Homophily and acrophilily as drivers of political segregation

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Political segregation is an important social problem, increasing political polarization and impeding effective governance. Previous work has viewed political homophily, the tendency to affiliate with others who have similar views, as a driver of segregation. However, we propose that, in addition to political homophily, people’s social tie decisions are driven by political acrophilily, the tendency to associate with others who have more extreme political views (rather than more moderate). We examined this using a paradigm in which participants share emotions and attitudes on political policies, observe others’ responses and choose which others to affiliate with. In four experiments (\textit{N} = 1,235), both liberal and conservative participants’ social tie decisions reflected the presence of acrophilily. We found that participants who affiliated with peers who expressed more extreme views as more prototypical of a political group also tended to engage in greater acrophilily. These results identify a previously overlooked tendency in tie formation.

The extreme levels of political segregation evident in the United States today presents a major social challenge\textsuperscript{1}. Political segregation reduces interactions between group members, which contributes to polarization and inter-group hostility, and undermines political civility and effective governance\textsuperscript{2-4}.

Previous work has focused mainly on one key driver of segregation, namely political homophily, defined as the tendency to affiliate with others who have similar political views\textsuperscript{5-9}. Political homophily is a pervasive and enduring propensity\textsuperscript{10} that results in the formation of echo chambers of like-minded people who rarely interact across political lines\textsuperscript{11,12}. But does homophily alone drive individuals’ decisions about who to affiliate with in political contexts?

In this Article, we propose that, in addition to political homophily, people’s tie selection decisions are also driven by political acrophilily, which we define as the tendency to prefer to affiliate with others who represent more extreme (as opposed to more moderate) political views in the direction of one’s political leaning. Take for example a group of the exact same distance from their view, one who is more moderate, and the other who is more extreme. The prediction of homophily based on homophily would suggest an equal probability, whereas a prediction based on acrophilily would suggest a greater probability for the more extreme peer. Determining whether political homophily is in addition to homophily is important because it is a critical catalyst of political segregation in social networks, a driver of attitudinal and affective polarization.

Homophily and acrophilily are not mutually exclusive: the documented strength of political homophily, they co-occur. To illustrate how the two may integrate, consider a scenario where a person encounters others’ responses to the same incident. They may decide to affiliate with others whose responses to their own (Fig. 1a), regardless of whether these responses are more or less extreme. Under homophily, a person chooses to affiliate with those who have similar opinions to their own (Fig. 1a), whereas under acrophilily, a person chooses to affiliate with those whose opinions are more extreme than their own (Fig. 1b).
is considered a more extreme view related to one’s political beliefs, in this context others who express more outrage than they do. However, the chooser would not completely exclude others who expressed less outrage if their responses were similar. Finally, under acrophily, the chooser would elect to affiliate only with others who express more extreme responses than their own, which in this case is people who express more outrage (Fig. 1c). These strategies operate on a continuum, and dividing them into these three categories is done for heuristic purposes. Nevertheless, considering the strength of homophily, our assumption is that participants’ choices should be most similar to the homophily + acrophily strategy.

Indirect evidence for its occurrence can be found in existing work. One relevant finding is from research on group deviance, which suggests that people evaluate deviation from group norms towards the extreme more favourably than deviations towards more moderate views. A second relevant finding is that people like others who present more coherent political views, a tendency that is often associated with more extreme views. Third, acrophily can be extrapolated from the notion of directional voting, which suggests that people have a clear preference for representatives of their side, even if the distance in attitudes to these representatives is bigger than to representatives on the other side. One corollary of this idea is that people are attracted, to a certain extent, to representatives who are more extreme than them. However, this idea has been the focus of a great debate without clear empirical evidence for its occurrence. Furthermore, it is not clear that preference for representatives, on the one hand, and social ties, on the other hand, capture an identical phenomenon. Finally, a fourth indication of a tendency to prefer extreme views comes from the literature on attitude polarization. One driver of polarization, among many, is people’s tendency to express extreme views to be ‘better’ than others in their group. Interestingly, while the mechanisms that drive such polarization point to an attraction towards extreme views (as in acrophily), the individual-level immediate outcomes are actually opposite in the two cases. When polarizing, people adopt more extreme views, and therefore become more extreme in relation to others. Selecting ties on the basis of acrophily, however, results in individuals becoming less extreme than others in their group because they have selectively affiliated with more extreme others. While acrophily, the chooser keeps those who are expressing higher outrage.

Fig. 1 | Three hypothetical tie selection strategies. The red ticker represents a chooser’s moral outrage to a certain case of police brutality. The blue tickers represent potential ties’ moral outrage, and the numbers represent the order of choosing. a. When applying homophily, the chooser elects to keep others whose responses are closest, regardless of whether they are more or less than b. When applying homophily + acrophily, the chooser has a preference for others who have expressed more outrage. c. When applying acrophily, the chooser keeps others expressing the most extreme responses.

We conducted four studies with the goal of examining the occurrence of acrophily. In studies 1–3 we examined participants’ strategies as they choose other participants on the basis of moral outrage responses. These studies show that one mechanism for acrophily is the perception that these views are more prototypical representations of their political group.

Results
Analyses for all studies were conducted in R using mixed-effects repeated measures. Assumptions of normality (Kolmogorov-Smirnov test) and equal variance (Levene test) were done for all analyses (for full report, see sections on formal tests of assumptions Supplementary Information). When these assumptions were violated, a robust estimation of mixed effects using the package lme4 was performed, finding similar results in all cases (Supplementary Information).

Acrophily based on moral outrage to police brutality
The goal of studies 1–3 was to examine participants’ strategies when evaluating responses of moral outrage to police brutality against Black demonstrators. We chose to focus on the expression of outrage—defined as a negative emotion primarily consisting of anger, towards a transgressor who wrongdoings—because it has been shown to be especially salient in social signalling and in driving affiliation decisions. Acrophily specifically focuses on responses to police brutality, which is a highly salient issue and because responses to police brutality vary greatly by political affiliation in the United States. We examined liberals’ tie selection decisions when choosing between the work of liberals and conservatives. In study 2 we tested an online design that allowed us to increase the sample size of both liberals and conservatives. In study 3 we replicated this design.
represented a more extreme view based on their political view. In the case of outrage to police brutality, acrophily for liberals meant preferring peers who expressed stronger outrage and acrophily for conservatives meant preferring peers who expressed weaker outrage.

**Task.** The task was similar in studies 1–3, with small variations described in each study (Fig. 2). In each trial, participants saw pictures of police brutality against Black demonstrators intended to elicit negative emotions. For each picture, participants were first asked to provide their emotional response to the picture in a few words and then to rate their emotions in response to the picture on a scale of 1 (no negative emotion) to 9 (a lot of emotion). After rating and responding to the picture, participants then saw six boxes with unique colours, each containing a peer response to the same picture that they just rated. Each box included a name that was congruent with the participant’s gender, a peer rating and their text response to the same picture. Peer ratings and responses were collected in a pre-test and included real ratings by real participants. After observing the responses for five seconds, participants’ choices were different in the choice versus no choice conditions. In the choice condition, participants were asked to select three peers they would not want to see in a subsequent trial by clicking on the boxes they wished to eliminate. In the no choice condition, participants were asked to eliminate a random subset of three names coloured in red. In both conditions, participants were told that the eliminated peers would be eliminated completely from the entire studies. Participants in study 1 were self-identified as either liberals or conservatives, participants in study 2 were self-identified as either liberals or conservatives, and participants in study 3 were self-identified as either liberals or conservatives. Participants were paid to complete the task in the lab. Participants in study 1 were paid $20 for completing the task in the lab. Participants in study 2 were paid $20 for completing the task in the lab. Participants in study 3 were paid $20 for completing the task in the lab. Participants in study 4 were paid $20 for completing the task in the lab.

To examine the occurrence of acrophily, we conducted a main analysis on the choice condition. Our first test of whether the differences in ratings of six peers, and were asked to eliminate three peers (three peers). Participants therefore had \( \binom{6}{3} = 20 \) possible sets of peers to keep in each trial. Of these 20 averages, one combination (or more) reflected the most preferred choice in each set. To create our coefficient, we calculated...
Fig. 3 | Results from study 2 (n = 213, experimental condition). a. The acrophily coefficient (reverse scaled for conservatives for ease of comparison) over trial number, where positive values represent a tendency for acrophily. Error bars represent 95% confidence intervals. b. Summary of comparisons between the average kept ratings and the four simulations (acrophily higher, acrophily lower, homophily and random). Each simulation was repeated 1,000 times and was compared with the actual average kept ratings. The zero line represents the average of participants' kept rating. Each red dot represents a coefficient for the simulation and its distribution. Participants' ratings are located in between a pure homophily tie selection strategy, higher for liberals and lower for conservatives.

coefficient by dividing it by the standard deviation (s.d.) of all possible choices of sets of peers.

In both studies 1 and 2, we calculated an acrophily coefficient for each participant in each trial in the choice condition and created a mixed-model analysis predicting the acrophily coefficient from trial number. We standardized trial number to be able to evaluate the average coefficient using the intercept of the model. In addition, and similar to the previous analysis, we used a random intercept of participants' ID. Furthermore, in study 2 we added an interaction term with political affiliation to evaluate differences in acrophily between the political groups. We report results by political affiliation although no significant differences were found between political groups (acrophily and political affiliation in Supplementary Information). Notice that coefficients for all of our analysis are in standardized values and can be compared across studies.

For our liberal participants, results suggested that the acrophily coefficient was significantly positive (study 1: $b = 0.33, t(30) = 2.51, P = 0.01, R^2 = 0.23, 95\%$ confidence interval [0.07, 0.60]; study 2: $b = 0.29, t(195) = 3.56, P < 0.001, R^2 = 0.32, 95\%$ confidence interval [0.11, 0.44]), pointing to an acrophily. Furthermore, results of study 2 (same direction to study 1 with less power) suggested that liberal tendency for acrophily increased over time (study 1: $b = 0.08, t(588) = 1.49, P = 0.13, R^2 = 0.23, 95\%$ confidence interval [-0.02, 0.19]; study 2: $b = 0.05 [0.001, 0.11], t(3,760) = 1.98, P = 0.04, R^2 = 0.32, 95\%$ confidence interval [0.02, 0.05]; Fig. 2a).

We then examined the same effects with our conservative participants in study 2. Looking first at the intercept of the model, results suggested that the acrophily coefficient was negative and significantly different from zero ($b = -0.21, t(196) = -2.53, P = 0.01, R^2 = 0.32, 95\%$ confidence interval [-0.40, -0.06]), pointing to an acrophily selection limitation by comparing participants' actual tie selections with the choice condition with what they would have chosen with four different tie selection strategies: a no choice strategy (without any acrophily) and two complete acrophily strategies (one towards more emotional ratings, and one towards more rational ratings). Simulating participants' tie selections of these strategies was done by using participants' actual choices when they saw the pictures they saw, but instead of making the actual choices that they made, our simulation executed one of the four selection strategies mentioned above. Notice that trials are dependent, such that the peers whom participants chose were dependent on their choices in previous trials. Our simulation was designed to replicate the task structure of the first trial and allow the simulation choices in each trial to correspond with the peers in the following trial.

In the random selection strategy, agents in our simulations choose peers randomly. In the homophily strategy, agents in one group chose in each trial the three peers closest to participants regardless of whether they were more moderate or more extreme than both of our acrophily simulations (more outrageous and more conservative) in our simulations chose the peers closest to the average, but only on one side of the scale, either more outrageous or more conservative. Only if there were no available peers in designated sides (depending on the simulation) did agents choose the closest peer on the other side.

We ran 1,000 iterations of each of the four simulation leaders in each simulation generated an average of ratings of the kind we ran on each trial. We then ran 1,000 models in which we compared actual average kept ratings (the peers whom participants chose) versus the actual average kept ratings (the peers whom participants chose) versus the simulation generated average ratings (the peers whom participants chose)

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Looking first at the liberal participants, results suggested that the average rating of the actually kept peers was significantly higher than the homophily simulation (study 1: $b = -0.646$, $t = -3.58$, 95% confidence interval $[-0.650, -0.643]$, $P < 0.001$; study 2: $b = -0.277$, $t = -2.60$, 95% confidence interval $[-0.275, -0.273]$, $P = 0.010$ [0.010, 0.11]), and significantly lower from the more outward acrophily strategy in study 2 but not in study 1 (Study 1: $b = 0.327$, $t = 1.82$, 95% confidence interval $[0.323, 0.331]$, $P = 0.088$ [0.084, 0.092]; study 2: $b = 0.396$, $t = 3.75$, 95% confidence interval $[0.395, 0.397]$, $P < 0.001$), indicating that participants’ tie selection strategy was between homophily and acrophily in study 2 and marginally significantly different from acrophily in study 1. Coefficient sizes indicate that differences from acrophily high was -50% smaller in study 1 and 44% bigger in study 2 than the distance to homophily. These findings suggest that, despite the fact that participants’ choices in both studies fell between homophily and acrophily, there was quite a lot of variance in whether participants behaviour was closer to homophily or acrophily. Finally, as expected, the average kept ratings in participants’ active choice was also significantly higher than a random selection (study 1: $b = -1.111$, $t = -6.15$, 95% confidence interval $[-1.117, -1.106]$, $P < 0.001$; study 2: $b = -1.313$, $t = -12.44$, 95% confidence interval $[-1.316, -1.311]$, $P < 0.001$) and the acrophily lower strategy (Study 1: $b = -1.911$, $t = -10.58$, 95% confidence interval $[-1.915, -1.907]$, $P < 0.001$; study 2: $b = -1.351$, $t = -12.80$, 95% confidence interval $[-1.353, -1.350]$, $P < 0.001$). Results from our comparisons in the choice condition provided further evidence that participants’ tie selection choices included a combination of homophily and acrophily towards more emotional responses.

Looking next at the conservative participants in study 2, as expected, results suggested the exact opposite: conservatives’ peer choices were lower than what they would have chosen with just homophily ($b = -0.277$, $t = 2.02$, 95% confidence interval $[0.259, 0.277]$, $P = 0.04$ [0.044, 0.045]) and higher than the acrophily lower simulation ($b = 0.515$, $t = -3.85$, 95% confidence interval $[-0.517, -0.514]$, $P < 0.001$), suggesting that choices were between homophily and acrophily lower (but 88% closer to homophily in this case), which represented a more extreme conservative view. As expected, the average rating of the actually kept peers was significantly lower than a random selection ($b = 0.860$, $t = 6.43$, 95% confidence interval $[0.857, 0.862]$, $P < 0.001$) and also significantly lower than the acrophily higher simulation ($b = 1.192$, $t = 8.91$, 95% confidence interval $[1.190, 1.194]$, $P < 0.001$). Results from our comparisons in the choice condition provided further evidence that participants’ tie selection choices involved a combination of homophily and acrophily, but in this case towards less intense ratings.

**Study 3.** The goal of study 3 was to replicate findings of study 2 and further test a potential mechanism driving acrophily. We hypothesized that participants were selecting ties who are more extreme because they evaluate these extreme responses as more prototypical of their groups’ responses. To evaluate this hypothesis, participants first completed a task that was similar to that of studies 1 and 2 (with some minor differences; Methods). At a second stage, participants were then shown six of the trials they completed again (with the exact same peer responses) and were asked to rank the three responses that represented the most prototypical response of their own political group. We did not provide participants further details regarding the meaning of that term but assumed that participants understood it to be related to the political spectrum.

1 and 2, the acrophily coefficient became stronger with preference for liberal participants ($b = 0.04$, $t(7,161) = 2.46$, $P = 0.019$, 95% confidence interval [0.01, 0.08]). The conservative participants, results suggested that the acrophily coefficient was significantly different from zero, and slightly smaller ($b = -0.15$, $t(374) = -3.06$, $P = 0.001$, $R^2 = 0.28$, 95% confidence interval $[-0.25, -0.05]$), pointing to an acrophily tie selection strongly, results suggested that the acrophily shown in our participants decreased with trial number ($b = 0.06$, $P < 0.001$, $R^2 = 0.28$, 95% confidence interval $[0.03, 0.10]$), why acrophily decreased for conservatives and increased for liberals. This could be caused by the salience of strong emotional responses and reduction of acrophily overall, or by some differences in the way acrophily operates between liberals and conservatives.

We then turned to our second method of evaluation, comparing it with simulated data of various strategies and results of study 2. Looking first at liberals, results suggested that the average rating of the actually kept peers was significantly just homophily ($b = -0.87$, $t = -5.06$, 95% confidence interval $[-4.89, -0.89]$, $P < 0.001$), and significantly lower compared with higher simulation ($b = 5.88$, $t = 6.11$, 95% confidence interval $P < 0.001$), revealing again a mix of homophily and acrophily from acrophily-20% bigger. Finally, as expected, the average rating in participants’ actual selection was significantly lower than a random selection ($b = -15.22$, $t = -15.81$, 95% confidence interval $P < 0.001$) and also significantly higher than the acrophily lower simulation ($b = 19.26$, $t = -20.00$, 95% confidence interval $P < 0.001$), suggesting that average kept ratings in homophily and acrophily. Findings of the conservative participants were as expected, the exact opposite. The average rating of conservative tie selection was lower than just homophily ($b = 0.515$, 95% confidence interval $[0.27, 0.29]$, $P < 0.001$), and higher than the acrophily lower simulation ($b = -7.24$, $t = -7.25$, 95% confidence interval $[-7.25, 7.23]$, $P < 0.001$). In this case, however, conservatives were much closer to homophily that previously seen significant on average). Finally, as expected, the average rating of participants’ actual choice was also significantly lower than a random selection ($b = 21.26$, $t = 21.29$, 95% confidence interval $P < 0.001$) and significantly lower than the acrophily higher ($b = 18.47$, $t = 18.49$, 95% confidence interval $18.46, 18.47$).

After establishing the existence of a possible mechanism for acrophily, we then examine one possible mechanism for this. As a result of completing the first phase of the task, participants were given previous trials that were identical to those just saw to rank the most prototypical response of their group of six peers, from 1 to 3. To analyse this phase of the task, we calculated a preference score between participants’ ratings and the peer marked as prototypical, such that a positive number indicated they chose prototypical person that was chosen by our participants the pictures more strongly than the participant and that a negative number. As participants chose prototypical (1–3), we did this for each of the three peers chosen by participants. We then conducted an interaction between the rank of peer (1–3) and participants’ political affiliation in preference score between participants and the prototypical outcome could tell us whether the first selected prototypical higher or lower than participant’s rating (the interaction...
participants was estimated to express more negative emotions compared to participants' own ratings by 8.07 points on the 1–100 scale ($b = 8.07$, $t(545) = 6.02$, $P < 0.001$, $R^2 = 0.30$, 95% confidence interval [5.45, 10.70]). As expected, going down the prototypicality rank led to a reduced difference between participants and the prototypical peer ($b = -4.15$, $t(545) = -7.50$, $P < 0.001$, $R^2 = 0.30$, 95% confidence interval [-5.25, -3.07]), as fewer peers who expressed stronger emotions were available (Fig. 4). We then centred the model on the conservative participants. The intercept of the model was significantly negative, suggesting that the most prototypical peer designated by the conservative participants was estimated to express less negative emotions compared to participants’ own ratings by 4.47 points ($b = -4.47$, $t(545) = -3.23$, $P < 0.001$, $R^2 = 0.30$, 95% confidence interval [-3.17, -1.76]). As expected, going down the prototypicality rank led to a reduced difference between participants and the prototypical peer ($b = 0.56$, $t(545) = 6.23$, $P < 0.001$, $R^2 = 0.30$, 95% confidence interval [2.44, 4.68]). Notice that conservatives’ third choice was on average higher in rating than participants’ own ratings. This is probably caused by the fact that on average there were not enough conservatives who were more extreme than participants by the third choice. Results also revealed a stronger difference for liberals, such that liberals assumed prototypical members to be more extreme compared with the assumption made by conservative (for further information, see prototypicality and political affiliation in Supplementary Information).

participants’ acrophily and participants’ choice of the members of their political group ($b = 0.30$, $t(375) = 6.82$, $R^2 = 0.09$, 95% confidence interval [0.34, 0.44]), suggesting that participants choice of prototypicality was associated with degree of acrophily.

**Study 4**

The goal of study 4 was to address key limitations of study 3; we wanted to examine whether acrophily can be seen not as based on other types of responses than emotions, asking participants to rate and choose ties on the basis of support for four political policies associated with four highly contentious topics: gun action, gun control, hunting and military budget. Second, we wanted to see whether acrophily is evident when participants are asked to choose rather than eliminate peers. Third, we wanted to simplify the procedure by allowing acrophily to be detected without using simulations. To achieve these goals, study 4 was quite a different design of the original studies. However, we believe that by addressing these limitations, we were able to expand the notion of acrophily to new ways. In the revised task, participants provided text rating of support (1–7 scale) for four political policies. For each policy, participants saw seven peers who provided responses to the policy on a 1–7 scale. Then, participants were asked to choose one peer whose response they would like to
participants' ID and one of policy type. Looking first at the intercept of the model, which was our liberal participants, results suggested that our liberal participants chose to keep peers whose rating represented the same policy position. In contrast, the conservative participants were more common than initially thought and can occur varieties on the basis of a variety of response types. Second, if acrophily can occur when people choose new ties, rather
acrophily. Removing such ratings (which represent 31.3% of all ratings) doubles the effect (study 4 analysis in Supplementary Information). Albeit small, these results are especially striking given the structure of the task and the fact that participants just rated their response to the stimuli and then immediately chose users whose ratings are more extreme than their own.

**General discussion**

The goal of the current project was to introduce the concept of acrophily—the tendency to prefer to affiliate with others with more extreme (as opposed to more moderate) political views—and to assess whether acrophily is evident in tie selection decisions as an additional driving force of political segregation and polarization. In four studies, we showed that participants tended to keep ties whose ratings reflected a preference towards more extreme (versus more moderate) views. Importantly, we found strong evidence for homophily as well, and participants’ tie selection strategy seemed to reflect a mix of homophily and acrophily.

Our findings have important implications for understanding political segregation. If people’s tie selection is affected by acrophily in addition to homophily, we should assume that segregation occurs at a faster rate and leads to more extreme outcomes than would otherwise be expected. To evaluate this possibility, we created an agent-based model (section on agent-based model of network segregation in Supplementary Information) that randomly populated a network of both liberals and conservatives and examined the rate and degree of network segregation as a result of homophily alone, acrophily alone or a combination of homophily and acrophily similar to that found in our studies. As expected, our simulation suggested stronger segregation in either version featuring acrophily, relative to homophily alone.

Research on acrophily is especially important in the current digital era, in which people make many tie selection decisions every day. Social media algorithms are often designed to increase or decrease strength in ties on the basis of users’ activity. Liking a certain post on social media is likely to lead to an increase in tie strength with the person who produced the post, and ignoring a post is likely to contribute to weakening of a social tie. Therefore, in the many hours that people spend on social media every day, they make many tie selection decisions. Further specifying tie selection strategies and the psychological processes that give rise to them is of utmost importance in light of their daily prevalence and their impact on social segregation.

In addition to providing evidence for the existence of acrophily, results of study 3 also provided an indication of why acrophily may be occurring, suggesting that one reason for the preference for more extreme views is that participants see the prototypical group member as more extreme than they actually are, and may want to have ties to these prototypical ingroup members. Further analysis supporting this idea revealed that individual-level tendencies to evaluate prototypical peers as extremes were associated with increased tendencies for acrophily. One limitation of the current measure is that participants were asked to indicate a prototypical member of their group, without specifically indicating a political group. Future work should re-examine this evaluation with a more specific indication of political group.

Despite this encouraging evidence, it is likely that other mechanisms also contribute to acrophily. One such mechanism is the relative salience of extreme views. Such salience may be caused by increased exposure. Our experiments leave open several questions about how acrophily is translated to emotions, attitudes and behavior in the real world, how interactions between political views influence interactions among voters, and how political views influence tie selection decisions in political systems. Future work should examine how tie selection decisions are affected by both political views and the presence of political leaders in the real world, including how they affect the occurrence of acrophily.

A second limitation relates to the fact that in each study participants were asked whether a user was more acrophilous or less acrophilous than the rest of the group, but that tie selection decisions that are based on the basis of responses to a single rating are more susceptible to being affected by more complex tie selection decisions, in which participants choose how to balance multiple issues. Future work should examine acrophily in natural social settings, for example, on social media in closed organizations such as companies and schools. Similar approaches should also examine whether acrophily occurs in tasks that do not involve political nature.

A third limitation of the current work is that we provided evidence for acrophily rather than thinking about ways to mitigate the effects of acrophily. Future work should also address the need for policies that can influence people’s tie selection decisions and the number of ties to achieve various affiliative and strategic needs. Participants should also modify the goals for participants’ interaction. These goals should also reflect whether participants’ interaction is to achieve various affiliative and strategic needs. Participants should also modify the goals for participants’ interaction. These goals should also reflect whether participants’ interaction is to achieve various affiliative and strategic needs. Participants should also modify the goals for participants’ interaction. These goals should also reflect whether participants’ interaction is to achieve various affiliative and strategic needs. Participants should also modify the goals for participants’ interaction. These goals should also reflect whether participants’ interaction is to achieve various affiliative and strategic needs. Participants should also modify the goals for participants’ interaction. These goals should also reflect whether participants’ interaction is to achieve various affiliative and strategic needs.

Finally, our findings raise interesting questions about how recent changes in political segregation. Given that we see increased levels of segregation and polarization in the United States and other societies around the globe now than ever before, one important question is what has changed. A related question is what the causes of this change have been. We believe that the presence of both homophily and acrophily in political tie selection decisions can inform our understanding of the true prototypical ratings of their group.

**Methods**

This research was approved by Stanford University (study 1), MIT, and Harvard University (studies 2 and 3: IRB-14-09; study 3: IRB-14-09; study 3: IRB-14-09). All participants provided informed consent and were compensated for their time.

**Studies 1–3**

**Participants.** In study 1, we used data from a task used in the presence of the task used in the present research to be able to estimate the sample size. Our estimated sample size for study 1 was based on evidence for homophily. Results suggested that using 30 participants completing 20 trials in our experimental condition would allow us to obtain at least 100% power for the study (for power estimation on each sample size, see Supplementary Information). The study included both choice and no choice conditions, the total number of participants was 30 in study 1 included 70 participants (male: 26; female: 44; age: 18–65).
2 and 3 when transitioning the task to online studies. No participants who completed the study were removed from the analysis.

Study 2 was designed with the goal to recruit a larger and more diverse participant sample. For this reason, we converted our lab task into an online task and increased the target sample size to 400 participants (200 in the choice condition), with the hope of recruiting 200 liberals and 200 conservatives and increasing the power to almost 100% (power analysis in Supplementary Information). Participants were recruited using the online platform Prolific in exchange for $2.50 (-20 min). Out of the 400 participants who completed our task, we removed 8 participants for providing nonsensical text responses or not providing their demographics. Our final sample therefore included 392 participants (males: 228, females: 160, other: 4; age: mean 37.15 years, s.d. 13.49 years), who were randomly divided into no choice and choice conditions. All participants were American citizens. We were aiming to get an equal number of participants in each political side. Accordingly, in terms of their political affiliation, 184 participants identified as liberals, 180 identified as conservatives and 28 identified as located in the middle. We removed middle participants from the main analysis.

In study 3, as in study 2, we recruited 400 participants with the hope of recruiting 200 liberals and 200 conservatives. Participants were recruited using the online platform Prolific in exchange for $3.5 (-30 min). Out of the 400 participants who completed our task, we removed 13 participants for providing nonsensical text responses or not providing their demographics. Our final sample therefore included 387 participants (males: 236, females: 149, other: 2; age: mean 43.25 years, s.d. 13.14 years). All participants were American citizens. In terms of their political affiliation, 194 participants identified as liberals, 183 identified as conservatives and 10 identified as located in the middle. Similar to study 2, we removed middle participants from the main analysis.

Ties selection task. The structure of the tie selection task was the same in all studies with a few modifications that will be described below. Participants were told that they were taking part in a study with the goal of understanding how people respond emotionally to political situations, as well as how they make decisions about what responses they would like to see. The task included 3 practice (in which participants saw anger-inducing pictures related to driving) and 20 actual trials. In the actual trials, participants saw pictures of police brutality against Black demonstrators. Pictures were pre-tested to elicit negative emotions, primarily anger (full description in the image pool below). For each picture, participants were first asked to provide their emotional response to the picture in a few words (Fig. 2). After providing their response, participants were asked to rate their emotions in response to the picture on a scale of 1 (no negative emotion) to 9 (a lot of negative emotion). We chose to use a neutral to negative emotion scale rather than a positive to negative scale for two reasons. First, measuring tie decisions on the basis of a neutral to negative scale allows us to test in study 2 whether acrophobia is caused by just attraction to more emotion, or rather to extreme views expressed by either no emotion or a lot of emotion, depending on one’s political beliefs. Second, we specifically selected pictures that were evaluated as eliciting negative emotions by more than 90% of the participants including conservatives (see description below), which means that positive ratings would be outliers and would change the focus of the task.

After rating and responding to the picture, participants then saw (for further details, see image and peer pool). Participants were asked to look at the six responses for 5 s before making any decision. After 5 s, participants’ choices were different depending on whether they were assigned to the choice versus no choice condition. In the no choice condition, participants were asked to select three peers to want to see in a subsequent trial by clicking on the boxes to eliminate. Clicking on each box eliminated it from the pool and chose to instruct participants to eliminate those they choose rather than selecting those they did want to see in order to select the fact that eliminated participants are never shown in the no choice condition, a random subset of three names was red. Participants were asked to click on the boxes with red names. In both conditions, participants were told that the eliminated would be eliminated completely from the entire task and responses would not be seen again, while the kept names would be seen in the subsequent trial.

After eliminating three peers in each trial, participants were assigned to the next trial, in which they were again asked to give a text response and rate their emotional response to the picture of police brutality. Participants were then shown six responses to the new picture. In every trial except for the very first, one of the six boxes was of peers who were kept from the previous trial, and the peer ratings and responses were from the same original person who participated kept from the previous trial. The other three boxes were randomly generated from the pool and included new names, ratings and responses. During 20 trials in which they provided their responses to rates and chose to eliminate three new peers, participants completed a short survey described below.

Image and peer pool. We conducted a pilot study to create the pool for the study, testing 40 candidate pictures of police against Black citizens. One hundred and four participants were presented with each picture and were asked to first provide a rate to the picture. Participants were then asked to rate the response the picture using the same scale that was used. Finally, participants were asked to select whether or not the elicited negative emotion, positive emotion or no emotion question did not appear in the actual task and was used. Two criteria were used to select pictures. First, all of the selected pictures were rated by less than 3 participants as positive. Second, we excluded pictures whose average score was higher than 7 or lower than 3 (to allow variance in pictures). As expected, our pictures were rated as eliciting significant negative emotion by liberals compared with conservatives (Fig. 1).

Out of the 104 participants who completed the pool, we chose 63 participants to be part of our peer pool to allow a large number of three peers in each trial in addition to six peer trials (9 × 3 × 6). Our first criterion in choosing peers was that our peer pool was heterogeneous in terms of peer selection. We chose 30 conservative, 30 liberals and 3 participants self-identified as middle. Our second criterion for choosing peers was the participants’ text. We chose participants who provided more than one-word responses to all of the pictures, and text responses were more or less similar to their rating.
Study 3 was based on study 2’s procedure with four meaningful changes. First, participants were only assigned to the select condition, as the goal was to get a better sense of the mechanism for acrophily. Second, we recreated our peer pool from that of study 2, by employing a new set of peers who provided new responses to the pictures of police brutality in the task. The reason for this change is that the social movement related to the death of George Floyd occurred between studies 2 and 3 and we suspected that such a large-scale movement may have changed people’s attitudes towards police brutality. We therefore ran an additional pilot in which we created a new peer pool to the same pictures of studies 1 and 2 (Supplementary Information). Third, we changed the scale participants used to rate their emotions from 1–9 to 0–100, 0 indicating no outcome and 100 very strong outcome. This was done to increase the variance in participants’ responses. The fourth and most important change to the task was our measurements of the prototypicality of response. After completing the task in a similar way to studies 1 and 2, participants then completed six additional trials in which they saw a copy of a previous trial (trials 3, 6, 9, 12, 15 and 18) and were asked to rank the responses that represented the top three most prototypical responses of their political group using this question: ‘Choose the three peers that represent the most prototypical response of your political group.’ After completing these six trials, participants were forwarded to a survey that included a few final questions described below.

**Measures.** While completing the task, we collected participants’ ratings and text in response to each picture. We also recorded which peers they chose to keep versus eliminate. In study 1, after completing the task, participants completed a survey that included two questions relating to their motivation to keep certain peers based on similarity and difference. In the similarity question, participants were asked: ‘To what extent did you choose people who felt similar emotions to you in response to the pictures?’ In the difference question, participants were asked the same question, but using the words ‘different emotions’ instead. Participants rated their response using a scale from 1 (not at all) to 6 (very much so). Participants also completed a few scales including a group identification scale, a heterogeneity test in which participants were asked to estimate what portion of their social environment has different race, socio-economic status, a political affiliation measure, an ‘in-to-belongs’ scale and a personality scale. These scales were measured with the intention of testing them as potential mechanisms for acrophily (for full description and analysis of the connection between these scales and acrophily, see Supplementary Tables 1, 5, 6, 10 and 11). In study 2 we removed the need to belong scales from our survey and added a few new scales in which we examined potential motivations for acrophily (choosing people because they are more creative, provided new interpretations, made the participants feel good, and so on), feeling thermometers for various groups, and participants’ political identification (for further analysis, see Supplementary Information). In study 3, after participants completed the task, we measured participants’ ranking of peers’ prototypicality using the task described above. Finally, participants answered a few survey questions that were similar to study 2 (Supplementary Information).

**Policy and peer pool.** We conducted a pilot study to recreate our peer pool for the study, testing six candidate policies, and six participants were presented with each policy and asked to first provide a text response to the picture. Participants were asked to rate their support for the policy using the scale that was used in the task. We selected the four policies that resulted in polarized ratings (to allow for the possibility of a greater range in the intention of selecting two elicits more supporting options and two among liberals: ‘Gradually increasing minimum wages’ and ‘Reducing the power of the federal government over states’ and two among liberals: ‘Gradually increasing minimum wages’ and ‘Reducing the power of the federal government over states’). As expected, our policies were rated differently by the left and right policies (Supplementary Fig. 3).

For each policy and for each rating (from 1 to 7), participants provided responses based on coherence and fit between the text and the policy. In the cases in which it was possible, we used responses from the other political group. To create a pool of participants who were most likely to provide responses, we selected participants who identified with their own political group, or that these included all ratings from 1 to 7 in response to the text in study 3 (Supplementary Table 5).

**Tie selection task.** The structure of the task was based on studies 1–3 with a few important modifications. The tie broke practice trial and four actual trials. Participants saw a policy, providing a political policy (see description below). For each policy group were first asked to provide their text response to the policy, and participants were first asked to provide their text response to the policy, followed by a few words. After providing their response, participants then rated their support for the policy on a scale of 1 (completely support) to 7.

After rating and responding to the policies, participants saw seven boxes, each containing a peer response to the policy that they just rated. While the type of content in the boxes was similar to studies 1–3 and included a name, a rating and a text, there were a few important differences in this stage compared with previous stages. First, we made sure that all seven options were present at each trial, covering the whole scale from 1 to 7 designed to allow participants in each trial to choose the option they wanted and not be limited by what was available in the previous trial. A random draw was used to simplify the acrophialy. The order of ratings was randomized to ensure that the participants were not biased towards a particular peer when rating their support for the policy using the scale that was used in the task. Unlike previous tasks, participants were told explicitly that choosing to keep certain people would not lead to their peers to be eliminated. Participants would see them in subsequent trials.

**Study 4**

We recruited 400 participants after processing results from study 3 to ensure that a sample of this size would produce power of 0.8, even with a 0.2 effect size, to test whether participants were more likely to choose peers who were more prototypical of their political group.
scale and participants’ political identification (for further analysis, see Supplementary Tables 16 and 17).

Reporting summary
Further information on research design is available in the Nature Portfolio Reporting Summary linked to this article.

Data availability
Data for study 1 are available here: https://osf.io/nz4dk/. Data for studies 2–4 are available here: https://osf.io/649fq/. Data for the agent-based model are available here: https://osf.io/ad7vh/.

Code availability
Code for study 1 is available here: https://osf.io/nz4dk/ Code for studies 2–4 is available here: https://osf.io/649fq/. Code for the agent-based model is available here: https://osf.io/ad7vh/.

References


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Author contributions
A.G., J.J.G., E.H., R.W. and J.M.A. conceived and designed the experiments. A.G., Z.H., J.S. and D.B. ran the experiments. J.M.A. analysed studies 1–4. A.G. wrote the paper, and E.H. and J.J.G. were involved in reviewing and editing the manuscript.

Competing interests
The authors declare no competing interests.

Additional information
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Correspondence and requests for materials should be directed to Amit Goldenberg.

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For all statistical analyses, confirm that the following items are present in the figure legend, table legend, main text, or Methods section.

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- The exact sample size (n) for each experimental group/condition, given as a discrete number and unit of measurement
- A statement on whether measurements were taken from distinct samples or whether the same sample was measured repeatedly
- The statistical test(s) used AND whether they are one- or two-sided
  - *Only common tests should be described solely by name; describe more complex techniques in the Methods section.*
- A description of all covariates tested
- A description of any assumptions or corrections, such as tests of normality and adjustment for multiple comparisons
- A full description of the statistical parameters including central tendency (e.g. means) or other basic estimates (e.g. regression coefficients) AND variation (e.g. standard deviation) or associated estimates of uncertainty (e.g. confidence intervals)
- For null hypothesis testing, the test statistic (e.g. F, t, r) with confidence intervals, effect sizes, degrees of freedom and P value
  - *Give P values as exact values whenever suitable.*
- For Bayesian analysis, information on the choice of priors and Markov chain Monte Carlo settings
- For hierarchical and complex designs, identification of the appropriate level for tests and full reporting of outcomes
- Estimates of effect sizes (e.g. Cohen’s d, Pearson’s r), indicating how they were calculated

Our web collection on statistics for biologists contains articles on many of the points above.

## Software and code

Policy information about availability of computer code

<table>
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<th>Data collection</th>
<th>Data collection was done using a task that was built in jspsych.</th>
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<tr>
<td>Data analysis</td>
<td>Data analysis was done with R and Python</td>
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For manuscripts utilizing custom algorithms or software that are central to the research but not yet described in published literature, software must be made available to editors reviewers. We strongly encourage code deposition in a community repository (e.g. GitHub). See the Nature Portfolio guidelines for submitting code & software for further information.

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Behavioural & social sciences study design

All studies must disclose on these points even when the disclosure is negative.

<table>
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<th>Study description</th>
<th>Studies are mostly repeated-measure within participant tasks evaluated quantitatively.</th>
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<td>Sampling strategy</td>
<td>Sampling for Study 1 was done through the Stanford participant pool. Sampling for Study 2 was done through prolific and mturk. Sampling for Study 3 and 4 through mturk (using the platform mturk prime). Sample sizes were determined by power analyses that were conducted as a result of previous findings (Study 1), or based on results from the previous studies in the study sequences.</td>
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<tr>
<td>Data collection</td>
<td>All of our data were collected online with a jspsych task that was designed by the research team. Participants were sent to that task and followed the instructions. Once they completed the task, they were sent to a Qualtrics survey and answered a few questions about cases in which some variables were manipulated, for example when manipulating whether participants were assigned to an odd or no choice conditions, participants were not informed of such manipulations due to the fear that it would affect their performance in the task.</td>
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| Timing            | Start - Feb 2018  
End - May 2022. |
| Data exclusions   | Our exclusion criteria for studies 1-4 was for participants who provided nonsensical text responses to the pictures (that were not related at all to the stimuli at hand). Study 1: N=70; excluded - 0, Study 2: N= 392; excluded - 8, Study 3: N= 384; excluded - 13, Study 4: N = 386; excluded - 14 |
| Non-participation | State how many participants dropped out/declined participation and the reason(s) given OR provide response rate OR state that all participants dropped out/declined participation. |
| Randomization     | In studies in which was done (Studies 1, 2) this was done randomly. |

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## Human research participants

Policy information about [studies involving human research participants](#)

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<td>Recruitment</td>
<td>Participants were recruited through the Stanford participant pool, prolific and mturk.</td>
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<td>Ethics oversight</td>
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Note that full information on the approval of the study protocol must also be provided in the manuscript.