

Ecocultural basis of cognition: Farmers and fishermen are more holistic than herders

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It has been proposed that social interdependence fosters holistic cognition, that is, a tendency to attend to the broad perceptual and cognitive field, rather than to a focal object and its properties, and a tendency to reason in terms of relationships and similarities, rather than rules and categories. This hypothesis has been supported mostly by demonstrations showing that East Asians, who are relatively interdependent, reason and perceive in a more holistic fashion than do Westerners. We examined holistic cognitive tendencies in attention, categorization, and reasoning in three types of communities that belong to the same national, geographic, ethnic, and linguistic regions and yet vary in their degree of social interdependence: farming, fishing, and herding communities in Turkey's eastern Black Sea region. As predicted, members of farming and fishing communities, which emphasize harmonious social interdependence, exhibited greater holistic tendencies than members of herding communities, which emphasize individual decision making and foster social independence. Our findings have implications for how ecocultural factors may have lasting consequences on important aspects of cognition.

social interdependence | Turkey | Black Sea | cultural psychology

A growing body of literature suggests that members of different cultural groups differ in their cognitive processing styles (1). Researchers have compared members of relatively interdependent and collectivistic East Asian cultures with relatively independent and individualistic European American cultures, finding that, compared with European Americans, East Asians are more likely to attend to the perceptual field as a whole, perceive relationships between the focal object and the field, and explain events on the basis of such relationships (2–6). Nisbett and colleagues called this mode of thought holistic. European Americans are more likely to detach focal objects from their context, focus on attributes of the object and categorize it, and use generic rules about the category to explain and predict the object's behavior. This mode of thought is referred to as analytic.

We maintain that these culturally divergent modes of thought are encouraged by the degree to which the culture's social practices reinforce either independence of the self from others or interdependence of the self with others (2, 7–9). East Asian cultures socialize members into closely knit networks, encouraging mutual obligations among individuals to develop an interdependent social system. Interdependent social systems foster the holistic mode of thought because the individual must pay attention to a broad range of social cues. Attention to the social field also entails greater attention to the physical field.

In contrast, European American societies socialize members into a network of loosely connected, autonomous individuals to form an independent social system, in which social relations are less intensive and less constrained by social roles. Independent social systems foster analytic thought because the individual can focus on relevant objects without paying so much attention to the way they are enmeshed with other people and their goals. A focus on the object's attributes and the categories implied by its attributes constitutes the analytic mode of thought.

Initial evidence for the hypothesis that social interdependence fosters holistic cognition comes from several studies that show that priming the idea of independence or interdependence is sufficient to change the mode of thought (10). For example, Kühnen and colleagues (11, 12) found that Western participants exhibited more holistic attention when they were encouraged to think about the ways in which they are similar to family members and friends or when they were asked to circle first-person plural pronouns (we, us, ours, etc.) in a paragraph. Although important, these laboratory studies lack ecological validity. They should be supplemented with a naturalistic study that compares different communities that vary in social interdependence.

To date, virtually all studies have compared East Asian with Western participants. But East Asians and Westerners differ in a host of ways, and we cannot be sure that it is relative degree of interdependence versus independence that produces differences in holistic versus analytic cognition. It would be more convincing to show that people who share a national identity, ethnicity, and language differ in cognitive tendencies if they differ in social orientations. Such a study adopts a “just minimal difference” approach, which allows keeping constant as many potentially confounding variables as possible while focusing on the cultural difference of interest (in this case, relative degree of independence vs. interdependence) (13). In the present study, we compared the cognitive tendencies of members of three communities in Turkey's eastern Black Sea region whose daily economic activities are governed by varying degrees of interdependence.

Specifically, we compared farming, herding, and fishing communities. Farming requires harmonious group collaboration. Moreover, farmers are largely sedentary; they are tied to the land they cultivate and, thus, to fixed communities. These factors are likely to encourage a high degree of social interdependence. In contrast, herding activities do not require much cooperation, but rely on individual decision making and autonomy. Moreover, herders are much less sedentary; their capital can be moved to any location with enough nutrition for animals. Herding communities are therefore unlikely to exert much pressure toward cooperation or conformity. Instead, they foster individualistic or independent social orientations (14, 15). These considerations suggest that farmers are more likely than herders to show holistic cognitive tendencies.

In agreement with this analysis, East African farmers were found to consult each other more frequently and act less individually than East African herders (16). In a large cross-national comparison, agricultural societies were found to be associated with greater degrees of conformity, whereas hunting and gathering societies were found to be associated with greater degrees of independent decision making (17, 18). Moreover, in agricultural societies, child socialization practices emphasize

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Table 1. Sample characteristics

Ecocultural group	Age*	Gender [†]	Education [‡]	Marital status [§]	Monthly income [¶]
Farmers	36.88 (9.02)	27 M (22 F)	Primary school: 26 High school: 16 University and above: 4	Single: 15 Married: 34	≤550 YTL : 6 551–1,000 YTL: 18 ≥1,001 YTL: 25
Fishermen	35.41 (10.24)	32 M (19 F)	Primary school: 23 High school: 16 University and above: 3	Single: 17 Married: 28	≤550 YTL: 5 551–1,000 YTL: 25 ≥1,001 YTL: 21
Herders	34.09 (9.38)	26 M (19 F)	Primary school: 18 High school: 21 University and above: 6	Single: 17 Married: 33	≤550 YTL: 20 551–1,000 YTL: 16 ≥1,001 YTL: 7

* $F(2, 142) = 0.998, P = 0.37.$

[†] $\chi^2(2) = 0.62, P = 0.73.$

[‡] $\chi^2(10) = 7.63, P = 0.67.$

[§] $\chi^2(4) = 2.40, P = 0.63.$

[¶] $\chi^2(4) = 25.80, P < 0.001.$

^{||}1 YTL corresponds to ≈0.80 USD (exchange rate on May 25, 2008).

compliance, conscientiousness, and conservatism, whereas in hunting and gathering societies, they feature individualism and assertiveness and were more venturesome (19). Consistent with the hypothesis that it is social orientation that fosters cognitive differences, Berry (20) found that farmers are more likely than hunters and gatherers to be unable to disentangle objects from their surrounding fields. Berry's study, however, used a cross-societal design comparing the Eskimo of Baffin Island in Canada (an independent group) with the Temne of Sierra Leone (an interdependent group). This confounds a number of potentially important variables.

Fishing societies have typically been viewed as sharing characteristics with hunting societies, and it has been suggested that the associated economic activity encourages independence (19). We maintain that how the activity of fishing is carried out may shape the mental makeup of the individuals in fishing societies. Fishing carried out as a solitary activity, like hunting, would be expected to lead to the development of an independent orientation. However, fishing, which involves group engagement in boats, would be expected to promote interdependence among the members of fishing communities (e.g., whale hunting demands high levels of cooperation) (21). Moreover, leaving the fishery and the port to which one belongs to seek another location can be a socially costly decision (22). Thus, we predict that fishing exercised as an activity that requires cooperation will foster interdependence and a cognitive style more similar to that of farmers than to that of herders.

The eastern Black Sea region of Turkey, which hosts fishing ports, tea plantations, and animal grazing fields, provides an ideal opportunity to test our predictions. The region consists of coastal mountain ranges descending to the sea. This ecology allows fishing in the coastal areas, a narrow strip for agriculture (limited to such products as tea, tobacco, and hazelnuts, which require a humid climate and fertile soil), and herding on the mountain tops where land is not suited to agriculture. Natural conditions have kept this region historically isolated from the inner lands of Anatolia, an additional factor that influenced our decision to conduct the study there.

The regions of Rize and Artvin were chosen as research sites based on the official statistics of the number of livestock animals, the amount of land used for tea cultivation, the tons of fish caught per year, the amount of local income based on these economic activities (see *Appendix* for more detailed information on study sites), as well as the local knowledge gathered from authorities and residents in the region. Fishing and farming are activities that constitute main sources of income in Rize, whereas herding is a major economic activity in Artvin. In 14 villages of Rize and 10 villages of Artvin, we recruited individuals who

identified farming ($n = 49$), fishing ($n = 51$), or herding ($n = 45$) as their main sources of income. Almost all individuals had lived most of their lives in the recruitment site. This feature of the sample allowed us to minimize any potential effects of self-selection to live in a chosen ecoculture and acculturation to a different ecoculture. Participants in the three ecoculture groups did not differ from each other in terms of age, educational background, gender breakdown, and marital status (Table 1). The only variable on which the three groups differed was income: Herders reported having less income than fishermen and farmers. All results reported below were controlled for income.

Using three cognitive tasks measuring attention, categorization, and reasoning, we tested the prediction that members of the farming and fishing communities would be more holistic in their cognitive mode than members of herding communities. The tasks chosen for the current study were pretested to determine their use; all tasks required minimal reliance on verbal and reading abilities to avoid potential difficulties with individuals who had low levels of literacy.

Method and Results

Participants who agreed to participate were tested on several tasks individually either at home or in the work setting by an interviewer who explained the instructions and guided the participants in completion of the tasks. Participants first completed the tasks described below in the order presented and finally responded to a series of demographic questions. The completion of tasks lasted for ≈40 min, after which participants were thanked and compensated with a hand radio. The gender of the interviewer and the interviewee was matched.

We predicted that farmers and fishermen[§] are more holistic in attention than herders. To test this prediction, we used a recently developed Framed Line Test (23). Participants were presented with a square frame in which a vertical line was printed, starting from the center of the upper horizontal line of the square. They were then given another square frame of the same or different size and asked to draw a line identical to the original line in either absolute length (absolute task) or in proportion to the height of the surrounding frame of the square (relative task) (see Fig. 1*a*).[¶] The absolute task

[§]For lack of a better word, we use the term "fishermen" to refer to both male and female participants in the sample recruited in fishing villages.

[¶]This procedure was repeated for one of the two tasks first for nine different combinations of lines and squares of which the first three were practice, with only the remaining critical six trials used for analyses. Participants were then given another set of three practice trials and six critical trials for the other task. The order of the two tasks was counterbalanced.

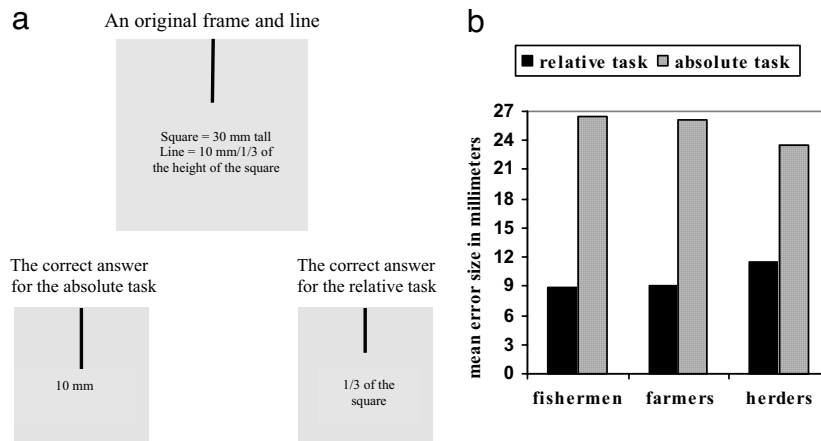


Fig. 1. Ecoculture and attention. (a) An illustration of the Framed Line Test from ref. 23. (b) The mean error size in millimeters show that herders were less accurate in the relative task than were farmers and fishermen, whereas farmers and fishermen were less accurate in the absolute task than were herders.

would be facilitated by the ability to decontextualize or ignore the square frame and, thus, would be interfered by holistic attention. The relative task would be facilitated by the inability to ignore the square frame. Performance errors measured in millimeters were averaged for both tasks.

We analyzed the mean error size in millimeters in a 2 (task type: relative vs. absolute) \times 3 (ecoculture) \times 2 (gender) mixed ANOVA. Overall, performance was better in the relative task than in the absolute task, $F(1, 140) = 254.93, P < 0.001$, suggesting that all of the three ecocultural groups showed some varying degrees of holism in attention. As predicted, however, in the relative task condition, farmers and fishermen drew the lines with greater accuracy than did herders ($P = 0.03$)^{||}. In the absolute task condition, however, herders were more accurate than farmers and fishermen ($P = 0.02$). The interaction between task type and ecoculture was significant, $F(2, 140) = 3.26, P = 0.04$. The pattern, displayed in Fig. 1b, is consistent with the hypothesis that farmers and fishermen are more holistic than herders in attention.

Second, we also anticipated that farmers and fishermen would attend more holistically to relationships and similarities among objects when organizing their environment than herders, who should tend to focus on salient objects and use rules and categorization. To test this prediction, participants were presented with 18 triads of three objects (e.g., pictures of glove, scarf, and hand) and asked to indicate which two of the three went together (Fig. 2a) (24). In all cases, two of the three objects shared either a functional/contextual relationship (e.g., glove and hand), and two of the three objects shared a category (e.g., glove and scarf). For each participant, the number of categorical groupings was subtracted from the number of functional/contextual groupings to yield a measure of holistic cognition (i.e., preference for relational vis-à-vis categorical classification). As Fig. 2b shows, all three ecocultural groups had a clear preference for relational over categorical classification. As hypothesized, however, this preference for relational groupings was greater for farmers and fishermen than for herders, $t(143) = 2.90, P < 0.005$.

Our third prediction concerns the relative salience of perceptual similarities versus abstract rules in determining category memberships. We predicted that farmers and fishermen would use similarities more and abstract rules less than would herders. To test this prediction, we presented participants with 10 sets of stimuli like the one shown in Fig. 3a. Their task was to look at

the target and judge which of two groups of four objects the target object most resembled (25). All objects in one of the two groups (group 2) had the same stem as the test object, whereas the objects in the other group (group 1) shared a large number of features with the target, although no one feature was shared by all members. Thus, whereas the first group shared a unidimensional rule with the target, the second group was holistically more similar to the target.

The number of similarity-based decisions was subtracted from the number of rule-based decisions, with higher positive numbers indicating greater preference for rule-based decisions. As shown in Fig. 3b, all of the three ecocultural groups had a clear preference for rule-based decisions over similarity-based decisions. As predicted, however, this preference for rule-based decisions was significantly less for farmers and fishermen than for herders, $t(143) = 2.47, P = 0.015$.

Discussion

Human groups inhabit very different ecological niches (14). These niches shape economic activities, which, in turn, lend themselves to different cognitive styles (1). Our findings reveal differences in how the field and the object are attended to and how stimuli are compared in the process of categorization between groups engaged in economic activities that foster different levels of interdependence. We observed that ecocultural contexts that promote social interdependence are associated with a more holistic cognitive style than are those promoting social independence. This general conclusion is consistent with an earlier study by Dershowitz (26), who found that Orthodox Jewish boys, whose families required strict observance of religious and social rules surrounding shared values, beliefs,

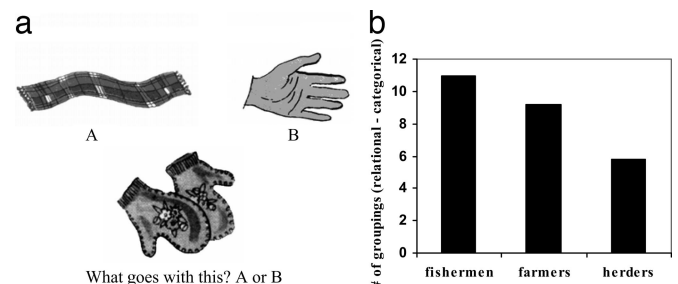


Fig. 2. Ecoculture and categorization. (a) An example of grouping tasks from ref. 24. (b) Farmers and fishermen much more often grouped objects on the basis of similarities and relationships among the objects than did herders.

^{||}The statistical analyses for all measures are based on planned contrasts between herders, on the one hand, and farmers and fishermen, on the other hand.

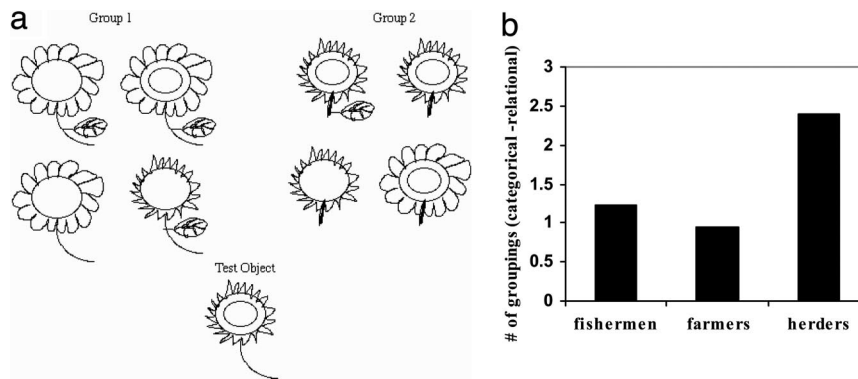


Fig. 3. Ecoculture and reasoning. (a) An example of categorization tasks from ref. 25. (b) Farmers and fishermen more often perceived similarities based on holistic judgments of family resemblance, but herders more frequently perceived similarities based on the unidimensional rule.

and patterns of behavior, were more field dependent, that is, unable to disentangle objects from their surrounding fields, than were secular Jewish boys.

It is noteworthy that we found no gender differences. At first glance, this might seem odd because, especially in fishing and herding, men are far more likely than women to engage in these activities. We suggest, however, that dominant forms of ecocultural activity of a community influence the degree of social interdependence of the community as a whole. All members of the community are, therefore, likely to be cognitively shaped regardless of whether they directly engage in the economic activities at issue.

An important strength of the current work is that it examines communities that fall in the same ethnic, national, linguistic, and geographic region and yet vary in the crucial theoretical variable of social interdependence. Although the obtained data are cross-sectional and correlational, this design feature enables us to draw strong causal inferences and to suggest that social interdependence fosters holistic cognition rather than any of the myriad differences that characterize different nations in different parts of the globe.

Appendix

Tea Farming. Turkey ranks fifth in the world in the total production of tea. The city of Rize is considered to be the center of tea production in Turkey, producing $\approx 75\%$ of the tea in Turkey. In 2006, 533,120 decares of land of 543,760 decares of total cultivable land was reserved for tea plantation. Tea farming is the main source of income for a vast majority of the city's inhabitants who harvest three to four crops each year between the months of May and October on terraced fields set on the mountainsides. Production is typically taken care of by families that own small-size tea gardens. Labor needed to maintain the tea plants and pick the tea leaves at harvest is carried out by family members, with none to little help hired from outside (except in the case of big producers). Recruitment of members of tea farming was conducted in the following districts and villages of Rize: Merkez: Balıkçılar Köyü, Veliköy, and Yeniköy; Ardeşen: Isıklı, Düz, and Yeni Yol.

Fishing. Fishing is the second main occupation of the people of Rize, which ranks fourth in fish production in the country. Fishermen in Rize mostly do open sea fishing and catch small size fish such as anchovy, mackerel, and red mullet. Almost all small to medium size fishing boats are family owned and operated. Ethnographic work in the region (27) suggests that most of the fishing-related tasks are ideally handled within the immediate family. The family-based work on the boat also is the primary context for socialization into fishing and sharing of information. When the team composition requirement cannot be met within the close family circle (father/sons/brothers), more distant relatives are called on to help. Recruitment of members of fishing communities was conducted in the following districts and villages of Rize: Merkez: Balıkçılar Köyü, and Söğütlü; Çayeli: Beyazsu, Yenipazar, and Küçüktaş; Fındıklı: Sahil Mahallesi, Aksu, and Kiyıcık.

Herding. Herders were recruited in villages on terraced heights that fall under the jurisdiction of Artvin, a city southeast to Rize. In this landscape, there is little agricultural land; most of the land is covered with forests, with the remaining land used for grazing animals. This region has no industry, and for the locals the main source income is herding animals on the mountainside and beekeeping. Animals herded consist of small animals, such as goat and sheep, and bigger animals, such as cow and ox. With the highest number of grazed animals, Ardanuç, the most mountainous administrative district in Artvin, was chosen as the site of recruitment. Recruitment of members of herding communities was conducted in the following villages of Ardanuç: Tosunlu, Karlı Köy, Tütünlü, Kızılçık, Bulanık, İncilli, Soğanlı, Sakarya, and Aydı Köy.

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PSYCHOLOGY. For the article “Ecocultural basis of cognition: Farmers and fishermen are more holistic than herders,” by Ayse K. Uskul, Shinobu Kitayama, and Richard E. Nisbett, which appeared in issue 25, June 24, 2008, of *Proc Natl Acad Sci USA* (105:8552–8556; first published June 13, 2008; 10.1073/pnas.0803874105), the authors note that on page 8554, right column, in the sentence beginning on line 2, the group designations were inadvertently switched. The sentence should read:

“All objects in one of the two groups (group 1) had the same stem as the test object, whereas the objects in the other group (group 2) shared a large number of features with the target, although no one feature was shared by all members.” In addition, in Table 1, row 2, column 4, the number of participants with high school education in the Fishermen group was given as **16** and should instead be **22**. These errors do not affect the conclusions of the article. The corrected table appears below.

Table 1. Sample characteristics

Ecocultural group	Age*	Gender [†]	Education [‡]	Marital status [§]	Monthly income
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