Birds of a Feather Sit Together: Physical Similarity Predicts Seating Choice

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Abstract

We hypothesized that people would sit closer to physically similar others in a variety of settings. Study 1 revealed significant aggregation in seating patterns in a computer lab on two easily-observed characteristics: glasses-wearing and sex. Study 2 included a wider variety of physical traits in university classrooms: race, sex, glasses-wearing, hair length and hair color. Multivariate tests revealed an overall tendency for people to sit beside physically similar others. These results remained significant even when controlling for sex and race, suggesting that people may match on physical dimensions other than broad social categories. Study 3 conceptually replicated these results in a laboratory setting. The more physically similar participants were to a confederate, the closer they sat prior to an anticipated interaction. This finding remained significant even when controlling for sex, race, and attractiveness similarity. These findings may have important implications for relationship formation.

The fact that similarity breeds interpersonal attraction is one of the most robust findings in the social sciences. People are more likely to be in relationships with others who are similar to themselves in terms of attitudes, values, social group memberships and physical appearance than others who are dissimilar (e.g., AhYun, 2002; McPherson, Smith-Lovin & Cook, 2002; Montoya, Horton & Kirchner, 2008). Though it is well-documented that people are more likely to be in relationships with similar others, scant research has examined how this general tendency plays out in day-to-day social situations. Romantic partners and friends tend to be similar on even seemingly trivial physical traits such as finger digit ratios, eye color and wrist circumference (Rushton, Russell and Wells, 1985; Voracek, Dressler, & Manning, 2006), so the tendency to seek out similar others might not be an entirely deliberate process. It is possible that the mere perception of physical similarity might influence relatively minor behaviors that ultimately have wide-ranging implications. For instance, people might choose to sit beside physically similar others more frequently than expected by chance. By consistently choosing to sit beside physically similar others, people decrease their physical proximity to dissimilar others. In doing so, the chances of interacting with similar others increases and the chances of interacting with dissimilar others decreases due to simple proximity. Interaction produced by sheer proximity can increase the chance of relationship formation (Festinger, Schachter & Back, 1950), so a preference to sit beside physically similar others may increase the odds of forming relationships with similar others by simple proximity alone. The current research examines seating choice as a function of physical similarity in both naturalistic and laboratory environments.

Demographic research reveals a tendency for social networks (i.e., friends, co-workers, romantic partners, etc.) to be more similar on a variety of sociodemographic variables than would be expected by chance alone, a tendency referred to as "homophily" in the literature. For example, most members of a specific social network tend to be similar in race, ethnicity, age, religion, education, occupation and sex, in roughly that order in terms of effect sizes (see McPherson et al., 2002 for a review). People also tend to enter romantic relationships with others who are similar in physical attractiveness to themselves (Berscheid, Dion, Walster & Walster, 1971; Little, Burt & Perrett, 2006; Murstein & Christy, 1976), a phenomenon known as the "matching effect." In fact, couples are more similar than chance on a variety of physical features beyond attractiveness. Married couples tend to be more similar in physical appearance than would be expected by chance, a phenomenon known as "assortative mating" (Alvarez, 2004). Pearson and Lee (1903) found that husbands and wives tended to have similar height, arm span, and forearm length. Much later, a review by Rushton et al. (1985) showed that spouses were slightly more likely to be similar to each other than chance on weight, hair color, eye color, chest breadth, wrist circumference and inter-pupillary breadth, to name only a few of the many physical traits studied. Mates have even been found to be similar on traits as obscure as finger length ratios (Voracek et al., 2006). The observed correlations in physical appearance between marital partners have been low, typically between.20 and .30 in the references cited above. Other research has focused more specifically on similarities in facial appearance. When coders rate individual pictures of married couples on overall facial similarity and attractiveness, married couples are rated as more similar than non-married pairs (Alvarez, 2004; Thiessen, Young & Delagado, 1997). Similar findings have occurred when researchers manipulate facial similarity using computer imaging. For instance, Debruine (2004a) generated pictures of faces that were 50% similar in shape, color and texture to participants' own faces. Participants rated the photo generated from their own face as more attractive than independent raters did. Strikingly, people even tend to report more positive attitudes towards children with whom they share facial similarity (Debruine, 2004b).

Though it is clear that similarity breeds interpersonal attraction, the processes underlying this phenomenon are less clear. A variety of theoretical frameworks have been offered in different literatures. Research in the homophily literature suggests that the tendency for social networks to be homogenous in race, ethnicity, age, religion, education, occupation and gender, is simply representative of an overall tendency for people to associate with others similar in wealth, power and prestige to themselves. The matching effect on physical attractiveness is theorized to occur in a similar fashion. Physical attractiveness is a resource, not unlike wealth or prestige; people might ideally want a partner who is as attractive as possible, but they minimize their chances for rejection by pursuing potential partners that are similar in attractiveness to themselves. In essence, these theories suggest that people try to maximize benefits while simultaneously minimizing their chances for rejection. This idea is broadly parallel with theorizing in the attitudinal similarity literature; associating with people who have similar beliefs validates one's own worldview and minimizes the chance of rejection (Byrne & Clore, 1970; though see also Rosenbaum's 1986 dissimilarity-repulsion theory).

In contrast, the literature examining assortative mating typically takes a biological standpoint. Some researchers suggest that married couples become more similar in facial appearance over time due to the habitual use of similar facial muscles as a result of shared emotional experiences (Zajonc, Adelmann, Murphy & Niedenthal, 1987). On the other hand, some theorists argue that assortative mating is evolutionarily beneficial to the organism practicing it, both by influencing genetic stability in a population, and by increasing the likelihood of one's genes being passed on to a second generation (Alvarez, 2004). Mating with genetically similar others can be evolutionarily adaptive, because it increases the likelihood of offspring having similar genes to the parent. Debruine (2004a) argues that the tendency to like others who have similar faces is really a kin-recognition system that carries over into romantic relationships. She argues that people are hardwired to have slightly more positive regard for people that look similar to themselves, regardless of sex, because these people are more likely to share more of our genetic makeup, and as such, are more likely be our kin.

Research on overall physical similarity and interpersonal attraction has tended to disproportionately focus on existing relationships, so the processes by which people end up in relationships with physically similar others are not yet clear. Moreover, research in this area has focused predominantly on romantic relationships, perhaps because it has generally been approached from an evolutionary framework in which the efficient propagation of one's genetic material is seen as the primary force guiding attraction to others (e.g., Alvarez, 2004; Debruine, 2004a). Whatever the reason, there is a paucity of research on the behavioral mechanisms that might contribute to people entering relationships with physically similar others. Any research that could help to shed some light on *how* people end up in relationships with physically similar others would be a significant advance in this area. In the present research we propose to complement and extend past work by examining a behavioral mechanism that may contribute to sorting based on physical similarity. Specifically, we examine how physical similarity affects seating preference. Seating choice (and other similar behaviors that regulate social distance) could play a role in the similarity-sorting process observed in research conducted from a variety of perspectives (e.g., homophily, social exchange, the matching effect) – demonstrating one way that even peripheral similarities might contribute to meaningful social relationships and groupings.

The existing research on seating preference has been confined primarily to sorting based on sex and race. Campbell, Kruskal and Wallace (1966) developed the *index of adjacency*, a statistical procedure that can be used to determine if the number of White/Black (or male/female) pairings within a group of seats (such as a classroom) are significantly different than would be expected by random assortment. The findings of their initial research revealed significant aggregation by sex and race within university classrooms. That is, women tended to sit by women, White people by other White people, and so on. More recently, Koen and Durrheim (in press) used Campbell et al.'s (1966) index of adjacency to examine aggregation by race at a South African university. They improved on the original study by photographing classrooms and testing the reliability of coding, thus reducing the impact of observer error. Generally speaking, they found significant racial aggregation within classrooms, similar to Campbell et al.'s (1966) research. Using more sophisticated analyses, Clack, Dixon and Tredoux (2005) found similar ethnic segregation in a multi-ethnic university cafeteria in London, England. When observing commuters on buses in Singapore, Sriram (2002) found similar results; there were significant levels of aggregation based on sex and ethnic group. Thus, multiple studies have found a tendency for people to sit nearer to others who are similar in terms of sex and race. However, seating choices have not been examined for physical similarity more generally. Might these aggregation tendencies even occur for physical traits that are not so closely tied to prominent social group memberships? If so, this bias in seating choice might partially explain why social networks are more homogenous in physical appearance than expected by chance.

The Current Research

Broadly speaking, the current research seeks to examine matching based on physical similarity in relation to seating choice. Specifically, we propose that people will sit closer to others who physically resemble themselves. The simple process of choosing to sit closer to people who are similar to us can have powerful implications at a macro level. By consistently choosing to sit closer to physically similar others, people put physical space between themselves and dissimilar others. As a result of simple proximity, people may then have greater opportunities to form a relationship with physically similar others, while decreasing their opportunities to form relationships with dissimilar others. We argue that the tendency to regulate physical proximity based on physical similarity to others is a basic psychological process that contributes to the homogeneity observed in personal relationships overall.

Though the primary purpose of this paper is to establish the existence of this basic psychological process, some attempts at unraveling the mechanism behind seating choice are explored. Because there are so many competing explanations for the similarity-attraction phenomenon across a variety of domains, a single set of studies could not hope to disentangle all aspects of the problem. In fact, the processes by which similarity breeds attraction are likely multifaceted, with no single theory predicting all of the variance. Thus, in the current research, we simply provide preliminary data to rule out two possible explanations for this phenomenon, at least with respect to seating choices. First, we propose that the tendency to sit beside physically similar others is not simply a reflection of aggregation based on sex and race. To test this, race and sex will be used as control variables in a set of naturalistic observations, and in a more controlled laboratory study. Since much of a person's physical appearance is determined by sex and race, controlling for these variables helps establish that seating aggregation still occurs even when more peripheral features are observed. Second, we propose that people sit beside physically similar others, even when examining physical traits that contribute little to attractiveness. To test this hypothesis, attractiveness similarity will be measured and entered as a control variable in Study 3, demonstrating that the effects of physical similarity on seating preference are not due entirely to attractiveness matching.

Study 1

Overall, the current research proposes that people will sit closer to physically similar others. One challenge with this hypothesis is that physical similarity is a somewhat nebulous variable, composed of many individual physical traits. In order to study physical similarity in a naturalistic environment, we decided to break this variable down into more manageable facets. Study 1 represents an initial attempt at capturing an aspect of physical similarity that was feasible to code in a field study. One physical trait was chosen with the following criteria in mind: (a) the trait should not be confounded with sex or race (b) the trait should elicit no strong negative social stereotype or prejudice, (c) and the trait should be a potentially dichotomous variable for reliable coding and for it to be amenable to the seating aggregation formula we used to calculate deviations from chance in seating patterns (described below). In the current research, we chose to study seating aggregation by glasses-wearing status.

There are a number of benefits to using glasses as a variable in naturalistic observations of seating patterns. First, glasses-wearing is unlikely to be conflated with sex; 2002 census research in the United States found no sex differences in prevalence rates for visual impairment (Vitale, Cotch, & Sperduto, 2006). Second, the stereotype of glasses wearers that does exist is largely a positive one. Glasses wearers are seen as relatively intelligent, hardworking, successful, intense, possessing a sense of humor, self-confident, and conscientious (Borkenau, 1991; Harris, Harris & Bochner, 1982; Harris, 1991). Though there are a few potentially negative stereotypes surrounding glasses wearers (e.g. less active and more introverted), the stereotype surrounding glasses-wearing is largely positive. More importantly, the effect sizes for stereotype endorsement tend to be very small, and can even vary depending on the person being observed (e.g. some people appear more intelligent when wearing glasses while others do not, see Harris, 1991). Thus, if affiliation occurs between non-glasses wearers, prejudice is unlikely to be the driving mechanism. Finally, the presence or absence of glasses is a clearly dichotomous variable that can be unambiguously coded by independent raters, which is an important criterion for our statistical analysis.

Finally, sex will also be used as a variable of secondary interest. Seating aggregation by sex has been consistently found in all the available studies on naturalistic seating arrangements (Campbell et al., 1966; Clack et al., 2005; Sriram, 2002). For this reason, sex is included as a replication of previous findings in order to establish the validity of our method. In addition, the male to female ratio of glasses-wearers will be compared, to ensure that any findings for glasses-wearing status are independent of sex. The hypotheses for the current study are as follows:

H1: When observing naturalistic seating arrangements there will be significant aggregation in terms of glasses wearing. That is, glasses-wearers will tend to sit beside other glasses-wearers (and non-glasses-wearers by other non-glasses-wearers) more frequently than expected by chance alone.

H2: When observing naturalistic seating arrangements, there will be significant aggregation in terms of sex. That is, women will tend to sit beside other women (and men by men) more frequently than expected by chance alone.

Method

Participants. An on-campus computer lab was observed on 21 different (non-overlapping) occasions over three months. In total, 356 persons were observed; 23% were wearing glasses (N=82) and 57.6% were women (N=205). Glasses wearing status did not differ by sex.

Procedure. Seating arrangement was observed at a computer lab with 31 seats in the library at a Canadian university. Using a seating diagram, the researcher indicated whether or not a particular seat was occupied by a person. If so, the researcher recorded (1) the sex of the person sitting, (2) whether or not the person was wearing glasses[1]. If unable to determine a participant's sex or glasses-wearing status, the researcher recorded that person as "unknown." For the purposes of analysis, unknowns (N = 2) were treated as an empty seat. Observations were recorded 1-3 times daily on weekdays, most frequently during the mid-day, which was when the library computer lab was most populated. On days where the lab was visited more than once (5 out of the 21 times the lab was visited) there was always a minimum of 4 ½ hours between recordings. If the lab had fewer than 9 people total in it, or if nobody in the room was wearing glasses, these trials were not recorded.

Analysis Strategy. A statistical method devised by Campbell et al. (1966) was used to determine the amount of aggregation in seating patterns. An "index of adjacency" was calculated using the following formula (see Appendix A for a full description of how each part of the formula is calculated):

$$I = (A - EA) / \sigma_A$$

I = Index of Adjacency

A = # of observed glasses / no-glasses adjacencies

EA = expected number of glasses / no-glasses adjacencies under randomness

σ_A = Standard deviation of the expected number of glasses / no-glasses adjacencies under randomness

Thus, the index of adjacency will be a negative value when more aggregation is occurring than under randomness (e.g. men sit beside men, and women beside women, more often than expected by chance), a positive number when less aggregation is occurring than under randomness (e.g. men tend to sit beside women more frequently than chance, and vice versa), and exactly zero when persons are evenly, randomly distributed throughout all of the seats. Thus, if our hypotheses are supported, the index of adjacency scores will be significantly less than zero for both sex and glasses-wearing. Simple one-sample t-tests, comparing the mean index of adjacency scores to zero will be used to test the hypotheses.

Given that people tend to avoid sitting beside strangers if there is any other option, and it is generally considered common courtesy in North America to leave one seat between oneself and another person when possible, an “adjacency” is defined as both a person sitting directly beside another person, and two people with only one empty seat between them. Counting participants with only one empty seat between them as adjacent is a modification of Campbell et al.'s (1966) original procedure, and was used in a recent paper by Koen and Durrheim (in press). This modification reduces the number of people sitting alone (known as "isolates"). This is important, because the number of isolates is accounted for in the standard deviation formula; as the proportion of isolates increases, so does the standard deviation. Thus, this modification increases the power of Campbell et al.'s index of adjacency.

Results and Discussion

An examination of histograms plotting the distribution of seating adjacencies for each observation reveals that the indexes of adjacency are approximately normally distributed for both the glasses and sex data. When examining the indexes of adjacency for glasses, 17 observations had a negative index of adjacency and 4 observations had a positive index. The mean index of adjacency averaged across all 21 observations (M = -0.57, SD = 0.90) was significantly lower than zero, $t(20) = 2.88$, $p = .009$, Cohen’s d = 0.63. This shows that glasses-wearers sat by other glasses wearers (and non-glasses-wearer by other non-glasses-wearers) more frequently than expected by chance alone.

Significant aggregation based on sex also occurred. When examining the indexes of adjacency for sex, 14 observations had a negative index of adjacency and 7 observations had a positive index. The mean index of adjacency averaged across all 21 measurements (M = -0.53, SD = 0.99) was significantly lower than zero, $t(20) = 2.44$, p = .024, Cohen's d = 0.54 This shows that men sat by men (and women by women) more frequently than expected by chance alone.

Finally, 26.5% of men wore glasses, compared to 20.5% of women. Using a simple test of proportions, it was found that this is a non-significant difference, z = 1.20, p = .34. In light of this, it is unlikely that the effects observed for glasses-wearing are merely acting as a proxy for aggregation by sex. Without a larger sample size within each observation, controlling for sex in Study 1 by testing for aggregation by glasses-wearing broken down by sex would result in too much data loss (i.e., almost 40% of our observations have samples too small to include in a female-only analysis). However, an analysis controlling for sex is included in Study 2.

The two hypotheses of this study were supported. Significant aggregation occurred based on sex, which replicates previous work and supports the validity of our methodology. Significant aggregation also occurred based on glasses-wearing status, which extends prior work by looking at a previously unexamined physical trait that is not strongly related to any prominent social group membership or stereotype. There was also no difference between the proportions of males and females who wore glasses suggesting that the effect of glasses-wearing on seating preferences was not driven by sex.

Clearly, other physical traits will have to be examined in order to more adequately test our hypotheses. Glasses-wearing is correlated with physical and socioeconomic factors, which could limit its validity as a general index of physical similarity. Most simply, visual impairment increases with age, and is transmitted genetically within families, so both age and familial relatedness could play a role in seating choice with respect to glasses-wearing. Moreover, given that visual impairments (and thus whether one wears glasses) may be more frequent among non-Caucasians in some populations (Vitale et al., 2006), future studies of naturalistic seating patterns might need to include race as a potential control variable. Although aggregation on the basis of race is an interesting phenomenon in its own right, it may be driven by prejudiced attitudes. We are interested in effects of physical similarity on seating preferences that are independent of group-based behavior. Finally, a larger sample size within each observation is required if control analyses are to be conducted for either sex or race. Study 2 attempts to address these limitations, using a similar methodology.

Study 2

Study 2 expands upon the naturalistic observation approach used in Study 1 using a broader set of physical characteristics to better approximate overall physical similarity. After all, it could be something about glasses-wearing specifically, rather than physical similarity more broadly, that led to seating aggregation in Study 1. Specifically, Study 2 will examine glasses-wearing, hair color and hair length, as well as sex and race. Given the strong levels of aggregation observed based on sex and race in previous research (Campbell et al., 1966; Koen & Durrheim, in press), we wanted to control these variables when testing the effects of physical similarity to ensure that any such effects are not due simply to the influence of sex or race.

Study 2 has three primary hypotheses:

H1: Seating aggregation will occur based on sex and race, replicating previous research.

H2: Seating aggregation will also occur based on physical similarities such as glasses-wearing status, hair length, and hair color extending Study 1 by examining a wider array of physical attributes.

H3: The seating aggregation observed based on glasses-wearing, hair length and hair color will remain statistically significant, even when controlling for sex and race.

Method

Participants. Eighteen introductory university classes (freshman and sophomore level courses) were observed, from September 8th, 2009 to September 26th, 2009. Classrooms were selected semi-randomly from the available pool. Three large classrooms at a Canadian university were chosen, and professors who taught introductory courses in those classrooms were emailed for permission to use their class in data collection. Permission was originally requested from 36 classes, so the overall response rate was 50%. No particular academic discipline was over-represented. Classes that were less than 40% of full capacity (N = 4) were omitted from the sample, leaving the total sample size at 14 classrooms, or 2228 total people.[2] Of this sample, 36.7% were men, 18.1% wore glasses, 68.8% were White, 36.9% were blonde and 28.3% had long hair (these variables correspond with the categories used to examine seating aggregation, described below). Also, 1.5% were Black, 8.5% were Asian, and 21.2% were of other ethnicities. Unknowns (participants who were unable to be coded due to picture quality or ambiguity on any particular variable) encompassed less than 2% of the sample.

Physical Traits Coded. A total of five physical traits were coded in seating diagrams, in a similar manner to Study 1. Note again that, in order to compute an index of adjacency, each physical trait must be coded as a dichotomous variable. Sex was coded as male or female. Race was coded as Caucasian versus Not-Caucasian (with the Not-Caucasian group including Asian, Black, and Other racial groups). This dichotomous categorization was chosen for convenience because 71% of our sample was Caucasian, not because of any true dichotomy in the population. Ethnicity and race are not always readily apparent upon observing photos of individuals, so this variable could also be thought of as “skin color,” dichotomized into “light” versus “dark.” Glasses status was coded as either the presence or absence of glasses, coding persons with sunglasses (N = 72) as non-glasses wearers. Hair length was coded as long versus short hair (with long hair defined as shoulder length or longer) and anyone with headwear that obscured their actual hair length was excluded from the analysis (N = 22). Hair color was coded as blonde versus not-blonde hair ("blonde" was operationalized as pure blonde hair, dirty blonde hair, blonde highlights and strawberry blonde hair), and anyone who had a buzz cut or headwear that obscured their hair color was excluded from the analysis (N = 130). An independent research assistant coded a subsample of two classrooms (N = 312) to test for inter-rater reliability. Inter-rater reliabilities were moderate to high for all variables (see Table 1). Unknowns and excluded participants were treated as empty seats within each analysis.

Procedure. The researcher entered the classroom (with the instructor’s prior permission) and verbally outlined the details of the project, as well as how to avoid participating if so desired. Then, the researcher took digital photos of all students in the classroom as they were sitting in their seats. Multiple pictures were taken to ensure the entire classroom was captured. The pictures were examined to create seating diagrams, in a similar fashion to Study 1, except with more variables being recorded. As in Study 1, Campbell et al.'s (1966) index of adjacency was employed to determine the amount of aggregation in seating patterns.

Results

Multivariate one-sample tests (Hotelling's Trace) comparing the mean indexes of adjacency to zero were used to test the four hypotheses of this research. The univariate results using this method are identical to a one-sample t-test. Given that we theorize physical similarity, broadly defined, is the driving mechanism behind seating aggregation, the multivariate results are useful to determine an overall effect from all the physical traits combined together. Examining a histogram of the frequencies for all indexes of adjacency, the indexes appeared to be normally distributed.

Aggregation based on sex and race. The mean indexes of adjacency for sex and race were compared to zero using a multivariate one-sample test. The multivariate test showed that the mean indexes of adjacency for sex and race were significantly less than zero overall, Hotelling's Trace = 12.1, $F(2,12) = 72.6$, $p < .001$. This shows that people who are physically similar in sex and race tend to sit beside each other more frequently than expected by chance alone, replicating prior research. Means and univariate results are contained in Table 2.

Aggregation by glasses-wearing, hair length and hair color. The mean indexes of adjacency for glasses-wearing, hair length and hair color were compared to zero using a multivariate one-sample test. The multivariate test showed that the mean indexes of adjacency for glasses-wearing, hair length and hair color were significantly less than zero overall, Hotelling's Trace = 1.25, $F(3,11) = 4.57$, $p = .026$. This shows that people who are physically similar in glasses-wearing, hair length and hair color tend to sit beside each other more frequently than expected by chance alone. However, it is worth noting that hair color does not reach statistical significance by itself in the univariate analyses, though it is in the expected direction. Means and univariate results are contained in Table 2.

Analyses controlling for sex and race. When calculating an index of adjacency, control analyses can only be conducted by omitting participants, and treating the omitted participants as empty seats. Because of this, each control analysis reduces the sample size substantially. For this reason, we ran control analyses for sex and race separately, rather than controlling for both variables at the same time. An analysis controlling for both race and sex at the same time would omit over 60% of the sample, creating too many isolates to properly analyze.

To control for any effects due to gender, the first analysis excluded all males, in order to examine whether seating aggregation occurred for physical similarity among just females. Because of the smaller sample of male participants, analyses on men alone would lack the power to reliably test hypothesized patterns. The multivariate test showed that the mean indexes of adjacency for glasses-wearing, hair length and hair color were significantly less than zero overall, even when considering only female participants, Hotelling's Trace = 1.87, $F(3,11) = 6.85$, $p = .007$. This shows that the tendency for people who are physically similar in glasses-wearing, hair length and hair color to sit beside each other more frequently than expected by chance alone is not the result of confounding between these variables and sex. Hair color does not reach statistical significance by itself in the univariate analyses, and glasses-wearing is only marginally significant (p = .074), though both are still in the expected direction. See Table 2 for means and univariate results.

To control for effects due to race, the second control analysis excluded all non-Caucasian participants from the sample. An analysis examining the much smaller sample of non-Caucasian participants would have very little statistical power. The multivariate test showed that the mean indexes of adjacency for glasses-wearing, hair length and hair color were significantly less than zero overall, even when considering only Caucasian participants, Hotelling's Trace = 0.95, $F(3,11) = 4.57$, $p = .05$. Thus, the aggregation for glasses-wearing, hair color and hair length cannot be explained by a confounding of these variables with race. Again, hair color does not reach statistical significance by itself in the univariate analyses, though it is still in the expected direction. See Table 2 for means and univariate results.

Discussion

The three hypotheses of the current study received support. There was significant seating aggregation based on sex and race; people tended to sit beside others who matched themselves on these traits, which replicates findings from previous research (Campbell et al., 1966; Koen & Durrheim, in press; Clack et al., 2005) using a North American sample (prior research used South African or European samples). In addition, a multivariate test revealed that people were more likely to sit beside others similar in glasses-wearing status, hair length and hair color than would be expected by chance alone. This finding remained significant even when controlling for sex and race, so the tendency to sit beside physically similar others occurs over and above simple matching on broad social categories such as sex and race. Although glasses-wearing and hair length were stronger predictors of matching than hair color, it is quite striking that these three quite peripheral aspects of physical appearance demonstrated such consistent patterns. Overall, the results support the notion that people choose to sit closer to physically similar others in real-world environments.

The idea that physical similarity is broadly associated with seating distance is the impetus behind using multivariate analyses to test the above hypotheses. No single physical trait is the sole target of our research. Rather, the physical traits chosen for analysis thus far are merely conveniently measurable facets of overall physical similarity. The first two studies of this research have shown that people tend to sit beside others who match them on a variety of easily-observed, objective physical traits within naturalistic environments. Nevertheless, it may be desirable in future research to examine a more comprehensive index of physical similarity that is less dependent on specific physical attributes. Such an index may also allow sex and race to be statistically controlled more directly in analyses. A continuous physical similarity variable may thus be advantageous both in terms of generalizability and in terms of statistical power.

Furthermore, we contend that the effect of physical similarity on seating preference will occur even among strangers, and that this regulation of social distance may play a role in patterns of relationship formation. That is, people will prefer to sit beside a physically similar stranger than a dissimilar stranger, and this bias contributes to seating aggregation in naturalistic settings. However, although in Studies 1 and 2 it is likely that a significant proportion of students in an open computer lab or in large lecture classes (in the first few classes of the term) were *not* acquainted, we cannot determine whether people chose to sit beside strangers who were similar to them, or if they chose to sit beside their friends, who also happened to be similar to them. In other words, it is not clear at what point in the acquaintanceship process this aggregation effect occurs. Study 3 was designed to address these limitations by examining seating distance from a confederate whom participants had not previously met, and a coding scheme which treats overall physical similarity to that confederate as a continuous variable. This approach conceptually replicates Studies 1 and 2 using a different measure of physical similarity, and helps to rule out the possibility that matching occurs only between people who are already friends.

Study 3

Study 3 attempts to replicate the findings of Studies 1 and 2 in a more controlled laboratory setting. In addition to allowing greater control, Study 3 addresses several limitations of the previous studies. First, both physical similarity and seating distance can be measured as continuous variables (by having multiple coders rate each participant on overall physical similarity to a confederate, and by measuring seating distance in centimeters), which provides greater statistical power. Second, by asking participants to choose where to sit in relation to an unknown confederate, we can test the notion that people sit closer to physically similar others even when they have never previously met. Finally, other measures of interest, such as attractiveness similarity and participants' own perceived similarity to the confederate can be more easily measured within a laboratory setting.

In Study 3 we examine a number of control variables that may help to further refine our understanding of what aspects of physical similarity do, and do not, affect seating preferences. As in Study 2, we attempt to control sex and race in order to ensure that our effects are not simply a matter of prejudice or stereotypes on these variables. We also examine attractiveness similarity. Prior research has not tended to separate matching based on physical attractiveness from matching based on physical similarity. When physical similarity has been used as a variable, hypotheses are often framed such that "physical similarity increases perceived attractiveness" (e.g. DeBruine, 2004a; Penton-Voak, Perrett & Peirec, 1999). Regardless, if the relationship between physical similarity and seating distance remains significant, even when controlling for attractiveness similarity, then the observed relationship is not merely another example of the matching effect (Takeuchi, 2006).

Lastly, we examine perceived physical similarity, or how similar in physical appearance participants perceive themselves to be to the confederate overall. This allows us to examine whether or not the effect of physical similarity on seating preferences is driven by individuals' reported perceptions of physical similarity. If the relationship between physical similarity to the confederate (as rated by independent observers) and seating distance remains significant, even when controlling for participants' own perceptions of physical similarity, this suggests that the effect is not driven by deliberative judgments of physical similarity. This may further suggest that the observed bias in seating preference is a relatively automatic or at least "mindless" behavior. The two specific hypotheses of this research are as follows:

H1: Physical similarity to the confederate will be negatively related to seating distance. That is, the more physically similar participants are to a confederate, the closer they will choose to sit to the confederate.

H2: This relationship will remain significant, even when controlling for similarity in attractiveness, perceived physical similarity, sex and race.

Method

Participants. Our confederate in this study was a 20-year-old Caucasian female, with short, light brown hair, hazel eyes and an average BMI. She was wearing glasses for half of the participants[3]. She was rated as being of average attractiveness by three independent raters (M = 3.00 on a 5-point scale). She wore the same clothing (jeans and a brown sweater with no logo) for all participants. Seventy-two undergraduate psychology students participated in this study. One participant did not give consent to use her photos and videos for coding, and was omitted from the analyses. Approximately 15.7% of participants had light brown hair, 76.1% were Caucasian, 18.4% had hazel eyes, 25.4% wore glasses, 69% were female, 71.4% had an average BMI, and 29.2% had short hair. Of the non-Caucasians, one was Black, ten were Asian and six were of other racial groups. Age was relatively homogenous among participants, with 98.6% of participants being from ages 17-20. One participant was 33 years old.

Procedure. Before participants arrived, they knew only that the study was ostensibly examining non-verbal behaviors, and that they would have to participate in a 3-minute interview. As each participant arrived, there was a female confederate already sitting down in the room, posing as another participant. After completing a short computer-based task that is unrelated to the present analyses, the participants were informed that the next portion of the experiment would be a "short video-taped interview" where they would be asked to interact with the confederate. Participants were asked to pull up a chair to face the confederate (the experiment was designed such that the confederate always appeared to finish the computer-based task first, and placed her chair in the designated spot). The researcher flipped a coin, ostensibly to decide who was in each "condition." The coin flip was rigged, and the confederate was always the "interviewer" and the participant the "interviewee." In this short interaction, the confederate asked the participant some simple icebreaker questions, which were given to her on a piece of paper from the researcher. A sample question would be "What are some of your hobbies and/or interests?" The interview continued until all nine questions on the list were asked and answered. Actual observed interview lengths ranged from 1 min 37 sec to 3 min 45 sec, with a mean length of 2 min 37 sec. The confederate was coached to act in a similar way towards all participants.

After the short social interaction, the researcher took a photograph of both the confederate and the participant. Following this, both the participant and the confederate returned to separate cubicles to complete the remaining questionnaire measures, including attitudes towards the confederate after the social interaction, demographics, and some other measures that are not relevant to the present paper. The chair distance was measured by the researcher while the participant completed these questionnaires. Following this, participants were fully debriefed and thanked for their time. Physical similarity and attractiveness were coded from the photos and videos by research assistants at a later date.

Materials.

Overall physical similarity. Three independent coders (one male, two female) rated each participant's photo for overall physical similarity to the confederate. Photos of the confederate and the participant were examined side-by-side, and coders were asked to rate "How physically similar are these people to each other?" on a 5-point scale, ranging from 1 (Extremely Dissimilar) to 5 (Extremely Similar). The ratings from all three coders were added together and used as an overall measure of similarity. Inter-rater reliability using Cronbach's Alpha was acceptable (α = .76).

Physical attractiveness. The three independent coders also rated each participant's photo for overall physical attractiveness. Photos of the participants were examined individually, before rating overall physical similarity to the confederate. The confederate's level of attractiveness was also coded by three of the coders, before knowing which picture was the confederate (the confederate's photo was mixed in with the rest of the photos at random). Coders were asked to rate "How physically attractive is this person?" on a 5-point scale, ranging from 1 (Extremely Unattractive) to 5 (Extremely Attractive). The ratings from all three coders summed and used as an overall measure of physical attractiveness. Inter-rater reliability using Cronbach's Alpha was acceptable (α = .76). To measure similarity in attractiveness ratings to the confederate, we used an absolute difference method, where we computed attractiveness similarity by subtracting 3 (the average rating of attractiveness for our confederate as rated by our coders) from the ratings of attractiveness given to the participant by each coder, then taking the absolute value of that number.

Seating distance. This variable is defined as the number of centimeters between the participant's chair and the confederate's chair, after the participant has had a chance to position the chair relative to where the confederate is sitting. The chair was positioned shortly before a short social interaction. The participant was told: "The next part of the experiment is a short, video-taped interview. Please pull up a chair, facing her [gesturing to the confederate], while I set up the video camera." Seating distance was measured surreptitiously after the interview while the participant was in a different room completing other tasks. When measuring seating distance, the following procedure was used: First, the distance from the front right leg of the participant's chair to the front right leg of the confederate's chair was measured. Second, the distance between the front left leg of the participant's chair to the front left leg of the confederate's chair was measured. Then a mean distance was computed by averaging those distances.

Perceived physical similarity. A single questionnaire item was used to assess how similar participants perceived the confederate to be to themselves: "Generally speaking, how similar in physical appearance were you and your partner to each other?" This item was measured using a 7-point scale ranging from 1 (Extremely dissimilar) to 7 (Extremely similar).

Results

Table 3 lists means and standard deviations of all variables used in the analyses below. Table 4 presents a correlation matrix of the primary variables.

Physical similarity predicting seating distance

The first hypothesis of this study proposed that physical similarity would be negatively associated with seating distance. A simple linear regression revealed that, as predicted, physical similarity was negatively related to seating distance, B = -3.88, β = -0.39, p = .001: The more physically similar the participant was to the confederate, the closer the participant sat to that confederate.

This relationship remained statistically significant, even when controlling for similarity in attractiveness, perceived physical similarity, sex and race, supporting our second hypothesis. To test this, a multiple regression was conducted using seating distance as the dependent variable. The model included overall physical similarity (based on coder ratings), attractiveness similarity, perceived physical similarity, sex and race (see Table 5). The results of this analysis revealed that the relationship between actual physical similarity to a confederate and seating distance remained significant even when controlling for sex, race, attractiveness similarity and perceived physical similarity. Though it is not the focus of the current study, it is also worth noting that attractiveness similarity is also a marginally significant predictor of seating distance even when controlling for all other variables in the model; participants who were more similar in attractiveness to the confederate sat closer to the confederate than those with more discrepant levels of attractiveness.[4]

Discussion

Both of the hypotheses of this study were supported. Participants sat closer to a confederate as physical similarity increased Moreover, given the results of the multiple regression analysis, it appears that this tendency is not simply a function of matching on sex or race, and is not driven by attractiveness similarity or even perceived physical similarity. The zero-order correlation matrix (see table 4) further reveals that perceived physical similarity is entirely uncorrelated with seating distance, but is modestly correlated with actual physical similarity and attractiveness similarity. Thus, there is some evidence that actual and perceived physical similarity are related, which is an encouraging sign of the validity of the perceived physical similarity measure. Nevertheless, the two variables remain conceptually distinct in terms of how well they predict seating choice. It is also notable that the participants and the confederate were unacquainted at the beginning of the study, suggesting that the tendency to sit closer to physically similar others is not merely a function of prior acquaintanceship.

We also found that attractiveness similarity marginally predicted seating distance. Using the absolute difference between ratings of participants' own attractiveness and ratings of the confederate's attractiveness to represent attractiveness similarity suffers from some limitations in interpretation. Strictly speaking, because the confederate was of average attractiveness, our analysis showed that participants of average attractiveness sit closest to the confederate, whereas very attractive and unattractive participants sit furthest away. Though it is certainly possible that people of average attractiveness are friendlier, and sit closer to the confederate as a result, in light of previous work in this area (Takeuchi, 2006) we tend to interpret this finding as an effect of attractiveness similarity. That is, people will sit closer to others whom they match on physical attractiveness. This provides some rare evidence that the matching effect occurs amongst non-romantic dyads (though see also Cash & Derlega, 1978). Nevertheless, it would be worth replicating these findings with different confederates to improve generalizability.

General Discussion

Across three studies, it was found that people tend to sit closer to physically similar others than physically dissimilar others. This effect was observed in naturalistic settings (a computer lab and university classrooms) as well as in a lab study. It remained significant even when controlling for sex and race. In addition, overall similarity, rather than any single trait, seems to be the best predictor of seating distance. This matching phenomenon may serve a gating function in the formation of new relationships. The tendency to sit nearer to similar others limits opportunities to form relationships with dissimilar others. It is well documented that people tend to have more similar others in their social networks. This tendency may reflect, in part, the “downstream” effects of seating choices, and physical proximity more generally. Quite simply, without the opportunity to interact facilitated by physical proximity, a relationship is less likely to form.

Although the present studies clearly document the effect of physical similarity on seating distance, the mechanism by which this effect occurs is not yet clear. Study 3 provides some insight by helping to rule out some possibilities. The results of this study showed that overall physical similarity predicts seating distance over and above attractiveness similarity, which suggests that physical similarity is not merely a function of attractiveness similarity. Results remain significant when controlling for race and sex as well, so this effect is not merely a function of prejudice or stereotypes on these dimensions. The results of Study 3 also suggest that the effect of physical similarity is not a function of perceived physical similarity, so the preference to sit beside physically similar others might not be a deliberate bias. Finally, the bias in seating preference reported in the current study appears to be a more general phenomenon that is not limited to romantic partners (see also Debruine's 2004a work on facial similarity).

In conclusion, the current research showed that persons tend to sit closer to physically similar others, and demonstrated that this effect was not driven by sex, race, attractiveness similarity or perceived similarity. People sat closer to physically similar strangers, even based on seemingly trivial physical dimensions that were relatively unrelated to broad, stereotyped social categories. Though perhaps appearing innocuous on the surface, the simple process of choosing to sit beside people who are similar to us can have broad implications at a macro level. If a person avoids sitting with others based on the color of their skin, the length of their hair, or whether or not they wear glasses, they miss out on the opportunity to develop relationships with these individuals. As a result, segregation may occur, which can result in a myriad of prejudices and misunderstandings. Of course, this tendency is merely one portion of the overall processes that contribute to segregation and homophily more generally, but given the implications for racial and ethnic segregation, it is certainly a phenomenon with profound implications worthy of further pursuit.

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Endnotes

[1] We could not partial out contact-lens wearers or persons who refuse to wear their prescription glasses; thus, our coding of glasses wearing is more of a chosen/alterable aspect of physical appearance than strictly a marker for those with genetic deficits in eyesight.

[2] As in Study 1, low density classes were removed because in a very low density classroom virtually everyone sits alone, which reduces the power and accuracy of the index of adjacency.

[3] We planned to experimentally test whether glasses-wearing status affected seating distance by manipulating whether the confederate wore glasses. Unfortunately, very few participants (N = 18) actually wore glasses to the experimental sessions, reducing the power of analyses using this variable. Glasses-wearing status of the confederate did not significantly predict any variable by itself in the current study, though it was in the expected direction. Although this is somewhat at odds with the findings of Studies 1 and 2, we conceptualize glasses-wearing as merely one facet of the primary predictor variable, physical similarity.

[4] We also tested whether similarity on single traits could predict seating distance. Specifically, we examined: sex, race glasses-wearing, hair color, hair length, eye color and body mass index, computing a dichotomous similarity variable for each (1=similar to confederate, 0 = dissimilar to confederate). A series of t-tests revealed that although no single, individual physical trait significantly predicted of seating distance at the $p < .05$ level, all were in the expected direction (i.e. similarity to the confederate resulted in a

closer seating distance), and a composite variable summing these physical traits reveals similar, statistically significant results to those in Table 5. Likely, we have too little statistical power with our small sample (N =72) to detect effects based on single physical traits alone in Study 3. One might also consider each of these traits as only a portion of overall physical similarity, gaining predictive power only when combined together into an aggregate measure. These analyses are available upon request from the first author.

Table 1

Inter-rater reliability for physical traits coded in study 2

Variable	% Agreement	Kappa	95% CI Kappa Lower	95% CI Kappa Upper
Sex	99.4%	.987	.969	1.00
Glasses	97.3%	.908	.846	.971
Race	86.0%	.658	.567	.750
Hair Color	85.8%	.704	.619	.789
Hair Length	88.7%	.669	.567	.770

* Reliabilities based on a sub-sample of 2 classes (N = 312 participants)

Table 2

Univariate results comparing indexes of adjacency to zero

Variable	Mean (SD) Aggregation Index	Effect Size (d)	Univariate F-test (Comparing to zero)
All Inclusive			
Sex	-2.60 (0.92)	-2.82	$F(1,13) = 111.7, p < .001$
Race	-2.01 (1.40)	-1.44	$F(1,13) = 28.7, p < .001$
Glasses	-0.68 (1.11)	-0.61	$F(1,13) = 5.26, p = .039$
Hair Color	-0.45 (0.98)	-0.46	$F(1,13) = 2.92, p = .111$
Hair Length	-0.94 (1.23)	-0.76	$F(1,13) = 8.21, p = .013$
Females Only			
Glasses	-0.56 (1.07)	-0.52	$F(1,13) = 3.79, p = .074$
Hair Color	-0.35 (1.30)	-0.27	$F(1,13) = 1.00, p = .336$
Hair Length	-0.90 (0.94)	-0.96	$F(1,13) = 12.8, p = .003$
Caucasians Only			
Glasses	-0.51 (0.88)	-0.58	$F(1,13) = 4.68, p = .050$
Hair Color	-0.11 (0.90)	-0.12	$F(1,13) = 0.22, p = .646$
Hair Length	-0.78 (1.07)	0.73	$F(1,13) = 7.36, p = .018$

Table 3

Means and standard deviations of all variables in study 3

Variable	Mean	SD
Physical Similarity	6.75	2.52
Perceived Physical Similarity	5.21	1.41
Attractiveness	8.96	2.16
Seating Distance (cm)	132.2	23.2

Table 4

Zero-order correlations for all variables in study 3

	1	**2**	**3**	**4**	**5**	**6**	**7**
1	1						
2	.275*	1					
3	-.010	.030	1				
4	-.132	.239*	-.072	1			
5	-.394**	.090	-.081	.282*	1		
6	.175	-.073	.148	.032	-.122	1	
7	.563**	.13	.158	-.092	-.179	.047	1

1 = physical similarity; 2 = perceived physical similarity; 3= participant's attractiveness 4 = attractiveness similarity; 5 = seating distance; 6 = Sex Similarity to Confederate (0 = Male, 1 = Female), 7 = Race Similarity to Confederate (0 = Non-Caucasian, 1 = Caucasian)

* $p < .05$ ** $p < .01$

Table 5

Physical similarity (coded and self-reported), attractiveness, sex and race predicting seating distance

Variable	**B**	**SE B**	**β**	**Partial Correl.**
Physical Similarity	-3.60	1.44	-.365*	-.302*
Attract Similarity	4.28	2.18	.210†	.242†
Perceived Similarity	-0.91	1.99	-.055	-.058
Sex	-3.25	5.63	-.066	-.073
Race	3.26	7.56	.060	.055
R^2			.211**	

Note: Physical similarity was coded by raters, and perceived similarity refers to participants' self-reports of perceived physical similarity

† $p < .06$ * $p < .05$ **$p = .01$

Appendix A: Details on the Index of Adjacency Formula

Campbell et al.'s (1966) Index of adjacency is as follows:

$$I = \frac{(A - EA)}{\sigma_A}$$

Where:

A = observed number of adjacencies

EA = expected number of adjacencies under randomness

σ_A = standard deviation of number of adjacencies under randomness

EA and σ_A are calculated using the following formulas:

$$EA = 2\frac{M(N-M)}{N(N-1)}(N-K)$$

$$\sigma_A^{\ 2} = 2\frac{M(N-M)}{N(N-1)}(2N-3K+K_1) + 4\frac{M(M-1)(N-M)(N-M-1)}{N(N-1)(N-2)(N-3)}$$

$$[(N-K)(N-K-1)-2(N-2K+K_1)] - 4\frac{M^2(N-M)^2}{N^2(N-1)^2}(N-K)^2$$

Legend (using glasses-wearing as an example):

N = Total number of students in the lab

M = Number of students with Glasses

N – M = Number of students without glasses

K = number of groups of row-wise contiguous students

K_1 = The number of students with no one next to them (isolates)

EA = Expected number of adjacencies under randomness

In this paper, persons with only one empty seat in between still count as adjacent.