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## Pattern Deviancy Aversion Predicts Prejudice via a Dislike of Statistical Minorities

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CITATION

# Pattern Deviancy Aversion Predicts Prejudice via a Dislike of Statistical Minorities

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Research has documented an overlap between people's aversion toward nonsocial pattern deviancy (e.g., a row of triangles with 1 triangle out of line) and their social prejudice. It is unknown which processes underlie this association, however, and whether this link is causal. We propose that pattern deviancy aversion may contribute to prejudice by heightening people's dislike of statistical minorities. Infrequent people in a population are pattern deviant in that they disrupt the statistical regularities of how people tend to look, think, and act in society, and this deviancy should incite others' prejudice. Nine studies ($N = 1,821$) supported this mediation. In Studies 1.1 and 1.2, adults' and young children's nonsocial pattern deviancy aversion related to disliking novel statistical minorities, and this dislike predicted prejudice against Black people. Studies 1.3 and 1.4 observed this mediation when experimentally manipulating pattern deviancy aversion, although pattern deviancy aversion did not directly impact racial prejudice. Study-set 2 replicated the proposed mediation in terms of prejudice against other commonly stigmatized individuals (e.g., someone with a physical disability). Importantly, we also found pattern deviancy aversion to affect such prejudice. Study-set 3 provided additional support for the mediation model. Pattern deviancy aversion predicted prejudice dependent on group-size, for instance, greater racial prejudice in cases where Black people are the statistical minority, but decreased racial prejudice when Black people are the statistical majority. Taken together, these findings indicate that people's aversion toward pattern deviancy motivates prejudice, and that this influence is partially driven by a dislike of statistical minorities.

*Keywords:* prejudice, pattern deviancy aversion, minority groups, group size, social cognition

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From early on in the field of psychology (Allport, 1958; Bogardus, 1925; Katz & Braly, 1933) to more recently (see Nelson, 2009), psychologists have attempted to understand prejudice—unfavorable attitudes towards groups or members of groups (Allport, 1958; Duckitt, 1992; Nelson, 2009; Pettigrew & Meertens, 1995). And for good reason. Prejudice, whether implicit or explicit, has detrimental outcomes for societies and the individuals inhabiting them. From Rohingya Muslims in Burma (Myanmar) to Yazidis in parts of the Arab World to Black people in the United States, people are persecuted and disadvantaged, resulting in psychological and physiological harm (e.g., Okazaki, 2009; Pascoe & Smart Richman, 2009). As such, it is paramount to discover the factors and processes that underlie prejudice.

In terms of ultimate factors, prejudice may have developed to aid survival. Prejudice can help individuals avoid danger (Schaller, Park, & Faulkner, 2003; Stangor & Crandall, 2000), and can help ingroups uphold cohesion and functioning (Neuberg, Smith, & Asher, 2000). Proximate factors contribute to prejudice as well, either to aid survival or as a byproduct. For instance, on the societal level, competition for resources (Sherif, Harvey, Hoyt, Hood, & Sherif, 1961; Sherif, White, & Harvey, 1955), a preference for unequal social structures and hierarchies (e.g., Sidanius & Pratto, 1999; Whitley, 1999), and threat toward the self and group threat (e.g., Blalock, 1967; Blumer, 1958; Cottrell & Neuberg, 2005; Quillian, 1995, 1996) are just three examples of social factors that incite prejudice. And, on the cognitive level, people's use of simplistic, fast, and efficient decision-making heuristics (stereotypes) contributes to prejudice (e.g., Bodenhausen, 1990; Nelson, 2009). Finally, on the emotional level, disgust plays an important role in inciting prejudice (e.g., Hodson & Costello, 2007; Taylor, 2007).

In addition to these causes, researchers have recently proposed that prejudice may be motivated by a simple affective-cognitive construct - aversion towards pattern deviancy (Gollwitzer, Marshall, Wang, & Bargh, 2017). Aversion toward pattern deviancy is defined as *the activation of negative affect in response to a perceived pattern being broken, disrupted, or distorted* (Gollwitzer et al., 2017; Gollwitzer & Clark, 2018; Gollwitzer, Martel, &

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Bargh, 2019; Gollwitzer, Martel, Bargh, & Chang, 2019). Put another way, pattern deviancy aversion captures people's discomfort in response to pattern distortion as conceptualized in research on pattern-recognition—a repetition or redundancy violation (Garner, 1970; Näätänen, Paavilainen, Titinen, Jiang, & Alho, 1993; Posner, 1973). For instance, discomfort toward a collection of objects that are all very similar to each other except for one outlier, the disruption of a repeated event, and more generally, deviations from clear regularities, all qualify as pattern deviancy aversion.

A number of psychological phenomena indirectly suggest that people are pattern deviancy averse. For instance, people tend to resist change (Jost, 2015), dislike atypical objects (Palmer, Schloss, & Sammartino, 2013), prefer familiar stimuli (Zajonc, 1968), imitate and mimic others (e.g., Chartrand & Bargh, 1999), and subscribe to habitual thinking and acting (e.g., James, 1890; Neal, Wood, & Quinn, 2006). Past research has also directly demonstrated that people are pattern deviancy averse (e.g., Gollwitzer et al., 2017; Heintzelman, Trent, & King, 2013).[1] For instance, Gollwitzer and colleagues (2017) measured people's pattern deviancy aversion via discomfort toward broken patterns of simple geometric shapes and found that people across cultures (the United States and China) as well as children as young as 3 years old exhibit a dislike of broken patterns.

Importantly, pattern deviancy aversion is not the same as a general dislike of ambiguity (e.g., Budner, 1962; Webster & Kruglanski, 1994). Simply put, broken patterns are not ambiguous; they entail an evident irregularity rather than the potential of an irregularity occurring. Indeed, past research has only found weak-to-moderate correlations between pattern deviancy aversion and variables associated with disliking ambiguity and uncertainty (e.g., intolerance for ambiguity, need for closure). Moreover, pattern deviancy aversion is linked to social phenomena independent of such variables (Gollwitzer et al., 2017, Gollwitzer, Martel, & Bargh, 2019; Gollwitzer, Martel, Bargh, & Chang, 2019).

Though both reflecting deviancy, pattern deviancy also diverges from prototype deviancy. Prototype deviancy, unlike pattern deviancy, entails deviations from people's perceived perfect mental representation of a category rather than deviations from a pattern (Palmer et al., 2013). For instance, most leaves on a tree are prototypically deviant in that they deviate from the prototype of a perfect leaf; however, these leaves are not pattern deviant as they do not break a repetition or redundancy (a pattern). And finally, pattern deviancy is not the same as novelty. Stimuli that are novel are not necessarily pattern deviant. For instance, consider a grove of many novel, exotic fruits. In this scenario the fruits are novel but not pattern deviant; in the grove, the pattern is the exotic, novel fruits—a common fruit would actually be pattern deviant in this scenario.

## Pattern Deviancy Aversion and Prejudice

Researchers have found pattern deviancy aversion to predict people's prejudice (Gollwitzer et al., 2017). Across seven studies, Gollwitzer and colleagues (2017) found aversion toward nonsocial pattern deviancy (e.g., a row of triangles with one triangle out of line) to predict substantial variance in individuals' prejudice, ~10% to 15%. Prejudice in these studies was represented via participants' dislike of various types of stigmatized individuals (e.g., someone with a skin condition), social-norm breakers, sta-

tistically negative and positive deviants (e.g., someone very poor, someone very rich), and racial minority group-members (Black individuals). Pattern deviancy aversion predicted prejudice against these groups across explicit and implicit measures, across cultures (United States and Chinese), and in children as young as 8 years old. And, this overlap remained when controlling for theoretically relevant variables (e.g., political orientation, disgust, sensitivity toward threat, and disliking ambiguity and unpredictability).

That a factor as basic as people's aversion toward pattern deviancy potentially contributes to prejudice aligns with the universality, early emergence, and domain-generality of prejudice (see Major & O'Brien, 2005; e.g., Bigler & Liben, 2006; Dunham, Baron, & Banaji, 2008; Sigelman, Miller, & Whitworth, 1986; Weiss, 1986). And, the link between pattern deviancy aversion and prejudice also aligns with the targets of prejudice predominantly being individuals who are perceived as violating physical or social patterns in society, that is, people who exhibit physical deviancy (e.g., dwarfism), character deviancy (e.g., addiction), or group-identity deviancy (e.g., minorities in the United States; Goffman, 1963). Furthermore, this link aligns with research indicating that prescriptive judgments (what *should* be) are informed by descriptive judgments (what *is*; e.g., Roberts, Gelman, & Ho, 2017). And finally, the findings of Gollwitzer et al. (2017) may help explain why people are prejudiced against individuals who are harmless yet deviant in society, for instance, individuals with dwarfism or individuals who are transgender (e.g., Lombardi, Wilchins, Priesing, & Malouf, 2002).

## Goals of the Current Research

The research of Gollwitzer et al. (2017) is limited in several respects, however. Most importantly, it remains unknown (a) which mechanisms underlie the relationship between pattern deviancy aversion and prejudice, and (b) whether this relationship is causal. Here, we primarily examine these two questions. Additionally, we (c) exploratorily consider the developmental trajectory of the proposed mechanism in a children's sample (d) examine whether pattern deviancy aversion can help explain the context-dependency and flexibility of prejudice; that is, why the targets and strength of prejudice fluctuates with time and context.

## Mechanism: Proposed Mediation Model

Regarding a potential mechanism, we propose that the link between pattern deviancy aversion and prejudice may in part be mediated by a dislike of statistical minorities—*disliking people who are statistically infrequent in terms of appearance, beliefs, or actions.* Notably, by statistical minorities we mean people who are proportionally infrequent; that is, infrequent in comparison to a majority group. Pattern deviancy aversion may incite prejudice by heightening negative attitudes toward statistical minorities because

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[1] Though people are averse towards broken patterns, researchers have found European Americans but not Asian Americans (and Asians) to exhibit a comparative preference for the *single object* responsible for distorting a pattern, when asked to rank all the shapes in a broken pattern (Kim & Sherman, 2008). When asked to judge the entire broken pattern in a nonranked manner, however, European Americans exhibit a clear aversion towards broken patterns (Gollwitzer et al., 2017).

such individuals distort the repeated model and form (the pattern) of how people tend to feel, think, and act.

Supporting a link between pattern deviancy aversion and disliking statistical minorities (path A of the proposed mediation; Figure 1), statistical minorities are perceived as atypical. Statistical minorities are numerically anomalous and are thus perceived as distinctive and uncharacteristic (Halberstadt, Sherman, & Sherman, 2011; Mullen, 1991; Mullen & Hu, 1989). Indeed, Moscovici (1985) noted that people who are infrequent and uncommon are perceived as deviant because they diverge from the way that people tend to look and act in a society (the established pattern in society).

Research also supports the possibility that the statistical infrequency of individuals incites prejudice (path B of the proposed mediation). For instance, research on the illusory correlation bias finds that people dislike minorities because both negative behaviors and infrequent people are distinctive (Chapman, 1967; Chapman & Chapman, 1969; Hamilton & Gifford, 1976). And further, people may claim that negative evolutionary reasons underlie the infrequency of a certain group or type of individual in society (akin to social Darwinism; e.g., Crandall, 2000; pp. 134–135). Finally, mere exposure (people's preference for stimuli they have seen before; e.g., Zajonc, 1968) and cognitive fluency (people's preference for stimuli that are easily processed; Alter & Oppenheimer, 2009) may induce individuals to dislike minorities because minorities are less likely to be encountered in everyday life (Lick & Johnson, 2015).

Finally, in direct support of the entire proposed mediation model, research has found that pattern deviancy aversion predicts prejudice against stigmatized individuals, social-norm breakers, and racial minorities (Gollwitzer et al., 2017)—all proportional minorities in society (Crocker, Major, & Steele, 1998). Furthermore, Gollwitzer and colleagues (2017) found pattern deviancy aversion to relate to prejudice against 'positive' statistical minorities as well, individuals who are high in power but are infrequent in society (e.g., the very intelligent, the very rich).

In the current article, we test the proposed mediation model across nine studies. To ensure that our findings hold correlationally (at the trait level) as well as experimentally (at the causal level), we included both correlational as well as experimental studies. And, to ensure that the mediation model conceptually replicates, we examined the model in terms of two different types of prejudice, racial prejudice (against Black individuals) and prejudice against other commonly stigmatized individuals in society (e.g., someone with a handicap, someone who is a Muslim).

## Causality

Beyond investigating the proposed mediation model, we also examined whether the relationship between pattern deviancy aver-

sion and prejudice is causal. A causal effect would indicate that the link between pattern deviancy aversion and prejudice is not restricted to individual differences, would reduce the likelihood that this link arises via a confounding third-variable, and would potentially open the door for intervention possibilities. Thus, we tested whether temporarily inducing pattern deviancy aversion causally heightens prejudice (in the United States) against Black people and against other commonly stigmatized individuals in society (e.g., someone with a physical disability).

## Early Emergence of Prejudice

One subordinate aim of the present research was to examine the proposed mediation model from a developmental perspective. A particularly apt way to shed light on prejudice is by examining the development of prejudice. Prejudice is early emerging—children even as young as four exhibit prejudice against Black people (e.g., Aboud, 1988; Bigler & Liben, 2006; Dunham et al., 2008; Raabe & Beelmann, 2011), as well as against other stigmatized individuals (e.g., people who are obese, people with mental illness; Lerner & Gellert, 1969; Sigelman et al., 1986; Weiss, 1986; Westervelt & Turnbull, 1980). Notably, although these targets of children's prejudice are statistical minorities, how children think and feel about people who are uncommon in a population is largely unknown (see Primi & Agnoli, 2002 for one examination).

Potentially, one reason children come to adopt prejudice against stigmatized individuals is because their pattern deviancy aversion incites negative attitudes toward statistical minorities. That is, pattern deviancy aversion—which has been documented in children as young as 3 (Gollwitzer et al., 2017)—may predict children's negative evaluation of infrequent individuals, and in turn their prejudice against stigmatized individuals (given the infrequency of such individuals). We investigated this possibility by examining whether the proposed mediation model also exists in children ranging from 4 to 7 years old.

## Context-Dependent and Flexible Prejudice

A second subordinate aim of the current research is to shed light on why prejudice is both stable and unstable (see Garcia-Marques, Santos, Mackie, Hagá, & Palma, 2017; Payne, Vuletich, & Lundberg, 2017). Although prejudice against certain groups has been around for centuries (e.g., against Jewish individuals), prejudice against other groups fluctuates with time and context. Pattern deviancy aversion may contribute to the context-dependency of prejudice and its targets. What is pattern-deviant in one situation is not necessarily pattern-deviant in another, and thus, who is perceived as deviant and therefore targeted should depend on the surrounding pattern.

With respect to the proposed mediation model, we suggest that pattern deviancy aversion predicts prejudice against whomever the minority might be in a specific context. For instance, paradoxically, people high in pattern deviancy aversion should, absent any other information, exhibit prejudice against Black individuals when Black people are the minority (e.g., in the United States), but exhibit *reduced* prejudice or even a preference for Black people when Black people are the majority (e.g., in countries in Africa).
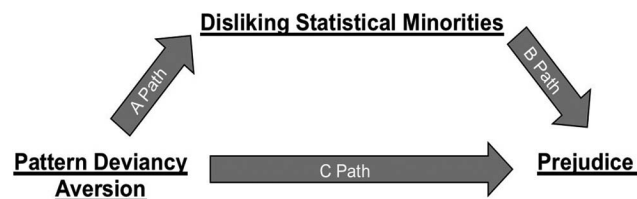


*Figure 1.* The proposed mediation model.

## The Current Research

Across nine studies ($N = 1,821$), we investigate whether pattern deviancy aversion impacts people's prejudice against stigmatized individuals, and whether this effect occurs via a general dislike of statistical minorities—disliking people who are infrequent in a population.

Study-set 1 examined prejudice against Black individuals. Studies 1.1 and 1.2 tested the proposed mediation model in terms of racial prejudice in correlational studies with adults and children. We examined whether nonsocial pattern deviancy aversion relates to disliking novel statistical minorities—minority aliens on imaginary planets (A Path), whether disliking such novel statistical minorities relates to prejudice against Black individuals (B Path), and whether pattern deviancy aversion relates to prejudice against Black individuals (C Path; Figure 1). Finally, we examined whether the link between pattern aversion and racial prejudice is accounted for by participants' dislike of statistical minorities (Indirect Effect). Studies 1.3 and 1.4 again tested the proposed mediation but in a causal manner; we examined whether experimentally manipulating pattern deviancy aversion influences explicit as well as implicit prejudice against Black people, and whether this effect is mediated by a dislike of novel statistical minorities.

In Study-set 2, we extended the proposed mediation model beyond racial prejudice to prejudice against other individuals who are stigmatized in Western society (e.g., someone cross-dressing, someone wearing a Burka). Study 2.1 examined whether the mediation exists in a longitudinal correlational design (pattern deviancy aversion assessed at Time 1, disliking statistical minorities at Time 2, prejudice against stigmatized individuals at Time 3). In Studies 2.2 and 2.3, we tested the mediation in a causal manner. And, in line with a causal mediation model, in Study 2.3, we tested whether intervening on the proposed mediator—disliking statistical minorities—eliminates the effect of pattern deviancy aversion on prejudice.

Finally, Study-set 3 tested whether pattern deviancy aversion predicts prejudice that is context-dependent in terms of group-size. We examined whether pattern deviancy aversion predicts greater prejudice against Black people (Study 3.1) and Muslims (Study 3.2) when such people are presented as statistical minorities in society, but also predicts *decreased* prejudice against Black people and Muslims when such people are presented as statistical majorities in society. Such results would strongly align with the claim that pattern deviancy aversion is linked to prejudice via a dislike of statistical minorities, and further, would theoretically extend our findings by demonstrating that pattern deviancy aversion is linked to context-dependent, flexible prejudice.

One challenge we encountered was differentiating between minorities in terms of infrequency in a population (Doms, 1984; Latané & Wolf, 1981; Tanford & Penrod, 1984) and low social status or power (Blanz, Mummendey, & Otten, 1995; Moscovici, 1976; Mugny, 1982). As argued by Kruglanski and Mackie (1990), in the Western world, statistical minorities are likely seen as underprivileged and disadvantaged.[2] A potential link between pattern deviancy aversion and disliking statistical minorities may thus be driven by a dislike of low power individuals rather than a dislike of infrequent people in a population. Indeed, pattern deviancy aversion may predict disliking low-status individuals because

such people are potentially associated with instability, disorder, and rebellion (Kruglanski & Mackie, 1990). Therefore, we controlled for participants' power ratings—the extent to which they judged statistical minorities and majorities as being in charge, in many of the reported studies.[3]

A final challenge is the group membership of our participants. Researchers have noted the importance of recognizing that participants' racial identity may moderate psychological findings, especially in terms of prejudice (Brown, 1995; Henrich, Heine, & Norenzayan, 2010; Nielsen, Haun, Kärtner, & Legare, 2017). To recognize this concern and present inclusive findings, we examined whether our results differed depending on the racial identity of participants.

## Study-Set 1: Racial Prejudice

Study-set 1 examined the proposed mediation model in terms of racial prejudice (against Black individuals). In Study 1.1, we first tested this mediation in a correlational manner. As noted earlier, because statistical minorities may be perceived as less powerful than majorities (e.g., Kruglanski & Mackie, 1990), we controlled for the extent to which participants judge novel statistical minorities and majorities as being in charge.

## Method

**Participants.** A power-analysis based on Study S3 (a pilot study examining the correlation between pattern deviancy aversion and racial prejudice; $r = .15$; see online supplemental materials),[4] revealed that we needed 346 participants to have 80% power. We aimed to recruit 375 adults on Mechanical Turk (MTurk). We ended up recruiting 377 participants residing in the United States (193 female; $M_{age} = 36.48$, $SD_{age} = 11.29$). Nine participants were excluded for failing an attention check. Of the final participants, 35 identified as Asian/Asian American, 45 as Black/African American, 19 as Latino/Hispanic, 262 as White/European American, three as other, and four as more than one race. See the online supplemental materials for a link to the verbatim methodology and data files of all the presented studies. All the presented studies were conducted in compliance with APA ethical standards.

**Pattern deviancy aversion.** Pattern deviancy aversion was assessed via three measures (presented in random order). The first was an adapted version of the measure validated by Gollwitzer et al. (2017; this identical measure was also used by Gollwitzer, Martel, Bargh, & Chang, 2019). Participants evaluated five pairs of broken and unbroken patterns comprised of

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[2] Though see (Cao & Banaji, 2017, who found that people in the United States) perceive small groups as more competent explicitly but not implicitly.

[3] Though we control for participants' power judgments, we note that statistical minorities are not always subordinate. Statistical minorities have held power in the past (e.g., feudal Europe), and in some cases are currently the dominant group (e.g., White people in South Africa).

[4] Before conducting Study 1.1, we conducted Studies S1, S2, and S3. Studies S1 (conducted with adults) and S2 (conducted with children) were correlational studies that examined solely Path A of the proposed mediation. Study S3 was a correlational study that examined the full mediation model but had a smaller sample size than Study 1.1 (see the online supplemental materials).

geometric shapes: "How much do you like the above image?" (1 = *not at all* to 7 = *a lot*; reverse-coded; see Figure 2).[5] Each image was presented individually and in randomized order. As noted by Gollwitzer et al. (2017), these stimuli were created in line with conceptualizations of pattern distortion (repetition or rule violations) in research on pattern-recognition (Garner, 1970; Näätänen et al., 1993; Posner, 1973).

The two other pattern deviancy aversion measures were nonvisual measures validated by Gollwitzer et al. (2017; Gollwitzer, Martel, & Bargh, 2019; Gollwitzer, Martel, Bargh, & Chang, 2019). The first assessed participants' attitudes toward explicit pattern deviancy aversion. Participants responded to the following: "People feel differently about things that break a pattern, are out of line, and are disordered. How much do you agree with the following statements? Things that break a pattern, are out of line, and are disordered make me feel . . ." "Positive," "Happy," and "Content," scored on a Likert-scale from 1 (*not at all agree*) to 7 (*strongly agree*; reverse-coded).

The second nonvisual measure was one of mental imagery. Participants read: "Imagine a collection of objects where all the objects are very similar to one-another . . . if an object that is very different from the other objects is added to the collection that would make me feel . . ." Again, participants responded to three items: "Positive," "Happy," and "Content," scored on a Likert-scale from 1 (*not at all agree*) to 7 (*strongly agree*; reverse-coded).

**Disliking statistical minorities.** Participants evaluated novel statistical minorities and majorities on six different planets. The inhabitants of these planets were 50 red (blue) people and seven blue (red) people (statistical minority: ~15%; color counterbalanced). We then depicted the minority and the majority individually and assessed two response-items: Participants' liking, "How much do you like these people?" (1 = *not at all* to 7 = *a lot*), and desired identity judgments, "If you lived on this planet, would you want to be this type of person" (1 = *not at all* to 7 = *absolutely*; Figure 3).

**Power judgments.** In response to the minority and in response to the majority (individually presented; randomized), participants read, "How much do you think these people are in charge on the planet" (1 = *not at all in charge* to 7 = *completely in charge*). Within each planet, the order of the two disliking statistical minorities items and the power item was randomized (see Figure 3).

**Distractor.** Before assessing racial prejudice, we presented a distractor task—an unrelated word search task. We did so because participants may feel compelled to match their responses on the racial prejudice measure to their responses on the disliking statis-
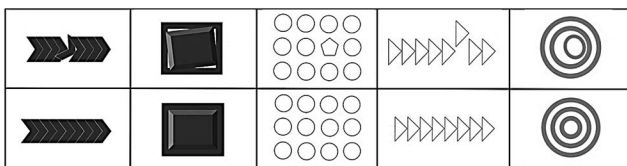


*Figure 3.* Example item of the disliking statistical minorities measure in Study 1.1. The example item is of participants' evaluation of the minority. See the online article for the color version of this figure.

tical minorities measure (i.e., exhibit prejudice if they had previously exhibited a dislike of minorities).

**Racial prejudice.** We presented 16 images, each depicting either a White (eight images) or a Black (eight images) individual. Half of the images were from a race Implicit Associations Test (IAT) measure (Greenwald, McGhee, & Schwartz, 1998). These images have been used in previous research linking pattern deviancy aversion to racial prejudice (Gollwitzer et al., 2017), and have been validated in past research examining racial prejudice (see Nosek, Banaji, & Greenwald, 2002 and Xu, Nosek, & Greenwald, 2014). The other half were from the NimStim2 faces dataset (Tottenham et al., 2009); these faces have also been used in past research on racial prejudice (see Donders, Correll, & Wittenbrink, 2008, and Sesko & Biernat, 2010). In response to each image, participants read: "I like this person," "I feel positively about this



*Figure 2.* Study 1.1: The geometric shapes pattern deviancy aversion measure. Example items of the broken patterns (top row) and their matched unbroken counterparts (bottom row). Each image was presented and evaluated individually.
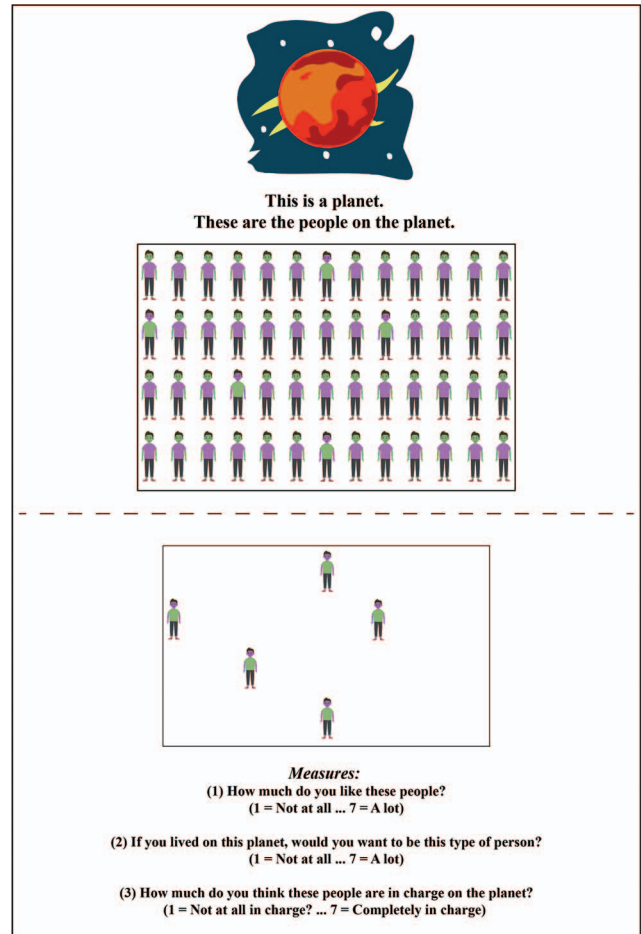
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[5] The items assessed liking and not disliking of broken patterns. However, we refer to participants' responses as pattern deviancy *aversion* because participants reported liking the broken patterns less than the unbroken patterns (see results section below). We also confirmed in the other studies reported here that our findings replicate across item-valence.
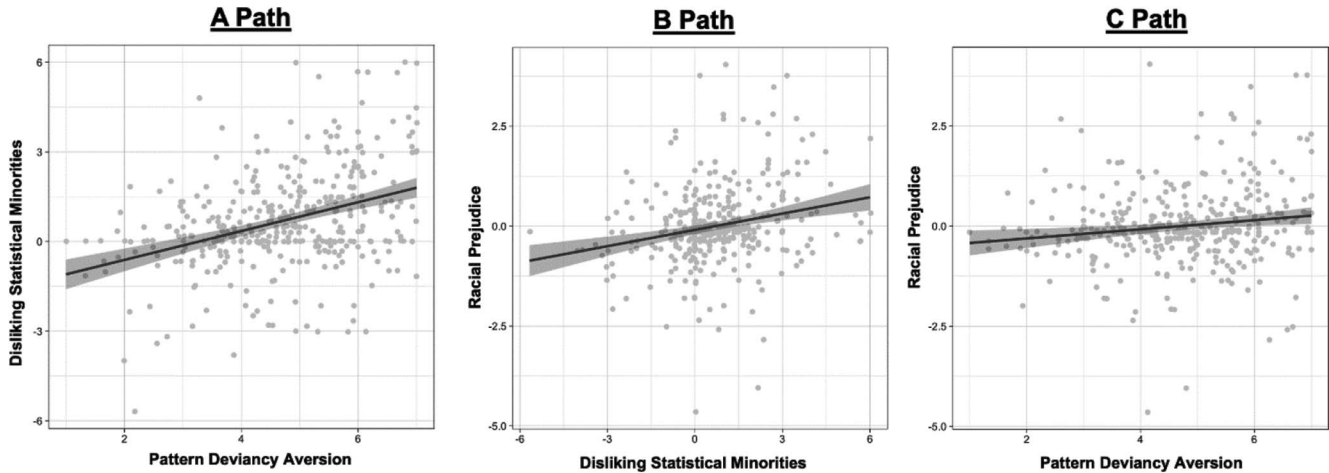
*Figure 4.* Correlations between key variables—pattern deviancy aversion, disliking statistical minorities, and racial prejudice against Black individuals (when controlling for prejudice against White individuals)—in Study 1.1; Error bands: ±1 *SE*.

person," "I would like to be friends with this person" 1 (*not at all agree*) to 7 (*strongly agree*). We used positive items to assess prejudice as recommended by past literature; floor effects are often found when assessing prejudice in a negative manner because people do not want to admit being prejudiced (see Maass, Castelli, & Arcuri, 2000).

**Procedure.** In line with the proposed mediation model, participants completed the pattern deviancy aversion measure, then the disliking statistical minorities and power measures (randomized), then the distractor task, and then the racial prejudice measure.

**Attention check.** Participants completed an indirect attention check (see the online supplemental materials). This attention check was in all reported studies except Study 1.2, which was with children.

## Results

We calculated pattern deviancy aversion by reverse-coding participants' responses and averaging across the three included measures, $M = 4.72$, $SD = 1.29$; the three measures strongly loaded on a single factor (Eigenvalue of 2.15; principle axis factor analysis) and exhibited high reliability, $\omega_t = .81$.[6] Participants' dislike of statistical minorities was calculated by averaging their liking and desired identity responses toward the majority and subtracting their liking and desired identity responses to the minority, difference score: $M = .69$, $SD = 1.70$, $\omega_t = .94$. Participants' prejudice was calculated by reverse-coding and averaging across the three liking items in response to the eight images of Black individuals, $M = 4.13$, $SD = 1.24$, $\omega_t = .98$.[7]

Participants exhibited pattern deviancy aversion—they preferred the unbroken patterns over the broken patterns, $p < .001$, $d_z = 1.09$. Participants also disliked statistical minorities—they preferred novel statistical majorities over minorities, $p < .001$, $d_z = .41$, and judged the majorities as more in charge than the minorities, $p < .001$, $d_z = .89$. Finally, participants exhibited prejudice—they preferred White over Black individuals, $p = .005$, $d_z = .15$ (Table S4).

Importantly, as predicted, pattern deviancy aversion related to disliking novel minorities, $r(366) = .37$, $p < .001$ (path A in the proposed mediation model; Figure 4). And, disliking novel minorities related to racial prejudice, $r(365) = .23$, $p < .001$ (B path; we controlled for prejudice against White individuals in this analysis via a partial correlation). Finally, replicating Gollwitzer and colleagues (2017), pattern deviancy aversion related to racial prejudice, $r(365) = .15$, $p = .003$ (C path; we controlled for prejudice against White individuals in this analysis via a partial correlation). The relationship between pattern deviancy aversion and disliking statistical minorities remained, $r(365) = .28$, $p < .001$, when controlling for power judgments—participants' judgments of whether novel statistical minorities or majorities are in charge.

We conducted a mediation analysis using SPSS PROCESS macro (Hayes, 2012). Five thousand bootstrap samples were used to create 95% bias-corrected and accelerated (BCa) confidence intervals to test the mediation. Our analysis supported the hypothesized mediation model: The link between pattern deviancy aversion and prejudice significantly reduced and was no longer significant after accounting for participants' dislike of statistical minorities. Approximately 50% of the relationship between pattern deviancy aversion and racial prejudice was accounted for by a general dislike of statistical minorities—dislike of people who are proportionally infrequent in a population. As such, these results also indicate that mediators aside from disliking statistical minorities likely exist given the 50% unexplained variance. Importantly, the observed indirect relationship remained when controlling for participants' power judgments (see Table 1). These results should be approached cautiously, however, given the correlational nature of the study.

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[6] Participants' dislike of unbroken patterns of geometric shapes was not included in our analyses as a control variable because it correlated negatively with dislike of broken patterns, $r(366) = -.15$, $p = .004$. Doing so did not change any of the results.

[7] We controlled for participants' prejudice towards White individuals in the latter analyses because participants responses towards Black and White individuals were highly positively correlated.

Table 1
*Mediation Analyses in Study 1.1 (Adults)*

| Effect | Predictor variable | Mediator | Dependent variable |
|---|---|---|---|
| Study 1.1 ($N = 368$) | Pattern deviancy aversion | Disliking statistical minorities | Racial prejudice |
| Total effect | $\beta = .098$, *SE* $= .033$, $t = 2.97$, $p = .003$, 95% CI [.033, .163]* | | |
| | $\beta = .090$, *SE* $= .033$, $t = 2.73$, $p = .007$, 95% CI [.025, .154][a]* | | |
| Direct effect | $\beta = .051$, *SE* $= .035$, $t = 1.45$, $p = .147$, 95% CI [−.018, .119] | | |
| | $\beta = .053$, *SE* $= .034$, $t = 1.56$, $p = .119$, 95% CI [−.014, .119][a] | | |
| Indirect effect | $\beta = .047$, *SE* $= .014$, 95% CI [.022, .078]* | | |
| | $\beta = .037$, *SE* $= .012$, 95% CI [.017, .062][a]* | | |

*Note.* The relationship between pattern deviancy aversion and racial prejudice was mediated by disliking statistical minorities. $\beta$ = standardized estimate; *SE* = standard error; CI = confidence interval.
[a] Controlling for participants' power judgments.
* $p < .05$.

Initially we had planned to examine whether the results in each of our studies are moderated by participants' racial identity. However, given the small number of minority participants in Study 1.1 (and the subsequent studies), we collapsed across the presented studies and report these analyses directly before the General Discussion.

## Study 1.2

Study 1.2 provided an exploratory and preliminary test of whether the observed mediation in Study 1.1 holds true in children (4- through 7-year-olds). By doing so, we tentatively examine whether pattern deviancy aversion plays a role in the development of prejudice (e.g., Bigler & Liben, 2006; Dunham et al., 2008; Sigelman et al., 1986; Weiss, 1986). Specifically, children in the United States may develop prejudice against Black individuals because their pattern deviancy aversion incites them to dislike people who are infrequent in a population.

We recruited children aged between 4 and 7. We chose this age range because studies documenting prejudice in children have largely been conducted with children as young as 4 but not younger (e.g., Dunham et al., 2008; Sigelman et al., 1986). Further, our study materials are unlikely to have been suitable for children younger than 4 years old. Regarding the upper age-range, we chose to recruit 7-year-olds but not older children because Dunham and colleagues (2008) have documented that older children in the United States begin to regulate their explicit prejudice against Black people (respond in a more egalitarian manner).

### Method

**Design.** The design was largely as in Study 1.1, but did not include the distractor task.

**Participants.** Given the difficulty of collecting large samples of children, our power analysis was based on the relationship between pattern deviancy aversion and disliking statistical minorities (Study S3, $r = .39$; a similar correlation was found in Study 1.1, $r = .37$). That is, we had 90% power to detect at least this relationship in children (though we had poor power, ~20%, to detect the relationship between pattern deviancy aversion and racial prejudice, $r = .15$; Study 1.1).[8] We recruited 67 children ranging from 4 to 7 years old; at least 15 per age group. Participants (37 female; $M_{age} = 5.83$, $SD_{age} = 1.18$) were recruited at a laboratory ($n = 29$) and local museum ($n = 38$) in the Northeast of the United States. Experimenters read all the materials orally while the children responded on a tablet. Four children were excluded because their ages later revealed that they were 3 years old. Five additional participants were excluded, three for failing an attention check (described in the materials below), and two for not paying attention (including these participants did not change the results; final $N = 58$). Of the final participants, one was Asian/Asian American, six were Black/African American, five were Latino/Hispanic, 45 were White/European American, and one was Other.

**Pattern deviancy aversion.** We utilized a binary version of the geometric shapes pattern deviancy aversion measure of Study 1.1 (young children may find it easier to respond to these items on binary scales; see Study S2). Children were presented with the pairs of broken and unbroken patterns of geometric shapes (randomized order; screen-side randomized) and asked for each pair of images: "Which picture do you like more?"

**Disliking statistical minorities.** We utilized a binary version of the minority dislike measure of Study 1.1. Again, the two response-items were, preference: "Who do you like more—These people or these people?" and group-identity: "If you lived on this planet, which type of person would you want to be—These people or these people?" 0 = *minority*, 1 = *majority*.

**Power judgments.** We adapted the power item of Study 1.1 to measure children's power judgments: "Who do you think is in charge on the planet—These people or these people?" 0 = *minority*, 1 = *majority*. This item has been validated in previous developmental research (Gülgöz & Gelman, 2017).

**Racial prejudice.** We utilized a binary version of the racial prejudice measure of Study 1.1. Eight items each depicting a pair of the White and Black individuals included in Study 1.1 were presented (screen-side randomized). Participants were asked:

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[8] We did not collect more children in this study because of resource constraints. We realize that 20% power is problematic. However, this was solely the power to observe the link between pattern deviancy aversion and racial prejudice. For instance, as noted earlier, we had around 90% power to observe the link between pattern deviancy aversion and disliking minorities (based on Study S2 and Study 1.1), and indeed, we did observe this link (see results).

1.1 and 1.2 observed the hypothesized mediation in adults and tentatively in children 4 to 7 years old, albeit, in a correlational manner.

Notably, the developmental findings (Study 1.2) are largely exploratory and limited given the small sample size; the results should be considered with caution and are predominantly reported here to encourage future research. Possibilities for future research include examining how the exposure of children to the targets of prejudice being tested moderates the potential link between pattern deviancy aversion and prejudice, and how this link relates to other studied predictors of prejudice in children, such as essentialism.

## Studies 1.3 and 1.4: Experimental Mediation Analyses—Racial Prejudice

Researchers have noted the risks of deriving process/mediation models from correlational data (e.g., Bullock, Green, & Ha, 2010; Fiedler, Schott, & Meiser, 2011). In Studies 1.3 and 1.4, we conducted causal experiments. Specifically, we experimentally manipulated pattern deviancy aversion and examined the proposed mediation model in terms of explicit (Study 1.3) and implicit (Study 1.4) racial prejudice.

### Method

**Design.** In both studies, participants were prompted to generate either negative or positive aspects of nonsocial pattern deviancy (between-subjects: high vs. low pattern deviancy aversion). We then assessed participants' dislike of novel statistical minorities (mediator), and thereafter their prejudice against Black people (dependent variable).

**Participants.** A power-analysis (correlation between pattern deviancy aversion and racial prejudice in Gollwitzer and colleagues [2017]; approximately $r = .20$) revealed that we needed approximately 192 participants to achieve 80% power. We recruited 268 participants in Study 1.3, and 199 participants in Study 1.4. Of the total participants (Study 1.3: 161 female; $M_{age} = 36.21$, $SD_{age} = 12.41$; Study 1.4: 120 female; $M_{age} = 37.30$, $SD_{age} = 11.78$), 19 participants (Study 1.3) and eight participants (Study 1.4) were excluded for failing one or more of the attention check items. In Study 1.3, an additional response was excluded because a participant took the experiment twice. Of the final participants in Study 1.3, 12 identified as Asian/Asian American, 12 as Black/African American, 12 as Latino/Hispanic, 201 as White/European American, three as other, and eight as more than one race. Of the final participants in Study 1.4, nine identified as Asian/Asian American, 13 as Black/African American, seven as Latino/Hispanic, 157 as White/European American, two as other, and three as more than one race.

**Pattern deviancy manipulation.** Participants were either assigned to generate and reflect on negative (high pattern deviancy aversion) or positive (low pattern deviancy aversion) attributes of nonsocial pattern deviancy. Participants read and responded to the following prompt:

> Think of things/objects that break a pattern, are out of line, and create disorder. What are three negative (*positive*) attributes of such things/objects? For instance, what is something negative (*positive*) about a few objects that are different in a collection of objects that are all the same? For example, what is something negative (*positive*) about a few

blueberries in a bowl of many strawberries, or what is something negative (*positive*) about the images below?

The images presented to participants depicted two of the broken patterns of geometric shapes included in Studies 1.1 and 1.2 (see Figure S4). Participants thereafter were prompted to imagine and reflect on the negative (versus *positive*) attributes of pattern deviancy that they had come up with (depending on condition). In all of the studies, participants were reminded of their response to the manipulation before they completed each of the disliking statistical minorities, racial prejudice, and pattern deviancy manipulation check measures (see the online supplemental materials for complete materials).[10]

**Disliking statistical minorities and power judgments.** Participants' dislike of statistical minorities and power judgments were assessed as in Study 1.1.

**Racial prejudice.** In Study 1.3, the racial prejudice measure was that of Study 1.1.[11] In Study 1.4, racial prejudice was assessed via a race IAT (Greenwald et al., 1998). Participants' IAT scores were reverse-coded so that higher scores indicated greater prejudice (for details see the online supplemental materials).

**Manipulation check: Pattern deviancy aversion.** The pattern deviancy aversion manipulation check in Studies 1.3 and 1.4 was a shortened version of the geometric pattern deviancy aversion measure from Study 1.1.

**Attention checks.** Participants completed three attention checks (see the online supplemental materials).

**Procedure.** In each study, participants were first randomly assigned to the high or low pattern deviancy aversion condition. Participants then completed the dislike of statistical minorities and power measures, thereafter the racial prejudice measure, and finally, the pattern deviancy aversion manipulation check.

### Results

In both studies, the pattern deviancy aversion manipulation successfully altered participants' pattern deviancy aversion, $ps < .001$. Further, in each study, participants in the high (vs. low) pattern deviancy aversion condition reported greater dislike of novel statistical minorities, $ps < .001$ (A path). This effect remained when controlling for participants' power judgments, $ps < .001$ (see Table 3). Additionally, in each study, disliking novel statistical minorities related to racial prejudice (B path); Study 1.3: $r(245) = .20$, $p = .002$ (explicit racial prejudice); Study 1.4: $r(184) = .20$, $p = .006$ (implicit racial prejudice).

We did not, however, find a total effect of pattern deviancy aversion on racial prejudice in either of the two studies (C path; Table 3). Given these inconclusive results, we conducted an *exploratory* meta-analysis of the findings of Studies 1.3 and 1.4 (and two online supplemental materials, Studies S4 and S5, which also examined the effect of pattern deviancy aversion on racial prejudice; see the online supplemental materials for details). We did not

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[10] Repeatedly reminding participants of their response to the manipulation prompt may have heightened demand effects. In Study-set 2, we dealt with this issue by removing these reminder prompts.

[11] We also included a stereotype item in Study 1.3: "This person is unlikely to be a criminal" for exploratory purposes. We found no effect of pattern deviancy aversion on this item (see the online supplemental materials).

Table 3

*Experimental Effects in Studies 1.3 and 1.4*

| Measure | High pattern deviancy aversion (*M* and *SD*) | Low pattern deviancy aversion (*M* and *SD*) | Significance test |
|---|---|---|---|
| Study 1.3 | *n* = 129 | *n* = 119 | |
| Manipulation check | | | |
| Pattern deviancy aversion | 2.91, 2.03 | 0.64, 1.89 | $F(1, 246) = 82.75$, $p < .001$, $\eta_p^2 = .252$ |
| Mechanism | | | |
| Disliking statistical minorities | 0.65, 1.89 | −0.53, 1.68 | $F(1, 246) = 27.21$, $p < .001$, $\eta_p^2 = .100$ |
| Disliking statistical minorities[a] | 0.57, 1.76 | −0.45, 1.76 | $F(1, 245) = 20.28$, $p < .001$, $\eta_p^2 = .076$ |
| Dependent variable | | | |
| Racial prejudice (continuous) | 4.11, 1.17 | 3.84, 1.21 | $F(1, 245) = 2.89$, $p = .090$, $\eta_p^2 = .012$ |
| Study 1.4 | *n* = 102 | *n* = 89 | |
| Manipulation check | | | |
| Pattern deviancy aversion | 2.91, 1.95 | 0.27, 1.84 | $F(1, 189) = 92.26$, $p < .001$, $\eta_p^2 = .328$ |
| Mechanism | | | |
| Disliking statistical minorities | 0.59, 1.87 | −0.48, 1.49 | $F(1, 189) = 18.82$, $p < .001$, $\eta_p^2 = .091$ |
| Disliking statistical minorities[a] | 0.56, 1.67 | −0.44, 1.68 | $F(1, 188) = 16.79$, $p < .001$, $\eta_p^2 = .082$ |
| Dependent variable | | | |
| Racial prejudice (implicit) | 0.30, 0.36 | 0.32, 0.40 | $F(1, 184) = 0.16$, $p = .687$, $\eta_p^2 = .001$ |

*Note.* Effects of pattern deviancy aversion manipulation on disliking novel statistical minorities and racial prejudice (prejudice against Black individuals).
[a] Controlling for participants' power judgments.

observe a convincing total effect collapsed across these studies; our meta-analysis indicated that if a total effect of pattern deviancy aversion on racial prejudice does exist, this effect is exceedingly small ($r \sim .06$; see the online supplemental materials).

Despite not observing a significant total effect, the proposed mediation was found in both studies: The link between pattern deviancy aversion and racial prejudice was mediated by disliking novel statistical minorities. These mediation analyses remained significant when controlling for participants' power judgments (see Table 4), and further, a moderated mediation—with power judgments as the moderator—was not found. In both studies, the mediation model was also not moderated by participants' political orientation, age, or sex (see the online supplemental materials).

## Discussion: Studies 1.3 and 1.4

Studies 1.3 and 1.4 provide experimental evidence for the proposed mediation model. Participants induced with high pattern deviancy aversion compared with those induced with low pattern deviancy aversion exhibited a greater dislike of novel statistical minorities, and this dislike predicted their degree of racial prejudice. This mediation was found across explicit (Study 1.3) and implicit (Study 1.4) measures of racial prejudice, and the mediation remained when controlling for participants' power judgments—participants' judgments of who was likely to be in charge in a population (novel minorities vs. novel majorities). Furthermore, the mediation was not moderated by participants' power

Table 4

*Mediation Effects in Studies 1.3 and 1.4*

| Effect | Predictor variable | Mediator | Dependent variable |
|---|---|---|---|
| Study 1.3 (*n* = 248) | Pattern deviancy aversion | Disliking statistical minorities | Racial prejudice (explicit) |
| Total effect | $\beta = .118$, *SE* = .070, $t = 1.70$, $p = .090$, 95% CI [−.019, .255] | | |
| | $\beta = .145$, *SE* = .071, $t = 2.06$, $p = .041$, 95% CI [.006, .284][a*] | | |
| Direct effect | $\beta = .056$, *SE* = .072, $t = 0.77$, $p = .442$, 95% CI [−.087, .198] | | |
| | $\beta = .079$, *SE* = .072, $t = 1.10$, $p = .271$, 95% CI [−.062, .220][a] | | |
| Indirect effect | $\beta = .063$, *SE* = .026, 95% CI [.019, .119][*] | | |
| | $\beta = .066$, *SE* = .025, 95% CI [.024, .121][a*] | | |
| Study 1.4 (*n* = 186) | Pattern deviancy aversion | Disliking statistical minorities | Racial prejudice (implicit) |
| Total effect | $\beta = −.060$, *SE* = .147, $t = −.40$, $p = .687$, 95% CI [−.350, .231] | | |
| | $\beta = −.031$, *SE* = .148, $t = −0.21$, $p = .835$, 95% CI [−.323, .261][a] | | |
| Direct effect | $\beta = −.200$, *SE* = .151, $t = −1.32$, $p = .189$, 95% CI [−.498, .099] | | |
| | $\beta = −.178$, *SE* = .150, $t = −1.18$, $p = .238$, 95% CI [−.474, .119][a] | | |
| Indirect effect | $\beta = .140$, *SE* = .053, 95% CI [.043, .247][*] | | |
| | $\beta = .147$, *SE* = .052, 95% CI [.053, .256][a*] | | |

*Note.* Pattern deviancy aversion's effect on racial prejudice was mediated by disliking statistical minorities. $\beta$ = standardized estimate; *SE* = standard error; CI = confidence interval.
[a] Controlling for participants' power judgments.
[*] $p < .05$.

judgments, political orientation, age, or biological sex in either of the presented studies, and online supplemental material confirmed that the observed mediation holds across binary and continuous measures of racial prejudice (Study S4).

Although we observed the proposed mediation model in Studies 1.3 and 1.4, and observed a significant correlation between pattern deviancy aversion and racial prejudice in Study 1.1, we did *not* find a total effect of pattern deviancy aversion on racial prejudice. Observing significant mediations and nonsignificant total effects is not uncommon; total effects are typically smaller (and thus require greater power to observe) than indirect effects (Kenny & Judd, 2014). These results indicate that although pattern deviancy aversion is indirectly linked to racial prejudice, temporarily manipulating pattern deviancy aversion does not seem to meaningfully impact racial prejudice.

Possibly, a total effect of pattern deviancy aversion on racial prejudice was not observed because this causal link develops over time and is difficult to induce in a state manner. Alternatively, or additionally, this total effect was not observed because of the societal and historical complexity of prejudice against Black individuals in the United States. That is, other social and societal variables may take precedence. Variables such as group-threat, dominance motives, institutional factors, resource competition, histories of oppression, dehumanization, and egalitarianism (see Nelson, 2009) may eliminate or suppress any effects of pattern deviancy aversion on racial prejudice. We discuss this possibility in greater depth in the general discussion.

Finally, we note some limitations of Studies 1.3 and 1.4. First, the studies did not include a no-treatment control. As such, it remains unclear whether increasing pattern deviancy aversion heightens prejudice or decreasing pattern deviancy aversion reduces prejudice. Second, Studies 1.3 and 1.4 only examined prejudice against Black individuals; these studies did not examine prejudice against other target groups. We address this issue in Study-set 2.

## Study-Set 2: Prejudice Against Stigmatized Individuals

Given the results of Study-set 1, Study-set 2 ($k = 3$; $N = 602$) had three main goals. First, we wished to examine whether the mediation model observed in Study-set 1 extends beyond prejudice against Black individuals; does the observed mediation hold true for other groups of stigmatized people in Western society (e.g., someone with dwarfism, someone wearing a Burka; someone with a skin condition)? To examine this possibility, Study 2.1 tested the proposed mediation model in terms of prejudice against various groups of stigmatized individuals in a longitudinal, correlational manner, and Studies 2.2 and 2.3 tested this mediation model in an experimental manner.

Second, we examined whether pattern deviancy aversion, although it largely did not directly affect prejudice toward Black people in Studies 1.3 and 1.4, does have an effect on prejudice against other types of stigmatized individuals (Studies 2.2 and 2.3). Supporting this possibility, pattern deviancy aversion correlates more strongly with prejudice toward various types of stigmatized individuals than it does with prejudice against Black individuals (Gollwitzer et al., 2017).

Third, we sought to establish a *causal* pathway in terms of the proposed mediation. Study 2.3 examined whether intervening at

the level of the mediator, disliking statistical minorities, reduces or eliminates the effect of pattern deviancy aversion on prejudice. Such an effect would support a causal pathway (e.g., Kendler & Campbell, 2009; Spencer, Zanna, & Fong, 2005) from pattern deviancy aversion to prejudice via a dislike of statistical minorities.

## Study 2.1

Study 2.1 was a longitudinal, correlational study. Pattern deviancy aversion was assessed at Time 1, disliking novel statistical minorities at Time 2 (2 days later), and prejudice against stigmatized individuals at Time 3 (6 days later). This design was adopted for two reasons. First, we sought to reduce the possibility that demand bias drives our findings; the earlier studies were all conducted in a single setting and the measures all shared connotations of deviancy. Second, mediation models suggest a time-course in terms of longitudinal progression. If the proposed mediation model is valid, then the mediation should be observed even when the variables of interest are assessed in a longitudinal manner.[12] In Study 2.1, we also assessed participants' aversion toward novel stimuli (their novelty aversion) to exclude the possibility that our findings are simply driven by a dislike of novelty.

### Method

**Design.** The design of Study 2.1 was correlational and longitudinal. We assessed pattern deviancy aversion at Time 1, dislike of novel statistical minorities at Time 2 (2 days after Time 1), and prejudice against stigmatized individuals at Time 3 (6 days after Time 1). We also assessed participants' aversion toward novelty (Time 1).

**Participants.** A power-analysis based on the findings of Gollwitzer et al. (2017; $r = .32$) revealed that we needed 98 participants to have 90% power. However, we aimed to collect 400 participants to account for participants dropping out after Time 1 and Time 2, and to account for smaller effect sizes given the longitudinal nature of the study. The number of recruited participants was 404 (MTurk; 213 female; $M_{age} = 38.99$, $SD_{age} = 12.67$). Of the 404 participants, 140 were excluded because they did not complete all three parts of the survey. Six additional participants were excluded for failing an attention check. Of the final participants ($N = 258$), 21 identified as Asian/Asian American, 22 as Black/African American, 12 as Latino/Hispanic, 197 as White/European American, two as other, and four as more than one race.

**Time 1: Pattern deviancy aversion.** We assessed the three measures of nonsocial pattern deviancy aversion from Study 1.1.

**Time 1: Novelty aversion.** We assessed participants' dislike of novelty via a face-valid three-item measure (see Gollwitzer & Clark, 2018). Participants read: "People feel differently about things that are new, novel, and original. How uncomfortable do the following things make you feel?" and responded to three items:

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[12] Of course, the longitudinal design reported here is not the classic way to test a mediation model longitudinally, which would include measuring each of the relevant variables at each time point. We did not do so because our main goal was to reduce demand/response bias and presenting the three relevant variables at each time point would have defeated this purpose.
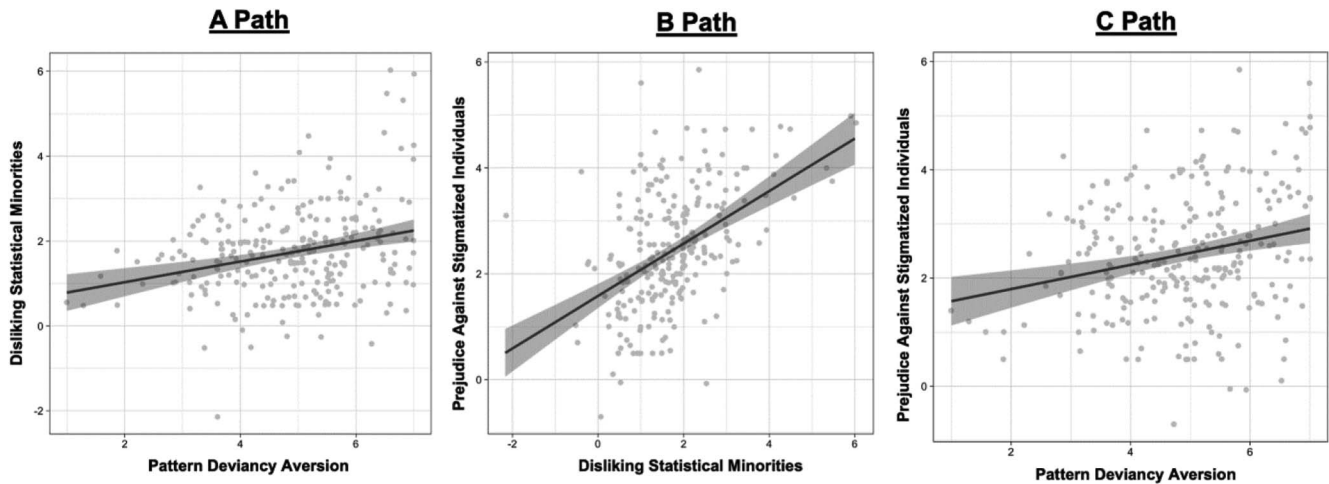
## A Path



## B Path

## C Path

*Figure 5.* Study 2.1: Correlations between key variables—pattern deviancy aversion, disliking statistical minorities, and prejudice against stigmatized individuals. Study 2.1 was longitudinal. Error bands: ±1 *SE*.

"New Things," "Novel Things," and "Original Things" (1 = *not at all uncomfortable* to 7 = *extremely uncomfortable*).

**Time 2: Disliking statistical minorities.** We assessed disliking statistical minorities using the measure of Studies 1.1, 1.3, and 1.4. We also added a second, face-valid minority dislike measure to increase the generalizability of our findings, and to ensure that our findings are not constrained to visual measures. Participants read: "How do you feel about statistical minorities in society, that is, how do you feel about individuals who are statistically anomalous in society in terms of their appearance, actions, and attitudes . . ." and then responded to three items: "I want to be friends with such people," "I like such people," and "I feel warmly towards such people" (1 = *not at all agree* to 7 = *strongly agree*; responses were reverse-coded to represent dislike). We averaged across these two measures to create a single disliking statistical minorities score for each participant.

**Time 3: Prejudice against stigmatized individuals.** Participants evaluated 20 images each depicting a different person. Ten of these images depicted *normative* individuals, and the other 10 depicted individuals commonly stigmatized in society (e.g., someone with a physical disability, someone with a skin condition, someone crossdressing, someone wearing a Burka; randomized order; similar images were included in Gollwitzer et al., 2017). In response to each image, participants responded with 1 = *I do not like this person* to 7 = *I like this person* (see Verbatim Methodology files for images).

To extend the generalizability of our findings, we also assessed prejudice against stigmatized individuals using a nonvisual and arguably more standardized measure: Participants' general evaluation of varying types of people (see Cottrell & Neuberg, 2005; Johnson, Rowatt, & LaBouff, 2010). Participants reported how much they like someone transgender, a highly committed Muslim, someone with mental illness, and someone homeless (1 = *I do not like this person* to 7 = *I like this person*; reverse-coded; randomized; see the online supplemental materials). Again, we used positive response items because floor effects are often found when assessing prejudice in a negative manner (due to egalitarian concerns; Maass et al., 2000). We averaged across the visual and

nonvisual prejudice measures to create a single prejudice score for each participant.

**Prejudice against women.** Participants reported how much they like someone who is a woman (1 = *I do not like this person* to 7 = *I like this person*; reverse-coded). Pattern deviancy aversion should *not* relate to prejudice against women given that women are not a statistical minority in society and are largely not perceived as socially deviant.

**Procedure.** At Time 1, participants completed the pattern deviancy aversion and novelty aversion measures in random order. These measures were separated by a distractor task to reduce demand bias (the distractor task of Study 1.1) At Time 2, participants completed the two minority dislike measures (random order). At Time 3, participants completed the two prejudice measures (random order). Demographics and an attention check (see Study 1.1) were assessed at Time 1.[13]

## Results

As predicted, pattern deviancy aversion (Time 1) related to disliking novel minorities (Time 2), $r(256) = .27$, $p < .001$ (Path A; see the online supplemental materials for descriptive statistics), and disliking novel minorities (Time 2) related to prejudice (Time 3), $r(256) = .48$, $p < .001$ (B path). Finally, pattern deviancy aversion (Time 1) related to prejudice (Time 3), $r(256) = .24$, $p < .001$ (C path; Figure 5). These relationships all remained when controlling for participants' aversion toward novelty, $r$s $> .22$, $p$s $< .001$.[14,15] Pattern deviancy aversion also significantly predicted the *individual* disliking statistical minorities and prejudice measures, $p$s $< .002$; for instance, pattern deviancy aversion

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[13] Three items related to a different line of research were included at the end of Time 2 and the end of Time 3. The results of these items are not reported as they are not relevant to the presented results.

[14] Pattern deviancy aversion and novelty aversion correlated marginally, $r(256) = .12$, $p = .063$.

[15] As in Study 1.1, we did not control for participants' aversion towards the unbroken patterns because such aversion correlated negatively with aversion towards broken patterns, $r(256) = -.23$, $p < .001$.

Table 5
*Mediation Effects in Study 2.1*

| Correlation | Predictor variable Time 1 | Mediator Time 2 | Outcome variable Time 3 |
|---|---|---|---|
| Study 2.1 ($N = 258$) | Pattern deviancy aversion | Disliking statistical minorities | Prejudice (stigmatized) |
| Total effect | β = .243, $SE$ = .061, $t$ = 4.00, $p < .001$, 95% CI [.123, .362]* | | |
| Direct effect | β = .121, $SE$ = .057, $t$ = 2.13, $p = .034$, 95% CI [.009, .232]* | | |
| Indirect effect | β = .122, $SE$ = .032, 95% CI [.062, .190]* | | |

*Note.* The link between pattern deviancy aversion and prejudice against stigmatized individuals was mediated by disliking statistical minorities. β = standardized estimate; $SE$ = standard error; CI = confidence interval.
* $p < .05$.

predicted prejudice on both the visual prejudice measure, $r(256) = .20$, $p = .001$, and the face-valid nonvisual prejudice measure, $r(256) = .21$, $p = .001$. Finally, in line with our hypotheses, while pattern deviancy aversion predicted prejudice against stigmatized individuals who are statistically infrequent in society, it did not predict prejudice against women, $r(256) = -.10$, $p = .108$.[16]

The proposed mediation was observed. As was the case for racial prejudice, the relationship between pattern deviancy aversion and prejudice reduced when accounting for participants' dislike of statistical minorities. Nearly identically to Study 1.1, approximately 50% of the relationship between pattern deviancy aversion and prejudice was accounted for by participants' dislike of statistical minorities. Again, these results also indicate that mediators aside from disliking statistical minorities likely exist—indeed, in Study 2.1, the direct effect, though reduced, remained significant after accounting for disliking statistical minorities. Importantly, the observed indirect relationship remained when controlling for participants' novelty aversion (see Table 5).

### Study 2.2

Study 2.2 causally tested the mediation observed in Study 2.1. We also tested whether pattern deviancy aversion—though it only indirectly affected racial prejudice in Studies 1.3 and 1.4—does directly affect prejudice against other types of stigmatized individuals.

### Method

**Participants.** The power-analysis for Study 2.2 was as in Studies 1.3 and 1.4. We recruited 217 participants in Study 2.2 (107 female; $M_{age}$ = 34.14, $SD_{age}$ = 9.84). Of the total participants, 95 were excluded for failing one or more attention check items or taking the study more than once.[17] Of the final participants, 13 identified as Asian/Asian American, five as Black/African American, eight as Latino/Hispanic, 93 as White/European American, one as other, and two as more than one race.

**Pattern deviancy manipulation.** Unlike Studies 1.3 and 1.4, in which we manipulated pattern deviancy aversion in a descriptive manner, in Study 2.1 we manipulated pattern deviancy aversion in a motivational manner.[18] Specifically, we induced participants with the goal to evaluate pattern deviancy as negative (positive) and unbroken patterns as positive (negative) and while this goal was active—before goal-attainment had occurred—participants completed the disliking statistical minorities and racial prejudice measures. Goals generally remain active and intrude on

current tasks and judgments until goal-attainment is achieved (e.g., Förster, Liberman, & Friedman, 2007; Förster, Liberman, & Higgins, 2005; Klinger, 1975; Martin & Tesser, 1989; Masicampo & Baumeister, 2011).

Participants in the high pattern deviancy aversion condition were told they would receive a potential reward for coming up with a large number of *negative* attributes of pattern deviancy and *positive* attributes of unbroken patterns. In comparison, participants in the low pattern deviancy aversion condition were told they would receive a potential reward for coming up with a large number of *positive* attributes of pattern deviancy and *negative* attributes of unbroken patterns (see the online supplemental materials). We added *positive attributes of unbroken patterns* (high pattern deviancy aversion condition) and *negative attributes of unbroken patterns* (low pattern deviancy aversion condition) to the manipulation prompts to account for potential valence differences depending on condition.

Before continuing, participants completed two attention check items (see the online supplemental materials for Study S5 for details), and a self-report motivational item, depending on condition: "I feel motivated to come up with negative (*positive*) attributes about things that break a pattern, and positive (*negative*) attributes about things that follow a pattern" (Likert-scale: 1 = *not at all agree* to 7 = *strongly agree*). Finally, participants were told that they would have to report the attributes they came up with directly after answering three question-sets and thus, should come up with these attributes while completing the three question-sets. Before beginning these three question-sets, participants were told, depending on condition, to "start thinking of negative (*positive*) words that are associated with things that break a pattern (e.g., disruptive [*exciting*]), and positive (*negative*) words that are associated with things that follow a pattern (e.g., organized [*boring*])."

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[16] We also assessed pattern deviancy aversion at Time 3 (at the very end of the study) and examined the temporal stability of pattern deviancy aversion. Participants' pattern deviancy aversion at Time 1 strongly related to their pattern deviancy aversion at Time 3, $r(256) = .71$, $p < .001$.

[17] The higher exclusion rate compared with Studies 1.3 and 1.4 was likely attributable to the additional attention check items and attributable to a decrease in the quality of MTurk responses documented in the Summer of 2018.

[18] Given the shift from a descriptive manipulation to a motivational manipulation between Study-set 2 and 3, we conducted Study S5. In Study S5, we tested racial prejudice using the motivational manipulation utilized in Studies 2.2 and 2.3. This study did not find the shift in manipulation to impact the results.

For all prompts and detailed materials, see Study S5 and the online supplemental materials of Studies 2.2 and 2.3.

**Disliking statistical minorities.**    We adapted the disliking statistical minority measure of Study-set 1 to a binary format. Participants saw three planets and the minority and majority inhabitants on these planets and were asked: "Which people do you consider more negative" (0 = *majority*, 1 = *minority*). Unlike Study-set 1, we assessed participants' *negative* evaluation to ensure that our findings replicate across valence.

**Prejudice against stigmatized individuals.**    Prejudice was assessed as in the visual measure in Study 2.1 (evaluation of images of commonly stigmatized people vs. images of normal people).

**Procedure.**    The procedure was as in Studies 1.3 and 1.4.

## Results

The manipulation successfully altered participants' pattern deviancy aversion, $p < .001$. Replicating Studies 1.3 and 1.4, participants in the high (vs. low) pattern deviancy aversion condition exhibited increased dislike of novel statistical minorities, $p = .013$ (Path A; see Table 6 and Figure S5). Disliking novel minorities also related to prejudice against stigmatized individuals—disliking stigmatized individuals as compared to more normative individuals, $r(120) = .30$, $p = .001$ (Path B). Finally, an effect of pattern deviancy aversion on prejudice against stigmatized individuals was found, $p = .030$ (Path C; see Table 6 and Figure S6).

Conceptually replicating the findings of Studies 1.3 and 1.4, we observed the hypothesized mediation model in Study 2.2: The effect of pattern deviancy aversion on prejudice against stigmatized individuals was mediated by disliking statistical minorities (see Table 7).

More specifically, the effect of pattern deviancy aversion on prejudice decreased by approximately 30% when accounting for participants' dislike of statistical minorities. Finally, the observed mediation was not moderated by participants' political orientation, age, or biological sex (see the online supplemental materials).

## Study 2.3

Study 2.3 was identical to Study 2.2, except that we sought to establish a *causal* pathway in terms of the proposed mediation. We examined whether intervening at the level of the mediator reduces or eliminates the effect of pattern deviancy aversion on prejudice. Such an effect would support a causal pathway (e.g., Kendler & Campbell, 2009; Spencer et al., 2005) from pattern deviancy aversion to prejudice via a dislike of statistical minorities.

## Method

**Participants.**    The power-analysis was based on the findings of Study 2.2 (total effect: $f = .20$). We needed 237 participants to have 80% power. Given the high exclusion rate in Study 2.2, we recruited 353 participants (193 female; $M_{age} = 34.63$, $SD_{age} = 9.98$). One hundred fifty-one participants were excluded for failing one or more attention check items or taking the study more than once. Of the final participants, 16 identified as Asian/Asian American, 11 as Black/African American, 13 as Latino/Hispanic, 157 as White/European American, one as other, and four as more than one race. The materials and design of Study 2.3 were identical to Study 2.2, except for the additional mediator-intervention condition.

**Pattern deviancy manipulation.**    Study 2.3 included the two conditions of Study 2.2 and a third between-subjects condition in

Table 6
*Study-Set 2: Experimental Effects in Studies 2.2 and 2.3*

| Measure | High pattern deviancy aversion (M and SD) | Low pattern deviancy aversion (M and SD) | High PDA plus mediator intervention (M and SD) | Significance test |
|---|---|---|---|---|
| Study 2.2 | $n = 67$ | $n = 55$ | | |
| Manipulation check | | | | |
| Pattern deviancy aversion | 2.68, 1.74 | 0.15, 3.03 | | $F(1, 120) = 33.58$, $p < .001$, $\eta_p^2 = .219$ |
| Mechanism | | | | |
| Disliking statistical minorities | 0.73, 0.39 | 0.53, 0.46 | — | $F(1, 120) = 6.30$, $p = .013$, $\eta_p^2 = .050$ |
| Dependent variable | | | | |
| Prejudice (stigmatized) | 1.70, 1.74 | 1.02, 1.68 | — | $F(1, 120) = 4.80$, $p = .030$, $\eta_p^2 = .038$ |
| Study 2.3 | $n = 71$ | $n = 70$ | $n = 61$ | |
| Manipulation check | | | | |
| Pattern deviancy aversion | 2.38, 1.92 | 0.46, 2.70 | 2.41, 1.60 | $F(2, 199) = 18.54$, $p < .001$, $\eta_p^2 = .157$ |
| | ◇ | ◇ | | $t(139) = 5.30$, $p < .001$, $d = .90$ |
| | ◇ | | ◇ | $t(130) = 0.07$, $p = .940$, $d = .01$ |
| | | ◇ | ◇ | $t(129) = 5.18$, $p < .001$, $d = .91$ |
| Mechanism | | | | |
| Disliking statistical minorities | 0.76, 0.38 | 0.57, 0.43 | 0.61, 0.45 | $F(2, 199) = 3.99$, $p = .020$, $\eta_p^2 = .039$ |
| | ◇ | ◇ | | $t(139) = 2.66$, $p = .008$, $d = .45$ |
| | ◇ | | ◇ | $t(130) = 2.08$, $p = .037$, $d = .36$ |
| | | ◇ | ◇ | $t(129) = 0.47$, $p = .634$, $d = .08$ |
| Dependent variable | | | | |
| Prejudice (stigmatized) | 1.67, 1.40 | 0.95, 1.48 | 1.25, 1.24 | $F(2, 199) = 4.80$, $p = .009$, $\eta_p^2 = .046$ |
| | ◇ | ◇ | | $t(139) = 3.09$, $p = .002$, $d = .52$ |
| | ◇ | | ◇ | $t(130) = 1.73$, $p = .084$, $d = .30$ |
| | | ◇ | ◇ | $t(129) = 1.24$, $p = .217$, $d = .22$ |

*Note.*    PDA = pattern deviancy aversion. Effects of pattern deviancy aversion manipulation on disliking statistical minorities and prejudice against stigmatized individuals. ◇ signifies inclusion in a pairwise comparison.

Table 7

*Mediation Effects in Studies 2.2 and 2.3*

| Experiments | Independent variable | Mediator | Dependent variable |
|---|---|---|---|
| Study 2.2 (N = 122) | Pattern deviancy aversion | Disliking statistical minorities | Prejudice (stigmatized) |
| Total effect | β = .393, *SE* = .179, *t* = 2.19, *p* = .030, 95% CI [.038, .747]* | | |
| Direct effect | β = .274, *SE* = .178, *t* = 1.54, *p* = .126, 95% CI [−.078, .627] | | |
| Indirect effect | β = .118, *SE* = .062, 95% CI [.014, .257]* | | |
| Study 2.3 (N = 202) | Pattern deviancy aversion | Disliking statistical minorities | Prejudice (stigmatized) |
| | Relative effect: High (coded: 1) versus low pattern deviancy aversion (coded: 0) | | |
| Total effect | β = .510, *SE* = .165, *t* = 3.08, *p* = .002, 95% CI [.184, .836]* | | |
| Direct effect | β = .378, *SE* = .161, *t* = 2.35, *p* = .020, 95% CI [.060, .695]* | | |
| Indirect effect | β = .133, *SE* = .059, 95% CI [.031, .263]* | | |
| | Relative effect: High (coded: 1) versus high PDA plus mediator intervention (coded: 0) | | |
| Total effect | β = .297, *SE* = .171, *t* = 1.73, *p* = .084, 95% CI [−.041, .635] | | |
| Direct effect | β = .189, *SE* = .166, *t* = 1.14, *p* = .255, 95% CI [−.137, .516] | | |
| Indirect effect | β = .108, *SE* = .057, 95% CI [.007, .231]* | | |
| | Relative effect: Low (coded: 1) versus high PDA plus mediator intervention (coded: 0) | | |
| Total effect | β = −.213, *SE* = .172, *t* = −1.24, *p* = .217, 95% CI [−.552, .126] | | |
| Direct effect | β = −.188, *SE* = .165, *t* = −1.14, *p* = .254, 95% CI [−.513, .136] | | |
| Indirect effect | β = −.025, *SE* = .056, 95% CI [−.139, .085] | | |

*Note.* The link between pattern deviancy aversion and prejudice against stigmatized individuals was mediated by disliking statistical minorities. β = standardized estimate; *SE* = standard error; CI = confidence interval.
* $p < .05$.

which we intervened on the proposed mediator (high PDA plus intervention condition). In this new condition, we induced pattern deviancy aversion as in the high pattern deviancy aversion condition, and thereafter, prompted participants to reflect and report on the positive aspects of minorities (before the disliking novel minorities and prejudice measures):

> Important: Before you continue, please imagine the positive aspects of minority groups. That is, please think about the positive attributes of small groups of people that deviate from the majority in a society (e.g., unique, special, exciting). Really try to think of the positive attributes of minority groups and their members and how you feel warmly towards such groups and their members.

## Results

The manipulation successfully altered participants' pattern deviancy aversion, $p < .001$. Replicating Study 2.2, a main effect of pattern deviancy aversion on disliking novel statistical minorities was observed, $p = .020$ (Path A; Figure S7), and participants' dislike of statistical minorities predicted their prejudice against stigmatized individuals, $r(200) = .33$, $p < .001$ (Path B). Finally, pattern deviancy aversion again influenced prejudice against stigmatized individuals, $p = .009$ (Path C; see Table 6 and Figure S8).

We examined pairwise comparisons. Suggesting a successful intervention at the level of the mediator, participants in the high pattern deviancy aversion condition exhibited greater dislike of novel statistical minorities compared with participants in the low pattern deviancy aversion and high PDA plus intervention conditions, $p = .008$ and $p = .037$, respectively. Participants in the high pattern deviancy aversion condition also exhibited higher prejudice than those in the low pattern deviancy aversion condition, and marginally higher prejudice than those in the high PDA plus intervention condition, $p = .002$ and $p = .084$, respectively. Finally, participants in the low pattern deviancy

aversion condition did not differ from those in the high PDA plus intervention condition in terms of disliking statistical minorities and prejudice, $ps > .217$ (Table 6).

Notably, despite participants in the high pattern deviancy aversion condition exhibiting a greater dislike of minorities and marginally greater prejudice than those in the high PDA plus intervention condition, the two conditions did not differ in terms of pattern deviancy aversion, $p = .940$ (Table 6). That is, intervening at the mediator did *not* eliminate the effect of the manipulation on pattern deviancy aversion. This finding supports the directionality of the proposed mediation model.

The results of Study 2.3 supported a successful intervention at the level of the mediator. First, as in Study 2.2, the effect of high pattern deviancy aversion versus low pattern deviancy aversion on prejudice was mediated by disliking statistical minorities; the effect of pattern deviancy aversion on prejudice decreased by approximately 25% when accounting for participants' dislike of statistical minorities. Second, the effect of the high pattern deviancy aversion condition versus the high PDA plus intervention condition was also mediated by disliking statistical minorities; the effect of pattern deviancy aversion on prejudice decreased by approximately 35% when accounting for participants' dislike of statistical minorities. Third, a mediation was *not* found when comparing the low pattern deviancy aversion condition to the high PDA plus intervention condition (see Table 5). Again, none of the calculated indirect effects were moderated by participants' political orientation, age, or biological sex (see the online supplemental materials).

Finally, in Studies 2.2 and 2.3, participants' self-reported motivation to generate positive (negative) aspects of pattern deviancy and negative (positive) aspects of unbroken patterns within each of the conditions neither related to participants' dislike of novel statistical minorities nor their level of prejudice, $ps > .134$. These

findings reduce the likelihood that our findings were driven by demand effects.

## Discussion: Study-Set 2

In Study-set 2, we replicated and extended the mediation model observed in Study-set 1. We observed a link between pattern deviancy aversion and prejudice against various groups of stigmatized individuals. and found this link to be mediated by participants' dislike of novel statistical minorities. In Study 2.1, we observed the proposed mediation model in a longitudinal correlational study. These are the first results indicating that pattern deviancy aversion relates to prejudice in a stable, long-term manner. In Studies 2.2 and 2.3, we documented this mediation experimentally, and further, found that manipulating pattern deviancy aversion causally impacts people's prejudice against stigmatized individuals in society (e.g., someone cross-dressing, someone wearing a Burka). These results are the first to document that pattern deviancy aversion has a causal effect on prejudice. Furthermore, in Study 2.3, intervening at the level of the mediator—by prompting participants to directly reflect on the positive attributes of minorities—eliminated the effect of pattern deviancy aversion on prejudice. These findings support the validity of the proposed mediation model in terms of a causal-pathway.

## Studies 3.1 and 3.2: Pattern Deviancy Aversion Predicts Group-Size Dependent Prejudice

We have argued that pattern deviancy aversion is linked to prejudice via a dislike of statistically infrequent individuals in society. These results suggest that pattern deviancy aversion may no longer predict prejudice if individuals who are the targets of prejudice become more populous in society. For instance, making Black people the statistical majority (vs. minority) should lead individuals high in pattern deviancy aversion to exhibit less prejudice toward Blacks. Put another way, pattern deviancy aversion should relate to comparatively lower prejudice toward Black people when Black people are the majority as compared to when they are the minority.

Study-set 3 tested—as the proposed statistical deviancy line of argument would suggest—whether pattern deviancy aversion predicts such group-size dependent prejudice. We examined this question in terms of prejudice against Black individuals (Study 3.1) and in terms of prejudice against Muslims (Study 3.2). To do so, we assessed participants' prejudice against Black people and Muslims when these groups were presented as statistical minorities versus majorities in society. We chose Muslims as the stigmatized group in Study 3.2 because pattern deviancy aversion predicted and heightened prejudice against such individuals in Study-set 2.

## Study 3.1

In Study 3.1, we examined whether pattern deviancy aversion predicts group-size dependent prejudice against Black individuals.

## Method

**Participants and design.** A power-analysis based on the average of the relationships observed in Study 1.1 ($r = .25$) indicated that we needed approximately 123 participants to have 80% power.

We aimed to recruit 150 adults on MTurk. We ended up recruiting 142 participants (78 female; age: $M = 34.77$, $SD = 11.42$). Four participants were excluded because they failed the attention check items. Two further responses were excluded because participants completed the survey twice (identified via IP address). One further response was excluded for leaving more than half of the survey blank. Of the final participants ($N = 135$), 12 identified as Asian/Asian American, six as Black/African American, nine as Latino/Hispanic, 106 as White/European American, and three as more than one race.

**Materials.**

*Pattern deviancy aversion.* Pattern deviancy aversion was assessed as in Study 1.1, except, the response items were changed to: "Uncomfortable," "Annoyed," and "Happy." This was done to replicate our findings across negatively valenced items (Study 1.1 only included positively valenced items).

*Group-size dependent racial prejudice.* Participants were presented with images of groups of people (approximately 50 individuals per group) in which the percentage of Black and White individuals varied. In three of the images, Black people were the majority, whereas White people were the minority. In the three other images, Black people were the minority, whereas White people were the majority. The percentage of Black and White people in these images were based on actual countries in the
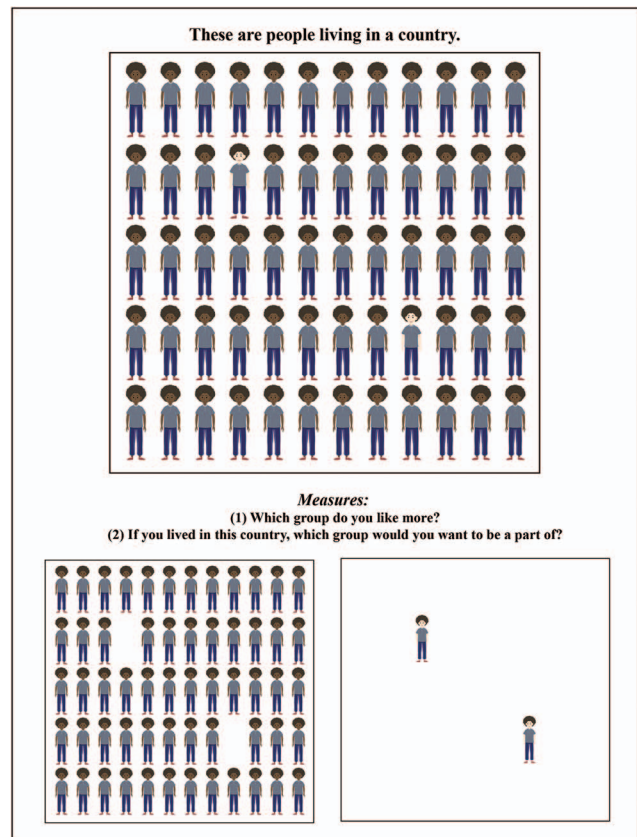


*Figure 6.* An example item from the group-size dependent racial prejudice measure in Study 3.1. In this example, Black people are the majority group and White people are the minority group. See the online article for the color version of this figure.

western world (United States [12% Black], France [6% Black], Canada [2% Black]), and in Africa (South Africa [10% White], Namibia [6% White], Botswana [3% White]). That the percentage of Black and White people echoed those of real countries was not shared with participants. The following prompt was above each image: "These are the people living in a country." In response to each minority and majority in each country, participants responded to two binary-choice items: "Which group do you like more?" and "If you lived in this country, which group would you want to be a part of?" (see Figure 6).

*Social desirability.* The study included a measure of social desirability (Haghighat, 2007) to account for one form of response bias—participant s' tendency to engage in self-presentational/socially desirable responding (e.g., Fisher, 1993; Maccoby & Maccoby, 1954).

*Attention check.* The study included two attention checks. The first was the attention check in Study 1.1. The second was an attention check that asked how someone whose name is Anton would respond to the following question: "What is your name?" ("Anton," "Ben," or "Jasmine").

**Procedure.** Participants completed the pattern deviancy aversion measure, the group-size dependent racial prejudice measure, the attention checks, demographics, and the social desirability measure (in that order).

## Results

Conceptually replicating Path A of the proposed mediation, pattern deviancy aversion predicted participants' dislike of minority groups across all the countries/races, $r(133) = .204$, $p = .017$. This relationship remained when controlling for participants' level



*Figure 8.* An example item from the group-size dependent prejudice measure in Study 3.2. In this example, people wearing Burkas are the majority group and people not wearing Burkas are the minority group. See the online article for the color version of this figure.

of social desirability, $r(132) = .173$, $p = .046$. Importantly, as predicted, pattern deviancy aversion predicted racial prejudice depending on group size. Pattern deviancy aversion related to greater racial prejudice against Black people when Black people were presented as the minority, $r(133) = .25$, $p = .004$, but related to comparatively less racial prejudice against Black people when Black people were presented as the majority, $r(133) = -.12$, $p = .186$, interaction term: $F(1, 133) = 5.76$, $p = .018$, $\eta_p^2 = .042$. Said another way, participants high in pattern deviancy aversion ($+1.5$ $SD$) exhibited greater prejudice when Black people were presented as the minority, $M = .80$, $SE = .060$, and lower racial prejudice when Black people were presented as the majority, $M = .34$, $SE = .064$, $F(1, 133) = 17.95$, $p < .001$, $\eta_p^2 = .119$. Importantly, this was not true of participants low in pattern deviancy aversion ($-1.5$ $SD$)—they evaluated Black people similarly irrespective of group-size, minority: $M = .51$, $SE = .060$, majority: $M = .48$, $SE = .064$, $p = .815$ (see Figure 7). For additional descriptive statistics, see the online supplemental materials.

## Study 3.2

Study 3.2 was largely identical to Study 3.1, except, instead of prejudice against Black individuals we examined group-size prej-
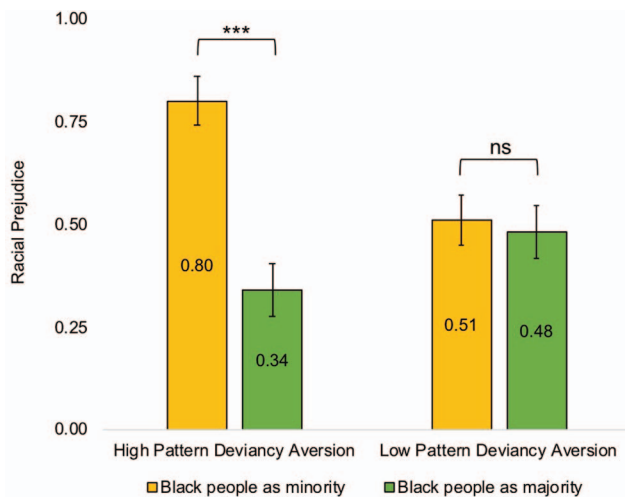


*Figure 7.* Study 3.1: Pattern deviancy aversion predicted group-size dependent racial prejudice. Participants high in pattern deviancy aversion (left bars; $+1.5$ $SD$) exhibited prejudice against Black people when Black people were presented as the statistical minority. This prejudice reduced (and even flipped to preference), however, when Black people were presented as the statistical majority. No such effect was observed for participants low in pattern deviancy aversion (right bars; $-1.5$ $SD$). Error bars: $\pm 1$ $SE$. *** $p < .001$. ns = .815. See the online article for the color version of this figure.

udice against Muslims (represented in Study 3.1 as people wearing Burkas).[19]

## Method

A power-analysis based on Study 3.1 ($\eta_p^2 = .042$) indicated that we needed approximately 190 participants to have 90% power. We aimed to recruit 250 adults on MTurk. We ended up recruiting 250 participants (125 female; age: $M = 39.69$, $SD = 13.12$). Four participants were excluded because they failed the attention check items. Two further responses were excluded because participants completed the survey twice (identified via IP address; final $N = 244$). Of the final participants, 29 identified as Asian/Asian American, 18 as Black/African American, 20 as Latino/Hispanic, 176 as White/European American, and seven as more than one race. Study 3.2 was identical to Study 3.1, except we assessed participants' prejudice against people wearing Burkas as a function of group-size instead of their prejudice against Black people as a function of group-size. We also added a description of the minority/majority to ensure that participants understood that the people depicted were wearing Burkas (see Figure 8).

## Results

Again, pattern deviancy aversion predicted participants' dislike of minority groups across all the countries, $r(242) = .25$, $p < .001$, and this relationship remained when controlling for participants' level of social desirability, $r(241) = .25$, $p < .001$. Importantly, as predicted, pattern deviancy aversion predicted prejudice depending on group size. Pattern deviancy aversion related to greater prejudice against people wearing Burkas when such people were pre-



*Figure 9.* Study 3.2: Pattern deviancy aversion predicted group-size dependent prejudice against stigmatized individuals. Participants high in pattern deviancy aversion (left bars; +1.5 *SD*) exhibited prejudice against Muslims (people wearing Burkas) when such people were presented as the statistical minority. This prejudice reduced, however, when Muslims were presented as the statistical majority. No such effect was observed for participants low in pattern deviancy aversion (right bars; +1.5 *SD*). Error bars: ±1 *SE*. *** $p < .001$. *ns* = .078. See the online article for the color version of this figure.
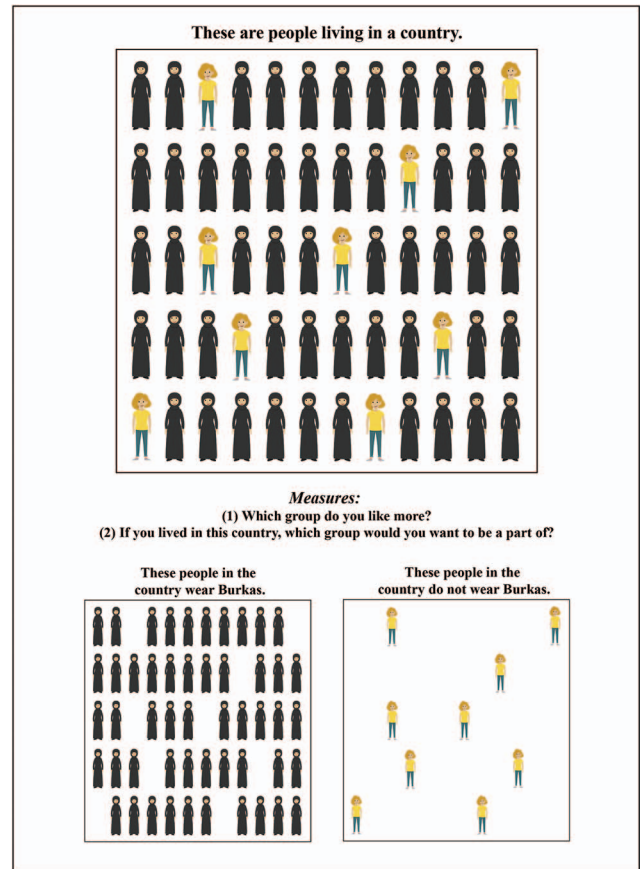
sented as the minority, $r(242) = .24$, $p < .001$, but related to comparatively less prejudice against people wearing Burkas when such people were presented as the majority, $r(242) = -.10$, $p = .117$, interaction term: $F(1, 242) = 15.45$, $p < .001$, $\eta_p^2 = .060$. Said another way, participants high in pattern deviancy aversion (+1.5 *SD*) exhibited greater prejudice when people wearing Burkas were presented as the minority, $M = 0.96$, $SE = .038$, and comparatively lower prejudice when people wearing Burkas were presented as the majority, $M = .70$, $SE = .046$, $F(1, 242) = 22.81$, $p < .001$, $\eta_p^2 = .086$. Participants low in pattern deviancy aversion did not exhibit this trend—they evaluated people wearing Burkas more similarly across presentation format: minority, $M = .73$, $SE = .038$, and majority, $M = .82$, $SE = .046$, $F(1, 242) = 3.14$, $p = .078$, $\eta_p^2 = .013$ (see Figure 9). For additional descriptive statistics see the online supplemental materials.

## Discussion: Study-Set 3

Study-set 3 found pattern deviancy aversion to predict group-size dependent prejudice. Participants high in pattern deviancy aversion were more prejudiced against Black people and Muslims (individuals wearing Burkas) in contexts in which Black people and Muslims were the minority (e.g., countries in the Western world). However, they favored Black people and indicated that they would want to be Black in contexts in which Black people are the majority (Study 3.1), and they exhibited reduced dislike of Muslims and were more likely to select to wear a Burka in contexts in which the majority of people wear Burkas (Study 3.2). In contrast, the prejudice of participants low in pattern deviancy aversion largely did not depend on group-size. These findings support the proposed mediation model by indicating that pattern deviancy aversion is linked to prejudice against stigmatized people in society because these groups are statistically infrequent (at least in the United States).

The findings of Study-set 3 also suggest that pattern deviancy aversion promotes prejudice that is attuned to the surrounding context/environment. That is, pattern deviancy aversion may contribute to the contextual and flexible nature of prejudice and its targets (see Payne et al., 2017). Finally, we note that our findings align with the argument that race and stigma categories are often inherently meaningless. For instance, it is not *Blackness* that results in prejudice against Black individuals, instead it is the superficial features associated with Black people that incite prejudice (e.g., Brown, 1995; Katz & Braly, 1933), including potentially (at least in the United States), an aversion toward proportionally small groups.

## Participants' Racial Identity Across the Reported Studies

It is important to consider that participants' racial identity may moderate psychological findings, especially in terms of prejudice (Brown, 1995; Henrich et al., 2010; Nielsen et al., 2017). Unfortunately, our individual studies only included a small number of participants of minority racial identity (e.g., Black, Asian). There-
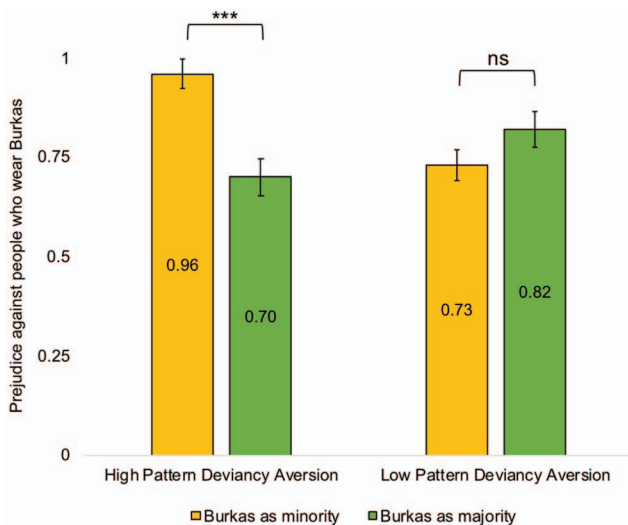
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[19] Of course, not all Muslims wear Burkas. It is unclear whether the findings of Study 3.2 extend to Muslims more generally, that is, extends above and beyond individuals wearing Burkas.

fore, we collapsed across the reported studies, including Studies S3, S4, and S5, but excluding Study-set 3 (see the online supplemental materials for more details), and then examined whether participants' racial identity moderated any of the reported results.

When collapsing across all the studies, we did not find participants' minority racial identity (participants who responded Asian, Black, Hispanic, other, or more than one race; $n = 478$) versus majority racial identity (White; $n = 1544$) to moderate any of the paths of our mediation model. Path A: $p = .609$, Path B: $p = .642$, Path C: $p = .426$. We also did not find minority versus majority racial identity to impact specifically the correlational (Studies 1.1, 2.1, and S3; minority [$n = 199$]; majority [$n = 577$]) or experimental (Studies 1.3, 1.4, 2.2, 2.3 S4, and S5; minority [$n = 279$]; majority [$n = 967$]) results, $ps > .227$. Or, to impact specifically the studies examining racial prejudice (Study-set 1, Studies S3, S4, and S5; minority [$n = 356$]; majority [$n = 1145$]) or the studies examining prejudice against various groups of stigmatized individuals (Study-set 2; minority [$n = 122$]; majority [$n = 399$]), $ps > .453$.

We recognize, however, that comparing racial minority with majority participants is a heavy-handed approach to examining potential interracial differences. Therefore, we reconducted the analysis collapsed across all studies solely with Black participants (including those of mixed race; $n = 164$) versus White participants ($n = 1544$). Again, we found no effects of participants' race for any of the three examined paths, $ps > .082$. This .082 significance value pertained to the link between pattern deviancy aversion and prejudice; the data appeared to trend toward a greater link between pattern deviancy aversion and prejudice for Black participants as compared with White participants, rather than indicating that Path C does not exist for Black participants.

Finally, we reexamined these analyses only for the studies that included racial prejudice as the dependent variable (Study-set 1 and Studies S3, S4, and S5; Black participants, $n = 122$; White participants, $n = 1145$). Participants' race (Black vs. White) did not moderate any of our findings, $ps > .281$. To examine the strength of these final null findings—given the small sample-to-moderate sample size of Black participants—we conducted Bayesian model comparisons using the JASP software (JASP Team, 2018). We found that the best model (a model including solely main effects) was ~5.8 times (Path A), ~9.2 times (Path B), and ~4.3 times (Path C) more explanatory than a model including an interaction of participants' racial identity (Black vs. White). Nonetheless, these analyses should still be approached with caution given the small-to-moderate sample size of Black participants, and because we were unable to examine the impact of participants' racial identity in each of the individual studies.

## General Discussion

In nine studies ($N = 1,821$), we examined whether pattern deviancy aversion causally impacts prejudice, and whether this effect is partially driven by a general dislike of statistical minorities—disliking people who are statistically infrequent in a population (see Table 8 for overview). Studies 1.1 and 1.2 tested the proposed mediation model in a correlational manner. In these studies, adults' and 4- to 7-year-olds' pattern deviancy aversion related to their dislike of novel statistical minorities (compared with novel majorities; Path A), their dislike of statistical minorities

predicted their racial prejudice against Black individuals (Path B), and pattern deviancy aversion predicted such racial prejudice (in adults but not in children; Path C). Finally, the proposed mediation was observed both in adults and children.

Studies 1.3 and 1.4 extended these findings causally. Participants prompted to come up with negative (vs. positive) aspects of nonsocial pattern deviancy exhibited a greater dislike of novel statistical minorities (compared with majorities; Path A), and this dislike predicted their racial prejudice (Path B). Though we observed the proposed mediation (i.e., indirect effect) across these studies, an effect of pattern deviancy aversion on racial prejudice was not found (Path C). A meta-analysis of Studies 1.3, 1.4, and two online supplemental materials (Studies S4 and S5s) did not indicate a meaningful effect of pattern deviancy aversion on racial prejudice.

In Study-set 2, we extended the proposed mediation model beyond prejudice against Black individuals to prejudice against other groups of stigmatized individuals (e.g., someone crossdressing; someone wearing a Burka). In Study 2.1—a longitudinal correlational study—pattern deviancy aversion (at Time 1) predicted disliking statistical minorities (at Time 2; Path A), and this dislike predicted prejudice against stigmatized individuals (at Time 3; Path B). A relationship between pattern deviancy aversion and prejudice against stigmatized individuals was also observed (Path C), and this relationship was, as predicted, mediated by participants' general dislike of novel statistical minorities.

Importantly, Study 2.1 also provided an important constraint on the link between pattern deviancy aversion and prejudice; in line with the proposed mediation model, pattern deviancy aversion did not relate to prejudice against women, a group that suffers from prejudice despite not being a statistical minority. These results demonstrate that pattern deviancy aversion does not predict generalized bigotry per se; instead, it seems to specifically predict prejudice against groups that are statistical minorities.

Studies 2.2 and 2.3 built on these findings by experimentally manipulating pattern deviancy aversion and documenting the mediation observed in Study 2.1 in a causal manner. Notably, unlike in Studies 1.3 and 1.4, in which pattern deviancy aversion did not have a meaningful total effect on prejudice against Black individuals, pattern deviancy aversion did have a moderately sized total effect on prejudice against other types of stigmatized individuals. Finally, in Study 2.3, we observed that intervening on the mediator—by having participants reflect on the positive attributes of statistical minorities—eliminated the effect of pattern deviancy aversion on prejudice against stigmatized individuals. These results support the existence of a *causal* pathway from pattern deviancy aversion to prejudice via disliking minorities (e.g., Kendler & Campbell, 2009; Spencer et al., 2005).

Finally, in Study-set 3, we collected further evidence supporting the proposed mediation model, and zeroed in on the *type* of prejudice pattern deviancy aversion influences, by examining whether pattern deviancy aversion predicts context-dependent prejudice. We demonstrated that the link between pattern deviancy aversion and prejudice depends on the size of groups in the surrounding environment. In Study 3.1, participants' pattern deviancy aversion predicted greater racial prejudice in contexts in which Black people were depicted as the statistical minority, but reduced racial prejudice in contexts in which Black people were depicted as the statistical majority. And, in Study 3.2, participants'

Table 8

*Overview of All Presented Studies*

| Study | Design | Sample type | N | Predictor | Mediator | Outcome | Path A | Path B | Path C* | Indirect |
|---|---|---|---|---|---|---|---|---|---|---|
| **Study-set 1** | | | | | | | | | | |
| Study 1.1 | Correlational | Adult | 368 | PDA | Dislike of statistical minorities | Racial prejudice | ✓ | ✓ | ✓ | ✓ |
| Study 1.2 | Correlational | Children | 58 | PDA | Dislike of statistical minorities | Racial prejudice | ✓ | ✓ | ✗* | ✓ |
| Study 1.3 | Experimental (descriptive) | Adult | 248 | PDA | Dislike of statistical minorities | Racial prejudice (continuous) | ✓ | ✓ | ✗ | ✓ |
| Study 1.4 | Experimental (descriptive) | Adult | 186 | PDA | Dislike of statistical minorities | Racial prejudice (implicit - IAT) | ✓ | ✓ | ✗ | ✓ |
| *Study S1* | *Correlational* | *Adult* | *81* | *PDA* | *Dislike of statistical minorities* | *—* | ✓ | — | — | — |
| *Study S2* | *Correlational* | *Children* | *86* | *PDA* | *Dislike of statistical minorities* | *Racial prejudice* | ✓ | ✓ | ✗* | ✓ |
| *Study S3* | *Correlational* | *Adult* | *150* | *PDA* | *Dislike of statistical minorities* | *Racial prejudice* | ✓ | ✓ | ✗ | ✓ |
| *Study S4* | *Experimental (descriptive)* | *Adult* | *345* | *PDA* | *Dislike of statistical minorities* | *Racial prejudice (binary)* | ✓ | ✓ | ✗ | ✓ |
| *Study S5* | *Experimental (motivational)* | *Adult* | *199* | *PDA* | *Dislike of statistical minorities* | *Racial prejudice (binary)* | ✓ | ✓ | ✗ | ✓ |
| **Study-set 2** | | | | | | | | | | |
| Study 2.1 | Correlational (longitudinal) | Adult | 258 | PDA | Dislike of statistical minorities | Prejudice against various stigmatized individuals | ✓ | ✓ | ✓ | ✓ |
| Study 2.2 | Experimental (motivational) | Adult | 122 | PDA | Dislike of statistical minorities | Prejudice against various stigmatized individuals | ✓ | ✓ | ✓ | ✓ |
| Study 2.3 | Experimental (motivational) | Adult | 202 | PDA | Dislike of statistical minorities | Prejudice against various stigmatized individuals | ✓ | ✓ | ✓ | ✓ |
| **Study-set 3** | | | | | | | | | | |
| Study 3.1 | Correlational | Adult | 135 | PDA | Dislike of statistical minorities | Group-size dependent racial prejudice | ✓ | — | — | — |
| Study 3.2 | Correlational | Adult | 244 | PDA | Dislike of statistical minorities | Group-size dependent prejudice against Muslims | ✓ | — | — | — |

*Note.* PDA = pattern deviancy aversion. The italics indicated that the studies were online supplemental materials. ✓ indicates $p < .05$. ✗* indicates $.05 < p > .10$. ✗ indicates $p > .10$. Path C* = The total effect, not the direct effect.

pattern deviancy aversion predicted greater prejudice against Muslims (people wearing Burkas) in contexts in which such people were depicted as the statistical minority, but reduced prejudice against Muslims in contexts in which such people were depicted as the statistical majority. Together, these findings provide strong support for the proposed mediation model, and further, demonstrate that pattern deviancy aversion predicts prejudice that is highly context-dependent on one's surrounding social regularities.

The four most central contributions of our findings are: (a) A replication and extension of the recent findings of Gollwitzer and colleagues (2017) by consistently demonstrating that a dislike of statistical minorities in part drives the link between pattern deviancy aversion and prejudice. (b) The first demonstration that pattern deviancy aversion can causally impact prejudice (at least in terms of prejudice against stigmatized individuals other than Black individuals). (c) The elucidation of two important boundary conditions on the influence of pattern deviancy aversion on prejudice. First, although pattern deviancy aversion substantially influenced prejudice against various types of stigmatized individuals, it did *not* meaningfully influence prejudice against Black individuals. Second, although pattern deviancy aversion was related to prejudice against groups that are infrequent in society, it was not related to generalized prejudice per se; pattern deviancy aversion did not relate to prejudice against women. (d) Finally, our findings help elucidate which type of prejudice pattern deviancy aversion specifically impacts: Pattern deviancy aversion predicts prejudice toward people who are socially deviant in a specific context, for instance, toward individuals who are statistical infrequent in terms of their social surroundings.

Beyond these four primary contributions, we also shed light on the development of prejudice. Our findings not only replicate children's explicit prejudice against Black individuals (e.g., Aboud, 1988; Dunham et al., 2008), but also very tentatively suggest one potential pathway via which children become prejudiced. Children's pattern deviancy aversion may heighten their dislike of people who are infrequent in a population (compared with those who are frequent), in turn, potentially increasing their racial prejudice against Black individuals (at least in the United States where Black people are a minority).

The current findings also are among the first to directly address how children think about people depending on their statistical frequency (e.g., Johnston & Jacobs, 2003; Primi & Agnoli, 2002). Empirically verifying the prediction of Bigler and Liben (2006), children in our studies overall disfavored novel minorities over majorities (Study 1.2). And additionally, we found children's dislike of novel minorities over majorities to predict their level of prejudice against Black individuals (a statistical minority in the United States). These latter findings raise the interesting possibility that the target of children's prejudice is in part determined by the statistical infrequency of types of people in a society (see Roberts et al., 2017). Notably, however, our developmental findings were solely correlational and the prejudice measure of Study 1.2 was arguably a poor measure of prejudice ("Which picture do you like more?"). Further, given the small sample size of Study 1.2, our results should be approached cautiously. Future research should consider these with a larger sample size, in a causal manner, with an improved measure of prejudice, and with respect to prejudice beyond racial prejudice.

The current findings also suggest that pattern deviancy aversion may contribute to the flexible and contextual nature of prejudice and its targets (Garcia-Marques et al., 2017; Payne et al., 2017). In Study-set 3, pattern deviancy aversion predicted greater prejudice against Black people and Muslims (individuals wearing Burkas) when these groups were depicted as statistical minorities as compared with when they were depicted as statistical majorities. We conclude that pattern deviancy aversion seems to predict prejudice that is strongly attuned to the surrounding environment; these findings may help explain why the targets of prejudice vary across time and context. And, on an applied level, these results suggest that pattern deviancy aversion may drive people to become less prejudiced against minorities as these minorities become more populous. Research has indicated that minorities (as a collective) will soon become the majority in terms of population in the United States (see Craig & Richeson, 2014; Craig, Rucker, & Richeson, 2018); potentially, people's pattern deviancy aversion may reduce people's prejudice when this occurs.

The current results also extend previous research in demonstrating that the link between pattern deviancy aversion and prejudice observed by Gollwitzer et al. (2017) exists even when these variables are measured longitudinally. In Study 2.1, participants' pattern deviancy aversion predicted their degree of prejudice assessed 6 days later. These findings indicate a stable temporal link between pattern deviancy aversion and prejudice.

Our findings also indicate that people are unaware that their pattern deviancy aversion influences their dislike of novel minorities and prejudice. Though pattern deviancy aversion influenced participants' dislike of minorities and prejudice in Studies 2.2 and 2.3 (and Study S5), participants' self-reported motivation to generate negative aspects of broken patterns versus positive aspects of unbroken patterns neither related to their dislike of minorities nor their prejudice. These results suggest that the effects of pattern deviancy aversion on disliking minorities and prejudice occur largely outside of awareness (see Bargh, 2007; Bargh, Gollwitzer, Lee-Chai, Barndollar, & Trötschel, 2001; Bargh & Morsella, 2008). Indeed, prejudices can be activated nonconsciously (e.g., Banaji, 2001; Bargh, 1999; Devine, 1989; Greenwald & Banaji, 1995). In line with this claim, researchers have found that people create inaccurate type-rationalizations—consciously reasoned justifications for their prejudice (e.g., Jewish people are greedy, Gay individuals threaten family values; Lapiere, 1936).

Finally, we tentatively found that participants' racial identity does not influence the link between pattern deviancy aversion, disliking statistical minorities, and prejudice. This finding, disheartingly, suggests that racial minorities in the United States perceive themselves as breaking the social regularities and assumed *pattern* around them in society. If true, pattern deviancy aversion may be one factor motivating internalized prejudice—members of disadvantaged groups holding prejudice toward their own in-group (Pyke, 2010). Future research should examine this possibility.

## Types of Prejudice

As noted earlier, our findings reveal an important constraint on the effect of pattern deviancy aversion on prejudice. Pattern deviancy aversion did not conclusively influence prejudice against Black individuals, but did meaningfully impact prejudice against

other groups of stigmatized individuals. And, this difference was not driven by manipulating pattern deviancy aversion differently in Studies 1.3 and 1.4 versus Study-set 2 (in Study S5, we induced pattern deviancy aversion in a motivational manner but still did not observe a significant total effect of pattern deviancy aversion on racial prejudice). So, why does pattern deviancy aversion causally influence prejudice against various stigmatized individuals but not against Black people? For one, numerous historical (e.g., segregation; Amir, 1969), social (e.g., group-threat, dominance motives, group-position, resource competition; e.g., Sherif et al., 1961), and large-scale societal and structural (e.g., Blauner, 1972; Bonacich, 1972) factors contribute to the complexity of racial prejudice in the United States (see Quillian, 2006). These factors may override or suppress any effect of pattern deviancy aversion on racial prejudice.

Additionally, or alternatively, people may simply judge Black individuals as less socially deviant than other groups of stigmatized individuals. Confirming this possibility, in a online supplemental material (Study S6; $N = 92$), participants explicitly judged various stigmatized individuals (compared with more normative individuals) as three times more pattern deviant in society ("more likely to break a pattern and be out of line") than Black individuals (compared with White individuals). What explains participants' perception of Black individuals as less socially deviant than other groups of stigmatized individuals, however? Potentially, the integration of Black people in mass media and American culture (e.g., in music, in sports), and the increased awareness of the contribution of Black people in American society (e.g., Black history month), may lead people to perceive Black individuals as more normative. And this may be a recent development; researchers in 1988 explicitly argued that Black people in the United States are discriminated against because they are perceived as deviant in society (Katz & Hass, 1988).

Given these results, we posit that pattern deviancy aversion particularly motivates prejudice against groups and individuals who are perceived as socially deviant. Supporting this claim, in Study 2.1, we observed that pattern deviancy aversion does not relate to prejudice against women, a group that is statistically normative; these results strongly align with our proposed mediation model given that women are not a statistical minority in the United States (examining this relationship in China where women are a minority would be an interesting extension of the current work). And, in Study-set 3, pattern deviancy aversion predicted reduced prejudice against Black and Muslim people when such people were presented as the nondeviant statistical majority in a society. We therefore propose that pattern deviancy aversion particularly predicts prejudice against individuals that break the regularities in a specific context—pattern deviancy aversion does not seem to be related to generalized prejudice or bigotry per se.

As such, prejudice driven by pattern deviancy aversion seems to diverge from prejudice driven by social factors, such as resource-competition (e.g., Sherif et al., 1961), threat (e.g., Blalock, 1967; Blumer, 1958; Cottrell & Neuberg, 2005; Quillian, 1995, 1996), and social identity (Tajfel & Turner, 1979). Prejudice driven by pattern deviancy aversion is directed specifically toward social deviancy, is unrelated to conservatism (see Gollwitzer et al., 2017), is flexible and fluctuates with regard to the specific context (see Study-set 3), and does not seem to be driven by ingroup biases (see the racial identity results directly before the general discus-

sion). Prejudice in the service of social factors, on the other hand, is largely directed toward competitive or disadvantaged outgroups, and is commonly driven by in-group bias (e.g., Riek, Mania, & Gaertner, 2006). Future research should directly examine how pattern deviancy aversion differentially impacts prejudice compared with other causes of prejudice (e.g., right-wing authoritarianism; Duckitt & Sibley, 2007), especially in terms of the resulting targets of prejudice and the processes involved.

## The Mediation Model: Methodological Considerations

Correlational mediation analyses and even experimental mediation analyses have certain pitfalls (Bullock et al., 2010; Fiedler et al., 2011). For instance, significant mediations can be driven by spurious mediators. To begin to combat this possibility, we included one such possible third variable in our analyses: Participants' judgments of whether statistical minorities or majorities hold power. Controlling for these judgments did not reduce the observed mediation effects (except in Study 1.2). Further, pattern deviancy aversion has been shown to predict prejudice independently of political orientation, disgust, need for closure, disliking ambiguity, negativity bias, threat sensitivity, social dominance orientation, right-wing authoritarianism, a self-reported desire to be egalitarian, and a tendency to anthropomorphize (Gollwitzer et al., 2017; Gollwitzer & Clark, 2018). These variables are thus unlikely to qualify as third-variables leading to spurious mediation effects.

Further in support of a genuine mediation, we conceptually replicated the mediation model numerous times (Bullock et al., 2010). We observed the model across different manipulations of pattern deviancy aversion (descriptive as well as motivational), different measures of prejudice (binary and continuous; explicit and implicit), different types of prejudice (racial prejudice, prejudice against stigmatized individuals), different measurement items (e.g., liking and group-identity, positive and negative items), and across time (when the variables were measured longitudinally).

As suggested by Bullock and colleagues (2010), we also tested whether the observed mediation holds for different subgroups relevant to the theoretical model. We did not find participants' racial identity (minority vs. majority; Black vs. White), power judgments, political orientation, age, or sex to moderate the observed mediation effect. Importantly, we also successfully intervened on the proposed mediator—disliking statistical minorities—in Study 2.3. This finding provides causal support for the B pathway of the mediation model. That is, disliking statistical minorities causally impacts prejudice. This causal-interventionist test supports a causal pathway model (e.g., Kendler & Campbell, 2009; Spencer et al., 2005).

## Limitations and Caveats

A number of limitations and caveats should be addressed. First, in the experimental studies, we did not include a no-treatment control condition. Therefore, it is unclear whether heightening pattern deviancy aversion raises prejudice or reducing pattern deviancy aversion attenuates prejudice (or both). We thus cannot conclude that decreasing people's pattern deviancy aversion reduces their prejudice, a finding which could have applied interventionist value. Relatedly, we did not consider which factors may

lead certain individuals to be more responsive to our pattern deviancy aversion induction and its potential effect on prejudice, and we did not examine whether mechanisms aside from disliking statistical minorities exist; across the reported studies (in which we observed a significant total effect) approximately 40% of the variance of the link between pattern deviancy aversion and prejudice was explained by disliking statistical minorities, suggesting the existence of additional mechanisms. Future research should examine these questions.

Second, the reported studies did not examine real-world behavioral expressions of prejudice (e.g., hiring practices). Therefore, the generalizability of the present research is limited. Future research should examine whether inducing pattern deviancy aversion leads individuals to exhibit prejudice against social deviants in more real-world contexts.

Third, some conceptual clarifications are in order. Though we often use the term disliking statistical minorities to represent the proposed mediator, such dislike was operationalized as a comparative preference for statistical majorities over minorities (Study-set 1 and Study 2.1) and a comparative dislike of statistical minorities over majorities (Studies 2.2 and 2.3). Therefore, it is unclear whether participants' responses truly communicated disliking minorities rather than a comparative preference for majorities and a comparative dislike of minorities. Similarly, while we use the term prejudice throughout the article, it is unclear whether participants' responses entailed a comparative liking for White people (Study-set 1) and normative people (Study-set 2) or a comparative dislike of Black people (Study-set 1) and stigmatized people (Study-set 2; see Greenwald & Pettigrew, 2014). These conceptual caveats should be kept in mind when considering the observed findings.

Fourth, one might argue that demand effects account for our findings. A number of points argue against demand interpretations, however. First, we found the predicted results in Study 1.1 despite including a distractor task. Second, Study 2.1 was a longitudinal study, and we still observed the predicted results. Third, in Study-set 2, we removed the reminder prompts included in Studies 1.3 and 1.4 (that kept the manipulation salient throughout the studies) and still observed the hypothesized mediation. Fourth, Study 1.4 assessed participants' *implicit* racial prejudice and still observed the hypothesized mediation. Fifth, in Studies 2.2 and 2.3 (and Study S5), participants' self-reported motivation to come up with positive (vs. negative) attributes of pattern deviancy neither impacted participants' dislike of statistical minorities nor their prejudice. Past research indicates that demand effects are highly unlikely when participants' self-reported motivations to follow a manipulation do not align with their responding on dependent variables (e.g., Gollwitzer, Schwörer, Stern, Gollwitzer, & Bargh, 2017).

Fifth, aside from controlling for participants' power judgments, we did not consider factors related to functionality; the presented findings may be moderated by participants' goals. Indeed, motivational causes of prejudice often override simple cognitive determinants (e.g., see Blanchard, Adelman, & Cook, 1975). And further, in line with the lack of a meaningful effect of pattern deviancy aversion on racial prejudice (Studies 1.3 and 1.4), motivational factors underlying racial prejudice (e.g., dominance motives; resource competition; institutional factors; Blauner, 1972; Bonacich, 1972; Sherif et al., 1961) may override the influence of pattern deviancy aversion on racial prejudice.

Sixth, we did not consider a number of constructs conceptually related to pattern deviancy aversion in the present research. For instance, we did not consider whether people's response to expectation violations play a role in our findings, and similarly, whether the literature on prediction error and conflict is relevant for the current results (e.g., Proulx, Inzlicht, & Harmon-Jones, 2012). Relatedly, we did not examine whether creativity plays a role in our findings—a liking for broken patterns may relate to creative thinking and reduced prejudice has been linked to creative out of the box thinking (Gocłowska & Crisp, 2013).

Seventh, we explicitly note some limitations of the individual studies and analyses. First, Study 1.2 (the children's sample) had a very small sample size ($n = 58$). Therefore, the results of this individual study should be interpreted cautiously, and future research needs to be conducted before strong conclusions are drawn. Second, our analysis of whether participants' racial identity moderated our results is similarly limited. Only a small number of Black participants were included across our studies (total $n = 164$), making it difficult to conclude whether participants' race impacted the results of any of the individually reported studies. Future studies should continue to examine these questions.

Finally, the observed findings may extend to contexts apart from the societal or population level. For instance, pattern deviancy aversion may lead individuals to dislike statistical minorities in specific contexts (e.g., band geeks in a high school) aside from disliking minorities in the general population. Building on Study-set 3, future research should continue to examine whether pattern deviancy aversion dynamically influences prejudice depending on the frequency/infrequency of different types of people in a specific environment.

## Conclusion

Perhaps it is no coincidence that those who are the targets of prejudice in society are described as not fitting in. We demonstrate a causal link between people's aversion toward pattern deviancy—distortions of repeated forms and models—and their degree of prejudice against stigmatized individuals. And further, it may be no coincidence that the targets of prejudice tend to be statistical minorities in society. We observed that pattern deviancy aversion influences prejudice by contributing to people's dislike of statistical minorities—disliking people who are proportionally infrequent in a population. Taken together, our results elucidate how an aversion toward something as simple as broken patterns contributes to the complex social construct that is prejudice. In doing so, our findings may help explain one pathway via which people become prejudiced against individuals perceived as deviant in society.

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