Being a Tough Person in a Tight World: Cultural Tightness Leads to a Desire for Muscularity

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Abstract

Compared to loose cultures, tight cultures are characterized by stronger norm adherence and sanctioning of norm deviant behavior. In the current research, we proposed that culture tightness (vs. looseness) triggers a desire for physical formidability (being big and muscular), and interpersonal dominance. Fives studies converged to support our hypotheses. Through the analysis of archival data of over 1.6 million American residents, Study 1 showed that compared to those in loose states, individuals living in tight ones have a bigger body size (higher BMI), a correlate of muscle mass and strength. Studies 2-5 (N = 1626) further demonstrated a causal relationship. As such, placing people in a simulated tight society increased their drive for muscularity of the self (but not for body fat, Studies 2 and 3, nor for others' muscularity, Study 3). This effect was further replicated in the following studies using a different manipulation method for cultural tightness (Studies 4 and 5). In addition, we found that a desire for dominance acted as a mediator in this process (Studies 4 and 5). We also differentiated dominance from a related concept – prestige (Study 5), and discussed contributions of these findings for the understanding of culture tightness-looseness.

Key Words: cultural tightness, formidability, muscularity, dominance, big body size

Being a Tough Person in a Tight World: Cultural Tightness Leads to a Desire for Muscularity

Human social coordination is facilitated by shared norms that indicate how people ought to behave in social settings. Norms enable cooperation and distribution of economic resources within informal and legitimized social structures, in institutions, and between nations. In spite of the ubiquity of social norms, the extent to which individuals endorse norms, regulate their behavior by norms, and sanction deviants vary across cultures (e.g., Gelfand et al., 2006; Gelfand et al., 2011). Gelfand coined this phenomenon tightness-looseness of culture (Gelfand et al., 2006), a concept that has theoretical roots in multiple disciplines, including anthropology (e.g., Pelto, 1968), psychology (e.g., Berry, 1967), and sociology (e.g., Boldt, 1978).

Compared to loose cultures, tight cultures are characterized by stronger norm adherence and sanctioning of norm deviant behavior (Gelfand et al., 2006). They also rely on authoritarian practices of power within hierarchical structures (Aktas et al., 2016; Jackson et al, 2020; Guinote, 2017). As such, people in tight, compared to those in loose, cultures are subject to greater social control, and face the risk of subjugation. In spite of the protective value of strong norms, sanctions, and authoritarianism against ecological threats (Gelfand et al., 2011), they threaten universal needs for control and autonomy (Reis et al.,2000). Individuals in tight cultures may therefore be motivated to possess personal attributes and skills that prevent loss of control and autonomy. In this article, we investigate the consequences of culture tightness-looseness for people's desired formidability (physical strength, seen in muscularity) and dominance (the motivation to attain power, status and valued resources; Barrick et al., 2002), tools that are instrumental in the face of constraints and threats. Within a culture, individuals are not equally exposed to sanctions and social constraints. Dominance affords autonomy and facilitates ascendance towards less constraining social positions with greater control and agency. Formidability is the physical embodiment of dominance in social contexts (van Vugt & Grabo, 2015). In brief, we hypothesize that tight cultures, compared to loose cultures, elicit the desire for formidability and dominance, and that the desire for dominance antecedes and triggers the desire for physical formidability.

Cultural Tightness and Dominance

Cultural tightness is characterized by strong norms and severe punishments of deviate behaviors (Gelfand et al., 2011). In this vein, individuals living in tight nations, compared to loose ones, have developed neural systems that show stronger reactivity to norms (Mu et al., 2015). They are oriented towards recognizing and valuing norms, orderliness, and regulations (Jackson et al., 2021; Jackson et al., 2019). Orderliness and sanctions are imposed primarily by power hierarchies that provide structure and guidance within social groups (e.g., de Kwaadsteniet & van Dijk 2010; Halevy et al., 2011; Ronay et al., 2012). In other words, dominance can be an effective tool for establishing and maintaining cultural tightness. Indeed, people who endorse the existence of strong power asymmetries in society tend also to justify existing structures and orderliness (e.g., Vargas-Salfate et al., 2018). This notion is consistent with more general evidence that dominant leaders, who are assertive, fearless, and forceful (Mast et al., 2010; Lukaszewski et al., 2016), are endorsed and emerge in times of uncertainty (Kakkar & Sivanathan, 2017), conflict, war, and threats (Laustsen & Petersen, 2017; Little et al., 2007; van Vugt & Grabo, 2015), features that are associated with tight cultures. In other words, dominance contests can be a prevalent feature in tight cultures and could be a common path to hierarchy formation in these cultures.

Here we hypothesize that tight, compared to loose cultures, elicit a higher desire for dominance. In human societies, dominance affords social control with immediate benefits, as well as the possibility of upward mobility (Cheng et al., 2013; Clutton-Brock & Harvey 1976; Mascaro & Csibra, 2012). This could be particularly important in tight cultures. For example, dominant individuals convey competence, and so they are afforded status and power (Anderson & Kilduff, 2009; Wang et al., 2018). Therefore, they are over-represented in power positions (Melamed & Bozionelos, 1992). Crucially, the needs of people in power are more likely recognized and met in society, compared to those who are powerless (e.g., Pratto, 2016). A tight society could therefore constitute permission and prohibition of behaviors that are largely determined by one's rank, with norms and punishment usually protecting the dominant and powerful individuals (e.g., Stamkou et al., 2016). In addition to providing advantages in upward mobility within the social hierarchy, the motivation to have power can be linked to the desire to enhance control over one's lives and resources (i.e., personalized power, Barrick et al., 2002, Lammers et al., 2009). Thus, dominance and power pave a way to autonomy, control and agency (Lammers et al., 2016), needs that are thwarted in tight cultures.

Dominance, Physical Formidability, Body Size, and Muscularity

Body size is correlated with dominance rank in group-living species (Galbany et al., 2015; McElligott et al., 2001; Pelletier & Festa-Bianchet, 2006). As a result, individuals signal dominance and power by conveying the appearance of having large body sizes through expansive postures (Boehm & Flack, 2010; Carney et al., 2005). In other words, a large body size signals dominance, the ability to exercise coercion and win in physical contests.

It has been argued that in ancestral human environments, formidable individuals are more likely to emerge as group leaders who intervened in intragroup conflicts and fights, enforcing order (Lukaszewski et al., 2016; van Vugt, 2014). The association between formidability and dominance is established early in ontogeny. Ten- to thirteen-month-old infants use the agents' relative sizes to predict the outcomes of the very first dominance contests between them, associating a big size with dominance (Thomsen et al., 2011). Preschool children form hierarchies based on the ability to prevail in competition for property ownership (e.g., toys, Kalish, 2005). As a result, humans naturally form a symbolic link between physical formidability and dominance (Kordsmeyer et al., 2018; Wang et al., 2018). For instance, a recent study using a data-driven approach found that human faces representing dominance and physical strength are highly similar, and that strength is a robust cue for dominance (Toscano et

al., 2016). In summary, big body size and muscularity, features signaling physical formidability, are universal predictors of perceived dominance. This association is the focus of the current research.

Larger bodies are typically stronger due to having larger muscles and greater muscle mass. Although larger bodies can carry larger fat mass, especially when individuals are overweight, they also carry larger muscles and larger muscle mass (Freedman et al., 2005; Hardy et al., 2013; Hasan et al., 2016; Westerterp et al., 1995). From an evolutionary perspective, one function of the musculoskeletal system is to facilitate dominance during agonistic encounters (Carrier et al., 2015). Upper-body muscularity predicts objective strength, as measured with a handgrip dynamometer, and also self-perceived strength (Muñoz-Reyes et al., 2019). Muscularity is in fact a better indicator of physical strength than body size. Hence researchers from multiple disciplines very often equate muscle size or muscle activation with physical strength (e.g., Fink et al., 2016; Kent-Braun & Ng, 1999; Sell et al., 2017).

Muscle mass could serve as a central embodiment of dominance among humans. Initial evidence shows that compared to their less muscular counterparts, more muscular male action figures are more likely to be depicted in a dominant manner, showing hands in fists and with an angry emotional expression (Boyd & Murnen, 2017). Muscularity predicts the self-perceived ability to fight among men (Muñoz-Reyes et al., 2019). One study found that British male participants' drive for muscularity is significantly associated with a socio-political ideology that values dominance hierarchies (Swami et al., 2013). Therefore, to increase one's dominance, one should be motivated to be muscular. In the present context, we propose that cultural tightness, more than cultural looseness, will trigger the drive for muscularity, which is instrumental for gaining autonomy and ascending the power hierarchy.

The Present Research

The present research aims to test the hypothesis that cultural tightness influences the drive for formidability, that is, being muscular, and that this effect would (partially) be explained by the desire to be dominant. Body size and muscularity vary across nations, as a result of differences in food intake, genetics, lifestyle, and economics (e.g., Arnold & Braun, 1999; Hsueh et al., 2018; Zhang & Wang, 2004). To minimize the potential influence of these extraneous variables, the present research was carried out in the United States of America. Previous research has shown reliable variation in tightness-looseness across different states in the USA (e.g., Harrington & Gelfand, 2014).

Even though our primary interest is on the link between culture and drive for formidability, we also consider the possibility that cultural tightness may be related to actual formidability. If formidability is instrumental for sanctioning norm deviant behavior and ascending the hierarchy ladder, individuals in tight cultures may not only desire physical formidability but also demonstrate actual formidability. Accordingly, we first examined in Study 1 the association between cultural tightnesslooseness and body mass index (BMI) across 50 states of the United States of America. A growing body of literature suggests that BMI is a measure of excess

weight, rather than excess body fat, relative to height (e.g., Roubenoff et al., 1995; Rothman, 2008), and it is positively related to muscle mass and physical strength (e.g., Freedman et al., 2005; Hardy et al., 2013; Hasan et al., 2016).

To establish whether cultural tightness causes the desire for formidability, Study 2 employed an experimental manipulation of cultural tightness. The study aimed to differentiate the drive for muscle mass from the drive for fat mass. Specifically, U.S. participants were placed in a simulated tight culture or a loose one. We hypothesized that individuals in the tight culture would prefer a more muscular body for themselves, but not necessarily a fatter one. Study 3 was to replicate the findings of Study 2 and to test the hypothesis that tightness would enhance the desire for a muscular body for oneself, not for others.

Study 4 used a different paradigm to manipulate cultural tightness and measure people's desire for muscularity. More importantly, the study tested the mediating role of dominance on the effects of cultural tightness on desire for muscularity. Study 5 was to replicate the test of mediation of Study 4 and to further examine if dominance was a better mediator compared to prestige – another determinant of social hierarchy (Cheng & Tracy, 2014). To ascend the hierarchy, dominance and prestige can be two fundamental strategies, with the former relying on force and controlling behavior, and the latter counting on expertise and respect (Cheng & Tracy, 2014). Therefore, we included both measures and tested which one would be a more robust mediator.

All experiments in this manuscript were conducted with ethical approval. In all experiments, we report all measures, manipulations, and exclusions.

Sample Size Determination. Given that the aim of the current study is to test the effect of cultural tightness on body size preferences, we expected a main effect of culture condition (Studies 2–5). For all experiments, we aimed at a sample of two hundred participants per condition (one hundred participants per gender). Sensitivity power analyses (Faul et al., 2007) revealed that a minimum effect size of f = 0.16(Study 2: N = 414; Study 3: N = 411; Study 4: N = 399; Study 5: N = 402) could be detected under standard criteria (i.e., $\alpha = 0.05$ two-tailed, $\beta = 0.90$).

Study 1

Body mass is positively related to physical strength and muscle mass (e.g., Abe et al., 2014; Freedman et al., 2005; Hardy et al., 2013; Hasan et al., 2016; Kanehisa & Fukunaga, 2013). Consequently, Study 1 employed archival data to investigate the relationship between culture tightness and body size, a proxy for physical strength. To capture cultural tightness, the study used tightness-looseness scores of 50 U.S. states from Harrington and Gelfand (2014). The individual human body size data, indexed by body mass (BMI), was obtained from an annual national survey database of the Behavioral Risk Factor Surveillance System (BRFSS). We predicted a positive association between cultural tightness and BMI. To preclude plausible alternative explanations, we controlled for multiple confounding variables at the state and individual levels.

Method

Cultural Tightness at the State Level. We directly used cultural tightness scores of 50 U.S. states, from Harrington and Gelfand (2014). They were a composite index of nine items, reflecting the strength of punishment, latitude/permissiveness, institutions that reinforce moral order and constrain behavior, and the degree of high international diversity and an ambient mixture of people from different cultures.

Body Size at the Individual Level. BMI, i.e., one's weight in kilograms divided by height in meters squared, is a measurement of human body size (Keys et al., 1972; Peig & Green, 2010; Quetelet, 1994). We obtained data of a representative sample of U.S. residents on health-related information from BRFSS, which collects data from U.S. adults from 50 states as well as the District of Columbia each year, via a telephone survey. To deal with time lagging¹, we used the BMI, calculated from weight and height, from the year of 2015 to 2018 (2015: N = 387,840; 2016: N =427,341; 2017: N = 397,038; 2018: N = 384,467), with the latter being the most recent data available.

State-level Control Variables. We have controlled for several macro socioecological factors that could influence BMI as shown in previous studies, including Gross Domestic Product (GDP) per capita (e.g., Egger et al., 2012; Templin et al., 2019), temperature (e.g., Minos et al., 2016; Swinburn et al., 2019), elevation (e.g., Frisancho & Baker, 1970; Voss et al., 2013), and accessibility to unhealthy food in one's neighborhood (e.g., Mujahid et al., 2008; Spence et al., 2009). In addition, we have controlled for ecological threats (Harrington & Gelfand, 2014; Jackson et al., 2019; 2021), culture of honor (Cohen, 1998; Gastil, 1971; Nisbett & Cohen, 1996), conservatism (Harrington & Gelfand, 2014; Jackson et al., 2019; 2021), economy inequality, and urbanization (see Supplementary Materials for details), variables that could confound with cultural tightness or body size.

Individual-Level Control Variables. We have controlled for multiple variables at the personal level that could impact BMI, as shown by prior work. These include age (e.g., Hales et al., 2017), sex (e.g., Garawi et al., 2014), race/ethnicity (e.g., Baruffi et al., 2004), education (Miech et al., 2015), income (Zhang & Wang, 2004), employment status (Hughes & Kumari, 2017), smoking (Baum, 2009), diet constitution (Heo et al., 2011), physical activity (Orsini et al., 2008), and metropolitan status (Hales et al., 2018; Sallis et al., 2009, see Tables s1, s2 and s3 in Supplementary Materials for details).

Results and Discussion

Hierarchical linear mixed-effects regressions (using *lme4* in R) was employed to analyze the association between cultural tightness and residents' body size, i.e., BMI, after controlling for the confounding variables both at the state and individual levels². In particular, we entered individual years as dummy-variables to control for potential nestedness within years. We entered the individual level control variables as fixed effects at level 1, and the cultural tightness and state-level control variables at level 2, with intercepts of states taken as a random effect (Kershaw & Albrecht, 2014).

As expected, cultural tightness positively predicted residents' BMI, b = 0.30, 95%CI = [0.175, 0.432], $p < .001^3$ (see *Model* 1 in Table s5 in Supplementary Materials for details). When the data was analyzed separately for each year (i.e., one model for each year), the results remained the same (see Tables s4 in Supplementary Materials for details).

To control for other potential confounding variables, e.g., ecological threats, culture of honor, conservatism, economy inequality, and urbanization, ten additional models were tested. Results consistently showed that cultural tightness could still positively predict residents' body size, $bs \ge 0.19$, $ps \le .046$ (see *Model* 2 to *Model* 11 in Table s5 in Supplementary Materials). Together, these results support the hypothesis that body mass, a correlate of physical strength, is associated to cultural tightness after controlling for a series of confounding variables.

Study 2

Although Study 1 provided preliminary evidence in favor of our hypotheses, body mass is not a pure measure of formidability. Furthermore, the evidence obtained was correlational. It remains unclear whether cultural tightness was implicated in body mass. Study 2 was designed to ascertain a causal relationship between cultural tightness and the desire for physical strength, seen in muscularity. The study was an experiment that it investigated whether placing people in a simulated tight society, as compared to in a loose one, would result in a higher preference for being muscular. Participants also indicated their preferences for body fat, a second correlate of body mass (e.g., Gallagher et al., 2000). We hypothesized that cultural tightness would stimulate the preference for having a muscular body but not a fat one.

Method

Participants. Four hundred and twenty participants were recruited from Cloud Research (previously known as Turk Prime). We only targeted Caucasian Americans to minimize the influence of extraneous factors, such as ethnicity, on body size. Six participants failed attention check questions and were thus excluded from analysis. This left a total of four hundred and fourteen participants (185 women, M = 35.7, SD= 11.9) in the final analysis. Participants were randomly assigned to either a tightness or a looseness condition, resulting in approximately two hundred participants in each condition (one hundred participants per gender). Importantly, we ensured that the number of male and female participants in each condition was well-matched (tightness: 115 men, 93 women; looseness: 114 men, 92 women). All participants were compensated at the end of the study.

Procedure and Measures. To manipulate cultural tightness, we adapted a wellvalidated experimental paradigm (e.g., Blake & Brooks, 2019; Jetten et al., 2015). Participants were first presented with a scenario that seemed to be virtual but had realistic significance. They were asked to imagine themselves, as vividly as possible, living in the world that was depicted. Specifically, participants were told that, in 2208, natural resources on Earth would have been depleted. As a result, they, together with few other remaining humans, had been sent to a newly discovered planet. In the tightness condition, participants were told that: "For a society to be successful, it should be built on a foundation of law and order. Therefore, the new society should have strong social norms and deviant behaviors should be punished." In contrast, participants in the looseness condition were told that: "For a society to be successful,

it should be built on a foundation of freedom and openness. Therefore, although the new society can have norms, deviant behaviors should be tolerated." They were further required to tick the rules from a corresponding list that they would like the new society to adopt (see Supplementary Materials for details). To strengthen the manipulation, participants were further asked to write down a few suggestions that could reinforce the foundation of law and order (tightness condition)/ freedom and openness (looseness condition). A pilot study with a separate group of participants (N = 104) showed that those in the tightness condition (M = 4.76, SD = 0.78, 7-point Likert scale) were significantly more likely to perceive the culture of the simulated world as tighter than those in the looseness condition (M = 3.24, SD = 1.17), F(1, 102) = 61.1, p < .001, $n_p^2 = .375$ (see Supplementary Materials).

To measure body size preference, participants were asked to choose a body that they desired the most for themselves at that moment. For male participants, they were asked to indicate the ideal body shape on the Body Image Matrix of Thinness and Muscularity—Male Bodies (BIMTMMB, Arkenau et al., 2020), a twodimensional figure rating scale consisting of 64 3D male bodies, which has been validated among Caucasian participants. Specifically, the bodies were presented in an 8×8 grid, with muscularity increasing stepwise on the vertical axis and body fat on the horizontal axis. Given that there is no comparable scale existed in the literature, following the method of Arkenau et al. (2020), we developed the female version scale using DAZ Studio 4.10 Pro (see Figure 1). Preference scores were coded for two dimensions separately (e.g., the choice of body 38 is equivalent to 5 on muscularity and 6 on body fat), ranging from 1 to 8 with higher scores corresponding to higher levels on that dimension.

As control measures, participants next indicated their present body shape using the same scale. Finally, demographic information, including gender, age, educational level, income, perceived social rank, as well as sexual orientation, was collected before they were thanked and debriefed.



Figure 1. The female version of the body image matrix of thinness and muscularity, with muscularity increasing stepwise on the vertical axis and body fat on the horizontal axis. For the comparable male version, see Arkenau et al. (2020).

Results and Discussion

Exploratory analysis revealed that the effect of condition on body size did not vary as a function of gender, muscularity: F(1, 410) = 0.68, p = .411, $\eta_p^2 = .002$; body fat: F(1, 410) = 0.08, p = .778, $\eta_p^2 = .000$. Muscle and fat scores were then submitted to ANOVAs with condition (tightness/looseness) as a between-subjects factor. Results showed that participants in the tightness condition (M = 3.36, SD = 2.17), compared to the looseness condition (M = 2.71, SD = 1.72), desired a more muscular body shape for themselves, F(1, 412) = 11.3, p = .001, $\eta_p^2 = .027$, 95% CI = [0.269, 1.025]. This remained to be the case after controlling for current body shape, age, income, educational level, perceived social rank, and sexual orientation, F(1, 405) = 12.5, p< .001, $\eta_p^2 = .030$, 95% CI = [0.283, 0.992]. In contrast, cultural tightness did not significantly affect participants' preference for body fat, F(1, 412) = 0.63, p = .429, $\eta_p^2 = .002$, 95% CI = [- 0.344, 0.147]. These findings demonstrate that cultural tightness increases the desire for muscularity but not body fat.

Study 3

Study 3 was to replicate and extend the findings of Study 2. We argue that cultural tightness drives the desire for muscularity, as a means to dominate and resist social constraints that are typical in tight cultures. Consequently, the desire for muscularity should be unique for the self, rather than a generalized standard of how people ought to look like. This hypothesis was tested in Study 3. Furthermore, Study 3 investigated the effects of cultural tightness on desire a fat body, similarly to Study 2. We hypothesized that a tight culture, compared to a loose one, would elicit the desire for having a muscular body for oneself, but not for general others. In contrast, culture should not affect desired fat levels.

Method

Participants. Four hundred and twenty participants were recruited from Cloud Research (previously known as Turk Prime). Same as Study 2, we only targeted Caucasian Americans to minimize the influence of extraneous factors on body size. Nine participants failed attention check questions and were thus excluded from analysis. This left a total of four hundred and eleven participants (222 women, M =32.4, SD = 10.4) in the final analysis. Participants were randomly assigned to either a tightness or a looseness condition, resulting in approximately two hundred participants per condition (one hundred participants for each gender). Importantly, we ensured that the number of male and female participants in each condition was wellmatched (tightness: 94 men, 110 women; looseness: 95 men, 112 women). All participants were compensated with small amount of money at the end of the study.

Procedure and Measures. The procedure and measures were identical to those in Study 2 except one modification. Participants indicated both their own body size preference and the preference for general others living in this new world. In particular, participants were asked to indicate 1) the body shape they desired to possess

themselves and 2) the size of an average man (male participants)/ women (female participants) living in this world. The order of the two questions was counterbalanced between participants.

Results and Discussion

Exploratory analysis revealed that the effect of condition on body size either for oneself or others did not vary as a function of gender, Self mascularity: F(1, 407)= 2.38, p = .124, $\eta_p^2 = .006$; Self fat: F(1, 407) = 1.33, p = .250, $\eta_p^2 = .003$; Other mascularity: F(1, 407) = 0.63, p = .429, $\eta_p^2 = .002$; Other_fat: F(1, 407) = 1.88, p = .171, $\eta_p^2 = .005$. Therefore, muscle and fat scores for oneself and others were submitted to ANOVAs, with condition (tightness/looseness) as a between-subjects factor. Replicating the finding of Study 2, those in the tightness condition (M = 3.94, SD = 1.97), compared to those in the looseness condition (M = 3.32, SD = 1.92), desired a more muscular body shape for themselves, F(1, 409) = 10.3, p = .001, $\eta_p^2 = .025, 95\%$ CI = [0.239, 0.996]. This remained to be the case after controlling for participants' current body shape, age, income, educational level, and social rank, F(1,404) = 11.3, p = .001, η_p^2 = .027, 95% CI = [0.251, 0.956]. In contrast, this effect was not observed on the fat dimension for oneself, F(1, 409) = 0.003, p = .957, $\eta_p^2 = .000$, 95% CI = [- 0.324, 0.307]. Importantly, condition did not influence the body size choice for others, muscularity: F(1, 409) = 0.004, p = .948, $\eta_p^2 = .000$, 95% CI = [-0.314, 0.294]; fat: F(1, 409) = 0.80, p = .370, $\eta_p^2 = .002$, 95% CI = [-0.516, 0.193]. In addition, for those in the tight condition, they also desired to be more muscular than an average other (Self: M = 3.94, SD = 1.97; Other: M = 3.31, SD = 1.50), F(1, 203) = 21.25, p < .001, $\eta_p^2 = .095$, 95% CI = [0.362, 0.903]. These results support the hypothesis that cultural tightness uniquely increases the desire for the self to be muscular. It does not affect desired fat levels, nor how others should look like.

Study 4

The previous studies supported the notion that cultural tightness, compared to looseness, raises the desire for muscularity for oneself. The aim of Study 4 was to test this hypothesis more directly by investigating the effects of cultural tightness (vs. looseness) on desire for muscularity and dominance. We hypothesized that cultural tightness raises the desire for muscularity and dominance, and that the desire to dominate antecedes and explains the effects of cultural tightness on the desire for muscularity. For a generalizability purpose, the study used a different paradigm to manipulate cultural tightness, i.e., by shifting participants' support for cultural tightness temporarily, and then measuring their desire for muscularity, as well as dominance.

Method

Participants. Four hundred and ten American participants were recruited from Cloud Research (previously known as Turk Prime). Eleven participants failed attention check questions and were thus excluded from analysis. This left a total of three hundred and ninety-nine participants (194 women, M = 35.8, SD = 9.82, 81% Caucasian American, 9% African American, 5% Asian American, 5% other) in the final analysis. Participants were randomly assigned to either a tightness or a looseness condition, resulting in approximately one hundred participants for each gender in each condition. Importantly, we ensured that the number of male and female participants in each condition was well-matched (tightness: 103 men, 97 women; looseness: 102 men, 97 women). All participants were remunerated at the end of the study.

Procedure and Measures. To manipulate cultural tightness, participants were first presented with a writing task. Following the paradigm of Jackson et al. (2021), in the tightness condition, participants read a short paragraph attributing the success of the United States to its strong foundation of law and order. In the looseness condition, participants read an identical paragraph, this time attributing the success of the United States to its commitment to freedom and openness. To increase the power of the manipulation, participants in the tightness condition were required to personally endorse up to three elements of current American society that "preserve law and order," whereas participants in the looseness condition were required to endorse up to three elements of American society that "preserve freedom and openness." (see Jackson et al., 2021). A pilot with a separate group of participants (N = 104) showed that those in the tightness condition (M = 6.76 SD = 1.52, 9-point Likert Scales) believed that American culture should be tighter than those in the looseness condition $(M = 4.81, SD = 1.80), F(1, 100) = 39.6, p < .001, \eta_p^2 = .284$ (see Supplementary Materials for manipulation check questions). In other words, although manipulating culture-level variables like tightness is difficult in an experimental setting, this approach allowed us to temporarily shift participants' support of cultural tightness.

To measure the desire to be dominant, participants were then asked to indicate how *dominant*, *controlling*, *forceful*, *domineering*, *commanding*, and *aggressive* they would like to be, a measure adapted from Wiggins and colleagues' (1988) Revised Interpersonal Adjective Scales (IAS-R). Participants made their response on 7-point Likert scales (1 = not at all; 7 = very much). An overall dominance score was calculated by averaging the scores across items, with higher scores corresponding to higher levels of desired dominance (α = .91).

Then, a 15-item drive for muscularity scale (McCreary & Sasse, 2000) was adapted to measure one's *current* preoccupation with increasing their muscularity. Example items were: "Currently, I am thinking that I would lift weights to build up muscle." "Currently, I am thinking that I would drink weight-gain or protein shakes." and "Currently, I am thinking that I wish that I were more muscular." An overall drive for muscularity score was calculated by averaging the scores across items, with higher scores corresponding to higher levels of drive for muscularity ($\alpha = .93$). The order of measuring dominance and drive for muscularity was counterbalanced across participants. Finally, participants reported their current weight, height, and other demographic variables that were the same as in Study 2 before they were thanked and debriefed.

Results and Discussion

Drive for muscularity and dominance scores were submitted to ANOVAs, with condition (tightness/looseness) and gender (men/ women) as between-subjects factors. The analysis yielded a main effect of gender, such that compared to women (M = 3.39, SD = 1.14), men (M = 3.81, SD = 1.08) in general desired muscularity more, $F(1, 395) = 15.2, p < .001, \eta_p^2 = .037, 95\%$ CI = [0.207, 0.645].

Central to our hypothesis, there was a main effect of condition, such that those in the tightness condition (M = 3.83, SD = 1.02) showed a higher intention to gain muscle than those in the looseness condition (M = 3.38, SD = 1.19), F(1, 395) = 17.2, p < .001, $\eta_p^2 = .042$, 95% CI = [0.239, 0.675]. This effect caused by condition did not vary as a function of participants' gender, F(1, 395) = 2.25, p = .134, $\eta_p^2 = .006$, and remained to be significant after controlling for age, one's current BMI, income, educational level, social rank, ethnicity, and sexual orientation, F(1, 364) = 13.1, p< .001, $\eta_p^2 = .035$, 95% CI = [0.212, 0.649].

There was a main effect of condition on desire for dominance. Those in the tightness condition (M = 4.91, SD = 1.21) desired to be more dominant than those in the looseness condition (M = 4.10, SD = 1.49), F(1, 395) = 34.7, p < .001, $\eta_p^2 = .081$, 95% CI = [0.535, 1.071], and this effect did not vary as a function of gender, F(1, 395) = 2.02, p = .157, $\eta_p^2 = .005$. The main effect of gender was not significant, F(1, 395) = 0.12, p = .725, $\eta_p^2 = .000$.

To examine whether the motivation to be dominant can account for the effect of cultural tightness on drive for muscularity, a series of regression analyses were conducted. Cultural tightness did predict both drives for dominance and muscularity; motivation for dominance predicted drive for muscularity. When controlling for dominance drive, the effect of cultural tightness on muscularity was no longer significant (see Figure 2). A bootstrapped analysis (Preacher & Hayes, 2008; 5,000 resamples) revealed that the 95% confidence interval for the indirect effect did not include zero, a*b = .160, SE = .030, CI = [0.106 to 0.220], supporting the mediation model.



Figure 2. Mediation model for the effect of cultural tightness on drive for muscularity via desire for dominance, with b and *p* values after controlling for the mediator showing between parentheses, Study 4.

Study 5

Study 5 was to replicate the findings of Study 4 and to differentiate dominance from another source of social rank, namely, prestige. Prestige refers to the amount of respect and reputation that individuals enjoy in a social setting, and is another common path when rising within social hierarchies. Those who possess skills, expertise, and other desirable attributes enjoy prestige in the eyes of others, and are afforded higher status (Cheng et al., 2013; Durkee et al., 2020). However, unlike dominance, prestige is afforded by others and cannot escape personal control. Furthermore, dominance is the embodiment of muscularity and should be more valuable in contexts marked by constrains and sanctions, features typical for tight cultures. Therefore, we hypothesized that cultural tightness would trigger a unique desire for dominance rather than a general desire for hierarchy, in particular, for prestige. The effects of culture on the drive for muscularity should be explained by a desire to dominate rather than a desire to be prestigious.

Method

Participants. Four hundred and twelve American participants were recruited from Cloud Research (previously known as Turk Prime). Nine participants failed attention check questions and were thus excluded from analysis. This left a total of four hundred and two participants (231 women, M = 36.2, SD = 10.4, 74% Caucasian American, 10% Asian American, 9% African American, 7% other) in the final analysis. Participants were randomly assigned to either a tightness or a looseness condition. We ensured that the number of male and female participants per condition was well-matched (tightness: 86 men, 115 women; looseness: 85 men, 116 women). All participants were compensated at the end of the study.

Procedure and Measures. The procedure and measures, e.g., drive for muscularity ($\alpha = .91$), were identical to that of Study 4 except for one modification. Instead of measuring one's motivation for dominance, we measured people's motivation to attain social status via both dominance (i.e., via intimidation and coercion) and prestige (i.e., via the possession of skills or expertise), using the adapted Dominance-Prestige Scale (Cheng et al., 2010). Example items measuring dominance were: "*Currently, I feel that I would try to control others rather than permit them to control me.*" "*Currently, I feel that I would let others know it is better to let me have my way.*" Prestige: "*Currently, I feel that I would like members of my*

peer group to respect and admire me." "Currently, I feel that I would like that my unique talents and abilities to be recognized by others." An overall dominance and prestige score were calculated by averaging the corresponding items, respectively, with higher scores corresponding to higher levels on that dimension (dominance: α = .89; prestige: α = .82).

Results and Discussion

Drive for muscularity, dominance, and prestige scores were submitted to an ANOVA, respectively, with condition (tightness/looseness) and gender (men/ women) as between-subjects factors. The analysis yielded a main effect of gender on drive for muscularity, such that compared to women (M = 3.09, SD = 0.95), men (M = 3.53, SD = 1.04) in general desired to be muscular more, F(1, 398) = 20.0, p < .001, $\eta_p^2 = .048$, 95% CI = [0.241, 0.619]. Central to our hypothesis, there was a main effect of condition, such that those in the tightness condition (M = 3.53, SD = 0.95) showed a higher intention to gain muscle than those in the looseness condition (M = 3.02, SD = 1.00), F(1, 398) = 25.7, p < .001, $\eta_p^2 = .061$, 95% CI = [0.298, 0.676]. This effect caused by condition did not vary as a function of participants' gender, F(1, 398) = 2.01, p = .157, $\eta_p^2 = .005$, and remained significant after controlling for age, ethnicity, one's current BMI, income, educational level, and social rank, F(1, 387) = 22.8, p < .001, $\eta_p^2 = .056$, 95% CI = [0.236, 0.622].

There was a main effect of condition on desire for dominance. As such, those in the tightness condition (M = 3.38, SD = 1.28) desired to be dominant more than those in the looseness condition (M = 2.98, SD = 1.29), F(1, 398) = 9.80, p = .002,

 $\eta_p^2 = .024, 95\%$ CI = [0.149, 0.653], and this effect was not dependent on gender, $F(1, 398) = 0.10, p = .757, \eta_p^2 = .000$. There was also a main effect of gender, $F(1, 398) = 12.0, p = .001, \eta_p^2 = .029, 95\%$ CI = [0.193, 0.696], such that men (M = 3.44, SD = 1.30) desired dominance more than women (M = 2.99, SD = 1.27). When it comes to prestige, neither the main effect of condition nor gender were significant, $F(1, 398) = 2.22, p = .137, \eta_p^2 = .006; F(1, 398) = 0.76, p = .383, \eta_p^2 = .002.$

A parallel mediation model was used to examine whether the motivation to gain dominance and prestige could account for the effect of cultural tightness on the desire for muscle. The results showed that cultural tightness predicted dominance, but not prestige. Dominance, but not prestige, predicted the desire for muscle. When controlling for dominance and prestige simultaneously, the effect of tightness on desire for muscularity was significantly reduced (see Figure 3 for details). A bootstrapped analysis (Preacher & Hayes, 2008; 5000 resamples) revealed that the 95% confidence interval for the indirect effect did not include zero, a*b = 0.058, SE = 0.020, CI = [0.022, 0.101]. As expected, desire for muscularity was significantly explained by dominance derived from cultural tightness, a*b = 0.054, SE = 0.019, CI = [0.019, 0.094]⁴. In contrast, prestige was not a significant mediator in the model, a*b = 0.004, SE = 0.005, 95% CI = [-0.002, 0.022].



Figure 3. Mediation model for the effect of cultural tightness on drive for muscularity via desire for dominance (prestige), with b and *p* values after controlling for the mediator showing between parentheses, Study 5.

General Discussion

Social norms are ubiquitous in human societies, yet their strength or the extent to which individuals regulate their behavior by norms, and sanction norm-deviants varies across cultures (Gelfand et al., 2006). In the current research, we proposed that individuals in tight cultures would desire to be more formidable, compared to those in loose cultures, and that this would be driven by a desire for dominance. Physical formidability is represented by big body size and muscularity (Kordsmeyer et al., 2018; Wang et al., 2018), and is a physical embodiment of dominance. Dominance manifests in forceful behavior, which can help individuals resist constraints and sanctions, and enjoy greater autonomy. Together, high formidability and the drive to dominate should be more instrumental in tight cultures, which utilize greater control and threaten autonomy, compared to loose ones.

Fives studies utilizing different methodologies converged to support our hypotheses. Through the analysis of archival data of over 1.6 million American

residents, Study 1 showed that compared to those in loose states, individuals living in tight ones have a bigger body size as reflected by a higher BMI, a correlate of muscle mass and strength (e.g., Freedman et al., 2005; Hardy et al., 2013; Hasan et al., 2016). This result was obtained after controlling for macro and micro confounding variables, such as temperature, economic level, and diet constitution. Studies 2-5 employed controlled experiments to demonstrate a causal relationship between culture and the drive for muscularity. Specifically, U.S. participants in a simulated tight culture preferred more muscular bodies for themselves, but not fatter ones, in Study 2. This effect was replicated and extended in Study 3. In this study, participants in a tight culture condition showed a disproportionate desire to possess muscular bodies for themselves but not for average others. These results converged in showing that cultural tightness stimulated a unique desire for muscularity - the key determinant of formidability - rather than a desire for size that fat could equally provide. Furthermore, by preferring that the self but not others are more muscular, these results convey a desire for superiority in formidability in relation to others.

The effects of culture on the desire for muscularity were further replicated in Study 4. Furthermore, Study 4 demonstrated that tightness increased participants' drive for dominance, and that this drive was one reason why individuals in tight cultures preferred to be muscular. Study 5 replicated our mediation model and further demonstrated that the desire for dominance could not be generalized to another source of social rank: prestige, which is less instrumental in the exercise of control and autonomy. The results were obtained by using different methodologies, including employing real-world archival data with a large-sample-size (> 1.6 million people) and high ecological validity (Study 1), as well as conducting fully controlled experiments that were able to demonstrate a causal relationship (Studies 2-5). Across the studies the effects of cultural tightness were obtained for both male and female participants.

Previous work successfully examined cultural tightness within one country, with similar effects as cross-cultural tightness (e.g., Harrington & Gelfand, 2014). Drawing on this evidence, we examined cultural tightness within the USA. Specifically, we have used objective tightness of different states in the USA (Study 1; Harrington & Gelfand, 2014); we have developed a virtual paradigm that could situate participants in a tight environment (Studies 2 and 3; e.g., Blake & Brooks, 2019; Jetten et al., 2015); finally, we have temporally shifted participants' support for cultural tightness (Studies 4 and 5), following Jackson et al. (2021). To measure body preference, we have adopted the BIMTMMB scale (Arkenau et al., 2020), which differentiates muscularity from fatness, and a new female version of this scale.

Although socially accepted, tight norms limit the universal human need for autonomy and control over people's outcomes (Guinote & Lammers, 2017). This can create a conflict between people's norm-oriented values in tight cultures and their personal needs. Such conflict could be solved by securing a privileged position within the social hierarchy, which can be achieved by dominance. Furthermore, dominance

can help people gain immediate control, agency, and autonomy in the social context (Anderson & Kilduff, 2009), making them free from various constraints.

Previous studies have shown that not only the natural environment but also the social and cultural environments can act as the powerful forces that shapes one's body features, as proposed by biocultural approaches (e.g., Gremillion, 2005). In particular, desire for muscularity is subject to the influence of interpersonal processes, including peer pressure (e.g., Stratton et al., 2015) and social comparisons (e.g., Bucchianeri et al., 2014). More relevant to the present article, desire for muscularity is also influenced by macro-level sociological factors, such as media (e.g., Thornborrow et al., 2020) and gender roles (e.g., McCreary et al., 2005). In a similar vein, the current findings support the notion that people's desired body size and muscularity serve social regulatory functions that are sensitive to the social context.

Although early cultural psychologists have proposed that power distance should be an essential cultural dimension (e.g., Hofstede, 1997), the examination of power across cultures has been largely neglected. Past research has started to unravel conceptualizations and attainment of power and status in individualistic and collectivistic cultures (Torelli et al., 2020). However, cultural collectivismindividualism and cultural tightness-looseness are two distinct constructs, both theoretically and empirically (Baldwin & Mussweiler, 2018; Talhelm & English, 2020). Research on cultural tightness-looseness developed in parallel with psychological research on dominance and power, as two separate fields. To the best of

our knowledge, the present research is the first to examine people's own power motivation in the context of cultural tightness-looseness.

Limitations and Future Avenues

Study 1 focused on body mass as an index of physical strength. To appear formidable, one can increase one's weight and build muscle mass. A growing body of literature suggests that BMI is a measure of excess weight and body size, rather than excess body fat, relative to height (e.g., Roubenoff et al., 1995; Rothman, 2008), and BMI is indeed positively related to muscle mass and physical strength (e.g., Hardy et al., 2013; Hasan et al., 2016; Freedman et al., 2005). Nevertheless, body mass is a not an accurate index of physical strength. Future research could obtain direct data of individual muscle mass from a large representative sample once such data is made available.

To explain the drive for formidability we focused on dominance. Dominance may, however, not be the only mediator accounting for the effect of cultural tightness on physical formidability. For instance, cultural tightness typically follows social and ecological threats, and physical formidability could be important for survival under these circumstances. Nevertheless, our data suggests that cultural tightness could still predict body size even after controlling for various threats (Study1), and that people desire physical strength only for themselves but not for other members in the society (Study 3). These findings suggest that having superior formidability compared to others is important for people in tight cultures. Nevertheless, the links between the desire for formidability and threat resistance in tight cultures could be examined in

more detail in future research. In addition, although tightness entails law and order (Jackson et al., 2021; Jackson et al., 2019), the manipulation employed in the current study could affect power distance and social dominance orientation. Future studies could continue to examine other possible mechanism(s).

Our research showed that people living in tight cultures desire a larger body size, and more precisely, a more muscular body. This effect was present for both men and women. While men may value muscularity due to their gender role and social desirability, this should not be the case for women (Felson, 1996; Shilling & Bunsell, 2009). Therefore, this suggests that our effects should not be (solely) driven by social desirability associated with muscularity.

With the exception of Study 1, our focus was on motivation rather than on actual dominance and muscularity. Future research could examine whether cultural tightness and looseness are related to actual trait dominance and formidability. Such research could provide further insights into whether the drive for formidability and dominance found in tight cultures stems from a perceived deficit – when compared to human's averages – or from a desire to maintain and achieve high levels of power and formidability. The former hypothesis would be supported if tight cultures were linked to lower actual dominance and muscularity compared to neutral and loose cultures. However, the results of Study 1 speak against this deficit hypothesis, as individuals in tight cultures were naturally more formidable than those in loose cultures.

Henrich and Gil-White (2001) proposed two ways to obtaining power, i.e., dominance vs. prestige. We showed that a tight culture made residents desire

dominance, rather than prestige, more than those in a loose culture, thus linking cultural tightness-looseness with conceptions of dominance (vs. prestige) for the first time. The effects of culture on dominance rather than prestige may occur because traits and behavior associated with dominance (e.g., physical formidability) are directly instrumental in resisting constraints and winning in conflicts, which often accompany tight cultures (Halevy et al., 2012; Maner, 2017). In contrast, prestige is outside one's control, and is a less effective tool for autonomy and control compared to dominance.

In conclusion, the present research shows a relation between the cultural dimension of tightness and one's body shape preference, two factors that seem quite remote at first glance. The causal role of desire for dominance explains such findings, bringing together research from two separate domains – one on power and dominance, and the other on cultural tightness. Our findings highlight the social functions of being big and muscular, paving the way for new avenues for cultural psychology and socio-ecological psychology in the future (Oishi, 2014).

Footnotes

1: The years of collecting independent variables should precede that of the dependent variable.

2: We have used dummy transformation for the control variables at the individual level since they are categorical (Voss et al., 2013). The GDP per capita and elevations data were log-transformed due to their severe skewness. The independent and control variables at the state level were all standardized.

3: Cultural tightness could significantly predict BMI without adding any control variables, b = 0.412, 95% [0.305, 0.519], SE = 0.055, t = 7.547, p < 0.001.

4: Note that a smaller amount of the direct effect (i.e., the effect of cultural tightness on muscularity) was explained by the mediator in Study 5 compared to that in Study4. This could occur because two different scales were employed to capture dominance for a generalizability purpose, and wording was slightly different

(desire versus motive).

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