Not all overlaps are equal: Social affiliation and rare overlaps of preferences

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Abstract

Shared preferences are a critical component of social attraction. Knowing that someone likes the same things as you do is indicative of broader underlying similarities that support successful social partnerships. However, not all overlaps in preferences are equally informative. Here we propose that the rarity of overlaps in preferences may be a particularly salient cue for social affiliation. We find evidence that people are sensitive to the rarity of overlaps in preferences and affiliate themselves (Experiment 1) or predict others' affiliations (Experiment 2) with potential social partners who share a relatively rare preference. Because preferences provide information about both what people know and what they like, we also tested the effect of overlaps in knowledge (without taste) and overlaps in taste (without knowledge) to understand why we are drawn to people who share our preferences.

Keywords: social categories; preferences; probabilistic reasoning, social affiliation

Introduction

We are drawn to people who are similar to us. We find them attractive and trustworthy, and we find ourselves wanting to befriend them and learn from them (Boer et al., 2011). Of the many traits we might share with others, preferences exert a particularly powerful pull. Initial conversations with potential friends are filled with exchanges of one's likes and dislikes (Rentfrow & Gosling, 2006). We delight in discovering overlaps in these preferences, bonding over being fans of the same musicians or even liking the same local coffee shop.

However, not all overlaps in preferences are equally meaningful; some are better indicators of a successful friendship. Overlaps in favorite movies may be more meaningful than overlaps in favorite days of the week, and meeting someone who loves your favorite movie may be more exciting than finding someone who somewhat enjoyed your favorite movie. While there may be many factors that modulate the personal significance of shared preferences, here we focus on one factor that may have a general and profound influence on how we perceive and interpret such commonalities: the *prevalence*, or *rarity*, of overlaps in preferences.

Imagine meeting someone at a party who is raving about his iPhone. Even though you like your iPhone, too, this coincidence might not strike you as particularly meaningful; after all, many people also like iPhones. However, if you met someone who is enthusing about his Raspberry Pi (a tiny programmable computer), which you also like, somehow you might ascribe more meaning to this shared preference. Since Raspberry Pi users are much less common than iPhone users, meeting someone who shares your preferences for Raspberry Pi would also be much rarer than meeting someone who also appreciates iPhones. Here we propose that sensitivity to the distribution of preferences among a population informs our reasoning about people who share these preferences.

There are reasons to believe that people might be sensitive to the rarity of preferences. Developmental research suggests that humans are adept statistical reasoners even from an early age, readily differentiating between statistically common and uncommon events. Even preverbal infants use distributions of objects in the population to infer the likelihood of a sample from the population (Xu & Garcia, 2008; Xu & Denison, 2009), and attribute preferences or intentionality to agents whose behaviors violate random sampling (Kushnir et al., 2010; Gweon et al., 2010). Beyond sensitivity to the relative frequencies of physical events, teens and adults readily estimate the frequencies of different behaviors and preferences in the population. For example, sharing less mainstream tastes is found to be a good predictor of stable friendships in adolescents (Selfhout et al., 2009).

Why do shared preferences occupy such a privileged place in our social interactions? First, preferences might reveal much deeper information about values, personality, and past experiences than shallow similarities such as physical appearance (e.g. Rentfrow & Gosling, 2006). Second, by identifying those who like what we like, we could make better decisions about whom to approach for more information in the future (Fawcett & Markson, 2010). In fact, an overlap in preferences doesn't simply reflect shared tastes (i.e., liking); it also implies shared knowledge. After all, in order for you to like tinkering with Raspberry Pi, you had to know about it in the first place. It is possible the broader commonalities we infer from shared preferences may either be driven more by the overlap in knowledge, or by the overlap in tastes.

Shared knowledge between two individuals may be a useful indicator of similar personal histories or shared social experiences that allowed both individuals to have acquired that knowledge. By contrast, shared tastes alone may only reflect a relatively narrow set of commonalities such as similar personality traits or sensory experiences. Imagine meeting someone who tells you a lot about Raspberry Pi without expressing a clear preference, and someone who has never heard of it but after trying yours, really likes it; chances are you would assume more common ground with the former than the latter. Thus people might consider shared knowledge as more predictive of successful social affiliation than shared tastes. Consistent with this idea, a recent study by Soley and Spelke (2016) finds that children indeed place more weight on shared musical knowledge than shared musical taste when choosing whom to befriend.

The current study is inspired by the intuitive significance of rare preference overlaps in our everyday lives, and is motivated by both classic and recent research on our ability to estimate, represent, and use information about approximate statistical properties of events and behaviors. In a series of experiments, we ask whether the distribution of preferences in a population influences people's reasoning about the significance of preference overlaps. Furthermore, given prior work on the role of shared beliefs (Soley & Spelke, 2016), we attempt to separate the effect of shared preferences into "shared tastes" and "shared knowledge." We predicted that (1) rare overlaps in preferences are stronger cues for social affiliation than common overlaps, (2) shared knowledge has a larger impact on people's social affiliation judgments than do shared tastes, and (3) both the effect of shared knowledge and tastes would be systematically modulated by prevalence.

Experiment 1

In Experiment 1, we used a first-person paradigm to ask whether people use the prevalence of their own preferences as a cue for social affiliation. Participants first provided their preferences and generated prevalence estimates for each; they then chose someone to talk to between two agents who each shared one of their preferences. We predicted that, even though both agents have overlapping preferences with the participant, the relative prevalence of these preferences would influence the participant's choice: namely, people might prefer agents who share rarer preferences. In Experiment 1a, we looked at the effect of shared preferences, broadly construed; in Experiment 1b, we used identical task structures to tease apart the effect of shared knowledge and shared tastes.

Methods: Experiment 1a

Participants 300 adults participated in an online study on Amazon Mechanical Turk. All participants in this and subsequent experiments had U.S. IP addresses and provided informed consent in accordance with the requirements of Stanford IRB. 50 participants provided contradictory responses (see Procedure, below) and were excluded from the analyses.

Procedure Participants were first asked to select their favorite activity amongst three options: listening to music, watching movies, or reading books. These domains were selected based on pilot data and past research indicating that overlaps in these domains are stronger cues to social affiliation than overlaps in other domains such as food (Rentfrow & Gosling, 2003). Within their favorite domain, participants were asked to list their top five favorite items (i.e., songs, movies, or books) in no particular order. We then asked how "widely liked" each item is. Participants provided this popularity estimate in two steps: first, they rank-ordered each item from most to least widely liked by dragging and dropping each item into a list; second, they provided a numeric estimate of how many of 100 randomly selected people would like each item. People who provided inconsistent responses between these two questions (i.e., estimating that more people would like the lowest-ranked item than the highest-ranked item) were excluded from analysis.

In the final trial, participants were given a binary choice between two chat avatars of people they could talk to. Each avatar had a prompt above it saying "I like X!", where X was

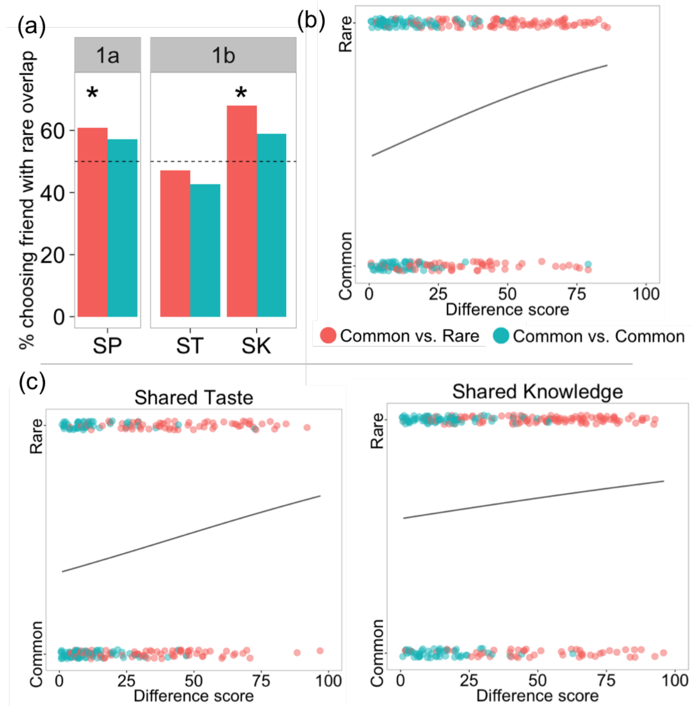

Figure 1: Experiment 1 results. (a) Percentage of participants who chose the agent with rare preference overlap. Asterisks indicate deviations from chance ($p < 0.05$). (b) Relationship between difference scores and friend choice: each point indicates one participant's difference score and friend choice; line indicates the logistic regression fit. (c) Logistic regression fits for Shared Taste (left) and Shared Knowledge (right).

one of the items the participant had listed. Participants were split into two between-subjects conditions. In the Common vs. Common (C vs.C) condition, participants were given a choice between an agent who liked the most widely-liked item and an agent who liked the *second* most widely-liked item. In the Common vs. Rare (C vs. R) condition, participants chose between an agent who liked the most widely-liked item and an agent who liked the *least* widely-liked item.

Methods: Experiment 1b

Participants We recruited 602 adults from Amazon mTurk. 78 participants were excluded for providing inconsistent responses (See Exp.1a Procedure).

Procedure The procedure was identical to that of Exp.1a except for a few prompts. Participants in the "Shared Knowledge" (SK, $n = 269$) group were asked how *widely known* each item is (i.e., how many of 100 people would know about each item). Participants in the "Shared Taste" (ST, $n = 255$) group were asked how *likable* each item is (i.e., how many of 100 people would like each item if given a chance to watch, listen to, or read it for the first time). Finally, participants were given a choice between two agents who shared the participant's knowledge (SK) or tastes (ST). As in Exp. 1a, both

SK and ST groups were split into C vs. C and C vs. R conditions.

Results and Discussion

Experiment 1a We hypothesized that participants would be more likely to choose the agent who shared their rarer preference, and this tendency would be modulated by the relative popularity of the two items. The results were consistent with our hypotheses. In the C vs. C condition, where the difference in popularity between the two agents' preferences was negligible, participants' responses did not differ from chance (57.14%; binomial test: $p = 0.142$). However, participants in the C vs. R condition were more likely to choose the agent who shared their rarer preferences (Figure 1(a), 60.84%; binomial test: $p = 0.012$).

We further examined whether participants' social affiliations were predicted by their fine-grained estimates of how widely shared their preferences are among the general population. For each condition, we took the difference of the numerical estimates of popularity (henceforth "Difference Scores") either between the first and second most widely liked items (C vs. C condition) or between the first and last items (C vs. R condition) to ask if this predicted people's choices. Even after controlling for condition, there was a significant relationship between the difference scores and participants' friend choice: the higher the gap in popularity between the two items, the more likely participants were to choose the agent with the rarer preference (logistic regression: $z = 3.446, p < 0.001$; Figure 1(b)).

Experiment 1b Liking something typically means that one also has prior knowledge of it. Under this assumption, Experiment 1b aimed to tease apart two factors that underlie the effect of shared preferences on social affiliation: shared knowledge (SK; without explicit mentioning of liking) and shared taste (ST; without prior knowledge). The results revealed interesting differences between the two factors. Participants in the SK group consistently chose the agent who knew about the less widely-known item in the C vs. R condition (68.03%; binomial test: $p < 0.001$); this effect was weakly present even in the C vs. C condition (59.02%; $p = 0.06$) where the difference between popularity was small. Consistent with this preference for the rare-overlap agent across both conditions, the Difference Scores did not predict people's choices ($z = 1.54, p = 0.12$) (Figure 1(c)). By contrast, the participants in the ST group did not differ from chance in either condition (C vs. C: 42.61%, $p = 0.14$; C vs. R: 47.14%, $p = 0.55$); however, the difference scores still predicted their friend choice (logistic regression: $z = 25.2, p = 0.01$).

Collectively, these results are consistent with our hypothesis that rare preference overlaps exert a stronger influence than common preference overlaps on people's judgments for social affiliation. In Exp. 1a, we found that the *degree* of rarity influenced people's choices: participants consistently chose the agent with the rarer preferences when the difference in rarity of the two agents' preferences was large (C vs. R), but not when this difference was small (C vs. C), and the magnitude of the difference predicted people's choices. Results from Exp. 1b echoed and extended these results, revealing differences between the two subcomponents of shared preferences: shared knowledge and shared tastes. Overall, shared knowledge had a much larger influence on people's choices compared to shared tastes.

One unique strength of this task is that it harnessed participants' own preferences and real-world knowledge: participants expressed their own preferences and generated their own estimates about their prevalence among the general population. Using this naturalistic approach, we were able to confirm the intuitive significance of rare preference overlaps.

However, these strengths were accompanied by some limitations. First, we may have neglected asymmetries between domains (music, books, movies). For example, people consider music preferences as particularly emblematic of their personalities, followed closely by movies, but far ahead of other domains such as food (Rentfrow & Gosling, 2003); thus people's prior knowledge in each domain and their beliefs about their diagnosticity might have influenced their judgments about the significance of an overlap. Second, we had little control over what population people used to generate the prevalence estimates. While it is indeed fascinating to wonder what cognitive mechanisms underlie our ability to estimate, for example, that 95 of 100 people like the *Harry Potter* books but only 8 of 100 like *The Silmarillion*, this method presumably introduced some variability in the exact nature of the population people drew from to generate these estimates. Furthermore, the self-generated nature of these estimates limited our ability to systematically manipulate the rarity of preferences. In Experiment 2, we use a complementary third-person task to directly address these issues.

Experiment 2

In Experiment 2, we sought a complementary way of investigating the role of rare preference overlaps in a tightly controlled context. We introduced participants to an alien planet whose inhabitants expressed their preferences for two novel games. Participants were then asked to pair these aliens with potential friends. Instead of generating their own prevalence estimates, participants were given explicit information about the popularity of each game, which was varied systematically across conditions. Thus this task allowed us to eliminate the role of people's existing knowledge and preferences, and have a tighter control over the prevalence information.

Methods

Experiment 2a: Methods

Participants 692 adults were recruited from Amazon Mechanical Turk.

Procedure Participants were introduced to a faraway planet called "Gazoom," inhabited by friendly aliens (Gazorps). Every Gazorp on the planet was asked whether they like to play two fun games, "wumbus" and "jibboo", and the results of

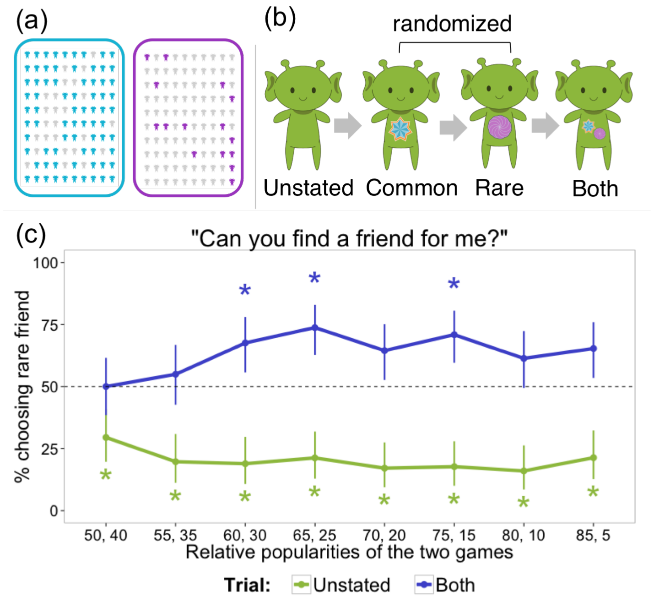

Figure 2: Experiment 2a results. (a) Example population information (75-15). (b) Trial order, showing the preferences of the target Gazorp on each trial. (c) Percentage of participants choosing the friend who likes the rare game. Error bars denote 95% CI. Asterisks denote significant deviations from chance, after Bonferroni correction.

the poll were presented on two separate pages. On each page, participants saw the logo for either wumbus or jibboo above the gray silhouettes of 100 Gazorps, a census representing the entire population of Gazoom. The Gazorps who liked each game were then filled in with the color of the game to indicate the game's popularity. Participants were shown a reminder of the census results throughout the study (Figure 2(a)).

In each of the four test trials, participants saw a target Gazorp who asked the participant to "find a friend" for her among two other Gazorps. Participants were asked to select a friend for: (1) a Gazorp with no stated preference, (2) a Gazorp who liked the majority-preferred game, (3) a Gazorp who liked the minority-preferred game, and (4) a Gazorp who liked *both* games (Figure 2(b)). In all trials, participants were given the choice between a potential friend who liked wumbus or a potential friend who liked jibboo. The preferences of all Gazorps were clearly indicated using verbal prompts and by overlaying the game logo over the image of the Gazorp.

Participants were randomly assigned to one of nine conditions, which differed in the number of aliens (out of 100) who liked each game: 45-45, 50-40, 55-35, 60-30, 65-25, 70-20, 75-15, 80-10, or 85-5. The order of the first and last trials was fixed, and the two middle trials were shuffled. All other aspects of the design were randomized, including: the logo for the games, the game preferred by the majority, the order in which the two polls were presented, the names of the target Gazorps, and the position of potential friends in the test trials.

Experiment 2b: Methods

Participants 1803 adults were recruited from Amazon Mechanical Turk. 228 participants were excluded for failing a manipulation check (see Procedure below).

Procedure The procedure was identical to that of Experiment 2a except for small changes in the prompts. In the Shared Knowledge (SK) group (N=823), Gazorps were asked which games they *knew* how to play, and the census results displayed how many Gazorps knew how to play each particular game. In the Shared Taste (ST) group (N=752), Gazorps were asked to try two new games that they had never played before, and the census results showed how many Gazorps liked each game after trying it for the first time. Accordingly, in the four test trials, participants were given the choice between potential friends who knew different games (SK) , or liked different games after trying them (ST).

Results and Discussion

Experiment 2a We first examined participants' responses in the middle two trials. Because the target Gazorp had a single, clearly stated preference, we expected participants to select the friend who shared the target Gazorp's preference. Indeed, 603 of 692 participants matched target Gazorps with friends who liked the same games in both trials; 52 matched in one trial, and 38 matched in neither trial ($\chi^2(2) = 901, p < 0.001$). This confirmed that the participants understood the task, and that they robustly chose the Gazorp who shared the target's preference regardless of the rarity.

Our main interest was in people's responses in the other two trials, where the target Gazorps' preferred games were uninformative. We first looked at the control (45-45) condition, where the two games were equally popular ($N = 84$). Given no difference in popularity, we predicted people to choose randomly between the two friends. This allowed us to looked for three potential sources of response bias: (1) the friend's position (left or right); (2) the names of the games (wumbus or jibboo); and (3) the color of each game (blue or purple). Across all three criteria, participants' responses did not differ from chance (all $p > 0.10$), suggesting that neither of the two potential friends was more appealing *a priori*.

In the remaining 8 conditions ($N = 608$), we asked whether participants' choice of friends for the target Gazorp was influenced by prevalence information. In the first trial where the target Gazorp's preference was *unstated*, we predicted that participants would choose the Gazorp with the more common preference; in the last trial where the target liked both games, we predicted that participants would choose the Gazorp with the rarer preference. Finally, we predicted that people's responses would be systematically influenced by the relative differences in the popularity of the games.

As predicted, participants' responses varied based on the trial type (Unstated vs. Both)(Figure 2 (c and b)), suggesting that they used the population information. Collapsing across all conditions, in the first trial (Unstated), 79.77% of participants chose the friend with the most common preference (485/608; binomial test: $p < 0.001$), and difference in the popularity of two games did not predict participants' choices (logistic regression: $z = 1.43, p = 0.151$). By contrast, in the last trial (Both), 63.65% of participants chose the friend with the rare preference (387/608; binomial test: $p < 0.001$), and the difference in the popularity significantly predicted these choices ($z = 1.97, p = 0.049$).

Experiment 2b Our results in Exp 2b aligned well with those in Exp 2a. In the middle two trials where the target had a preference for one of two games, participants consistently chose the friend who knew about (Shared Knowledge) or liked (Shared Taste) the same game. In the SK group, 618 matched in both trials, 82 in one, and 123 in none ($\chi^2(2) = 648, p < 0.001$); in the ST group, 588 matched in both trials, 114 in one, and 64 in none ($\chi^2(2) = 683, p < 0.001$).

When the target Gazorp's preferences were unstated (first trial), most participants chose the friend who knew or liked the common game (SK: 67.83%; ST: 77.08%; binomial test: all $p < 0.001$). Conversely, when the target Gazorp liked or knew about both games (last trial), most participants chose the friend who knew or liked the rare game (SK: 67.07%; ST: 57.45%; all $p < 0.001$).

We then used multinomial logistic regression to examine whether the relative popularity of the two games affected friend choice in the Unstated and Both trials. In the Unstated trial, participants in both SK and ST groups were more likely to choose the friend who knew or liked the more common game as the difference in the prevalence between the two games increased (SK: $z = 3.42, p < 0.001$; ST: $z = 3.94, p < 0.001$). In the Both trial, differences in popularity had the opposite effect: participants were more likely to choose the friend who liked or knew about the *less* common game as the difference in the prevalence between the two games increased (ST: $z = -3.25, p = 0.001$; SK: $z = -4.05, p < 0.001$). These results show that when the target Gazorp knew or liked both games, participants chose the friend who knew or liked the rarer game. A complementary way of looking at this is to examine each level of popularity separately and to test *at which levels* participants' friend choices differed from chance (Figure 3). We accounted for multiple comparisons using Bonferroni correction ($p < 0.006$). This analysis revealed a striking asymmetry between SK and ST groups. Participants in the SK group were highly influenced by the rarity information, choosing the friend who knew the rare game in most conditions, except when the difference between the two games was minimal (50-40: 55.29%, $p = 0.39$; all other $p < 0.003$). However, participants in the ST group chose the friend who liked the rare game when the difference in popularity between the two games was at its most pronounced (85-5: 66.67%, $p = 0.001$; all other $p > 0.008$).

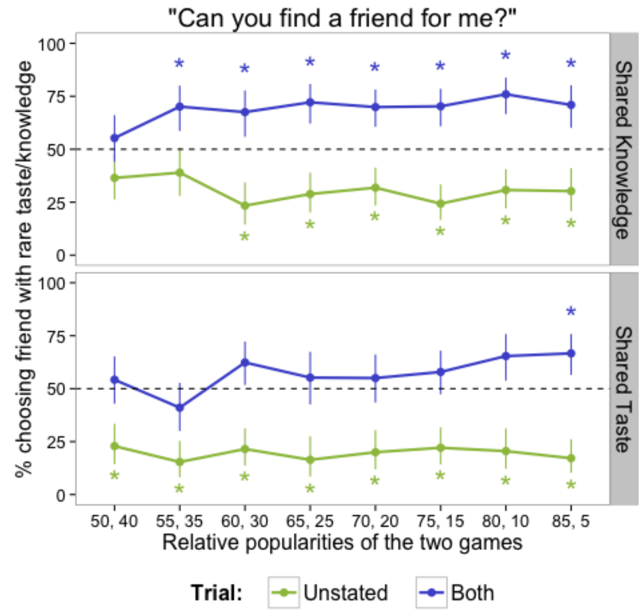

Figure 3: Experiment 2b results. Percentage of participants in the SK (top) and ST (bottom) groups who chose the friend who liked/knew about the rare game.

General Discussion

In a series of experiments, we found converging evidence that overlaps in rare preferences exert a stronger influence on social affiliation than overlaps in relatively common preferences. In Experiment 1, we found that participants preferred to affiliate with agents who shared a rare preference with them, based on their own estimates of how widely their preferences were shared among the general population. In Experiment 2, we systematically manipulated the prevalence of preferences in a novel population and asked participants to make third-party judgments. Using this complementary task, we again found that participants preferentially matched agents with friends who shared the rarer preference in games. Indeed, this was true only if the target agent had a preference for both games; in the absence of information about his preferences, participants recommended the friend with the more common preference. Finally, across both experiments, we found that rare overlaps in *knowledge* were particularly attractive, compared to overlaps in taste without prior knowledge.

Why do we find rare overlaps in preferences significant and indicative of social affiliation? Encountering someone who shares a preference with you may support a statistical inference about the causal mechanisms leading to this coincidence (see Griffiths & Tenenbaum, 2007); perhaps overlaps in rare preferences signal stronger, deeper similarities in values (Boer et al., 2011), personality traits (Rentfrow & Gosling, 2006), and cultural knowledge (Soley & Spelke, 2016). Even though overlaps in common preferences might also reflect similarities in particular domains, they may be less diagnostic of a shared social history, as such preferences span a larger, potentially more heterogeneous, set of people. For instance, a wide range of social experiences might lead people to know about (and like) iPhones, while a much more selective and distinctive set of experiences and values might lead people to know about (and like) programming in Raspberry Pi. Gershman and Gweon (under review) propose that we might use information about others' preferences to infer an underlying network of social connectivity between ourselves and others. Under this framework, finding someone who shares a rare preference might indicate a tighter social connection than finding someone with a common overlap.

Two caveats should accompany our findings. First, prior studies showed that U.S. adults tend to prefer unique (rare) items in a uniform group of objects compared to East Asians (Kim & Markus, 1999), suggesting that the degree to which item selection reflects individuals' preferences might depend on the shared cultural values. Thus we acknowledge that the effect of rarity might be culturally variable. Second, while we tried to separate knowledge from liking in our Shared Knowledge tasks, we cannot entirely rule out the effect of liking. The agents expressed knowledge without any references to liking the target items; however participants might have assumed that someone who says "I know about X!" is communicating at least a slight preference for X. The effect of knowledge might be weaker if agents expressed an explicit indifference, and even weaker if they expressed a dispreference. Future work should explore these possibilities.

Our results raise additional interesting questions for future work, including how people draw estimates about the prevalence of preferences, and what factors might bias these estimates. Social psychology research has shown that adults' estimates of the frequencies of different attitudes in a population are self-serving, and are typically biased to justify one's own choices (e.g., Monin & Norton, 2003). If rarity is an influential cue for social affiliation, we might also exaggerate or underestimate the rarity of our preferences to make certain overlaps appear more or less meaningful. Such biases are easily imagined in situations where people try to establish a bond with another person. Consider someone on a first date on the lookout for similarities, exclaiming: "You like pizza! What a coincidence, I do too!" By (intentionally or unintentionally) misconstruing an obviously common preference as rare, one might insinuate (of convince oneself of) the possibility that there must be many other overlaps yet to be discovered. We look forward to further testing these intuitions.

In sum, our study shows how our real-world knowledge (e.g., prevalence of traits, preferences) might underlie our intuitive sense of what interpersonal similarities are meaningful, and provide compelling evidence for the idea that shared rare preferences are strong cues for social compatibility. By combining intuitions from social psychology and cognitive science, these results provide new insights into the hidden social structure underlying shared preferences.

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