In light of these null findings, our initial research question became moot. Thus, some of the planned analyses involving our initial research question are now reported here instead of in the main text to streamline the results section in the main text.

To ensure that the relationships with value-based essentialism were reasonable, we examined preregistered correlations among general essentialism, biological essentialism, and value-based essentialism (Table S1). To test whether individual differences in value-based essentialism would have a unique impact on the group importance measure, we examined the influence of value-based essentialism on group importance in a preregistered linear regression controlling for the other essentialism indices. Only general essentialism was predictive in this model when controlling for the other two, $B = 0.15$, $SE = 0.06$, $p = .007$, $\beta = .19$ (biological essentialism: $B = 0.07$, $SE = 0.04$, $p = .057$, $\beta = .12$, value-based essentialism: $B = 0.05$, $SE = 0.05$, $p = .287$, $\beta = .07$).

Table S1

Zero-order Correlations Among Indices of Essentialist Beliefs in Studies 1-3

	Biological essentialism					Value-based essentialism				
	Study 1	Study 2	Study 3a	Study 3b	Study 3c	Study 1	Study 2	Study 3a	Study 3b	Study 3c
General essentialism	.39***	.60***	.58***	.58***	.75***	.52***	.62***	.59***	.63***	-
Biological essentialism	-	-	-	-		.10	.22***	.25***	.22***	-

*** $p < .001$

Study 2

SI.2.1

We examined correlations among general essentialism, biological essentialism, and value-based essentialism, to ensure that the relationships with value-based essentialism were reasonable (Table S1). Further, to examine the potential unique variance explained by individual differences in value-based essentialism we tested a preregistered linear regression with all three essentialism indices predicting generic endorsement. Only value-based essentialism was predictive when controlling for the other two, $B = 0.17$, $SE = 0.06$, $p = .005$, $\beta = .22$ (general essentialism: $B = -0.05$, $SE = 0.07$, $p = .509$, $\beta = -.06$, biological essentialism: $B = 0.09$, $SE = 0.05$, $p = .082$, $\beta = .13$).

SI.2.2

To measure stereotyping, participants were asked to indicate their endorsement of a generic statement about the Daxes and one of 15 blank, made-up properties. We measured perceived valence of the made-up property by asking participants whether they thought it was a

good thing or a bad thing on a 7-point scale from -3 (*bad*) to 0 (*neutral*) to 3 (*good*). Most participants thought the made-up property was neutral (57%), $M = 0.38$, $SD = 1.08$, $Median = 0$, $Range = [-3, 3]$.

In non-preregistered exploratory analyses, we found that valence was positively related to stereotyping, but there was no evidence that valence moderated the (non-significant) experimental effects of essentialism condition on stereotyping. Because valence was a continuous variable, we used a different analytic approach from that in the main text. Specifically, we computed a linear regression with stereotyping predicted by essentialism condition (biological essence, control, value-based essence), valence, and their two interaction terms (i.e., valence $\times$ biological essence vs. control and valence $\times$ value-based essence vs. control). To compute the condition $\times$ valence interaction, we compared this model to an identical model but without the two interaction terms and found no evidence for a significant interaction, $F = 1.21$, $p = .300$, indicating that valence did not significantly moderate the (still non-significant) experimental effects on stereotyping.

Because there was no evidence for a condition (biological essence, control, value-based essence) $\times$ valence interaction from this model comparison, we then moved on to examining whether the experimental effect of condition changed in significance when controlling for valence. To do so, we computed a model with stereotyping predicted by essentialism condition and valence. Valence was positively related to stereotyping, $B = 0.31$, $SE = 0.06$, $p < .001$, but the experimental differences remained non-significant even when controlling for valence: biological essence condition vs. control condition, $B = 0.05$, $SE = 0.24$, $p = .831$, biological essence condition vs. value-based essence condition, $B = 0.06$, $SE = 0.24$, $p = .815$, and value-based essence condition vs. control condition, $B = -0.01$, $SE = 0.24$, $p = .980$.

Study 3a

SI.3a.1

We again examined preregistered correlations among general essentialism, biological essentialism, and value-based essentialism to ensure that the relationships with value-based essentialism were reasonable (Table S1). Further, to examine the unique variance explained by individual differences in value-based essentialism, we again tested two preregistered linear regressions with value-based essentialism predicting stereotyping and, separately, prejudice controlling for the other essentialism indices. For stereotyping, only value-based essentialism was predictive when controlling for the other two, $B = 0.24$, $SE = 0.06$, $p < .001$, $\beta = .31$ (general essentialism: $B = 0.06$, $SE = 0.07$, $p = .362$, $\beta = .08$, biological essentialism: $B = .06$, $SE = 0.05$, $p = .294$, $\beta = .07$). For prejudice, no form of essentialism was significant once controlling for the others (general essentialism: $B = 0.12$, $SE = 0.08$, $p = .159$, $\beta = .12$, biological essentialism: $B = -0.12$, $SE = 0.06$, $p = .056$, $\beta = -.14$, value-based essentialism: $B = 0.12$, $SE = 0.07$, $p = .083$, $\beta = .13$).

Study 3b

SI.3b.1

We examined correlations among general essentialism, biological essentialism, and value-based essentialism, to ensure that the relationships with value-based essentialism were reasonable (Table S1). Further, we examined the potential unique variance explained by individual differences in value-based essentialism on stereotyping and prejudice in two preregistered linear regressions controlling for the other essentialism indices. For stereotyping, only value-based essentialism was predictive when controlling for the other two, $B = 0.20$, $SE = 0.04$, $p < .001$, $\beta = .25$ (general essentialism: $B = -0.05$, $SE = 0.05$, $p = .353$, $\beta = -.06$, biological essentialism: $B = 0.02$, $SE = 0.03$, $p = .581$, $\beta = .03$). For prejudice, only biological essentialism was predictive when controlling for the other two, $B = -0.08$, $SE = 0.04$, $p = .036$, $\beta = -.11$ (general essentialism: $B = -0.05$, $SE = 0.06$, $p = .359$, $\beta = -.06$, value-based essentialism: $B = 0.08$, $SE = 0.05$, $p = .089$, $\beta = .09$).

Supplementary Study

SI.4.1

Beliefs can come to be correlated, not because of cognitive mechanisms about these beliefs, but because of historical narratives and events that have created “packages” of related ideas. We reasoned that socio-historical processes may have similarly created a “package” that links essentialism and intergroup bias together. Arguments about (certain) social groups have appealed to biological differences to justify intergroup bias and discrimination. For instance, arguments about race-based biological differences have historically been used to justify bias and discrimination against disadvantaged racial groups (Cravens, 2010). These arguments may be partially responsible for the presence and direction of the correlation between biological essentialism and intergroup bias, rather than a causal relationship between these factors. Thus, although these correlations may not exactly be spurious, we hypothesized that there is not a stable or necessary correlation between essentialism and intergroup bias. Instead, this correlation may arise in the literature—and in our studies—because of the broader society.

The best way to test this hypothesis would be to randomly assign participants to different societies with different historical and contemporary narratives about social groups, essentialism, and intergroup bias. But because this is not possible, we instead designed a preliminary proof-of-concept experiment to test whether the correlation between biological essentialism and intergroup bias is fragile and contingent on invoking particular narratives. We introduced participants to a novel social group and exposed them to different arguments about the group. We predicted that invoking certain arguments (vs. others) about a novel social group—arguments reminiscent of some real-world narratives—would be sufficient to disrupt the usual positive correlation between participants’ biological essentialism and intergroup bias.

Methods. Initially, 440 respondents completed the survey using the Prolific platform, and 40 were excluded for failing preregistered attention checks. This resulted in the preregistered 400 participants: all were over 18 and U.S. residents, $M_{age} = 29.51$, 54% women, 43% men, and $\leq 3\%$ gender non-binary or unspecified, 68% White, 10% Hispanic/Latino, 9% Asian, 6% Black, 6% multi-racial, and $\leq 2\%$ either Native American, Middle Eastern, or unspecified. This sample size was chosen based on power simulations assuming a positive correlation of at least $r = 0.15$ in one condition and no correlation ($r = .00$) in the other condition ($1-\beta = 83\%$, $\alpha = 0.05$, groups = 2). Median completion time was 5.37 minutes and participants were compensated \$0.55.

We used a novel groups paradigm to control participants' familiarity with the different arguments made about the social group—that is, participants may already have been familiar with real-world arguments made about real social groups. As in Study 3, participants read information about the novel group called the Daxes, including six statements about negative, morally relevant behavior (e.g., “Beth is a Dax, and she yells at baristas when they make a mistake;” for all statements see the description in Study 3a).

Next, participants were randomly assigned to one of two conditions and read different arguments made about the Daxes. All participants were told, “Daxes have a controversial reputation in society. There are two main sides to this controversy.” Participants then read a few statements that were presented as being emblematic of what people say on “one side” of the controversy and a few statements from the “other side” of the controversy. With this design, all participants were exposed to similar information—all participants read statements (a) endorsing *and* (b) rejecting the idea that Daxes “have a unique biological marker” and (c) endorsing *and* (d) rejecting the idea that it’s okay to “make negative statements about Daxes.” The only thing we manipulated was the connection between these four different sets of ideas.

In the *packaged together* condition, the idea that Daxes have shared biology was used to justify expressing negative intergroup beliefs and the idea that Daxes do *not* have shared biology was used to argue that people should *not* express negative intergroup beliefs. But in the *packaged opposite* condition, this was flipped. In the packaged opposite condition, the idea that Daxes have shared biology was used to argue that people should *not* express negative beliefs about them, and the idea that Daxes do *not* have shared biology was used to justify expressed negative beliefs about them. Thus, the packaged together condition presented arguments about a novel social group that were reminiscent of real-world, racist (i.e., racial hierarchy enforcing) arguments made about stigmatized racial groups (i.e., that Black people are biologically distinct from and inferior to White people in society; Cravens, 2010). See Table S2 for the complete text of these arguments. After reading these arguments, participants were then asked which side of the controversy they agreed with most and why to encourage their engagement with the manipulation.

Finally, participants completed the same two-item measure of biological essentialism from Studies 1-3 in the main text and the same measures of prejudice and stereotyping about the Daxes from Study 3 in the main text.

Table S2*Arguments Packaging Essentialism and Bias Together or in Opposite Directions*

	Packaged together condition	Packaged opposite condition
Rejecting bias	Some scientists have studied Daxes and have not found evidence that Daxes have a unique biological marker. Based on this evidence, Daxes are similar to everyone else deep down. Therefore, it's not okay to make negative statements about Daxes. Those statements are unfair. It's not okay to judge Daxes as a whole group. Daxes should be accepted because Daxes really are just the same as everyone else.	Some scientists have studied Daxes and have found evidence that Daxes share a unique biological marker. Based on this evidence, Daxes are different from everyone else deep down. Therefore, it's not okay to make negative statements about Daxes. Those statements are unfair. It's not okay to judge Daxes for things they cannot control. Daxes should be accepted for who they are based on their real, biological differences.
Endorsing bias	Notably, other scientists argue that there <i>is</i> evidence that all Daxes share a unique biological marker. Therefore, Daxes have different in-born, biological tendencies. It's okay to tell the truth about Daxes. It's even okay to make negative statements about Daxes <i>when those statements are true</i> . It may be unpopular to say, but deep down, Daxes have different biological tendencies than everyone else. It's okay to be honest about this and to be honest about Daxes.	Notably, other scientists argue that there <i>is not</i> evidence that all Daxes share a unique biological marker. Therefore, Daxes have the same in-born, biological tendencies. It's okay to hold Daxes accountable for their actions. It's even okay to make negative statements about Daxes <i>when those statements are true</i> . It may be unpopular to say, but deep down, Daxes have the same biological tendencies as everyone else. It's okay to be honest about this and to hold Daxes accountable for things they can control.

Results. Following the preregistered plan, the scientific cause and biological essence items were averaged, $r(396) = .66, p < .001, 95\% \text{ CI } [.60, .71]$. The items designed to capture negative stereotypes about the Daxes' morality were also combined (Cronbach's $\alpha = .97$).

Essentialism, Stereotyping, and Prejudice. As preregistered, we first computed zero-order correlations collapsing across the packaged together and packaged opposite conditions. It is important to emphasize, the following correlations collapsing across these two conditions are not directly comparable to the correlations between essentialism and bias in Studies 1-3 in the main text because the present manipulation was designed to alter these correlations. Biological essentialism about the Daxes was positively correlated with stereotyping, $r(397) = .18, p < .001, 95\% \text{ CI } [.08, .27]$ and unrelated to prejudice, $r(397) = .06, p = .248, 95\% \text{ CI } [-.04, .16]$. Stereotyping and prejudice were correlated, $r(397) = .60, p < .001, 95\% \text{ CI } [.53, .66]$.

To test differences in the relationship between stereotyping and essentialism based on the manipulation, we computed a linear regression with stereotyping predicted by biological essentialism, condition, and their interaction term (Figure S1). In simple slopes analysis, we examined the correlation between biological essentialism and stereotyping in the packaged together condition and, separately, in the packaged opposite condition—we computed standardized betas (β) by standardizing essentialism and stereotyping to facilitate comparisons with the correlation coefficients (r) from Studies 1-3.

In the packaged together condition, stereotyping about the Daxes was positively correlated with biological essentialism, $B = 0.25, SE = 0.07, p < .001, \beta = 0.25, 95\% \text{ CI } [.12, .38]$. In contrast in the packaged opposite condition there was no evidence for a correlation between stereotyping and biological essentialism, $B = 0.11, SE = 0.07, p = .109, \beta = 0.11, 95\% \text{ CI } [-.03, .25]$. This pattern is consistent with our prediction, but there was not definitive

evidence that the direction and size of these two relationships was statistically significantly different because the interaction between biological essentialism and condition in the linear regression was non-significant, $B = 0.14$, $SE = 0.10$, $p = .152$.

For prejudice, we used the same analytic approach. In the packaged together condition, prejudice was positively correlated with biological essentialism, $B = 0.22$, $SE = 0.07$, $p = .001$, $\beta = 0.22$, 95% CI [.08, .35]. In contrast, in the packaged opposite condition there was no evidence for a correlation between prejudice and biological essentialism, $B = -0.12$, $SE = 0.07$, $p = .100$, $\beta = -0.12$, 95% CI [-0.25, .03]. Further, the direction and size of these two coefficients was significantly different from each other; that is, there was significant interaction between biological essentialism and condition, $B = 0.34$, $SE = 0.10$, $p < .001$.

Figure S1

Effect of the Manipulation on the Correlation Between Essentialism and Stereotyping (top) and Prejudice (bottom)

Note. Fitted lines are depicted with 95% CI bands in gray and raw data underlaid.

Discussion

We designed this supplementary study to begin to test whether the correlations between biological essentialism and intergroup bias are fragile and contingent on invoking particular narratives. We exposed participants to narratives that either packaged essentialism and bias together or in opposite directions. As predicted, we found that biological essentialism was positively correlated with stereotyping and prejudice but only in the packaged together condition. In the packaged opposite condition, the correlations were not significant.

There may not be a necessary cognitive connection between essentializing a social group and endorsing biased beliefs about the group. Instead, the correlation between biological essentialism and intergroup bias (i.e., in Studies 1-3) may, at least partially, be caused by invoking particular narratives. Here, even brief exposure to alternative narratives about a novel group was sufficient to disrupt the usual positive correlations.

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