

## PSYCHOLOGY

# Moving chairs in Starbucks: Observational studies find rice-wheat cultural differences in daily life in China

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Traditional paddy rice farmers had to share labor and coordinate irrigation in a way that most wheat farmers did not. We observed people in everyday life to test whether these agricultural legacies gave rice-farming southern China a more interdependent culture and wheat-farming northern China a more independent culture. In Study 1, we counted 8964 people sitting in cafes in six cities and found that people in northern China were more likely to be sitting alone. In Study 2, we moved chairs together in Starbucks across the country so that they were partially blocking the aisle ( $n = 678$ ). People in northern China were more likely to move the chair out of the way, which is consistent with findings that people in individualistic cultures are more likely to try to control the environment. People in southern China were more likely to adjust the self to the environment by squeezing through the chairs. Even in China's most modern cities, rice-wheat differences live on in everyday life.

## INTRODUCTION

In a laboratory study, we tested more than 1000 people from all over China on several psychological measures of culture (1). People who had grown up in southern China showed behaviors typical of interdependent cultures, such as Japan—holistic thought, low importance of the self, and a strong distinction between friends and strangers. People from northern China showed behaviors that are more common in individualistic cultures, such as the UK—analytic thought, strong importance of the self, and a smaller distinction between friends and strangers.

Another difference between northern and southern China is that, for thousands of years, people in northern China grew wheat and millet, whereas people in southern China farmed paddy rice (*Guanzi*, seventh century BC). The idea that how cultures historically made a living affects our behavior is called subsistence theory (2–4). For example, herding is a relatively individual activity, where people move from place to place, and many relationships are transitory. In contrast, many farming cultures are sedentary, with more stable, enmeshed ties between people.

The rice theory of culture breaks down farming further (1, 5). Compared to dryland crops, such as wheat and millet, rice paddy farming often requires irrigation systems that multiple families have to coordinate. Traditional paddy rice also required about twice as many man hours as crops, such as wheat, which led many rice cultures to form customs of exchanging labor (6–8). Over time, this tight coordination may have pushed rice cultures to develop a more interdependent culture.

## Study overview

Here, we test for rice-wheat cultural differences in everyday life in China. In Study 1, we counted how many people were sitting alone versus with other people in Starbucks and other cafes around China. In Study 2, we moved chairs to block aisles in Starbucks and observed how many people moved the self to squeeze through or moved the chairs. We designed this measure to test exerting control over the environment, which is more common in individualistic cultures (9).

These studies make several contributions to previous studies:

1) These studies test the rice theory outside of the laboratory using a sample that is not primarily students. In some ways, middle-class patrons of Starbucks in major cities might be the last people among whom we should expect to find subsistence style differences.

2) These studies address the fundamental problem of self-report measures in cultural psychology. Researchers have documented many problems with using self-report scales to measure differences across cultures, from the reference-group effect (10) to the stubbornly persistent finding that the United States is just as collectivistic as China and Korea (11, 12), or that Japan is actually less collectivistic than the United States [(13), p. 18]. There is also the complete lack of correlation between nation-level self-reports of conscientiousness with objective behaviors that tap into that same trait (14). However, observational studies of cultural differences are oddly rare in psychology [except for a few strong examples: (14, 15)]. Developing measures of concrete behaviors addresses the problems of self-report and may provide future researchers with documented non-self-report measures to use.

3) Much of cross-cultural psychology has focused on East-West differences and differences between nations. This study tests for differences within China.

4) This study extends the sample to include Hong Kong, which has not been tested as a part of rice-wheat differences.

## Strengths and weaknesses of observational studies

However, observational studies have weaknesses too. Laboratory studies are strong designs because they use a controlled environment and previously validated measures. Observational studies are not so tightly controlled. We also cannot be as sure we know what we are measuring—that the behavior we are measuring represents individualism as we expect it does. For example, if a driver does not stop completely at a stop sign, is that a sign of self-importance? Impatience? Or disregard for law? The meaning of particular behaviors is more open to debate than it is with laboratory measures.

To combat these weaknesses, we use one behavior (sitting alone) that psychologists have used before to document differences between groups of people. For the new measure that we create (chair moving), we validate the measure by collecting data in the United States, China, and Japan. We also validate the reliability of the observations by having multiple observers rate the same behaviors. This gives some evidence

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that these behaviors truly differ between individualistic and interdependent cultures.

Despite the difficulties of observational studies, they are a good antidote for the fact that many laboratory tests are not very helpful for describing what rice and wheat cultures are like in everyday life. In a thought style task, if people in northern China are more likely to pair “train” with “bus” rather than “train” with “tracks,” what does that mean for everyday life? These observational studies give a more concrete picture of how rice and wheat cultures differ in everyday life.

Testing sites

We tested in six cities: Beijing (wheat), Shenyang (wheat), Shanghai (rice), Nanjing (rice), Guangzhou (rice), and Hong Kong (rice). All the cities are in solidly rice areas (>70% farmland devoted to rice) or wheat areas [<20% farmland devoted to rice (16)]. We chose major cities because (i) it would be easier to obtain large samples in each site and (ii) they have chain store locations that we could use as semiuniform testing environments.

Figure 1 shows how the six cities compare on demographic variables. All are major metropolises, with gross domestic product (GDP) per capita much higher than the national average, which may actually make these places harder places to test the rice theory (if modernization strongly influences culture and pushes cultures further away from their agrarian roots). The fact that most people in major cities do not farm for a living means that we are testing for the legacy of a history of farming, rather than the effect of having farmed land oneself.

Why Hong Kong is an interesting test case

We included Hong Kong for two reasons: (i) Hong Kong is a much wealthier, more modernized city than the other cities. Hong Kong has a GDP per capita about three times those of Beijing and Shanghai (Fig. 1), as well as a longer history of market capitalism and globalization. (ii) Hong Kong is a former British colony, which has given it direct influence from a Western culture.

Using Hong Kong as a test case sets up a strong contrast between two competing theories: modernization and the rice theory. If Hong Kong shows more individualism, it would suggest that modernization (or British influence) has made the culture more individualistic. If Hong Kong shows more interdependence, it would suggest that rice differences can persist in the face of modernization.

Are people in Beijing cafes actually from Beijing?

One weakness of sampling large cities in China is that large cities have attracted newcomers from rural areas. So how do we know that people in Beijing cafes are actually from Beijing?

The answer is that people in Beijing cafes do not actually need to be from Beijing. Instead, this sample can adequately test the rice theory as long as most people in Beijing Starbucks are from the north—other wheat-growing provinces. Second, even among southerners who have moved to Beijing, there should be at least some cultural assimilation because most have lived in the north for years. Thus, the real threat to validity would be if more than 50% of people in Beijing cafes are recent arrivals from the south, which is unlikely.

But to be conservative, we surveyed 105 people in Starbucks in Beijing and Shanghai. We asked patrons which province they grew up in and how long they had lived in Beijing or Shanghai. In Shanghai Starbucks, 61% grew up in Shanghai, 89% were from rice provinces, and 93% were from rice provinces or had lived in Shanghai for at least 2 years (Fig. 1). In Beijing, 60% grew up in Beijing, 92% were from wheat provinces, and 98% were from wheat provinces or had lived in Beijing for at least 2 years. Thus, people in Starbucks overwhelmingly represent the rice and wheat regions.

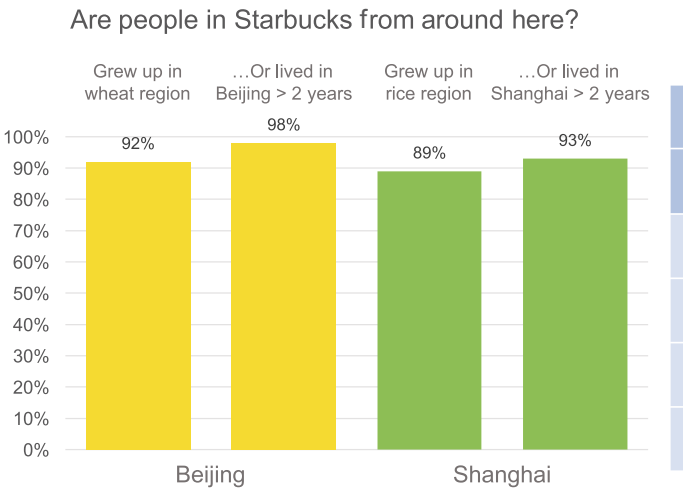
Are cafes too far removed from farming?

Cafes are expensive. In Beijing, the full-time minimum wage is US\$434 a month (17). At that rate, 10 Starbucks lattes a month would cost about 10% of someone’s income. Starbucks customers are probably wealthier than average.

However, that should make it harder to find evidence for the rice theory. If modernization erases differences based on historical rice farming, then it should be harder to find those differences among middle-class consumers in modern cafes. However, cultures have inertia, and differences rooted in subsistence styles can persist hundreds of years after people put down their plows (18). This study tests whether China’s rice-wheat differences persist among its urban middle class.

Natural laboratories

Cafes do have one strong advantage as a testing site. Cafes provide a naturally uniform environment across different cities. One benefit



City	Farming region	GDP per capita	Human dev. index	Pop. density (people/km <sup>2</sup> )
Beijing	Wheat	\$13,504	0.860	1289
Shenyang		\$12,582	0.854	565
Shanghai	Rice	\$13,053	0.848	3809
Guangzhou		\$17,341	0.869	1739
Hong Kong		\$33,906	0.910	6422
Nanjing		\$14,199	0.859	1243

**Fig. 1. About 90% of the people in Starbucks were from the local rice or wheat cultural region.** The Human Development Index is a United Nations index of health, education, and wealth for 2015. GDP per capita data are from 2013, converted to U.S. dollars. The population density is as of 2013.

of global capitalism is that it produces stores with more or less the same environment—the same colors, the same chairs, and the same smells—across China. This means that environmental cues should be roughly similar across cities.

## STUDY 1

### Sitting alone

In Study 1, we observed the number of people sitting with other people or alone in cafes. Why measure sitting alone? On the face of it, sitting alone seems consistent with the independent culture of wheat areas. There is also evidence that doing things alone is more common in individualistic cultures. For example, researchers created an index of individualistic markers across the United States, such as divorce rates and Libertarian voting rates (19). This index was positively correlated with the percentage of people driving to work alone versus carpooling, and the percentage of people living alone [(19), p. 284], which suggests that spending time alone is more common in individualistic cultures.

### Observation rules

Three researchers observed 8964 people in 256 stores across six cities (Beijing, Shenyang, Shanghai, Nanjing, Guangzhou, and Hong Kong). Observers coded the number of people sitting alone, the number of groups, the number of people in groups, and the gender of the people sitting alone. To test whether the observations were reliable, observers coded samples in Beijing ( $n = 447$ ) and Shanghai ( $n = 251$ ). Codings were nearly identical ( $r's > 0.99$ ).

We hypothesized that day of the week and time of day might affect the percentage of people sitting alone, so we noted these variables and made an effort to sample evenly by time and day of the week across cities. The observers avoided tourist areas, such as the Forbidden City and the Bund, as well as areas with lots of travelers, such as train stations and airports. To avoid seasonal variation, all coding took place in the summer between June and August. Observers did not sample during national holidays or exceptional events (such as a typhoon that hit Guangzhou).

### Control variables

As a predictor variable, we used the percentage of farmland devoted to rice paddies in the province, although results were similar using a binary rice-versus-wheat variable. We used the earliest rice data that we could find from the 1996 Statistical Yearbook. In addition to time of day and day of the week, we tested for city- and district-level GDP per capita, population density, and age of the population from 2013.

## RESULTS

People in rice regions were less likely to be alone ( $\gamma = -0.42$ ,  $P = 0.010$ ,  $r_{\text{city-level}} = 0.79$ ;  $\gamma$  represents group-level regression coefficients). On weekdays, roughly 10% more people were alone in the wheat region than the rice region. On weekends, the wheat region had about 5% more people sitting alone (Fig. 2).

### Day of the week

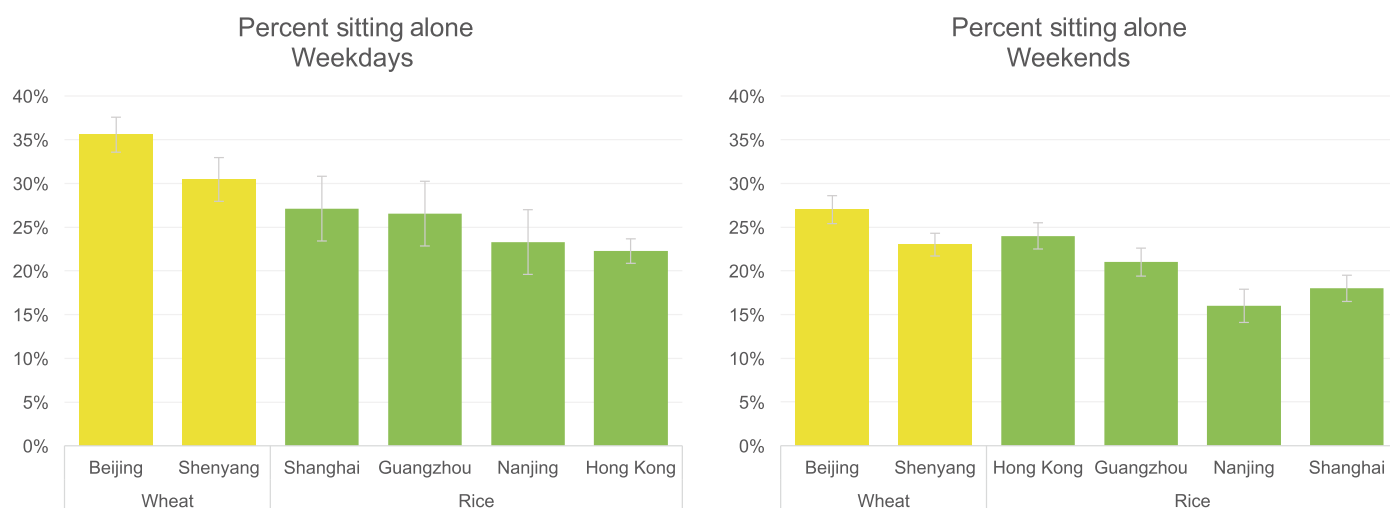
People were most likely to be alone on Mondays (32% on Mondays versus 22% on weekends). The percentage alone went down each day of the week through Sunday ( $B = -0.08$ ,  $P < 0.001$ ,  $r_{\text{ind-level}} = 0.10$ ; table S12) (a linear day-of-the-week variable explained slightly more variance than a weekday-versus-weekend variable).

### Morning versus afternoon

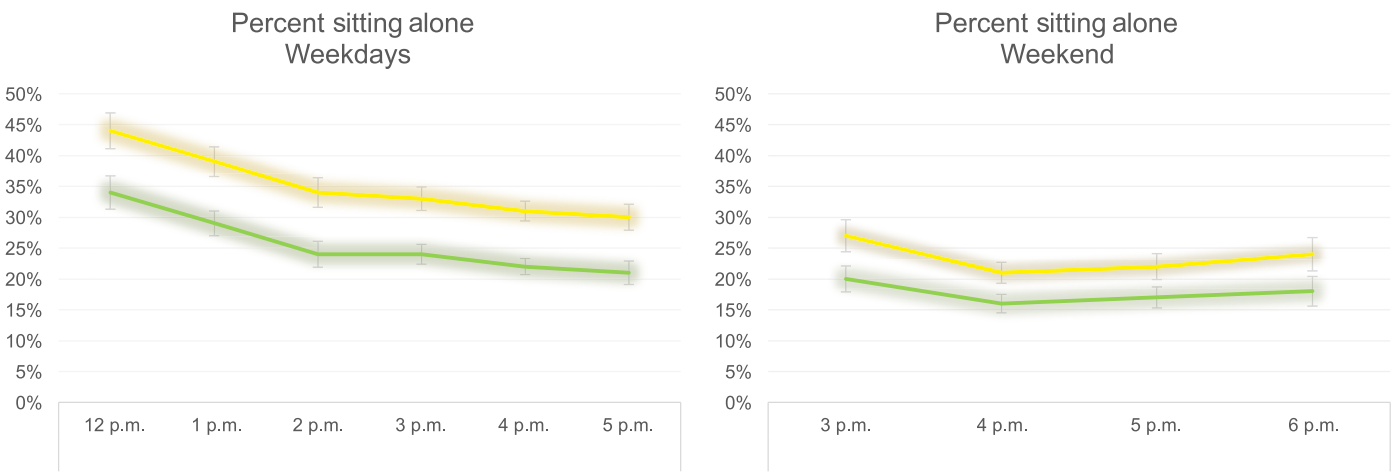
People were most likely to be alone early in the day and less likely to be alone in the afternoon and into evening ( $B = -0.07$ ,  $P < 0.001$ ,  $r_{\text{ind-level}} = 0.10$ ; time of day rounded to the nearest hour). However, rice-wheat differences persisted throughout the day (Fig. 3). Around noon, 33% of people were alone. By 5:00 p.m., 22% of people were alone. Controlling for time of day and day of the week, people in the rice areas were less likely to be alone ( $\gamma = -0.43$ ,  $P = 0.003$ ,  $r_{\text{city-level}} = 0.85$ ; Table 1). We controlled for time of day and day of the week in all the following analyses.

### Starbucks versus other cafes

People were more likely to be alone in Starbucks than other cafes ( $\gamma = 0.17$ ,  $P = 0.053$ ,  $r_{\text{store-level}} = 0.05$ ; table S1). Results were similar when we grouped together Starbucks and Costa Coffee to represent large international chains ( $\gamma = 0.21$ ,  $P = 0.028$ ,  $r_{\text{store-level}} = 0.08$ ). Rice-wheat differences remained after controlling for international chains ( $\gamma = -0.45$ ,  $P = 0.007$ ,  $r_{\text{city-level}} = 0.80$ ; Table 1).



**Fig. 2. Percentage of people sitting alone in cafes.** People in the wheat area were more likely to be sitting alone on weekdays (left) and weekends (right). Bars represent 1 SEM.



**Fig. 3. People were more likely to be alone earlier in the day, although rice-wheat differences persisted across the day.** Yellow represents wheat region; green represents rice region. Bars represent 1 SEM.

Table 1. Rice-wheat differences in sitting alone. Note that day of the week is coded numerically: Monday, 1 to Sunday, 7. Time of day is rounded to the nearest hour. Model is a hierarchical linear model (HLM) using the binomial GLMER function. Data are grouped at the city level in each model except the model with district GDP per capita. Table S10 presents models with districts nested within cities.				
	B/γ	SE	z	P
Percent rice	−0.42	0.16	−2.57	0.010
Time of day	−0.07	0.01	−6.55	<0.001
Day of the week	−0.07	0.01	−6.46	<0.001
Percent rice	−0.43	0.14	−2.97	0.003
Time of day	−0.07	0.01	−6.77	<0.001
Day of the week	−0.07	0.01	−6.38	<0.001
International chain	0.17	0.06	3.05	0.002
Percent rice	−0.45	0.17	−2.70	0.007
Time of day	−0.06	0.01	−6.60	<0.001
Day of the week	−0.07	0.01	−6.62	<0.001
City GDP per capita	0.018	0.005	3.38	0.001
Percent rice	−0.56	0.09	−6.37	<0.001
Time of day	−0.07	0.01	−5.50	<0.001
Day of the week	−0.07	0.01	−5.82	<0.001
City population density	0.02	0.03	0.59	0.559
Percent rice	−0.51	0.22	−2.33	0.020
Time of day	−0.07	0.01	−5.65	<0.001
Day of the week	−0.07	0.01	−5.87	<0.001
District GDP per capita	0.010	0.006	1.74	0.082
Percent rice	−0.53	0.16	−3.39	0.001

**Modernization**

If modernization makes cultures more individualistic and more Western, then we would expect more people in modernized districts to be sitting alone. However, people in wealthier cities were not more likely to be alone (GDP per capita;  $\gamma = 0.006$ ,  $P = 0.672$ ,  $r_{\text{city-level}} = 0.15$ ; table S3). This could be because the rice areas are also wealthier. After controlling for rice, people in wealthier cities were more likely to be alone ( $\gamma = 0.018$ ,  $P < 0.001$ ,  $r_{\text{city-level}} = 0.47$ ) (rice remained significant;  $\gamma = -0.56$ ,  $P < 0.001$ ; Table 1).

Results were similar using wealth at the district level. Wealthier districts were not more likely to have people sitting alone ( $\gamma = .002$ ,  $P = 0.824$ ,  $r_{\text{district-level}} = 0.08$ ; table S4). But controlling for rice, people were marginally more likely to be alone in wealthier districts ( $\gamma = 0.010$ ,  $P = 0.082$ ,  $r_{\text{district-level}} = 0.56$ ; Table 1). In sum, the basic rice-wheat differences were stronger than modernization differences. Modernization differences were apparent only after taking rice-wheat differences into account.

**Self-employed people**

Some people are alone in cafes because they are working, which may be particularly common for people who are self-employed and have no office space. We tested whether cities with a higher percentage of self-employed workers had more people sitting alone. Controlling for rice, areas with more self-employed people did not have more people sitting alone ( $\gamma = 1.75$ ,  $P = 0.629$ ,  $r_{\text{city-level}} = 0.27$ ; table S8).

**Population density**

Researchers have argued two opposite ideas for how population density might affect culture. On the one hand, some researchers have argued that population density should make cultures more collectivistic [for example, (20, 21), pp. 58–59]. On the other hand, cities are more densely populated than rural areas, and some researchers think that cities are more individualistic (22). In terms of the practicalities of sitting alone, people in dense cities may have smaller homes and more need to use a cafe as a place to work or read.

Results supported the idea that dense cities are more collectivistic. People were less likely to be alone in districts with a higher population density ( $\gamma = -0.03$ ,  $P = 0.177$ ,  $r_{\text{district-level}} = -0.22$ ). However, population density is highly correlated with rice; after controlling for rice, population density was not significant ( $\gamma = 0.02$ ,  $P = 0.559$ ,  $r_{\text{district-level}} = 0.31$ ). In sum, population density was not a strong predictor.



### Age and gender

If China's younger generation is more individualistic than the older generation, then districts with younger populations might have more people sitting alone. However, the finding was that those younger districts were no more likely to have people sitting alone (table S4). Men made up 50.6% of the people sitting alone in the wheat region and 52.4% in the rice region. Thus, gender did not seem able to explain differences between regions.

### Alternative predictors

In the Supplementary Materials, we present analyses of other variables that researchers have used to explain cultural differences: climate (temperature), pathogen prevalence, percentage of nonlocal residents, and alternative measures of modernization (service-sector employment, employment in private industry, and Internet penetration). Although the sample is small to test many different theories, rice consistently predicted differences more strongly than these alternatives (table S8).

## DISCUSSION

People in the wheat areas were more likely to be alone than people in the rice areas. This was also true in Hong Kong, a wealthier, more modernized city in the rice region. These results suggest that rice-wheat cultural differences within China extend into everyday life—not just in the careful, controlled laboratory measurements.

## STUDY 2

### Chair moving

Some cultural psychologists have argued that, when people run into a problem, individualists are more likely to try to change the situation, and collectivists are more likely to change the self to fit the situation [(21, 23), p. 67]. Similarly, in their classic paper on self-concept, Markus and Kitayama (24) theorized that individualistic Americans value “gaining control over surroundings” (p. 241), whereas Japanese people tend to see maturity as the ability to gain control over the inner world of the self (p. 227).

Findings have supported these theories. For example, researchers have found that Americans emphasize control and influence, whereas people in Japan emphasize adjustment and fitting in (9, 25–27). In addition, research on “primary control” (active control) versus “secondary control” (adjusting to the situation) has found that Americans are more likely to try primary control (28).

To test this theory in everyday life, we pushed chairs together in Starbucks and observed how many people moved the chairs out of their way and how many moved their body to squeeze through the chairs (Fig. 4). If people in rice areas are more collectivistic, with less importance placed on the self, they should be less likely to move the chairs.

To the best of our knowledge, no studies have used this method before. Thus, we cannot be certain what moving the chair represents. Thus, we tested the validity of this method by running samples in two countries shown to have differences in importance of the self—Japan and the United States. We also tested a subsample of participants in China who did and did not move the chair on psychological constructs previously shown to differ between individualistic and collectivistic cultures: cultural thought style, internal versus external locus of control, and self-efficacy (see the Supplementary Materials for more details).

Finally, moving the chair is similar to a study that put participants in front of a fan that was set to an uncomfortably high setting (29). Participants who were primed to feel powerful (and perhaps place more importance on the self) were more likely to turn the fan off or move it out of



**Fig. 4. Demonstrations of the chair-moving test.** A research assistant demonstrating how difficult it is to walk through the chair trap (left). To standardize chair width, researchers set the chairs to the width of their hips. Researchers only used light wooden chairs like these (right) to set the chair traps, never large stools or large plush chairs like those in the background of the picture.

the way. Thus, there is some evidence that actively removing an obstacle is more common among people who place a higher importance on the self.

### Observation rules

A total of 678 people in five cities walked through the chair trap (wheat: Beijing and Shenyang; rice: Shanghai, Guangzhou, and Hong Kong). All observations were made in the summer (11 July to 2 September). We ran the study in Starbucks only to keep the testing environment similar across cities.

### Control variables

Observers coded for several variables that we thought might affect how likely people are to move chairs: gender, time of day, day of the week, employee versus customer, walking alone versus in a group, and under/over 40 years old. Observers estimated whether people were under or over 40 years old on the basis of their appearance. In addition to rice, we ran models with GDP per capita and population density at the city and district level.

## RESULTS

People in the rice region were less likely to move the chair ( $\gamma = -1.86$ ,  $P < 0.001$ ,  $r_{\text{city-level}} = -0.99$ ,  $r_{\text{ind-level}} = -0.24$ ; Table 2). In the rice region, about 6% of people moved the chair, whereas in the wheat region, 16% of people moved the chair (Fig. 5).

### Employees

Employees were much more likely to move the chair ( $B = 1.93$ ,  $P < 0.001$ ,  $r_{\text{ind-level}} = 0.10$ ; Fig. 6). Among employees, 24% moved the chair compared to 4% of customers. However, rice-wheat differences were apparent among employees ( $\gamma = -2.55$ ,  $P < 0.001$ ,  $r_{\text{city-level}} = -0.86$ ,  $r_{\text{ind-level}} = -0.39$ ) and civilians ( $\gamma = -1.67$ ,  $P = 0.009$ ,  $r_{\text{city-level}} = -0.97$ ,  $r_{\text{ind-level}} = -0.19$ ).

### Gender

Among customers, women were less likely to move the chair ( $B = -1.06$ ,  $P = 0.016$ ,  $r_{\text{ind-level}} = -0.19$ ; Fig. 6). Among employees, men and women did not differ ( $B = 0.03$ ,  $P = 0.936$ ,  $r_{\text{ind-level}} < 0.01$ ). In a model controlling for gender and employee effects, the rice-wheat differences remained ( $\gamma = -2.02$ ,  $P < 0.001$ ,  $r_{\text{city-level}} = 0.97$ ,  $r_{\text{ind-level}} = -0.24$ ; Table 2).

**Table 2. Rice, GDP, and demographic predictors of chair moving.** Note that models are HLMs using the binomial GLMER function. Data are grouped at the city level, except for the bottom two models, which are grouped at the district level. See table S11 for models with districts nested in cities.

	<i>B</i> / $\gamma$	SE	<i>z</i>	<i>P</i>
Percent rice	−1.86	0.44	−4.19	<0.001
Employee	1.93	0.30	6.52	<0.001
Below 40 years old	0.03	0.38	0.09	0.928
Female (civilians only)	−1.06	0.44	−2.41	0.016
Employee	2.03	0.31	6.57	<0.001
Female	−0.46	0.30	−1.51	0.131
Percent rice	−2.02	0.48	−4.24	<0.001
Employee	2.03	0.35	5.80	<0.001
Female	−4.53	0.31	−1.47	0.141
City GDP per capita (10,000 RMB)	−0.02	0.17	−0.13	0.895
Percent rice	−1.99	0.51	−3.91	<0.001
Employee	2.07	0.32	6.53	<0.001
Female	−0.46	0.32	−1.46	0.145
District GDP per capita (10,000 RMB)	0.02	0.02	0.94	0.347
Percent rice	−2.30	0.62	−3.69	<0.001
Employee	2.10	0.32	6.65	<0.001
Female	−0.41	0.32	−1.27	0.205
District population density	−0.01	0.10	−0.12	0.902
Percent rice	−1.96	0.74	−2.64	0.008

Age and time of day

Many people have argued that the younger generation in China is more individualistic than the older generation (30). If so, older people might be less likely to move the chairs. On the other hand, older people may feel more respected in society or able to assert control. There were no significant differences in chair moving for people below 40 years old ( $B = 0.03$ ,  $P = 0.928$ ,  $r_{ind-level} < 0.01$ ).

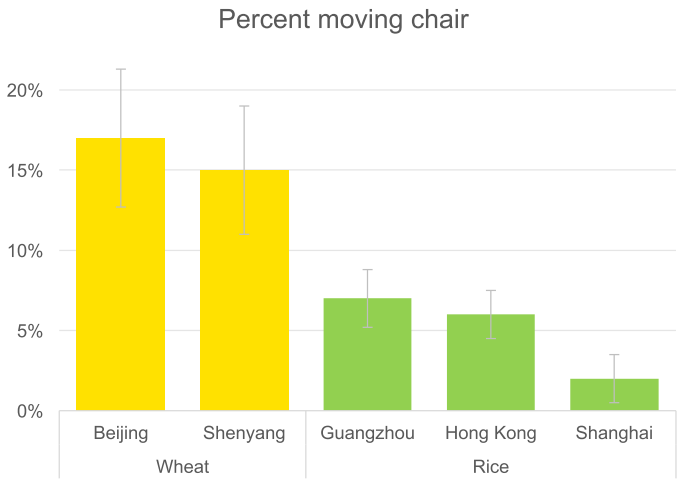
At the district level, districts with older populations were less likely to move the chair ( $\gamma = -0.18$ ,  $P = 0.041$ ,  $r_{dist-level} = -0.49$ ) (among nonemployees; table S6). However, this relationship became nonsignificant after adding rice ( $\gamma = -0.05$ ,  $P = 0.667$ ,  $r_{dist-level} = -0.19$ ). Time of day was not related to chair moving ( $P = 0.851$ ).

Alone versus groups

People in groups were marginally less likely to move the chair ( $B = -0.66$ ,  $P = 0.069$ ,  $r_{ind-level} = 0.11$ ). However, this might be because (i) employees never walked in groups and (ii) people in rice areas were more likely to be walking in groups. In a model including rice, employee, and gender, the effect of walking in a group was not significant ( $P = 0.565$ ).

Modernization

We tested whether people in more developed (and presumably more modernized) cities were more likely to move the chair. Wealth of the



**Fig. 5. People in wheat areas were about three times more likely to move the chair than people in rice areas.** Bars represent 1 SEM.

city was not related to chair moving ( $\gamma = -0.35$ ,  $P = 0.467$ ,  $r_{city-level} = -0.44$ ) (GDP per capita; table S6). This was also true after controlling for rice ( $P = 0.936$ ; Table 2).

Next, we zoomed into the district level. People in wealthier districts were not more likely to move the chairs (GDP per capita;  $\gamma = -0.02$ ,  $P = 0.517$ ,  $r_{city-level} = 0.23$ ; table S6). The slight negative relationship could be because the rice areas of China are wealthier than the wheat areas. Controlling for rice, people in wealthier districts were marginally more likely to move the chairs ( $\gamma = 0.03$ ,  $P = 0.199$ ,  $r_{city-level} = 0.67$ ).

People in more densely populated districts were less likely to move the chairs ( $\gamma = -0.19$ ,  $P = 0.052$ ,  $r_{dist-level} = -0.61$ ; table S6). But again, rice areas tend to be more densely populated than wheat areas; controlling for rice, population density was not significant ( $\gamma = 0.01$ ,  $P = 0.937$ ,  $r_{dist-level} < 0.01$ ). In sum, wealth and urbanization were not strong predictors of moving the chair.

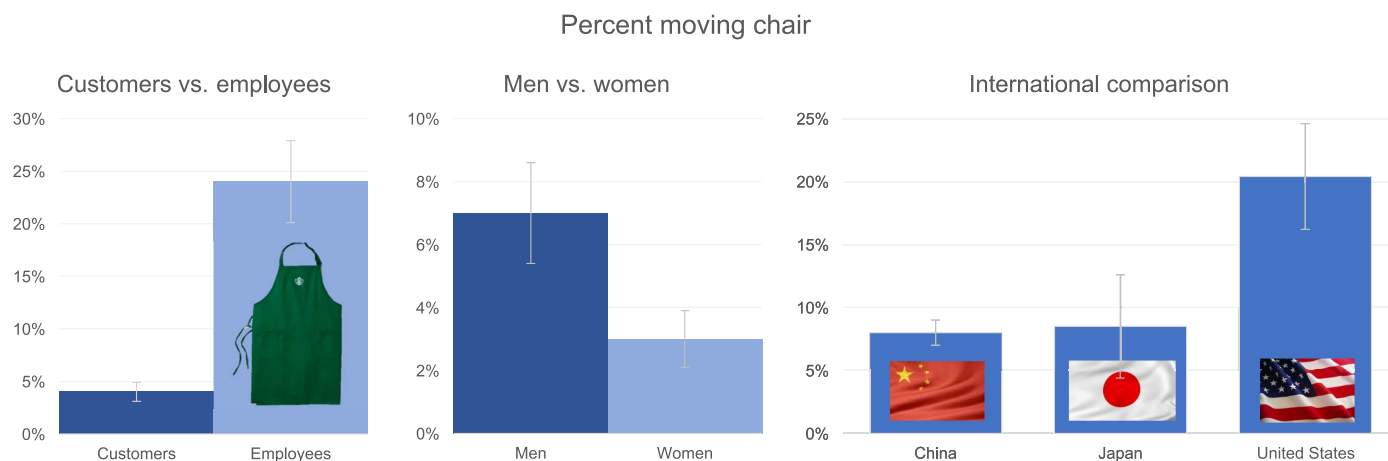
Alternative predictors

The Supplementary Materials present tests of temperature, pathogen prevalence, percentage of nonlocal residents, and alternative measures of modernization. These alternative variables were not strong predictors of chair moving, particularly after taking rice farming into account (table S9).

Validity checks

Because previous studies have not used chair moving as a psychological variable, we tested validity in several ways. We approached a subsample ( $n = 42$ ) of cafe goers who did or did not move the chair and asked them to complete several psychological measures. Chair movers thought more analytically (more common in individualistic cultures) than people who did not move the chair ( $B = 0.61$ ,  $P = 0.024$ ,  $r = 0.35$ ). Chair movers also scored marginally higher on internal locus of control ( $B = 0.60$ ,  $P = 0.088$ ,  $r = 0.27$ ). There were no differences on self-efficacy ( $B = 0.05$ ,  $P = 0.845$ ,  $r = 0.03$ ).

Next, we tested validity by testing in cultures known from previous research to differ in individualism: the United States and Japan. If moving the chairs actually taps into feelings of control over the environment that are more common in individualistic cultures, Americans should be more likely than people in China and Japan to move the chair. To test this, we observed 93 people walk through the chair trap in Washington, DC and New York City. Americans were more than twice as likely to move the



**Fig. 6.** Employees were about five times more likely than customers to move the chair (left). Among customers, men were more likely than women to move the chair (center). Comparing China, Japan, and the United States, Americans were about twice as likely to move the chair (right). Bars represent 1 SEM.

chair (8.0% in China versus 20.4% in the United States; Fig. 6) ( $B = 1.70$ ,  $P < 0.001$ ,  $r = 0.22$ ; table S9).

We also ran a small sample in Japan (Kyoto and Nagoya, 45 observations). As a rice culture and a collectivistic culture, Japan should have a low rate of moving the chair. Japan's rate of chair moving (8.5%) was similar to China's (8.0%) ( $\gamma = -0.15$ ,  $P = 0.788$ ,  $r = 0.02$ ). The results from the United States and Japan suggest that chair moving maps onto differences between individualistic and collectivistic cultures.

We also analyzed whether chair moving was more likely among particular demographic groups. Previous studies have found that men score higher on power [(31, 32); p. 953]. There is also some evidence that men score higher on individualism [(33), in China, (1), the Supplementary Materials; but see the study of Kitayama *et al.* (12), p. 243]. The fact that men were more likely to move the chair is consistent with the idea that this measure is tapping into a similar underlying concept.

Perhaps the most obvious validity check is to compare employees and civilians. Employees are in charge of the store and should feel like they have the authority to move the chairs. The finding that employees were five times more likely to move the chair supports the notion that chair moving taps into control over the environment.

Finally, we compared rates of chair moving to a measure of the importance of the self from a previous study of regional differences in China (1). That study used the sociogram task, in which participants draw circles to represent the self and friends. Researchers then measured the size of the circles to see whether people draw the self bigger than they draw friends. Participants from areas that scored higher on self-inflation were more likely to move the chair ( $\gamma = 2.21$ ,  $P < 0.001$ ,  $r_{\text{city-level}} = 0.99$ ,  $r_{\text{ind-level}} = 0.23$ ). This suggests that chair moving has convergent validity with other measures used to measure cultural differences.

## DISCUSSION

Two studies found evidence that historical subsistence styles can explain meaningful regional differences in people's everyday behavior in China. Modernization differences did not account for the differences—if anything, the wealthier cities (the rice areas) were less individualistic. The fact that these differences appeared among mostly middle-class city people suggests that rice-wheat differences are still alive and well in modern China.

## Replication and limitations

This study also serves as a conceptual replication of the laboratory study using entirely different outcome measures (34). Observational studies have inherent limitations. We cannot always know whether sitting alone or moving a chair taps into individualism, and we cannot guarantee that minor differences in the environment across cities affected the results.

However, when viewed with the previous laboratory study as a whole, the results here suggest that the rice and wheat regions of China are different and that these differences are not artifacts of particular laboratory tests. Measuring concrete behaviors is important because cultural psychologists have found that nations' self-reports on questionnaires do not always match their behavior (14). Concrete behavioral measures such as these provide an alternative to using self-report questionnaires to measure cultural differences—a method that researchers have frequently criticized (10–12).

## Rice farming and modernization

This study extended the rice theory by including Hong Kong. Hong Kong is particularly interesting because it has a history of British influence and it is far wealthier than the Mainland cities. However, few people in Hong Kong moved the chair or sat alone. These data suggest that modernization does not inevitably cause people to behave like Westerners—much as modern, wealthy nations, such as Singapore and Japan, still score much lower on individualism than Western countries (35). The results here suggest that these differences extend from self-report surveys into whether people are sitting alone in Starbucks.

## METHODS

### Sitting alone

In an effort to standardize the observations, observers followed several rules. Only seated patrons counted; people standing in line did not count unless they later joined someone sitting. Foreigners were not counted. Although this is not always easy to determine, the observers used appearance and the language that people were using (if they were talking). Each location could only be observed once per day to avoid counting the same people twice. People sitting outside were only counted if they had purchased something; this excludes people who were using outdoor chairs as a place to sit without buying anything.

The observers plotted routes based on the locations of Starbucks and visited any nearby cafes. We defined cafes as places that serve coffee or tea and where most patrons are drinking beverages and eating light snacks. If many patrons were drinking alcohol or eating meals, the store was not counted.

In most cases, it was easy to determine who was alone and who was together with other people. However, particularly in cafes that were crowded or had shared tables, people sat near each other, and it was not always clear whether they were together. In these cases, the observers lingered to look for signs that people were together, such as talking to each other.

### Statistical power

According to Cohen's effect for small effect size (Cohen's  $d = 0.2$ ), the sitting alone sample had more than 99% statistical power. Thus, instead of aiming for a specific sample size, we sampled to try to ensure that time of day and day of the week were similar across sites.

### Reliability

To test how reliable the observations were, three observers independently coded 447 people in 12 cafes in Beijing at the same time. Across coders, the percentage of people alone per cafe correlated almost identically ( $r_s \geq 0.99$ ). Two coders also tested for reliability in the rice region by independently coding 251 people in 10 stores in Shanghai. The percentage of sitting alone per cafe was nearly identical ( $r > 0.99$ ). These results suggest that coders agree on who is alone and who is with other people in the vast majority of cases.

### Chair moving

#### Checking sample comparability

Rice and wheat sites did not differ in the age, gender, or employee status of participants ( $P$ 's  $> 0.73$ ). Controlling for time of day and day of the week, people in the rice areas were more likely to be walking in groups (14% versus 30%,  $P < 0.001$ ). This data point supports the finding from Study 1 that people in the wheat area are more likely to be alone.

#### Observation rules

Two observers followed several rules to standardize the observations. In setting up the chair trap, the observers tried to be stealthy so that the other patrons would not know that we were testing their behavior. The observers used only lightweight wooden chairs, never heavy plush chairs or high metal stools. These heavier chairs would be much harder for people to move. In each case, the observer moved the chairs to the width of his hips to ensure that the chairs were always the same distance apart. In case body size differences between the observers might affect the results, we ran analyses controlling for the observer.

If a person moved the chairs, the observers repositioned the chairs to the standard distance and did not count anyone who walked through the moved chairs while they were farther apart than the standard distance. Sometimes, other patrons would sit down in one of the empty chairs. When this happened, the observers stopped coding until they could find alternate chairs or until the person left.

If someone walked through the chair trap more than once, the observers only coded the first time. The observers only set traps in places that did not require the chairs to be moved too far from their original position. All traps were set indoors.

### Statistical power

According to Cohen's convention for small effect size (Cohen's  $d = 0.2$ ), the chair moving sample had 96% statistical power. We sampled to ensure that both coders visited rice and wheat cities and sampled for at least 2 days in each city.

### Reliability

Two observers first trained together in two Starbucks to make sure that their procedures were the same. Next, the two observers independently coded the same people at two Starbucks to test whether their observations were reliable. The two coders agreed on all cases of whether the chairs were moved or not. All control variables were identical except for one observation, where one observer recorded two people and the other coder thought the second observation was the same person who had crossed previously. The Supplementary Materials include analyses with the observer as a predictor variable and find that it is not related to chair moving ( $P = 0.854$ ). Thus, the results suggest that the codings were reliable across observers.

### Validity checks: Psychological measures

As a validity check, we ran the chair trap in Beijing and approached 42 cafe goers who did or did not move the chair. They then completed paper-and-pencil tasks measuring cultural thought style, internal versus external locus of control, self-efficacy, and demographics.

To measure cultural thought style, the triad categorization task had participants categorize objects that can be paired on the basis of abstract category (for example, train and bus) or relation/use (train and tracks). Previous research found that people in East Asia and the rice areas of China choose more relational pairings than people from the West and wheat areas of China (1, 36).

Participants also completed a five-item version of the locus of control scale (37). Participants chose from competing statements that endorse the idea that outcomes in their life are determined by their own control or by external forces. Researchers had found that people in the United States and Western Europe score higher on internal locus of control than people in China and Hong Kong (38). Participants also completed a five-item scale measuring self-efficacy (39), which prior research found was higher in the United States than in Japan and Hong Kong (40).

### Statistical analysis

We used binomial (alone or not/moved chair or not) HLMs using the GLMER function in the program R. We present results for models nesting people in cities, districts, or stores depending on the predictor variable. Fully nested models with stores nested in districts nested in cities are in tables S10 and S11.

## SUPPLEMENTARY MATERIALS

Supplementary material for this article is available at <http://advances.sciencemag.org/cgi/content/full/4/4/eaap8469/DC1>

fig. S1. Sample chair trap in a Starbucks in Shanghai.

table S1. Are people in international chains more likely to be sitting alone?

table S2. Rice-wheat differences controlling for international chain.

table S3. Sitting alone and GDP.

table S4. Sitting alone and district-level data.

table S5. Basic predictors of chair moving.

table S6. City and district census predictors of chair moving.

table S7. International comparison of chair moving.

table S8. How well do other major theories of culture predict sitting alone?

table S9. How well do other major theories of culture predict chair moving?

table S10. Sitting alone models with stores nested in districts nested in cities.

table S11. Chair moving models with stores nested in districts nested in cities.

table S12. Chair moving models with stores nested in districts nested in cities.

section S1. Rice statistics

section S2. Chair moving

section S3. Controlling for observer

section S4. Hong Kong GDP per capita

section S5. Age in districts

section S6. Calculating effect sizes in GLMER



section S7. Graphing mean percent sitting alone  
 section S8. GDP per capita  
 section S9. Alternative predictors  
 section S10. Chair moving validity checks  
 section S11. Ethics statement  
 References (41)

## REFERENCES AND NOTES

1. T. Talhelm, X. Zhang, S. Oishi, C. Shimin, D. Duan, X. Lan, S. Kitayama, Large-scale psychological differences within China explained by rice versus wheat agriculture. *Science* **344**, 603–608 (2014).
2. J. W. Berry, Independence and conformity in subsistence-level societies. *J. Pers. Soc. Psychol.* **7**, 415–418 (1967).
3. R. E. Nisbett, K. Peng, I. Choi, A. Norenzayan, Culture and systems of thought: Holistic versus analytic cognition. *Psychol. Bull.* **108**, 291–310 (2001).
4. A. K. Uskul, S. Kitayama, R. E. Nisbett, Ecocultural basis of cognition: Farmers and fishermen are more holistic than herders. *Proc. Natl. Acad. Sci. U.S.A.* **105**, 8552–8556 (2008).
5. T. Talhelm, S. Oishi, How rice farming shaped culture in southern China, in *Socioeconomic Environment and Human Psychology*, A. K. Uskul, S. Oishi, Eds. (Oxford Univ. Press, 2018), pp. 53–76.
6. J. L. Buck, *Land Utilization in China* (Chicago Univ. Press, 1935).
7. F. Bray, *The Rice Economies: Technology and Development in Asian Societies* (Blackwell, 1986).
8. X. Fei, *Earthbound China: A Study of Rural Economy in Yunnan* (Chicago Univ. Press, 1945).
9. B. Morling, "Taking" an aerobics class in the US and "entering" an aerobics class in Japan: Primary and secondary control in a fitness context. *Asian J. Soc. Psychol.* **3**, 73–85 (2000).
10. S. J. Heine, D. R. Lehman, K. Peng, J. Greenholtz, What's wrong with cross-cultural comparisons of subjective Likert scales? The reference-group effect. *J. Pers. Soc. Psychol.* **82**, 903–918 (2002).
11. K. Peng, R. E. Nisbett, N. Y. C. Wong, Validity problems comparing values across cultures and possible solutions. *Psychol. Methods* **2**, 329–344 (1997).
12. S. Kitayama, H. Park, A. T. Sevincer, M. Karasawa, A. K. Uskul, A cultural task analysis of implicit independence: Comparing North America, Western Europe, and East Asia. *J. Pers. Soc. Psychol.* **97**, 236–255 (2009).
13. D. Oyserman, H. M. Coon, M. Kemmelmeier, Rethinking individualism and collectivism: Evaluation of theoretical assumptions and meta-analyses. *Psychol. Bull.* **128**, 3–72 (2002).
14. S. J. Heine, E. E. Buchtel, A. Norenzayan, What do cross-national comparisons of personality traits tell us? The case of conscientiousness. *Psychol. Sci.* **19**, 309–313 (2008).
15. R. V. Levine, A. Norenzayan, K. Philbrick, Cross-cultural differences in helping strangers. *J. Cross Cult. Psychol.* **32**, 543–560 (2001).
16. State Statistical Bureau of the People's Republic of China, *China Statistical Yearbook* (1996).
17. C. Liu, Beijing now has the highest minimum wage in China. *The Nanfang* (2016); <https://thenanfang.com/beijing-highest-hourly-minimum-wage-china/>.
18. R. E. Nisbett, D. Cohen, *Culture of Honor: The Psychology of Violence in the South* (Westview, 1996).
19. J. A. Vandello, D. Cohen, Patterns of individualism and collectivism across the United States. *J. Pers. Soc. Psychol.* **77**, 279–292 (1999).
20. M. J. Gelfand, J. L. Raver, L. Nishii, L. M. Leslie, J. Lun, B. C. Lim, L. Duan, A. Almaliach, S. Ang, J. Arnadottir, Z. Aycan, K. Boehnke, P. Boski, R. Cabecinhas, D. Chan, J. Chhokar, A. D'Amato, M. Ferrer, I. C. Fischlmayr, R. Fischer, M. Fülöp, J. Georgas, E. S. Kashima, Y. Kashima, K. Kim, A. Lempereur, P. Marquez, R. Othman, B. Overlaet, P. Panagiotopoulou, K. Peltzer, L. R. Perez-Florizno, L. Ponomarenko, A. Realo, V. Schei, M. Schmitt, P. B. Smith, N. Soomro, E. Szabo, N. Taveesin, M. Toyama, E. Van de Vliert, N. Vohra, C. Ward, S. Yamaguchi, Differences between tight and loose cultures: A 33-nation study. *Science* **332**, 1100–1104 (2011).
21. H. C. Triandis, *Individualism & Collectivism* (Westview, 1995).
22. T. Yamagishi, H. Hashimoto, Y. Li, J. Schug, Stadtluft macht frei (City air brings freedom). *J. Cross Cult. Psychol.* **43**, 38–45 (2012).
23. R. Diaz-Guerrero, The development of coping style. *Hum. Dev.* **22**, 320–331 (1979).
24. H. R. Markus, S. Kitayama, Culture and the self: Implications for cognition, emotion, and motivation. *Psychol. Rev.* **98**, 224–253 (1991).
25. B. Morling, S. Evered, Secondary control reviewed and defined. *Psychol. Bull.* **132**, 269–296 (2006).
26. B. Morling, S. Kitayama, Y. Miyamoto, Cultural practices emphasize influence in the United States and adjustment in Japan. *Pers. Soc. Psychol. Bull.* **28**, 311–323 (2002).
27. J. L. Tsai, F. F. Miao, E. Seppala, H. H. Fung, D. Y. Yeung, Influence and adjustment goals: Sources of cultural differences in ideal affect. *J. Pers. Soc. Psychol.* **92**, 1102–1117 (2007).
28. J. R. Weisz, F. M. Rothbaum, T. C. Blackburn, Standing out and standing in: The psychology of control in America and Japan. *Am. Psychol.* **39**, 955–969 (1984).
29. A. D. Galinsky, D. H. Gruenfeld, J. C. Magee, From power to action. *J. Pers. Soc. Psychol.* **85**, 453–466 (2003).
30. J. Sun, X. Wang, Value differences between generations in China: A study in Shanghai. *J. Youth Stud.* **13**, 65–81 (2010).
31. L. L. Carli, Gender, interpersonal power, and social influence. *J. Soc. Issues* **55**, 81–99 (1999).
32. L. J. Kray, L. Thompson, A. Galinsky, Battle of the sexes: Gender stereotype confirmation and reactance in negotiations. *J. Pers. Soc. Psychol.* **80**, 942–958 (2001).
33. S. E. Cross, L. Madson, Models of the self: Self-construals and gender. *Psychol. Bull.* **122**, 5–37 (1997).
34. T. Talhelm, J. Haidt, S. Oishi, X. Zhang, F. F. Miao, S. Chen, Liberals think more analytically (more "WEIRD") than conservatives. *Pers. Soc. Psychol. Bull.* **41**, 250–267 (2015).
35. M. J. Gelfand, B. Bhawak, L. Nishii, D. J. Bechtold, Individualism and collectivism, in *Culture, Leadership and Organizations: The GLOBE Study of 62 Societies*, R. J. House, P. J. Hanges, M. Javidan, P. W. Dorfman, V. Gupta, Eds. (Sage, 2004), pp. 473–512.
36. L.-J. Ji, Z. Zhang, R. E. Nisbett, Is it culture or is it language? Examination of language effects in cross-cultural research on categorization. *J. Pers. Soc. Psychol.* **87**, 57–65 (2004).
37. J. B. Rotter, Generalized expectancies for internal versus external control of reinforcement. *Psychol. Monogr. Gen. Appl.* **80**, 1–28 (1966).
38. P. E. Spector, C. L. Cooper, J. I. Sanchez, M. O'Driscoll, K. Sparks, P. Bernin, A. Büssing, P. Dewe, P. Hart, L. Lu, K. Miller, L. F. R. de Moraes, G. M. Ostrognay, M. Pagon, H. Pitariu, S. Poelmans, P. Radhakrishnan, V. Russinova, V. Salamatov, J. Salgado, S. Shima, O. L. Siu, J. B. Stora, M. Teichmann, T. Theorell, P. Vlerick, M. Westman, M. Widerszal-Bazyl, P. Wong, S. Yu, Do national levels of individualism and internal locus of control relate to well-being: An ecological level international study. *J. Organ. Behav.* **22**, 815–832 (2001).
39. R. Schwarzer, M. Jerusalem, Generalized self-efficacy scale, in *Measures in Health Psychology: A User's Portfolio*, J. Weinman, S. Wright, M. Johnston, Eds. (NFER-NELSON, 1995), pp. 35–37.
40. U. Scholz, B. G. Doña, S. Sud, R. Schwarzer, Is general self-efficacy a universal construct? Psychometric findings from 25 countries. *Eur. J. Psychol. Assess.* **18**, 242–251 (2002).
41. I. Grossmann, M. E. W. Varnum, Social structure, infectious diseases, disasters, secularism, and cultural change in America. *Psychol. Sci.* **26**, 311–324 (2015).

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## Moving chairs in Starbucks: Observational studies find rice-wheat cultural differences in daily life in China

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