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Cross-National Differences in Disease Rates as Accounted for by Meaningful Psychological Dimensions of Cultural Variability

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This study examined cross-national differences in the morbidity rates for six diseases and their relationship with four psychological dimensions of cultural variability in 28 countries. The cultural dimensions used were Individualism versus Collectivism (IC), Power Distance (PD), Uncertainty Avoidance (UA), and Masculinity (MA). PD and IC predicted the rates of infections and parasitic diseases, malignant neoplasms, circulatory system diseases, and heart diseases. IC also predicted rates of cerebrovascular disease. The predictions for infections and heart disease survived even when per capita GDP was controlled for, as did the correlations between circulatory system diseases and PD. Multiple regression analyses indicated that all four culture dimension scores predicted disease rates above and beyond per capita GDP for all diseases except malignant neoplasms, and they were the only scores to predict disease rates independently.

KEY WORDS: cultural influences; psychological dimensions; disease; regression analyses.

INTRODUCTION

Incidence and morbidity rates for a number of disease processes differ considerably across different countries (World Health Organization, 1991). Many factors certainly contribute to these differential rates. National differences in diet, for example, can play a large role in cardiovascular, res-

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piratory, and immune system wellness. National differences in exercise (e.g., as a function of different transportation systems) and lifestyle (e.g., smoking rates) also contribute to health and disease. On a macro level, the type and availability of health care differ considerably across countries (Rosemer, 1993), and these differences can contribute to different disease rates.

In the last few years, research has increasingly highlighted the role of social factors in disease processes, and the potential negative effects of social isolation and social disadvantage on health and disease (Feist & Brannon, 1988). In one study (Berkman & Syme, 1979), for example, 7,000 individuals (of which 4,725 were included in the study) were interviewed in terms of their degree of social contact. Following the initial assessment, deaths were monitored over a nine-year period. For both men and women, individuals having the fewest social ties suffered the highest mortality rate; those with the greatest social ties had the lowest rate. These findings were independent of the level of physical health self-reported at the time of the initial questionnaire, the year of death, socioeconomic status, and other health-related behaviors (e.g., smoking, alcohol consumption, etc.).

Some studies have demonstrated how culture may influence disease. In one study (Marmot & Syme, 1976), for example, 3,809 Japanese-Americans were classified according to how "traditionally Japanese" they were (i.e., spoke Japanese at home, retained traditional Japanese values and behaviors, etc.). The group that was the "most" Japanese had the lowest incidence of coronary heart disease, at levels comparable in Japan. The group that was the "least" Japanese had a three- to five-times greater incidence rate. These differences could not be accounted for by other coronary risk factors.

One previous study (Triandis, Bontempo, Villareal, Asai, & Lucca, 1988) has examined the influence of culture on cardiovascular disease on the ecological level. Eight cultural groups were differentiated according to how individualistic versus collectivistic they were. On one hand, individualistic cultures tend to emphasize the uniqueness and importance of the individual over groups; members of individualistic cultures tend to see themselves as separate, autonomous, and unique from each other, and personal needs, wishes, and goals take precedence over group needs. Collectivistic cultures, on the other hand, tend to emphasize the importance of groups over the individual; members of collectivistic cultures see themselves as fundamentally interconnected with others, and are more willing to sacrifice their own personal needs and wishes for the sake of the group. American Caucasians, the most individualistic of the eight cultural groups compared in Triandis *et al.*'s (1988) study, had the highest rate of heart attack; Caucasian Trapist monks, who were the least individualistic, had the lowest rate. Differences in social support and isolation may be possible mediators of these cultural differences.

Despite this evidence, our knowledge of the influence of culture as a macro-level variable on disease processes is still elementary. Studies documenting the relationship between culture and disease would be valuable, for several reasons. First, they would identify which aspects of culture contribute to specific disease states. Second, they would suggest other social variables that mediate health outcomes, above and beyond social support and isolation. Finally, in conjunction with other factors, including diet, exercise, and lifestyle, these studies would contribute collectively to a better overall picture of health and disease.

One problem that has hindered ecological-level research on culture across countries has been the inability to conceptualize and measure culture meaningfully. "Culture" is, of course, a construct that refers to many different areas of life, including physical, objective entities (e.g., architecture, transportation, government systems, food, utencils, etc.) as well as psychological, subjective aspects (e.g., attitudes, values, opinions, norms, etc.) (cf. Triandis, 1972). Although culture is often equated with race, ethnicity, or nationality, an increasing number of writers are turning their attention to conceptualizations of culture in terms of functional psychological characteristics—that is, how cultural groups differ along meaningful dimensions of psychological variability. Individualism versus Collectivism (IC), referred to above in the study by Triandis *et al.* (1988), is one such dimension. This dimension has been used in a considerable number of empirical and theoretical works to account for differences between cultural groups on a variety of psychological traits and behaviors (see Triandis, 1994, for a review).

Other dimensions also exist. Hofstede (1981, 1983), for example, has suggested that the dimensions of Power Distance (PD), Uncertainty Avoidance (UA), and Masculinity (MA) also differentiate cultures meaningfully. PD refers to the degree to which cultures maintain and encourage power and status differences among its members. Cultures high on PD emphasize such differentials, placing high value on obedience, conformity, authoritarian and autocratic decision making, and the like; cultures low on PD minimize power differences, placing less value on obedience, and more value on independence, consultative and democratic decision making. Uncertainty Avoidance refers to the degree to which cultures use technology or develop rules or rituals to deal with uncertainty and anxiety about the future. Cultures high on UA tend to have higher levels of stress and anxiety, less risk taking, and greater resistance to change; cultures low on UA, however, tend to have less stress and anxiety, more risk taking, and less hesitation to change. MA refers to the degree to which gender differences are fostered within a culture; cultures high on MA tend to foster greater gender differences, while cultures low on MA minimize such differences.

Hofstede's (1981, 1983) study of work-related values, which served as the basis for the derivation of the cultural dimensions described above, offers the additional empirical advantage of providing country-specific scores for each of the four dimensions derived. In his study, over 88,000 employees of a large, multinational corporation in 66 countries completed a comprehensive questionnaire covering four broad areas: satisfaction, perceptions, personal goals and beliefs, and demographics. Questions regarding values were isolated for cross-cultural analysis, and a combination of ecological factor analyses and theoretical selections were used in the derivation of the four dimensions. Based on the items loading on each of these dimensions, scores were generated for each country. Countries were also ranked according to their raw scores separately for each dimension. Both raw and rank scores have been published and are available for use as country scores for these four dimensions (e.g., Matsumoto's, 1989, study on cultural differences in perceptions of emotion).

Other dimensions of cultural variability have also been suggested. Pelto (1968), for example, suggested that cultures can be distinguished according to whether they are "tight" or "loose," referring generally to the degree of homogeneity versus heterogeneity within cultures. Hall (1966) suggested that cultures can be differentiated according to whether they are high or low contextualizing, with low context cultures fostering cross-context consistency in behaviors. Unfortunately, however, quantitative scores on these dimensions across countries are unavailable.

While the relationship between heart attack and IC has been studied, we need to expand the diseases examined. Broadening our base of health outcomes will allow us to examine which aspects of culture influence what types of disease processes. Unless multiple dimensions of culture are compared to multiple health indices, this question cannot be addressed.

The purpose of this study was to examine the relationship between four dimensions of culture and the morbidity rates for six diseases—infectious and parasitic diseases, malignant neoplasms, circulatory system diseases, heart diseases, cerebrovascular diseases, and respiratory system diseases. Data on national and per capita Gross Domestic Product (GDP), which should be related to disease-related influences such as diet and health care for each country, were also included. We hypothesized that culture would predict the rates of the various diseases above and beyond the contribution of national differences in GDP.

METHOD

Countries Included in the Study

Twenty-eight countries were included in the final data set, based on the criteria that all data used in this study were available from the sources they were obtained—four culture scores, all disease morbidity rates, and per capita GDP. The 28 countries were widely distributed around the globe, spanning five continents and representing many different ethnic, cultural, and socioeconomic backgrounds: Argentina, Australia, Austria, Belgium, Canada, Chile, Denmark, Finland, France, Great Britain, Federal Republic of Germany, Greece, Ireland, Israel, Italy, Japan, Mexico, Netherlands, Norway, New Zealand, Portugal, Singapore, Spain, Sweden, Switzerland, the United States, Venezuela, and Yugoslavia.

Culture Dimension Scores and Morbidity Rates

Four culture dimension scores for each country were taken from the studies described earlier (Hofstede, 1980, 1983). Both raw and rank-ordered scores were used in all analyses. Findings using rank-ordered data essentially replicated those using the raw scores; thus, for parsimony we report only the analyses using raw scores. Epidemiological data on the six diseases for each of the 28 countries were compiled from the World Health Organization (1991). Morbidity rates for each of these diseases were available at five age points for each country: at birth, ages 1, 15, 45, and 65.

National Economic Data

Data on GDP and per capita GDP were obtained from a standard reference text (Central Intelligence Agency, 1991). Pearson correlations were computed between both economic variables and each of the four cultural dimension scores. GDP was not significantly correlated with any of the four dimensions, and was thus dropped from further analyses. Per capita GDP, however, was significantly correlated with IC and PD ($r = 0.77$, $p < 0.01$; and $r = -0.53$, $p < 0.01$, respectively); that is, more affluent countries were more individualistic and less differentiating on power and status than less affluent countries. Thus, we allowed for the correction of national differences in per capita GDP in the correlational analyses between culture scores and epidemiological data.

RESULTS

Predicting Health Outcomes Using Individual Culture Dimension Scores

Pearson correlations were computed between each of the four culture scores and each of the disease rates and are given in the top entries of Table I. PD was positively correlated with rates for infections and parasitic diseases across the five age points; cultures scoring higher on PD also had higher rates for these types of diseases. PD was negatively correlated with malignant neoplasms, circulatory system diseases, and heart diseases. Countries that minimized power differentials among its members had higher rates of these diseases.

IC was positively correlated with malignant neoplasms, circulatory system diseases, and heart disease, indicating that individualistic cultures had higher rates of these diseases. These findings are not that surprising, given the findings above for these disease rates and PD, and the negative correlation between these two dimensions (Hofstede, 1980). The findings for individualism and heart disease replicate those found previously (Berkman & Syme, 1979; Marmot & Syme, 1976; Triandis *et al.*, 1988).

IC was also negatively correlated with infectious and parasitic diseases, and with cerebrovascular diseases. Collectivistic countries had higher rates of these diseases than individualistic countries. The findings on cerebrovascular diseases and individualism are interesting because the prediction is in exactly the opposite direction from that for heart disease and individualism. None of the cultural dimensions was significantly correlated with respiratory system diseases.

Controlling for Effects Due to Economic Differences Among the Countries

All of the correlational analyses were recomputed, partialing the effects of per capita GDP, and are given in the bottom entries of Table I. The significant correlations on infections and parasitic diseases and heart diseases all survived even when the effects of per capita GDP were accounted for, as did the correlations between PD and circulatory system diseases. These cultural dimensions predict these disease rates above and beyond what is accounted for by economic differences among the countries.

The partial correlations for malignant neoplasms, cerebrovascular diseases, and between IC and circulatory system diseases, however, were not significant. These suggest that economic differences among the countries

Table I. Correlations Between the Disease Rates and the Cultural Dimensions

	Ages				
Disease type	0	1	15	45	65
Infectious/parasitic					
Power distance	61**	60**	60**	61**	60**
	35*	35*	35*	36*	37*
Uncertainty	28	28	27	28	26
Avoidance	17	16	16	17	14
Individualism vs.	–68**	–68**	–68**	–68**	–67**
Collectivism	–41*	–42*	–43*	–43*	–44*
Masculinity	21	21	21	21	22
	23	23	23	23	23
Malignant neoplasms					
Power distance	–38*	–38*	–38*	–38*	–42*
	11	11	12	13	10
Uncertainty	–16	–15	–15	–14	–13
Avoidance	04	04	05	06	10
Individualism vs.	66**	66**	66**	67**	71**
Collectivism	19	19	19	20	28
Masculinity	07	07	08	08	08
	15	15	15	15	18
Circulatory system					
Power distance	–62**	–60**	–60**	–59**	–53**
	–56**	–55**	–55**	–55**	–52**
Uncertainty	–36	–34	–34	–34	–26
Avoidance	–30	–29	–29	–29	–22
Individualism vs.	39*	37*	36*	35*	30
Collectivism	27	27	27	28	26
Masculinity	–20	–20	–20	–21	–23
	–18	–18	–18	–19	–22
Heart diseases					
Power distance	–74**	–73**	–73**	–72**	–71**
	–65**	–65**	–65**	–65**	–65**
Uncertainty	–29	–30	–30	–29	–23
Avoidance	–22	–22	–23	–22	–16
Individualism vs.	53**	51**	51**	51**	48**
Collectivism	33*	34*	34*	34*	32
Masculinity	–14	–13	–13	–13	–13
	–13	–13	–12	–13	–14
Cerebrovascular					
Power distance	26	26	27	28	26
	15	14	14	14	13
Uncertainty	–19	–19	–18	–19	–20
Avoidance	–26	–27	–27	–27	–28
Individualism vs.	–37*	–38*	–38*	–39*	–35*
Collectivism	–24	–24	–24	–23	–20
Masculinity	–10	–10	–10	–11	–13
	–09	–09	–09	–10	–12

Table I. Continued

Disease type	Ages 0	1	15	45	65
Respiratory system					
Power distance	17	16	15	16	17
	27	26	26	27	27
Uncertainty	−18	−19	−19	−18	−19
Avoidance	−17	−17	−17	−17	−18
Individualism vs.	−09	−08	−08	−08	−09
Collectivism	−27	−27	−27	−26	−27
Masculinity	20	20	20	20	19
	20	20	20	19	18

Note: Decimals omitted. Top entry in each cell refers to Pearson correlation between culture score and disease rate. Bottom entry in each cell refers to partial correlation between culture score and disease rate controlling for per capita GDP.
*$p < 0.05$; **$p < 0.01$.

cannot be disentangled from the contribution of individual cultural dimensions in predicting these rates.

Predicting Health Outcomes Using the Four Culture Scores as a Set

Hierarchical multiple regressions were computed on each of the disease rates at each of the five age points. In each analysis, per capita GDP was entered first; all four cultural dimension scores were entered second. These analyses examined the total contribution of culture as a conglomeration of the four dimensions, above and beyond the contribution by per capita GDP. They also allowed us to investigate which of the five predictors in the regression independently account for the disease rates.

Table II summarizes the findings. The first two entries in each cell give the R on the first and second steps, respectively. The third entry reflects the change in R between steps 1 and 2. The last entry lists the variables that have significant partial regression coefficients on the final step. The variables listed in this cell, therefore, account for a significant portion of the variance in the morbidity rate data independent of the other variables in the regression.

With the exception of malignant neoplasms, the R change for all hierarchical analyses was significant, indicating that culture, defined as a set of four dimensions, predicts disease rates above and beyond per capita GDP. Also, again with the exception of malignant neoplasms, the only variables to contribute independent information to the regressions were the culture scores. These findings provide strong evidence for the relationship

Table II. Multiple Correlations Predicting Rates

Disease	Ages 0	1	15	45	65
Infectious/parasitic	39***	37***	37***	38***	34**
	63***	63***	63***	63***	62***
	24*	25*	26*	26*	28*
	UA*	UA*	UA*	UA*	UA*
	PD*				PD*
Malignant neoplasms	56***	55***	55**	57***	61***
	61***	61***	61***	63***	66***
	05	05	05	06	05
	GDP**	GDP**	GDP**	GDP**	GDP**
Circulatory system	08	07	06	05	03
	42*	40*	40*	39*	36
	34*	33*	34*	34*	33
	PD**	PD**	PD**	PD**	PD**
Heart disease	19*	17*	17*	16*	15*
	60***	59***	59***	58**	54**
	41**	42**	42**	41**	39**
	PD**	PD**	PD**	PD**	PD**
Cerebrovascular disease	08	09	10	11	09
	42*	42*	42*	43*	41*
	33*	33*	43*	32*	32*
	UA*	UA*	UA*	UA**	UA**
Respiratory system	01	01	02	01	01
	45*	45*	45*	45*	48**
	44**	44**	44**	44**	47**
	UA**	UA**	UA**	UA**	UA**

Note: Decimals omitted. First entry in each cell gives Multiple R using per capita GDP as the sole predictor. Second entry gives Multiple R on second step with addition of four culture scores. Third entry gives R change between steps 1 and 2. Fourth entry lists predictors with significant regression coefficients. UA, uncertainty avoidance; PD, power distance.
$^*p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$.

between cultural differences measured along the four dimensions and the morbidity rates of the diseases.

DISCUSSION

Bivariate analyses indicated that PD and IC predicted the rates of infections and parasitic diseases, malignant neoplasms, circulatory system diseases, and heart diseases (IC also predicted rates of cerebrovascular disease). Partial correlation analyses indicated that the predictions for infections and heart disease survived even when per capita GDP was controlled for, as did the correlations between circulatory system diseases and PD. Multiple regression analyses indicated that all four culture scores predicted disease rates above and beyond per capita GDP for all diseases except malignant neoplasms. Also, the culture dimension scores were the only scores to predict disease rates independently, again with the exception of malignant neoplasms. The regression analyses are particularly important because they control for the multicollinearity among the multiple predictors.

The idea of a relationship between culture and health is not new. Earlier studies (Berkman & Syme, 1979; Marmot & Syme, 1976) have pointed to possible connections between individualism and cardiovascular diseases. The findings from these previous studies have already highlighted the potential health-related consequences of certain behavioral tendencies based on cultural differences. Autonomy and individuality, for example, may be valued in individualistic cultures; but, a possible consequence of such value systems is behavioral tendencies that may foster cardiovascular disease. Other research on the relationship between socioeconomic status and health has also highlighted the potential effects of social ordering and hierarchical social structures on health outcomes (Adler, Boyce, & Chesney, 1994), which implicate the influence of PD on disease etiology and maintenance.

Yet, while previous research may have highlighted the potentially harmful consequences of individualism, the findings from this study suggest that collectivism—individualism's polar opposite—may have its own deleterious effects, especially in relation to infectious/parasitic diseases and cerebrovascular diseases. Also, the present study extends previous research by suggesting that cultural dimensions other than IC, notably PD, account for morbidity rates of diseases other than cardiovascular diseases.

Empirical and conceptual work is necessary to elucidate the possible mediating mechanisms of these relationships. Previous researchers, for example, suggested that one of the likely agents mediating the culture-disease relationship is social support. People in individualistic cultures enjoy less social support, which, in turn, would lead to greater rates of heart attacks. People in collectivistic cultures, however, have larger support systems, which help to buffer them against cardiovascular disease. Current knowledge about the relationship between social support and stress further supports this hypothesis.

Still, social support alone cannot account for the findings reported in this article, primarily because cultural dimensions other than IC were important predictors of disease. National differences in diet, exercise, and lifestyles certainly contribute to disease, as do differences in health care availability, food and water processing technology, and the like. The possible contribution of genetic and physiological differences among people to disease etiology also cannot be ruled out.

Some of the most pressing issues facing the incorporation of culture in future research concerns the development of measures of cultural variables that might influence health. Hofstede's (1981, 1983) measures were specific to work-related values, and his methodology allow for the production of country-, not individual-level scores. Ecological-level correlations may not be replicated with individuals as the unit of analysis, and such differences would pose important and difficult conceptual questions for us concerning the relationship between cultures and individuals with relation to psychological dimensions of cultural variability and health. Several individual-level measures of IC do exist, such as Triandis' multimethod approach (Triandis, McCusker, & Hui, 1990), and Hui's (1988) and Matsumoto's (Matsumoto, Weissman, Preston, & Brown, 1995) relationship-specific measurement methods. Each has its own advantages and disadvantages. Individual-level measures do not yet exist, however, for other cultural dimensions. The data from this study strongly suggest that future research incorporate such measures, and as such, the development of such measures is of paramount importance. Psychological values, attitudes, and opinions that help to shape and mold behaviors and that are shared on an ecological as well as personal level should be the focus of such developmental efforts.

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REFERENCES

Adler, N. E., Boyce, T., Chesney, M. A., Cohen, S., Folkman, S., Koahn, R. L., & Syme, S. L. (1994). Socioeconomic status and health: The challenge of the gradient. *American Psychologist, 49,* 15-24.

Berkman, L. F., & Syme, S. L. (1979). Social networks, host resistance, and mortality: A nine-year follow-up study of Alameda County residents. *American Journal of Epidemiology, 109,* 186-204.

Central Intelligence Agency (1991). *The world factbook.* Washington, DC: Central Intelligence Agency.

Feist, J., & Brannon, L. (1988). *Health psychology: An introduction to behavior and health.* Belmont, CA: Wadsworth.

Hall, E. T. (1966). *The hidden dimension.* New York: Doubleday.

Hofstede, G. (1980). *Culture's consequences.* Beverly Hills: Sage.

Hofstede, G. (1983). Dimensions of national cultures in fifty countries and three regions. In J. Deregowski, S. Dziurawiec, & R. Annis (Eds.), *Expiscations in cross-cultural psychology.* Lisse, Switzerland: Swets & Zeitlinger.

Hui, C. H. (1988). Measurement of individualism-collectivism. *Journal of Research in Personality, 22,* 17-36.

Marmot, M. G., & Syme, S. L. (1976). Acculturation and coronary heart disease in Japanese-Americans. *American Journal of Epidemiology, 104,* 225-247.

Matsumoto, D. (1989). Cultural influences on the perception of emotion. *Journal of Cross-Cultural Psychology, 20,* 92-105.

Matsumoto, D., Weissman, M., Preston, K., & Brown, B. (1995). *Context-specific measurement of individualism-collectivism on the individual level: The IC Assessment Inventory (ICAI).* Manuscript currently submitted for publication.

Pelto, P. J. (1968). The differences between "tight" and "loose" societies. *Trans-Action,* April, 37-40.

Rosemer, M. I. (1993). *National health systems of the world, Vol. 2: The issues.* Oxford: Oxford University Press.

Triandis, H. C. (1972). *The analysis of subjective culture.* New York: Wiley.

Triandis, H. C., Bontempo, R., Villareal, M. J., Asai, M., & Lucca, N. (1988). Individualism and collectivism: Cross-cultural perspectives on self-ingroup relationships. *Journal of Personality and Social Psychology, 4,* 323-338.

Triandis, H. C., McCusker, C., & Hui, C. H. (1990). Multimethod probes of individualism and collectivism. *Journal of Personality and Social Psychology, 59,* 1006-1020.

World Health Organization (1991). *World health statistics quarterly.* Geneva: World Health Organization.