



# The culture of social comparison

Matthew Baldwin<sup>a,1</sup> and Thomas Mussweiler<sup>b</sup>

<sup>a</sup>Social Cognition Center Cologne, University of Cologne, 50931 Cologne, Germany; and <sup>b</sup>Organizational Behavior Faculty, London Business School, London NW1 4SA, United Kingdom

Edited by Susan T. Fiske, Princeton University, Princeton, NJ, and approved August 15, 2018 (received for review December 11, 2017)

**Social comparison is one of the most ubiquitous features of human social life. This fundamental human tendency to look to others for information about how to think, feel, and behave has provided us with the ability to thrive in a highly complex and interconnected modern social world. Despite its prominent role, however, a detailed understanding of the cultural foundations of social comparison is lacking. The current research aims to fill this gap by showing that two prominent cultural dimensions, tightness–looseness and individualism–collectivism, uniquely explain variation in social-comparison proclivity across individuals, situations, and cultures. We first demonstrate the yet-undocumented link between cultural tightness and comparison proclivity across individuals, and further show that perceptions of ambient tightness and interdependence are uniquely associated with stronger social-comparison tendencies. Next, we show that these associations arise across social settings and can be attributed to properties of the settings themselves, not solely to individual differences. Finally, we show that both tight and collectivistic US states show a propensity to engage in Google searches related to specific social-comparison emotions, but that the tightness–comparison link arises from a unique psychological mechanism. Altogether, these findings show that social comparison—a fundamental aspect of human cognition—is linked to cultural practices based both in prevalence and strength of social norms as well as the tendency to construe the self in relation to others.**

social comparison | tightness–looseness | individualism–collectivism | culture | big data

How much time he gains who does not look to see what his neighbor says or does or thinks, but only at what he does himself . . .

Marcus Aurelius, *Meditations*

**T**he need to work together in large social groups characterizes the social life of humans to an extent that is unparalleled in the animal kingdom (1). Compared with other species, humans have developed elaborate systems of cooperation that go beyond genes, geography, and time. This uniquely human inclination is not only a prerequisite for efficient social and economic exchange (2), it may also constitute the default mode for human social interaction (3). To successfully navigate this complex web of social interactions, we need to assess our and others' social standing, strengths, and weaknesses. Furthermore, to facilitate the social coordination necessary for survival in groups, we must know and agree on norms for appropriate behavior and work together with others to maintain those norms.

These social processes require looking to others as comparison standards—we use those around us as standards to evaluate ourselves and gain information about how we should behave, think, and feel. Such social comparisons are pervasive in social life and are probably inevitable (4, 5). Indeed, knowing how one measures up to others is a core human need (6), and how good we feel about ourselves and how happy we are with our lives are determined less by our absolute qualities and fortunes than by our standing relative to others (5, 7, 8). Although some animals do exhibit a basic level of comparative cognition (9, 10), it is

arguably the immense degree to which human beings process complex social information relative to available, and sometimes imagined, comparison standards that sets our species apart from our animal cousins.

Humans' tendency to process information comparatively is widespread and ubiquitous. Many decades of research in psychology and related fields have demonstrated that comparison processes are involved in perceptions of physical objects (11), personal evaluations (12–15), language and problem solving (16), categorization (17), stereotyping (18), attitudes (19), person perception (20), decision making (21–23), and emotion (24, 25). Comparisons unfold so spontaneously and effortlessly (26) that they are even carried out with standards that are irrelevant to the task at hand (27, 28) and for stimuli that are presented outside of conscious awareness (29, 30). Comparative thinking can be observed in humans even as early as infancy (31–33). This evidence suggests that comparison is one of the most basic building blocks of human cognition.

Despite the ubiquity of comparison, some findings suggest that comparison can vary across individuals and situations. For one, people appear to differ in their social-comparison orientation, that is, in the frequency with which they seek, and the importance they attribute to, information about how others are doing in a particular domain (8). Other findings offer insight into the situational factors that influence social-comparison processes. Most of this evidence follows up on the basic premise that information about others has the potential to satisfy basic human needs, such as needs for certainty, affiliation, and esteem (13, 34–36), and is thus sought more, the more pronounced these needs are.

## Significance

**Humans have the unique ability to coordinate behavior, economic exchange, political action, and social relationships across immense distances and times. To keep this level of coordination running smoothly, we often look to others as comparison standards for how to behave, think, and feel. A detailed understanding of the relation between social comparison and broad patterns of social life is lacking, however. The current research is a step in this direction—we show that social comparison is linked to cultural practices that promote strong norms and punishment for deviance (tightness) and those that promote relational self-construal (collectivism). These findings advance our understanding of the origins of social comparison and highlight the essential role of comparison for the development of social life.**

Author contributions: M.B. and T.M. designed research; M.B. performed research; M.B. analyzed data; and M.B. and T.M. wrote the paper.

The authors declare no conflict of interest.

This article is a PNAS Direct Submission.

This open access article is distributed under [Creative Commons Attribution-NonCommercial-NoDerivatives License 4.0 \(CC BY-NC-ND\)](https://creativecommons.org/licenses/by-nc-nd/4.0/).

<sup>1</sup>To whom correspondence should be addressed. Email: mbaldwin@uni-koeln.de.

This article contains supporting information online at [www.pnas.org/lookup/suppl/doi:10.1073/pnas.1721555115/-DCSupplemental](http://www.pnas.org/lookup/suppl/doi:10.1073/pnas.1721555115/-DCSupplemental).

Published online September 10, 2018.

Can such individual and situational variation in comparison be traced to broader and more distal factors? To answer this question, we focus on two prominent perspectives in cultural psychology, and first introduce the idea that comparison will be particularly functional in tight cultures, or those that demand adherence to social norms. Because tight cultures demand attention to norms and norm violators to coordinate social behavior, and because social comparison provides valuable information about how to behave, think, and feel, we expect tightness to be associated with greater social-comparison proclivity. Alongside this prediction, we also aim to further test the idea that social comparison is more prominent in cultures that define the self in relation to others (37). Because people in interdependent cultures tend to construe the self in relation to others, it has been demonstrated that people from these cultures also use available others as comparison standards when seeking information about how to behave, think, and feel (38). The following sections elaborate further on tightness–looseness and self-construal and their hypothesized connection to social comparison.

### **Tightness–Looseness and Social Comparison**

Cultures can be distinguished by their degree of tightness–looseness, which is defined as the strength of social norms and the degree to which behavior is regulated and sanctioned (39–41). In tight societies, norms are clear and harsh punishments are enforced for those who deviate from them, and as a result, knowing and following norms are particularly important in tight cultures. In one study, participants from a tight culture (China) exhibited increased neural activity when confronted with social norm violations compared with those from a loose culture (United States), indicating that individuals from tighter cultures have developed neural systems that are sensitive to detecting such violations (42). The awareness of norms, along with the detection of norm violations, can be considered the glue that holds tight societies together.

Tightness–looseness can meaningfully differentiate US states (43) and nations (44) and can also manifest in everyday situations, in what is known as situational strength (45). Strong (tight) situations are those that have a high degree of behavioral restriction, and where behavior is highly monitored and restricted, such as in the library or doctor's office. Weak (loose) situations are those that afford a wide range of behavioral variation, such as at a dance club or one's own backyard. A study of nations showed that a significant amount of variability in the strength of immediate situations, self-reported by individuals from those nations, could be explained by cultural tightness between those nations (44). In other words, tight cultures can also breed tight situations.

Because social comparison can be a particularly informative and efficient way to gain information about social norms (26, 46), we hypothesize that people in tight cultures will be prone to engage in social-comparison activity; and there is suggestive evidence in the literature hinting at this possibility. For instance, if pressures to look to others for information about appropriate behavior are high in tight settings, we would expect that individuals from tight settings display a general tendency to rely on contextual information, as comparison requires comparing a target to available contextual stimuli. Indeed, people in tight settings tend to construe the self in relation to its context rather than as a differentiated entity (47) and display field-dependent cognitive styles (48, 49), meaning that they process information relative to the context in which that information is found.

Moreover, we would expect individuals in tight settings to pay close attention to others, due to pressure to monitor and report nonnormative behaviors. For instance, children in some tight societies are expected to inform their superiors of individuals who are deviating from societal rules (50) and individuals from tight cultures appear to be more perceptive of norm violations compared with those from loose cultures (42). These broad

systems of monitoring in tight cultures lead to a strong sense of accountability to others—feeling that one's actions are being evaluated and judged (39–41, 47, 51), which in turn can prompt individuals to closely monitor their own behavior (52). Self-monitoring is highly dependent on comparing oneself to others, so much so that individuals with high self-monitoring tendencies are more likely to mimic the behavior of those around them (53). Even though norms are often clear and known in tight settings, people in those settings look to others to verify the norms at play, check how others interpret them, and regulate their own behavior accordingly.

In tight contexts characterized by high behavioral monitoring, social comparison is highly functional as it allows individuals to evaluate the appropriateness of their own behavior as well the behavior of others. Doing so helps coordinate social behavior in large groups, an outcome that is highly valued in tight cultures and situations because these cultures experience many ecological and societal threats, which increase the need for social coordination (39–41). To survive in such environments, strong social norms and punishment for deviance help to reduce uncertainty and chaos, facilitate the management of scarce resources, allow for groups of individuals to act cohesively in times of territorial threat, and so on. Thus, in tight settings, comparison is particularly useful because it facilitates the social coordination needed for survival.

### **Self-Construal and Social Comparison**

A second cultural variable that is likely to be intimately linked to social-comparison tendencies is self-construal related to independence–interdependence. In fact, social comparison will likely be more prominent in cultures that value interdependent self-construals and fitting into the group (collectivistic) vs. independent self-construals and standing out as an individual (individualistic; ref. 37). Like tightness–looseness, self-construal also varies across nations (54–56) and US states (57); moreover, some situations can promote the interdependent self, such as a family reunion, whereas others can promote the independent self, such as a job interview.

It is clear that social comparison is built into the fabric of collectivism because these comparisons are necessary for defining the self relationally, creating strong ingroups and outgroups, and assessing one's status relative to others in the group, all of which are characteristics of collectivist cultures. Indeed, research has found that individuals from collectivistic cultures, and individuals primed with an interdependent self-construal, are more attentive to contextual information (58), are more likely to assimilate to others (59), and are more influenced by social comparisons when prompted (60). However, these general patterns can be qualified by other moderating variables. People from collectivistic cultures seem to engage in more social comparison primarily when self-improvement motives are strong (38), suggesting that collectivism may be more strongly related to comparison under certain conditions. There is other mixed evidence that individuals from collectivistic cultures are more prone to social comparison. In one study, personally relevant economic behaviors exhibited by participants from individualist and collectivist countries were influenced by social-comparison information to the same degree, although the same social-comparison information differentially affected participants' neural activity (61). Social comparison, then, may have stronger effects depending on the level of analysis (brain vs. behavior) and whether the outcome is relevant for one's relation to others (personal vs. collective action). Taken together, these findings highlight that the link between interdependence/collectivism and social comparison has yet to be firmly established in the literature.

Perhaps the most obvious limitation of the current state of the literature, however, is that the independent contributions of self-construal and tightness–looseness on social-comparison proclivity have yet to be tested in a single study. Although collectivism

and tightness are at least moderately correlated (43, 62–64), and each is said to emerge from similar environmental threats and pressures (39, 65, 66), it is likely that the mechanisms leading to social comparison in these cultures are different, as each culture developed different ways of reacting to those threats and pressures. Whereas tight cultures developed formal systems of norm adherence and punishment, collective cultures developed strong bonds with similar others and a tendency to see clear boundaries between ingroups and outgroups. Each of these unique cultural practices are said to have protected individuals from exposure to, and negative effects of, foreign disease, among other threats such as extreme weather and foreign invasion. Thus, it should be the case that tightness and collectivism have unique and independent contributions to social comparison through different mediating variables: attention to norms in the former and relational self-construal in the latter.

Against this backdrop, the current research aims to (i) examine the influence of tightness–looseness on comparison proclivity, (ii) to further elucidate the link between self-construal and comparison proclivity, and (iii) to assess the independent contribution of both tightness–looseness and self-construal on comparison proclivity. We tackle these goals with diverse methods and measures, using both self-reports and big data from Google.

## The Present Research

In a series of studies, we investigate the associations between tightness–looseness, self-construal, and comparison proclivity at the level of the person, context, and culture. In part 1, we focus on the individual, using self-reports to establish the link between tightness and social-comparison proclivity and to assess the unique contributions of tightness and interdependence on social-comparison proclivity. In part 2, we turn our focus to the situation and look at whether tight and interdependent settings are those that yield more social comparison. Part 3 focuses on culture and examines social-comparison proclivity across states in the United States using search data from Google. In part 3, we also identify a psychological mechanism that underlies the tightness–comparison link in an attempt to further distinguish the effects of tightness from collectivism.

### Part 1: The Person

We first examined whether individual variation in perceptions of ambient situational tightness predicts comparison activity in a group of American participants. Approximately 400 adults participating online indicated their perceptions of tightness in situations at home, at work, and in public (e.g., “In public places, there are very clear expectations for how people should act”), and then completed a measure of social-comparison orientation, which assessed their agreement with statements about typical comparison activities and behaviors (e.g., “I always like to know what others in a similar situation would do”). Structural equation modeling was used to examine the correlation between situational tightness and social-comparison orientation. As predicted, participants who perceived their surroundings as tighter also expressed stronger social-comparison proclivity ( $\phi = 0.347$ ,  $SE = 0.057$ ,  $z = 5.758$ ,  $P < 0.001$ , 95% CI [0.217, 0.441]).

Next, we assessed participants’ perceptions of ambient situational tightness as well as the strength of their own independent and interdependent self-construals. Doing so allowed us to compare the unique contribution of tightness and self-construal on social-comparison proclivity. A new group of 400 American adults participated online and were asked to consider “most situations” in their daily life before responding to the same six-item measure of tightness–looseness as before (e.g., “There are very clear expectations for how people should act in most situations”). Participants also completed a measure of self-construal, which consisted of two subscales assessing interdependent (e.g., “I feel my fate is intertwined with the fate of those around me”)

and independent (e.g., “I do my own thing, regardless of what others think”) aspects of the self. Finally, they completed the same measure of social-comparison orientation as before.

Structural equation modeling was used to examine the unique contributions of tightness–looseness and self-construal to social-comparison proclivity by regressing social comparison on tightness, independence, and interdependence simultaneously. Tightness was a significant predictor of stronger social-comparison proclivity ( $b = 0.271$ ,  $SE = 0.078$ , 95% CI [0.119, 0.424],  $\beta = 0.232$ ,  $z = 3.480$ ,  $P = 0.001$ ). Interdependence was also associated with higher social-comparison proclivity ( $b = 0.489$ ,  $SE = 0.072$ , 95% CI [0.348, 0.630],  $\beta = 0.419$ ,  $z = 6.790$ ,  $P < 0.001$ ). Independence was associated with significantly lower social-comparison proclivity ( $b = -0.205$ ,  $SE = 0.069$ , 95% CI [−0.340, −0.069],  $\beta = -0.175$ ,  $z = -2.966$ ,  $P = 0.003$ ).

Overall, people who experience ambient tightness in their daily lives, or who construe themselves in relation to others, are also those who tend to compare themselves with others. By testing each variable simultaneously, these findings offer evidence that social comparison is a function of the unique influence of both tightness and interdependence. For detailed methods and results, see *SI Appendix, Part 1*. Next, we examine whether the links among tightness, interdependence, and social comparison are found across situations.

### Part 2: The Context

In part 1, we focused on participants’ experience of tightness and self-construal in their own lives. Now we extend this analysis to focus on social comparison, tightness, and interdependence as properties of everyday settings. We predict that settings that are perceived as tight and interdependent are also those that are perceived as prompting social comparison. We tested this hypothesis using three diverging but complementary approaches.

First, we presented ~100 American adults with a list of 15 settings, which were taken from prior research (e.g., job interview, library). They were shown each set of 15 settings three separate times and were asked to rank the settings on tightness, interdependence, and comparison proclivity. For the tightness ranking, they were told to “think about how much people adhere to social norms, whether there are clear expectations for how to act, and whether people would be punished for acting inappropriately” in each situation. For the interdependence ranking, they were told to “think about how much people are intertwined or connected to each other, how much people tend to define themselves in relation to others, and whether people’s group memberships mean more than their individuality” in each setting. For the comparison ranking, they were told to “think about how much people look to others for how to behave, compare what they are doing with what others are doing, and pay a lot of attention to how others are doing things” in each setting. The ranking tasks were presented in random order.

**Within-Individual Perceptions.** We then assessed the relative contributions of perceived tightness and interdependence on perceived comparison by computing two partial rank correlations for each participant: (i) the association between tightness and comparison controlling for interdependence and (ii) the association between interdependence and comparison controlling for tightness. Finally, we obtained the average correlations across all participants using a bootstrapping technique and examined the CI to determine whether each correlation was significantly different from zero.

As expected, there was some overlap between participants’ tightness and interdependence rankings, such that situations that were perceived as tight were also perceived as interdependent ( $\rho = 0.225$ , 95% CI [0.155, 0.294]). Despite this overlap, tight situations were also seen as promoting social comparison after controlling for interdependence ( $\rho_{\text{partial}} = 0.182$ , 95% CI [0.112,

0.253]), and interdependent situations were seen as promoting social comparison after controlling for tightness ( $\rho_{\text{partial}} = 0.293$ , 95% CI [0.232, 0.358]).

These correlations reveal the positive correspondence among individual perceptions of tightness, interdependence, and comparison across settings. However, this analysis does not provide evidence that participants agree on the rankings of each setting. To know whether these associations are properties of the settings themselves, we would need to test whether there is agreement among the individual participants, that is, whether one person's tightness rankings match another person's comparison rankings, and so on.

**Cross-Individual Perceptions.** To test for these associations, we calculated the same partial rank correlations as before, but for every possible pair of participants in the dataset. For instance, participant A's tightness ranks were correlated with every other participants' comparison ranks, and then this procedure was repeated to obtain every partial rank correlation possible from the data (5,151 total correlations). As before, we obtained the average correlations of interest from this set of correlations using a bootstrapping technique and examined the CI to determine whether each correlation was significantly different from zero.

Average correlations between participants' tightness ranks ( $\rho = 0.320$ , 95% CI [0.310, 0.330]), interdependence ranks ( $\rho = 0.195$ , 95% CI [0.185, 0.204]), and comparison ranks ( $\rho = 0.276$ , 95% CI [0.268, 0.285]) were all significantly different from zero. This means that participants tended to agree on which settings were tight, interdependent, and prompting comparison. Moreover, participants' tightness rankings correlated with other participants' comparison rankings on average, after controlling for interdependence ( $\rho_{\text{partial}} = 0.104$ , 95% CI [0.095, 0.112]). The same pattern was found for interdependence after controlling for tightness ( $\rho_{\text{partial}} = 0.189$ , 95% CI [0.181, 0.197]).

**Cross-Sample Perceptions.** In a final test, we compared the rankings of the sample of participants above (sample 1) to the average rankings from a completely new and independent sample of 150 American participants (sample 2). The new participants were randomly assigned to rank the settings on either tightness, interdependence, or comparison, which resulted in ~50 total rankings for each variable. We then calculated partial rank correlations between each participant's individual ranks in sample 1 and the average ranks in sample 2, and then obtained the average correlations across all sample 1 participants with bootstrapping. We examined the CI to determine whether each correlation was significantly different from zero. This procedure offers a rigorous test that the links among tightness, interdependence, and social comparison are properties of the settings themselves, and not simply individual perceptions.

Consistent with the findings above, individual rankings from sample 1 agreed with average rankings from sample 2: tightness,  $\rho = 0.533$ , 95% CI [0.463, 0.604]; interdependence,  $\rho = 0.388$ , 95% CI [0.324, 0.451]; and comparison,  $\rho = 0.446$ , 95% CI [0.382, 0.509]. Because completely independent raters agree on the ranks of these settings, it can be said that tightness, interdependence, and comparison are likely to be actual properties of the settings themselves.

Also supporting our predictions, individual rankings of tightness were correlated with average rankings of comparison after controlling for interdependence ( $\rho_{\text{partial}} = 0.349$ , 95% CI [0.292, 0.407]). The same pattern emerged for interdependence after controlling for tightness ( $\rho_{\text{partial}} = 0.325$ , 95% CI [0.270, 0.381]). For detailed methods and results, see *SI Appendix, Part 2*. In part 3, we zoom out further and examine the culture-comparison link at the level of US states.

### Part 3: Culture

In part 3, we operationalize social-comparison proclivity as the search for social-comparison emotions on the internet. Social-comparison emotions are those that arise primarily when comparing oneself to others (25). For instance, comparing oneself to a colleague after her promotion could lead to feelings of jealousy for some people, or inspiration in others. Comparing oneself to the same colleague after her being fired may prompt feelings of sympathy. Importantly, similar affective experiences may also arise if one looks to others to learn about pertinent social norms. For instance, one might look to others to gain information about the norms at play in the workplace, such as how to dress. As a result, some could feel jealousy toward those who can afford expensive suits and dresses, while others may be inspired to reach a similar status. Others still may feel sympathy for those colleagues who cannot afford to meet the expected norm. In all of these examples, social comparison is the primary reason for feeling the emotion, which sets them apart from other emotional experiences.

If individuals from tight and interdependent settings are more likely to engage in social-comparison activity, as shown previously, they should also be more likely to experience social-comparison emotions. To test this prediction, we examine the frequency of comparison emotion searches on the internet across US states. The internet is a massive source of information, containing what could be around 50 billion web pages (67). People use the internet to ask specific questions (68) and to obtain social information, such as when seeking help or advice from other internet users in forums (69) or on websites tailored to specific social groups or goals (70). Thus, web search activity can be useful for investigating individual psychological processes and motives with real-world activity in a variety of contexts (71).

Here, we make use of search data from Google Correlate, which is a database of tens of millions of search queries since the year 2003 in the United States. This approach is highly reliable and ecologically valid. No research to our knowledge has investigated how comparison proclivity manifests as real-world information search on the internet. Thus, this research makes use of a yet-undiscovered source of data to study this fundamental aspect of human cognition. Moreover, search frequency data obtained from Google is composed of millions of search queries, tapping into billions of potential web pages, by hundreds of millions of individuals over several years. Thus, each individual data point (i.e., a search frequency score for a single US state) is highly reliable as the estimate is obtained from what is (virtually) the entire population of interest. Whereas laboratory research can only speculate about how comparison might manifest in the real world, this approach assesses such behavior directly. See *SI Appendix, Part 3*, for details and validation of the database for testing our culture-specific hypotheses.

**State-Level Tightness, Looseness, and Comparison.** To begin, we computed a social-comparison emotion search index for each state by averaging Google search frequencies for each of seven social-comparison emotion words selected from a pilot study ( $\alpha = 0.810$ ; *SI Appendix, Pilot Study 2*). We also tested six additional variables as potential covariates—political orientation (conservatism), geographic region (coded south vs. nonsouth), residential mobility, percent urban population, and percent minority population (total Hispanic, Asian, and Black). Given that each of these variables has been shown to correlated with tightness or collectivism (43, 57), we considered that these variables could potentially explain the association between culture and comparison emotion searches.

First, we conducted an ordinary least-squares regression analysis to examine the independent contributions of tightness and collectivism on comparison emotion searches without covariates. Each variable contributed significantly to comparison emotion

searches:  $b_{\text{tightness}} = 0.014$ ,  $SE = 0.006$ , 95% CI [0.005, 0.021],  $\beta = 0.249$ ,  $t_{(47)} = 2.173$ ,  $P = 0.035$ ;  $b_{\text{collectivism}} = 0.032$ ,  $SE = 0.007$ , 95% CI [0.020, 0.049],  $\beta = 0.539$ ,  $t_{(47)} = 4.693$ ,  $P < 0.001$ . Next, we determined which subset of our predictor variables and covariates best explained variation in comparison emotion searches across states using a best subsets regression analysis, which searches for the combination of predictors that maximizes model fit. The superior model for explaining variation in social-comparison emotion searches was one that included tightness–looseness, collectivism, and political orientation as predictors. In this model, tightness and collectivism remained significant and positive:  $b_{\text{tightness}} = 0.026$ ,  $SE = 0.009$ , 95% CI [0.012, 0.037],  $\beta = 0.483$ ,  $t_{(46)} = 3.035$ ,  $P = 0.004$ ;  $b_{\text{collectivism}} = 0.026$ ,  $SE = 0.007$ , 95% CI [0.014, 0.045],  $\beta = 0.431$ ,  $t_{(46)} = 3.515$ ,  $P = 0.001$ . The effect of political orientation was negative, such that conservative states engaged in fewer comparison emotion searches after controlling for culture ( $b_{\text{political orientation}} = -0.022$ ,  $SE = 0.011$ , 95% CI [-0.044, 0.009],  $\beta = -0.322$ ,  $t_{(46)} = 2.049$ ,  $P = 0.046$ ). A US map depicting the frequency of social-comparison emotion searches in each state predicted by the final regression equation can be found in Fig. 1.

**Testing a Mechanism.** We hypothesize that comparison proclivity related to tightness and collectivism results from different mechanisms. With regard to collectivism, the mechanism is built into the construct itself—that is, social comparison in collective cultures is a direct function of the extent to which people define themselves in relation to others. Self–other overlap is the driving factor in the comparison–collectivism link. In contrast, the effect of tightness on social comparison is likely mediated by a third variable, namely, attention to norms. It is not the mere presence of established social norms and formal punishment that prompts social comparison in tight cultures, but rather how much people in those cultures constantly monitor and attend to the norms at play. Attention to norms should be apparent across states as a function of tightness–looseness, and attention to norms should account for the effect of tightness, but not collectivism, on comparison emotions searches.

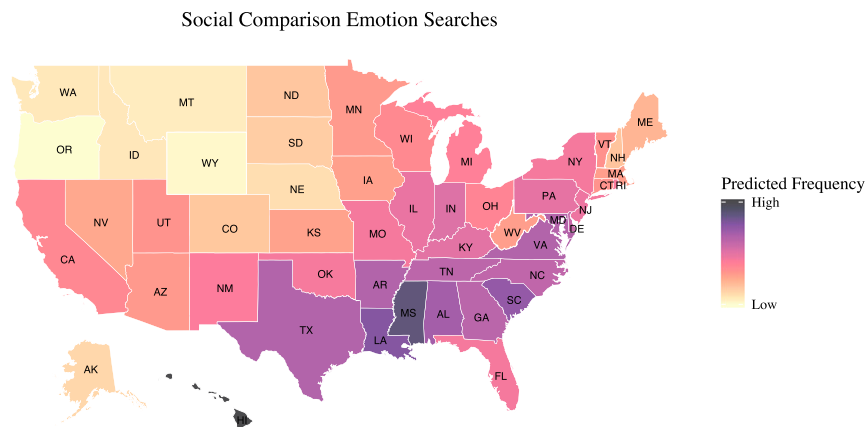
We tested these hypotheses by assessing the extent to which individuals from US states seek normative information on the internet. Attention to norms can manifest linguistically in expressions of the “generic you” (72). People use generic-you phrases when describing norms about behavior, for instance, when explaining uses for a hammer (e.g., “You hit nails with it”), or what to do at the library (e.g., “You should whisper when you talk”). In these expressions, the “you” is interpreted as referring to people in general, rather than to an individual addressee, and

describes general norms rather than individual preferences. Generic-you phrases are especially useful for communicating prescriptive norms—statements about how people should behave—and use of the generic you emerges even in early childhood (72, 73).

On this basis, we predicted that internet searches for prescriptive generic-you phrases would be more strongly associated with tightness, compared with collectivism. We assessed attention to norms with a generic-you index made from two search terms: “you should” and “should you” [ $r_{(48)} = 0.813$ ,  $P < 0.001$ ]. These terms would capture searches such as “What should you wear to a job interview?,” “How should you punish a child?,” “Things you should do at the beach,” and so on. To demonstrate that tightness predicts attention to norms specifically, we created a first-person index with two terms: “I should” and “should I” [ $r_{(48)} = 0.673$ ,  $P < 0.001$ ]. Although these terms could be used in similar searches (e.g., “Things I should do at the beach”), use of the first-person pronoun reflects a shift away from rule-based norms and a focus on individual preferences.

As before, we first tested the unique contribution of tightness and collectivism on generic-you searches without covariates. Only tightness was a significant predictor:  $b_{\text{tightness}} = 0.047$ ,  $SE = 0.009$ , 95% CI [0.033, 0.063],  $\beta = 0.622$ ,  $t_{(47)} = 5.305$ ,  $P < 0.001$ ;  $b_{\text{collectivism}} = 0.000$ ,  $SE = 0.010$ , 95% CI [-0.018, 0.023],  $\beta = 0.004$ ,  $t_{(47)} = 0.034$ ,  $P = 0.973$ . All variables were then submitted to a best-subsets regression as before, and the superior model was one that included only tightness–looseness as a predictor. Neither cultural variable was a significant predictor of first-person searches:  $b_{\text{tightness}} = 0.013$ ,  $SE = 0.011$ , 95% CI [-0.004, 0.030],  $\beta = 0.185$ ,  $t_{(47)} = 1.255$ ,  $P = 0.216$ ;  $b_{\text{collectivism}} = -0.003$ ,  $SE = 0.012$ , 95% CI [-0.026, 0.021],  $\beta = -0.229$ ,  $t_{(47)} = -0.229$ ,  $P = 0.820$ . Thus, we proceed to test the predicted mediation model with only generic-you searches as the mediator.

We tested for the indirect effect of tightness on social-comparison emotions through generic-you searches as the mediator and, consistent with the findings above, included collectivism and political orientation as covariates on comparison emotions. In the mediation model, tightness was a significant predictor of generic-you searches ( $b = 0.047$ ,  $SE = 0.0085$ , 95% CI [0.030, 0.064],  $\beta = 0.623$ ,  $t_{(48)} = 5.514$ ,  $P < 0.001$ ). As predicted, generic-you searches were associated with increased comparison emotion searches ( $b = 0.454$ ,  $SE = 0.075$ , 95% CI [0.303, 0.604],  $\beta = 0.633$ ,  $t_{(45)} = 6.075$ ,  $P < 0.001$ ). The indirect effect through generic-you searches was significant ( $ab = 0.021$ ,  $SE = 0.007$ , 95% CI [0.008, 0.034],  $ab_{\text{standardized}} = 0.394$ ,  $SE = 0.095$ , 95% CI [0.174, 0.548]).



**Fig. 1.** Tighter and more collectivist states make more searches for social-comparison emotions on Google. Color is proportional to the expected search frequency from the regression equation (from low to high frequency of searches). Data from Google Correlate are adjusted for year-over-year growth, and state-by-state variation in internet usage.



distinguishing the self from others but keeping status equal across individuals, whereas vertical individualism stresses both distinctiveness and status. Horizontal collectivism is about promoting harmony and cohesion within the group, whereas vertical collectivism is focused on submission and position in the hierarchy, such as when children submit to parents or when sacrificing one's own pleasure for the sake of the group.

It seems plausible, then, that people from individualistic cultures are also prone to comparisons, but specifically those that focus on differences between the self and others; these comparisons would be particularly beneficial for vertical individualists who value distinctiveness and status. In contrast, people from collectivistic cultures may favor both comparisons: a focus on similarities between the self and others for the purpose of group harmony (horizontal), and a focus on differences between the self and someone of relatively lower or higher status to assess the hierarchy (vertical) (37).

Considering these possibilities, it seems difficult to imagine how these cultural practices could emerge and be sustained in the absence of individuals engaging in a high degree of social comparison in daily situations. Such speculations could be tested in future research by observing trends in tightness and comparison activity over time, paying close attention to cross-lag causal effects of each variable. Future research could also assess social-comparison activities before and after events that would be expected to promote tightness or collectivism, such as terror

threats, extreme weather, or disease outbreaks. In addition, future research could examine broader seasonal trends in comparison activity over time. For instance, comparison activity may be higher in seasons that promote tightness or collectivism, such as the start of "flu season," for months in which school is in session, during national elections, and so on.

This research represents a methodological innovation for the social and behavioral sciences and highlights the fruitfulness of using ecologically valid internet search data for conducting research in this field. Given that data from Google are highly representative of the population of interest (in our case, individuals living in the United States), our findings are generalizable. Furthermore, individuals conducting searches on the internet are unlikely to predict how their search activity could be used for any specific hypothesis, and thus research with internet search data are absent of demand effects. Broadly speaking, this research makes clear how the internet can be considered an extension of the mind, as it is a tool that facilitates cognition (76). This means that internet search data can be fruitfully explored to examine basic social, behavioral, and psychological processes in and across cultures.

All studies were covered under Institutional Review Board approval from the Social Cognition Center Cologne, and participants provided consent by clicking a box on the first page of each study.

- Fehr E, Fischbacher U (2003) The nature of human altruism. *Nature* 425:785–791.
- Fehr E, Rockenbach B (2004) Human altruism: Economic, neural, and evolutionary perspectives. *Curr Opin Neurobiol* 14:784–790.
- Rand DG, Greene JD, Nowak MA (2012) Spontaneous giving and calculated greed. *Nature* 489:427–430.
- Mussweiler T (2003) Comparison processes in social judgment: Mechanisms and consequences. *Psychol Rev* 110:472–489.
- Suls J, Martin R, Wheeler L (2002) Social comparison: Why, with whom, and with what effect? *Curr Dir Psychol Sci* 11:159–163.
- Tesser A (1988) Toward a self-evaluation maintenance model of social behavior. *Advances in Experimental Social Psychology*, ed Berkowitz L (Academic, New York), Vol 21, pp 181–227.
- Fliessbach K, et al. (2007) Social comparison affects reward-related brain activity in the human ventral striatum. *Science* 318:1305–1308.
- Gibbons FX, Buunk BP (1999) Individual differences in social comparison: Development of a scale of social comparison orientation. *J Pers Soc Psychol* 76:129–142.
- Nieder A (2005) Counting on neurons: The neurobiology of numerical competence. *Nat Rev Neurosci* 6:177–190.
- Schmitt V, Fischer J (2011) Representational format determines numerical competence in monkeys. *Nat Commun* 2:257.
- Coren S, Enns JT (1993) Size contrast as a function of conceptual similarity between test and inducers. *Percept Psychophys* 54:579–588.
- Dunning D, Hayes AF (1996) Evidence for egocentric comparison in social judgment. *J Pers Soc Psychol* 71:213–229.
- Festinger L (1954) A theory of social comparison processes. *Hum Relat* 7:117–140.
- Gilbert DT, Giesler RB, Morris KA (1995) When comparisons arise. *J Pers Soc Psychol* 69:227–236.
- Jones DC (2001) Social comparison and body image: Attractiveness comparisons to models and peers among adolescent girls and boys. *Sex Roles* 45:645–664.
- Gentner D, Markman AB (1997) Structure mapping in analogy and similarity. *Am Psychol* 52:45–56.
- Nosofsky RM, Palmeri TJ (1997) An exemplar-based random walk model of speeded classification. *Psychol Rev* 104:266–300.
- Biernat M (2003) Toward a broader view of social stereotyping. *Am Psychol* 58:1019–1027.
- Sherif M, Hovland CI (1961) *Social Judgment: Assimilation and Contrast Effects in Communication and Attitude Change* (Yale Univ Press, Oxford).
- Higgins ET, Lurie L (1983) Context, categorization, and recall: The "change-of-standard" effect. *Cognit Psychol* 15:525–547.
- Choplin JM, Hummel JE (2002) Magnitude comparisons distort mental representations of magnitude. *J Exp Psychol Gen* 131:270–286.
- Herr PM (1986) Consequences of priming: Judgment and behavior. *J Pers Soc Psychol* 51:1106–1115.
- Smith ER, Zárate MA (1992) Exemplar-based model of social judgment. *Psychol Rev* 99:3–21.
- Lange J, Crusius J (2015) The tango of two deadly sins: The social-functional relation of envy and pride. *J Pers Soc Psychol* 109:453–472.
- Smith RH (2000) *Assimilative and Contrastive Emotional Reactions to Upward and Downward Social Comparisons* (Kluwer Academic Publishers, Dordrecht, The Netherlands).
- Mussweiler T, Epstude K (2009) Relatively fast! Efficiency advantages of comparative thinking. *J Exp Psychol Gen* 138:1–21.
- Gilbert P, Allan S (1994) Assertiveness, submissive behaviour and social comparison. *Br J Clin Psychol* 33:295–306.
- Tversky A, Kahneman D (1975) Judgment under uncertainty: Heuristics and biases. *Utility, Probability, and Human Decision Making: Selected Proceedings of an Interdisciplinary Research Conference, Rome, 3–6 September, 1973*, eds Wendt D, Vlek CA (Springer, Dordrecht, The Netherlands), pp 141–162.
- Dehaene S, et al. (1998) Imaging unconscious semantic priming. *Nature* 395:597–600.
- Mussweiler T, Rüter K, Epstude K (2004) The man who wasn't there: Subliminal social comparison standards influence self-evaluation. *J Exp Soc Psychol* 40:689–696.
- Baillargeon R (1991) Reasoning about the height and location of a hidden object in 4.5- and 6.5-month-old infants. *Cognition* 38:13–42.
- Gentner D, Medina J (1998) Similarity and the development of rules. *Cognition* 65:263–297.
- Gentner D, Rattermann MJ (1991) Language and the career of similarity. *Perspectives on Language and Thought: Interrelations in Development* (Cambridge Univ Press, New York), pp 225–277.
- Buunk BP (1994) Social comparison processes under stress: Towards an integration of classic and recent perspectives. *Eur Rev Soc Psychol* 5:211–241.
- Pyszczynski T, Greenberg J, LaPrele J (1985) Social comparison after success and failure: Biased search for information consistent with a self-serving conclusion. *J Exp Soc Psychol* 21:195–211.
- Schachter S (1959) *The Psychology of Affiliation* (Stanford Univ Press, Stanford, CA).
- Cross SE, Hardin EE, Gercek-Swing B (2011) The what, how, why, and where of self-construal. *Pers Soc Psychol Rev* 15:142–179.
- White K, Lehman DR (2005) Culture and social comparison seeking: The role of self-motives. *Pers Soc Psychol Bull* 31:232–242.
- Gelfand MJ, Nishii LH, Raver JL (2006) On the nature and importance of cultural tightness-looseness. *J Appl Psychol* 91:1225–1244.
- Pelto PJ (1968) The differences between "tight" and "loose" societies. *Trans Action* 5:37–40.
- Triandis HC (1989) The self and social behavior in differing cultural contexts. *Psychol Rev* 96:506–520.
- Mu Y, Kitayama S, Han S, Gelfand MJ (2015) How culture gets embraced: Cultural differences in event-related potentials of social norm violations. *Proc Natl Acad Sci USA* 112:15348–15353.
- Harrington JR, Gelfand MJ (2014) Tightness-looseness across the 50 United States. *Proc Natl Acad Sci USA* 111:7990–7995.
- Gelfand MJ, et al. (2011) Differences between tight and loose cultures: A 33-nation study. *Science* 332:1100–1104.
- Mischel W (1977) The interaction of person and situation. *Personality at the Crossroads: Current Issues in Interactional Psychology*, eds Magnusson D, Endler NS (Lawrence Erlbaum, Hillsdale, NJ), pp 333–352.
- Miller DT, Prentice DA (1996) *The Construction of Social Norms and Standards* (Guilford Press, New York).
- Witkin HA, Berry JW (1975) Psychological differentiation in cross-cultural perspective. *J Cross Cult Psychol* 6:4–87.
- Dawson JLM (1967) Cultural and physiological influences upon spatial-perceptual processes in West Africa. Part I. *Int J Psychol* 2:115–128.

