

Cultural consonance and arterial blood pressure in urban Brazil

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Abstract

In previous research in Brazil, we tested the hypothesis that cultural consonance is associated with arterial blood pressure. Cultural consonance is the degree to which individuals are able to approximate in their own behaviors the prototypes for behavior encoded in shared cultural models. Individuals who had higher cultural consonance in the domains of lifestyle and social support had lower blood pressures. The aim of the current research was to replicate and extend these findings. First, a more extensive cultural domain analysis was carried out, improving the description of cultural models. Second, more sensitive measures of cultural consonance were developed. Third, data were collected in the same community studied previously. The following findings emerged: (a) cultural domain analysis (using a mix of quantitative and qualitative techniques) indicated that cultural models for these domains are widely shared within the community; (b) the associations of cultural consonance in these domains with arterial blood pressure were replicated; and, (c) the pattern of the associations differed slightly from that observed in earlier research. This pattern of associations can be understood in terms of macrosocial influences over the past ten years. The results support the importance of long-term fieldwork in anthropology.

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Introduction

Since the work of Scotch (1963), medical anthropologists have been interested in the social and cultural dimensions of cardiovascular disease (Dressler, 2004). The aim of this paper is to replicate and extend one set of findings in this area, employing data collected in an

urban area in southern Brazil. Dressler and his associates (Dressler & Santos, 2000; Dressler & Bindon, 2000) suggested that blood pressure differences within a community are in part a function of the degree to which individuals are able to approximate in their own behaviors those prototypical behaviors that are encoded in widely shared cultural models. This cultural dimension of individual behavior is referred to as “cultural consonance.” In previous research, higher cultural consonance in two domains, lifestyle and social support, was associated with lower arterial blood pressure. In the research reported here, these findings were examined

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further, employing more precise methods for the analysis of these cultural domains, in order to improve the measurement of cultural consonance at the individual level. Also, the data were collected in the same neighborhoods in urban Brazil in which data had been collected 10 years earlier. The association of cultural consonance and blood pressure was replicated. There were, however, some differences in the pattern of associations, differences that can be understood in the context of changes occurring in Brazil over the past 10 years. In addition to replicating previous findings, these results offer an opportunity to reflect on how anthropological explanations are embedded in the specific contexts of macro- and microsocial processes affecting individuals at the local level.

Culture and arterial blood pressure

The observation that in some societies average community blood pressures are low by standards of the industrialized world dates back to the 1920s (Henry & Cassel, 1969). Community average blood pressures tend to increase along a continuum that can be glossed variably as “industrialization,” “modernization,” or “sociocultural complexity” (Waldron et al., 1982). Intensive studies of diet and body composition have shown that changes in these factors account for part of this increase, but not for all of the difference (McGarvey, 1999).

Cassel, Patrick, and Jenkins (1960) offered an early hypothesis regarding the influence of social and cultural factors in this process. They suggested that in instances of migration or rapid culture change, individuals socialized with a particular understanding of the social world had to adapt to a different understanding and set of expectations; the confusion and frustration experienced is stressful and increases the risk of high blood pressure. Scotch (1963) suggested that this process explained differential correlates of blood pressure in two Zulu communities in South Africa, and Henry and Cassel (1969) employed a similar line of reasoning to account for age-related increases in blood pressure in the industrialized world. Generally speaking, these authors argued that an inconsistency between sets of beliefs and values was stressful, leading to higher blood pressure.

The emphasis on the stressful nature of culture change or migration drew many researchers to the growing body of theory and research on psychosocial stress in psychology (Lazarus, 1966). This theoretical orientation also reduced researchers’ reliance on vague (and increasingly discredited) terms like modernization. The aim in these studies was to use anthropological theory and ethnographic methods to identify and measure the stressors important in communities progressively drawn into the world system (Bindon, Knight, Dressler, &

Crews, 1997; Chin-Hong & McGarvey, 1996; Dressler, 1991a; Janes, 1990). The specification of statistical models and variable measurement in all of these studies depended on the sensitivity of the researcher to the particular cultural context.

Reviewing this work, Dressler (1995) suggested that investigators needed to take the concept of culture more seriously, both theoretically and methodologically. From a theoretical perspective, he argued that the relationship between local knowledge and meaning and the selection and measurement of variables entering into models needed to be made more explicit. From a methodological perspective, he suggested that there were innovative methods that could be used to study that local knowledge and meaning, which in turn would improve models of individual psychophysiological adaptation.

This perspective informed two research projects, one in Brazil (Dressler & Santos, 2000, 2001), and the other in an African American community in the Southern United States (Dressler & Bindon, 2000), which drew on a cognitive theory of culture (Holland & Quinn, 1987; D’Andrade, 1995; Shore, 1996). In this orientation, culture consists of sets of “cultural models” that apply to various cultural domains (e.g., the family, leisure activities, success in life, etc.). These models (also sometimes called “schemas”) are skeletal outlines of the elements of the domain and basic processes within the domain. These models are made up of two components: one is a function of individual biography and can be thought of as a personal model; the other is a function of what the individual learns about that domain as a member of society, and hence is a cultural model, because it is shared with other members of society (Shore, 1996, p. 49).

The notion of sharing (or “consensus”) is essential in this theory of culture, as has been recognized for well over a century in the social sciences (Tylor, 1871; Berger & Luckman, 1967). Many (although not all) cultural models define things in the world in an arbitrary way. What gives these arbitrary definitions causal force is that people agree that this is, indeed, the way things are (D’Andrade, 1984). It is this consensus that also gives culture its aggregate properties.

Consensus is not a dichotomy. People will agree on the nature of cultural things to a degree, leaving room for some models to be highly contested, while others are accepted with little dispute. Romney, Weller, and Batchelder (1986) quantified consensus with the cultural consensus model. Working from the pattern of agreement among key informants, the cultural consensus model evaluates the degree of sharing in a domain, as well as the degree to which individual informants share in that consensus, and it produces a “culturally best” set of responses within a particular domain (“best” in the sense that these are more likely to reproduce more

individuals' responses) by giving higher weight to the informants who can better replicate the group-level responses (Romney et al., 1986). This estimate is not a simple average but takes into account how meaning is distributed.

One criticism of a cognitive view of culture is that it treats only the way things are thought to be, and not action. Put differently, people do not just know or think things, people *do and believe* things, and assessing the degree to which individuals conform in their behaviors and their personal beliefs to cultural prototypes for those behaviors and beliefs is an important question (Crossley, 2001). Therefore, we proposed an additional theoretical construct and measure that can link the cultural to the individual. This is the concept of "cultural consonance," defined as the degree to which an individual approximates in his or her own behavior or belief the collective representation of a particular domain encoded in a cultural model.

In Brazil, Dressler and his colleagues (Dressler, Balieiro, & Dos Santos, 1997, 1998) examined cultural consonance in two cultural domains: lifestyle and social support. They argued that lifestyle (consisting of the accumulation of material goods and the adoption of related behaviors) could be viewed as a way in which claims to social status in mass society are expressed in mundane social interaction (see Bourdieu, 1984). Lifestyle is, in essence, a performative dimension of socioeconomic status. Persons who are seen to be closer in their approximation to cultural models of a successful lifestyle are accorded a basic social respect, which in turn is associated with more satisfying mundane social interactions. Social support, on the other hand, is an essential social resource for dealing with the inevitable crises, large and small, of everyday life. But, social support systems are not constructed solely out of voluntary relationships; rather, there are categories of persons to whom it is more (or less) appropriate to appeal for assistance in particular situations (Dressler, 1994). Therefore, it is likely that cultural models of social support guide individuals' choices in this regard, and closer approximation to these models may in turn lead to more satisfying social interactions.

In carrying out cultural consensus analysis, Dressler et al. (1997, 1998) worked with inventories of lifestyle items, and with combinations of everyday problems and potential social supporters, that had been developed using traditional ethnographic methods. They found consensus on lifestyle items deemed indicative of being a success in life, and on the pattern of resort to types of persons in relation to specific problems (tested in a sample of key informants). They then collected data on these same items in a survey sample on which they also collected blood pressure and other data. They found that those individuals who more closely approximated the cultural consensus model in their own behaviors in these two domains—that is, persons who were higher in

cultural consonance—also had lower blood pressures (after controlling for a variety of known and suspected correlates of blood pressure). The model was also tested in a study in an African American community in the Southern US (Dressler & Bindon, 2000), obtaining essentially the same results.

A theory of cultural consonance offers a useful orientation for studying the relationship between culture and health for several reasons. First, as Dressler (1995) suggested, it takes the concept of culture seriously in theoretical terms. The importance of cultural models in specific cultural domains occupies a prominent place in the theory, rather than serving only as background or context. Second, it takes advantage of recent innovations in research methods in the study of cultural models, notably the cultural consensus model. And third, it returns to a focus on sociocultural processes in the study of health outcomes that was curiously, if not lost, at least de-emphasized. The original work of Cassel and his colleagues represented quite sophisticated thinking about the link of the cultural at the aggregate, to the cultural at the individual, to the biological. But Cassel and his colleagues were stuck with conventional epidemiologic methods in investigating these associations, and hence could locate culture in their models only inferentially, and those inferences were quite large. It is no wonder that, in his later writings, Cassel (1976) de-emphasized sociocultural processes himself in favor of a closer adherence to a psychosocial model of stress processes. In many respects, the concept of cultural consonance is precisely what Cassel was driving at.

There is, however, more work to be done on this theory, which is why the research reported here was undertaken. First, the findings from prior research must be replicated to determine if these are genuine findings or are a function of sample-specific characteristics in the original study. Second, methods for deriving the measures of cultural consonance can be strengthened. As noted above, the specific items for which consensus was examined were derived from general ethnographic observations. Given that there are a number of structured and unstructured ethnographic research techniques that can lead to a much better description of the cultural domains under study, it seems prudent to start from the beginning in examining these cultural models. Third, a replication provides an opportunity to see how changing conditions in a community affect the associations observed in previous research. In the remainder of this paper, such a replication and extension of this research will be reported.

The research site

The city serving as the site of the research, Ribeirão Preto (population of around 500,000), is in the richest

agricultural region in Brazil. Much of the land surrounding the city is devoted to the cultivation of sugar cane, which is refined into sugar and used in the production of alcohol fuel for automobiles. Significant amounts of land are also devoted to the cultivation of coffee and citrus, and it serves as a regional center for health care and financial services. (In the following we will refer to the first study in the community as “the 1991 study,” in which active data collection spanned 1991–1993, and the current study as “the 2001 study,” in which active data collection spanned 2001–2003.)

One of the challenges of this research was to adequately sample the full range of socioeconomic variation in the city. In the 1991 study we identified four neighborhoods to represent that range (Dressler & Santos, 2000). Households were then sampled within those neighborhoods for more intensive study. The poorest neighborhood has a complicated history. In 1991, this neighborhood was a *favela*. *Favelas* are squatter settlements made up both of migrants seeking to partake of the affluence of the region, and of the socially marginal who have not been able to attain economic stability. Persons “invade” a piece of empty land and hammer together housing out of whatever materials are at hand. *Favelas* tend to be notorious as centers of illegal activity, especially drug trafficking. In 1993, roughly at the end of our first study, the local municipality created what could be referred to as a public housing project, consisting of tiny, 3-room cinder block houses. Members of the *favela* were moved to this housing project. Over the intervening 10 years we followed the development of this new neighborhood. While it continues to have an unsavory reputation with respect to crime, due in part to its roots in a *favela*, its composition has changed. Many of the original *favelados* had difficulty dealing with new demands of a neighborhood with legal status (e.g., paying rent, paying municipal service bills). Some returned to other *favelas*, paradoxically to be replaced by people of slightly higher means who could afford to purchase houses in the neighborhood. These persons tended to have suffered some kind of economic misfortune, selling their houses in other neighborhoods to buy something cheaper in a poorer one. This, along with macroeconomic changes in Brazil (to be discussed later), has meant that mean monthly family incomes have increased significantly in the neighborhood, from an average of R\$764 in 1991 (expressed in Brazilian *reais* standardized to the 2003 value of the currency; one US dollar equals about 2.9 *reais*) to R\$939 ($p < .05$). Persons from the *favela* tended to be exclusively employed as unskilled laborers and domestics, and while many in the new neighborhood continue in these kinds of jobs, variability in occupational status has increased substantially, with some persons working as skilled laborers and in lower-level

white collar jobs. In the following we will refer to this as the lower class neighborhood.

The second neighborhood sampled was a *conjunto habitacional*. A *conjunto* is a different kind of public housing project. In partnership with the local city government, a builder will develop houses on a tract of land on the edge of the city; the *conjunto* studied here was begun in 1988 and consisted of several hundred 3–4 room concrete houses. The houses are then sold to buyers who qualify for low-cost loans on the basis of stable employment. Persons in the *conjunto* tend to work in semi-skilled jobs such as driving a bus or in construction or low-status service jobs. The key, however, is the stability of the employment. A *conjunto* passes from nondescript sameness to variation in housing styles very quickly, as people add rooms (sometimes stories), garden walls, garages, and architectural details to their basic houses. As the *conjunto* evolves, more basic services are added, such as supermarkets, drug stores, and other shops. In this way, the *conjunto* takes on the feeling of a small independent community, and the *conjunto* studied here has grown substantially in this way. As a *conjunto* evolves and its character emerges, it can become attractive to persons employed in higher-status occupations (e.g., teachers). In the following we will refer to this as the working class neighborhood. In the past 10 years, comparing our 1991 and 2001 samples, family monthly incomes have increased from R\$1041 to R\$1301 ($p < .01$).

The third neighborhood sampled was a traditionally middle class area of the city. Early in the century this was a neighborhood created by Italian and Spanish immigrants; now it is an old neighborhood completely engulfed by the city proper. Many streets are still cobbled and the houses present seamless walls to the street. There is a large *praça* or square with a church in the center of the neighborhood, and many shops, bars, and restaurants. In short, this neighborhood has a much more urban feel to it, although it is not in the city center proper. Houses here are larger than in a *conjunto*, and although the economic participation of residents tends to be quite varied, incomes and occupational statuses were substantially higher, at least in the past. People tend to be in business, or to work as lower level managers in factories or the public sector (we will refer to this as the middle class neighborhood). Comparing the 1991 and 2001 samples, monthly family incomes have decreased from R\$1563 to R\$1346 ($p < .05$). The basis for this decrease will be discussed below.

The fourth neighborhood studied was an upper middle class area (as we will henceforth refer to it) of recently constructed houses. The residents are upper level managers, prosperous business persons, and professionals. This happens to be an attractive neighborhood for physicians and related professionals, some of whom have studied and taken graduate and

postgraduate degrees in the United States and Europe. The houses are large, with extensive and well-tended gardens. Comparing 1991 and 2001, monthly family incomes have remained steady (R\$1953 vs. R\$1914, difference statistically non-significant).

So, while these neighborhoods still represent the socioeconomic continuum in Brazil (differences between the neighborhoods in 2001 in family income are highly statistically significant, $p < .001$), it is apparent that they have been differentially affected by macrosocial changes occurring in Brazil. Notable in this regard is that in 1991 there was a significant difference in family income between the working class community (or *conjunto*) and the traditional middle-class community, and in 2001 that difference disappeared.

Methods and results

The research proceeded in two phases. The first phase was the cultural domain analysis, employing both structured and semi-structured ethnographic techniques. This culminated in testing for cultural consensus in the domains of lifestyle and social support, and results from that analysis were used to construct the interview schedule for the second phase of the research, an epidemiologic survey. Data collection and results of data analysis will be discussed for each phase in turn.

Cultural domain analysis

As noted above, one way in which previous research was extended and elaborated was in a more systematic analysis of the cultural domains of lifestyle and social support.¹ In the previous study we relied on key-informant, open-ended interviewing and participant-observation to derive the elements of cultural domains, while in the current study the cultural domain analyses followed a plan of data-elicitation and analysis techniques used in cognitive anthropology, as outlined in Weller and Romney (1988), de Munck and Sobo (1998), and Ross (2004). Different kinds of data were elicited from successive samples of respondents, with a subsequent interview depending on the results of prior interviews. In this phase of the research greater emphasis was placed on sampling respondents who represented important dimensions of variability in Brazil than on achieving a representative sample of the population. To that end, each sample was selected to represent all levels

of education (a proxy for socioeconomic status), age and sex. Particular care was taken to determine if there were class or socioeconomic differences in cultural models, using education as a measure of socioeconomic status (the majority of residents of the poorest neighborhood have a primary school level of education, while those in the working class and middle class neighborhoods have secondary school educations, and in the upper-middle class neighborhood university educations predominate). In what follows we will discuss the cultural domain analyses in general terms; more detail is available elsewhere (Dressler, Borges, Balieiro, & Dos Santos, 2005).

A cultural domain is any organized conceptual sphere of discourse. The domains of lifestyle (*estilo da vida*) and social support (*suporte social*) are topics that can easily arise in spontaneous conversation in Brazil. The prominent elements of lifestyle are consumer goods (*bens de consumo*) and leisure activities (*atividades de lazer*). To investigate the domain, we carried out a series of interviews (with samples ranging between 15 and 30 informants), starting with a free-list to generate items, followed by pile sorts and ranking tasks to understand the principal dimensions of meaning informants employed in talking about the domain. Items ranged from basic domestic items (e.g., owning a house, basic furniture and appliances) to various forms of social participation (e.g., going out with friends, participating in voluntary associations). As we found earlier (Dressler, Dos Santos, & Balieiro, 1996), informants talked about lifestyle in terms of those things truly necessary to live a good life, the latter defined in terms of a basic comfort and not in terms of any sort of conspicuous consumption. We tested for cultural consensus on this dimension in a larger sample ($n = 66$). Respondents rated 33 items in terms of their importance for living a good life (based on their perception of community standards). There was strong consensus among the respondents (eigenvalue ratio = 6.59, mean cultural competence = $.71 \pm .12$). Our respondents had no trouble at all thinking of the material goods and leisure activities along a single evaluative dimension. When intracultural variation was examined in the distribution of cultural competence, significant differences were found between the education groups ($p < .01$), with the least well-educated respondents having the highest competence (.76 for the least well-educated, versus .72 and .63 for persons with secondary and university educations, respectively). Interestingly, the more well-educated respondents were less convinced of the importance of certain items than were the less well-educated, but the differences were only variation in emphasis. The results suggest that there is a cultural model of lifestyle shared across socioeconomic levels (as we also found in our previous research, Dressler et al., 1996). These items describe a coherent domain of lifestyle.

¹The 2001 study provides an extension as well as replication of the 1991 study in that we examined cultural consonance in other cultural domains (including family life, national characteristics, and food); however, the goal of this paper is to replicate previous findings. The other measures of cultural consonance will be examined in other papers.

For social support, the same steps were followed. As the free lists were being collected, it was apparent that people thought in terms of social support as a hierarchy of resort within each problem type; i.e., when confronted with a specific problem, people would first ask one type of person, proceeding next to another, and so on. This appeared so uniform in the interviews that we decided no further exploration (e.g., via pile sorts) of the domain was necessary (and it was consistent with our previous results, Dressler et al., 1997). In the interview for cultural consensus analysis, each respondent ranked seven sources of social support (friends, family, colleagues, church members, counselors, other specialists in the area, others) as potential help in response to eight common problems (e.g., being in debt, family problems). Again, the focus was on community standards, not personal preferences. When analyzed for consensus, there was substantial agreement on these rankings (eigenvalue ratio = 6.53, mean cultural competence = $.67 \pm .14$). There were no differences in cultural competence by age, sex, or educational level. In general, the hierarchy of resort for most problems was from more intimate relationships, principally family and friends, to co-workers and acquaintances, to more formal types of social support (specialists in the area, or professional counselors and physicians).

The cultural domain analyses described thus far are useful for defining the elements and principal dimensions of a cultural model, and for examining cultural consensus. They do, however, provide only a skeletal outline of the domain. As a check on the results, and in order to fill in the culturally prototypical processes that help to organize the domains, we conducted 20 focus group interviews, five in each neighborhood. One focus group was conducted in each neighborhood on each of the cultural domains examined in this research. Discussions were recorded and transcribed, and the transcripts were analyzed using the qualitative analysis program NUDIST. Space precludes even a cursory discussion of these results. In general, the focus group results were consistent with the more structured cultural domain analyses in that the same elements of each domain were discussed and the principal dimensions uncovered in the cultural domain analyses also organized the discussions in the focus groups.

Survey research

To measure cultural consonance at the individual level, and to relate those measures to arterial blood pressure, a survey was carried out in the four neighborhoods. Households were randomly selected from lists of occupied addresses within each neighborhood. Both heads of household (if present) and one child over the age of 18 were invited to participate in the research. In 60% of households contacted at least one individual

agreed to participate, and 71.2% of households contributed more than one respondent. The final sample size was 271 individuals. Interviewers were Brazilian post-graduate students in each area of data collection (e.g., psychology, nutrition) and were trained by the principal investigators.

Each individual in the sample was interviewed four times. The initial interview collected social, cultural, and psychological data. Then each respondent was interviewed twice using a 24-h dietary recall interview. One of these interviews was always on a Monday, while the second was carried out indifferently at other points during the week. The final interview was a clinical interview at which anthropometric measures, arterial blood pressure, and a fasting blood sample were obtained. Blood pressures were measured using a Dinamap Vital Signs Monitor Model 845XT. Five measurements were averaged.

For lifestyle, the same 33 items from the cultural domain analysis were included on the interview schedule. For material goods, individuals were asked if they owned the item. For leisure activities, individuals indicated on a 4-point scale how frequently they participated in that activity (ranging from never to more than once per week). To measure cultural consonance in lifestyle, we selected only those 19 items that were considered to be most important in the cultural consensus analysis. Material goods were reported as dichotomies (present-absent) and we converted the frequencies of the leisure activities to dichotomies by combining “never” and “one or two times per month” to signify low participation, and “once a week” and “more than once a week” to signify high participation. We then counted the number of the 19 most important items that the respondent had/did, and divided by 19, to arrive at a score that varies between 0 and 1.0. Closer to zero indicates that the respondent has/does few of the lifestyle items that are culturally regarded as important, while closer to 1.0 indicates that the respondent does/has most of the items culturally regarded as important.

For social support, precisely the same task was used in the survey as was used in the cultural consensus interview, except that individuals were asked to rank to whom they themselves would turn in response to the eight specific problems. Also, they were asked to rank only their first three or four options of the entire seven options (the entire task proved too time consuming for the survey interview). Responses left unranked were all given a rank equal to the mean rank of the unranked options (this enabled all data points to be used in the calculation of cultural consonance, but made no assumption about the relative unimportance of those sources of support for that individual). To calculate cultural consonance in social support, the correlation was calculated between the rankings for each individual respondent and the cultural consensus rankings. Theo-

retically, this measure could vary from -1.0 (indicating completely opposite rank as the consensus results) to $+1.0$ (indicating precisely the same rank as the consensus results). In fact, this measure varied from $-.25$ to $+.81$. (The derivation of both measures of cultural consonance is discussed more extensively in Dressler et al., 2005).

The standard covariates employed in the analysis include: age (in years), sex (female = 0 and male = 1), and body mass index, calculated as weight in kilograms divided by the square of height in meters.

A number of alternative explanatory variables were included in the analysis. General socioeconomic status was measured by monthly household income (in Brazilian *reais*). A global measure of perceived stress developed by Cohen, Kamarck, & Mermelstein (1983) was included (this measure has adequate reliability in this sample, $\alpha = .79$). The 24-h dietary recalls were converted to nutrient intakes using DietPro 3.0 (2000), a program developed and standardized in Brazil using Brazilian food tables. The two recalls were averaged to stabilize the nutrient intake estimates. The nutrients included in this analysis were sodium (in milligrams) and total fat (calculated as a percent of total calories), along with alcohol intake (in grams).

Results

Descriptive statistics by gender and neighborhood are shown in Table 1. To evaluate the hypotheses regarding cultural consonance, ordinary least-squares multiple regression analysis was used, employing a hierarchical model. All variables except for blood pressure were standardized prior to the analysis, so that the metric regression coefficients can be read as the change in blood pressure associated with a one standard deviation change in the independent variable. First, age, sex and body mass index were forced into the equation. Second, cultural consonance in lifestyle, cultural consonance in social support, and a term representing the interaction of the two variables were entered. This interaction term was calculated in standard fashion by multiplying the two variables together (a cross-product); as noted, these variables had been standardized prior to this calculation. Then, the alternate explanatory variables were allowed to enter on a step-wise basis.

These analyses are shown in Table 2. The interaction between cultural consonance in lifestyle and cultural consonance in social support is statistically significant for both systolic and diastolic blood pressure. The coefficients for the alternate explanatory variables are given in parentheses, because these are the coefficient for that particular variable *if* it were to enter the analysis (entry level was set at the standard default of a .05 significance level). But, after entering the standard covariates and the cultural consonance measures, none

of these variables was strongly enough associated with blood pressure to enter the analysis. It is worth noting that the same results are obtained if the alternate explanatory variables are forced into the analysis along with the standard covariates; that is, there are no significant effects among them, nor do they alter the effects of cultural consonance.²

In order to display the pattern of results, cultural consonance in lifestyle and cultural consonance in social support were broken into tertiles. Fig. 1 shows systolic blood pressure in relation to these categories of cultural consonance (the results are not shown for diastolic blood pressure because there is no difference in the pattern). In general, blood pressure declines with higher cultural consonance, although there is an increase in blood pressure among persons who have both the highest level of cultural consonance in lifestyle and cultural consonance in social support.

Additional analyses

Because these results are a replication of those obtained 10 years earlier, it is instructive to contrast the two sets of data and to carry out some additional analyses. Fig. 2 shows the results from the 1991 study using generally the same categories of cultural consonance as shown in Fig. 1 (the categories are not precisely the same because the measures differ somewhat, but they are close enough to make this comparison useful, at least visually). What is immediately apparent is that mean blood pressures among the persons with the lowest cultural consonance on both measures are not as high in the 2001 study as they were in the 1991 study. Next, the 1991 study displays clearly the two main effects of the cultural consonance variables, while in 2001 the interactive effects are apparent. These interactive effects result primarily from no difference between the low and moderate cultural consonance in lifestyle categories among persons with low cultural consonance in social support; from no difference between the moderate and high categories of cultural consonance in social support overall; and from the slight increase in blood pressure among persons with high cultural consonance overall.

Another interesting comparison involves the proportion of variance accounted for in systolic blood pressure by the cultural consonance variables. Proportion of

²The analysis presented here has a statistical power of .80 in terms of detecting the effect of the interaction of cultural consonance in lifestyle and cultural consonance in social support (which is the level of statistical power conventionally deemed adequate, Cohen, 1977). Inspection of regression diagnostics revealed one case with a large studentized deleted residual and one case with a large leverage value; however, deletion of these cases made no difference in the analyses.

Table 1
Descriptive statistics

	Lower class neighborhood (n = 66)	Working class neighborhood (n = 65)	Middle class neighborhood (n = 71)	Upper middle class neighborhood (n = 69)	Total (n = 271)
Systolic blood pressure	122.9(±17.6)	124.2(±16.6)	122.9(±15.3)	121.6(±16.5)	122.9(±16.4)
Men	124.3(±9.9)	132.2(±17.3)	126.6(±12.9)	128.1(±13.3)	127.9(±13.7)
Women	122.4(±20.1)	119.3(±14.4)	120.0(±16.5)	116.6(±17.1)	119.7(±17.2)
Diastolic blood pressure	76.5(±13.2)	76.7(±12.1)	76.6(±11.4)	77.2(±11.8)	76.8(±12.0)
Men	77.3(±10.2)	83.1(±12.2)	79.4(±10.2)	81.5(±11.0)	80.5(±11.2)
Women	76.1(±14.4)	72.9(±10.4)	74.5(±11.4)	74.4(±11.4)	74.4(±12.0)
Age**	36.8(±10.1)	43.5(±11.5)	41.8(±11.9)	41.5(±12.0)	40.9(±11.6)
Men	37.6(±10.8)	44.4(±11.8)	40.0(±11.4)	42.3(±12.4)	41.2(±11.8)
Women*	36.5(±9.9)	42.9(±11.4)	43.2(±11.4)	41.0(±11.8)	41.0(±11.8)
Sex (% men)	30.3	38.5	43.7	43.5	39.1
Body mass index*	24.7(±5.2)	26.4(±5.7)	25.6(±4.9)	24.0(±4.9)	25.2(±5.2)
Men	24.9(±3.6)	26.7(±4.8)	25.3(±5.2)	25.6(±5.7)	25.6(±5.7)
Women*	24.6(±5.9)	26.2(±6.3)	25.8(±4.6)	22.8(±3.9)	24.9(±5.4)
<i>Cultural consonance</i>					
In lifestyle**	.53(±.10)	.67(±.11)	.64(±.15)	.82(±.08)	.67(±.15)
Men**	.54(±.10)	.68(±.11)	.64(±.13)	.81(±.08)	.68(±.14)
Women**	.53(±.11)	.67(±.11)	.63(±.16)	.83(±.07)	.66(±.15)
<i>Cultural consonance</i>					
In social support**	.41(±.18)	.43(±.20)	.52(±.18)	.57(±.15)	.48(±.19)
Men**	.46(±.16)	.39(±.23)	.56(±.14)	.58(±.18)	.51(±.19)
Women**	.39(±.19)	.46(±.18)	.49(±.19)	.56(±.13)	.47(±.18)
Sodium intake (mg)	2022(±810)	2117(±1020)	2098(±1027)	2023(±823)	2066(±924)
Men	2512(±891)	2552(±1175)	2527(±1281)	2155(±913)	2424(±1092)
Women	1806(±675)	1838(±806)	1765(±609)	1916(±737)	1829(±704)
Fat intake* (% calories)	28.8(±7.1)	31.0(±6.7)	32.8(±7.2)	31.2(±5.5)	31.0(±6.8)
Men	26.9(±7.5)	29.2(±6.6)	32.2(±8.3)	31.0(±5.7)	30.2(±7.2)
Women	29.6(±6.8)	32.1(±6.7)	33.2(±6.3)	31.2(±5.4)	31.5(±6.4)
Alcohol intake* (g)	11.5(±26.0)	15.9(±32.8)	4.3(±11.5)	18.8(±38.9)	12.5(±29.4)
Men	22.2(±36.2)	29.0(±46.1)	7.1(±15.4)	30.9(±53.4)	21.8(±41.0)
Women	6.9(±18.6)	7.8(±16.8)	2.2(±6.6)	9.6(±17.9)	6.6(±15.9)
Perceived stress	10.4(±5.6)	8.0(±5.2)	9.8(±6.1)	8.8(±5.6)	9.3(±5.7)
Men	8.4(±5.2)	7.6(±5.5)	8.6(±5.6)	8.2(±5.1)	8.2(±5.3)
Women	11.3(±5.6)	8.3(±5.1)	10.8(±6.4)	9.3(±5.9)	10.0(±5.8)
Family income (reais)**	939(±522)	1301(±533)	1346(±576)	1914(±237)	1381(±596)
Men**	910(±562)	1276(±581)	1464(±572)	1970(±164)	1458(±612)
Women**	952(±509)	1317(±507)	1255(±569)	1871(±275)	1331(±581)

* $p < .05$, ** $p < .01$ (one-way analysis of variance).

variance accounted for is a useful indicator of the importance of variables, although it must be interpreted cautiously, given that it can be influenced by a wide range of factors, including the reliabilities of the variables and the overall range of variability in the data (O'Grady, 1982). Therefore, it should not be regarded as

some kind of absolute measure of the importance of variables, but rather as a part of the general interpretation of the patterns described in a set of data using multiple regression analysis. In 1991, after controlling for age, sex and the body mass index, the main effects of the cultural consonance variables accounted for 9.5% of

Table 2

Regression of systolic and diastolic blood pressure on cultural consonance in lifestyle, cultural consonance in social support, and covariates (unstandardized coefficients)^a

	Systolic blood pressure	Diastolic blood pressure
Age	4.75**	3.39**
Sex	8.69**	5.94**
Body mass index	4.19**	3.38**
Cultural consonance in lifestyle	−1.75*	−.06
Cultural consonance in social support	−1.05	−.86
Lifestyle × social support	2.51**	1.46*
Sodium intake	(1.45)	(−0.12)
Fat intake	(−0.14)	(−0.34)
Alcohol consumption	(0.58)	(0.69)
Perceived stress	(0.13)	(0.96)
Family income	(−0.43)	(−0.30)
Constant	118.50	73.98
Multiple <i>R</i>	.572**	.550**
Multiple <i>R</i> ²	.327	.303

* $p < .05$, ** $p < .01$.

^aAll variables except for blood pressure were standardized prior to the analysis, so that the above coefficients can be read as the change in blood pressure associated with a one standard deviation change in the independent variable. The standard covariates of age, sex, and the body mass index were forced in as a block, and then the cultural consonance variables were forced in as a block. The remaining alternative explanatory variables were allowed to enter on a stepwise basis. The coefficients in parentheses indicate that none of the variables were strongly enough associated with blood pressure to enter the analysis. The coefficients given are the coefficient for that variable if it had been forced into the analysis. The multiple *R* is for the covariates and the cultural consonance variables only.

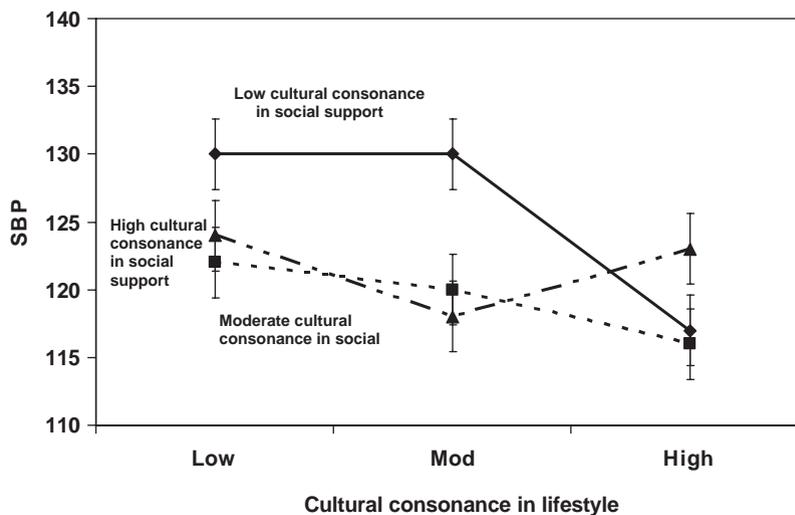


Fig. 1. Cultural consonance and blood pressure in Brazil—2001 study.

the variance in systolic blood pressure; the interactive effects of cultural consonance in lifestyle with skin color (see Dressler, Balieiro, & Santos, 1999) added an additional 3% variance. In 2001, the main and interactive effects of the cultural consonance variables account for 4.5% of the variance in systolic blood pressure. Restricting the analysis only to those

respondents considered to be “white” Brazilians ($n = 236$) increases the variance explained to 5.8%, and further limiting the analysis to persons aged 40 or over ($n = 114$) increases the variance explained to 10.1% (these results will be discussed further below). This pattern of results for this subsample is shown in Fig. 3.

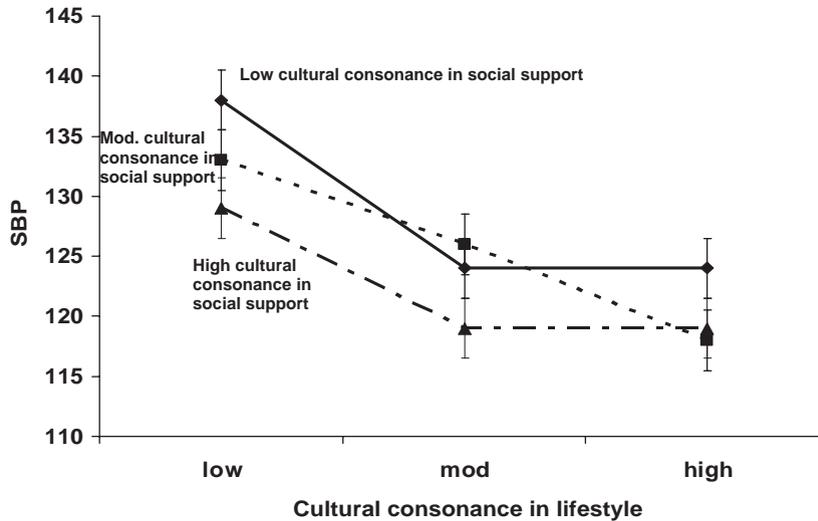


Fig. 2. Cultural consonance and blood pressure in Brazil—1991 study.

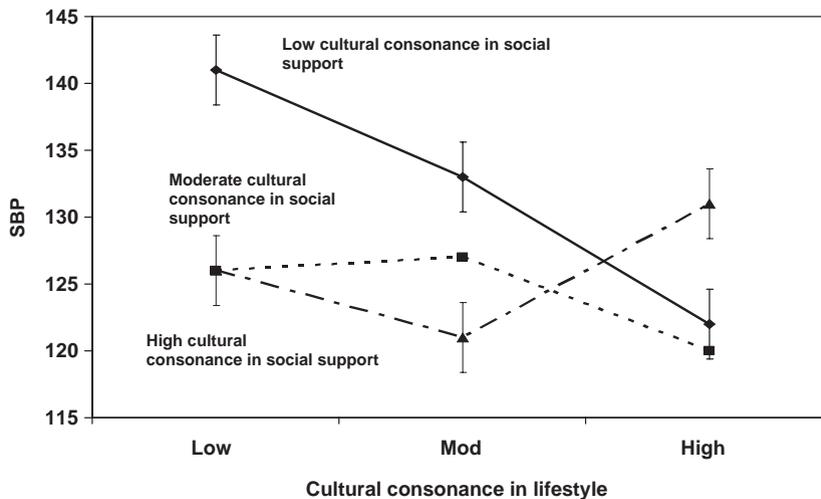


Fig. 3. Cultural consonance and blood pressure in Brazil—2001 study subsample (European-Brazilians >40 years old, see text).

Discussion

The aim of this research was to replicate findings from a previous study. As before, we found cultural consonance in lifestyle and cultural consonance in social support to be potent correlates of blood pressure. Overall, those persons with higher cultural consonance in both of these domains have lower blood pressure, controlling for known concomitants of blood pressure (including age, sex, and body mass index), as well as for competing explanatory variables (including perceived stress and diet).

The measurement of cultural consonance in these two cultural domains in the current study contributes to

confidence in the meaning of the results. More precisely than in previous studies, the measures of cultural consonance used here were developed in the terms and dimensions of meaning that Brazilians use to talk about these cultural domains. Prior studies had worked with existing scales that had been developed out of the amalgam of observation and interviewing characteristic of traditional ethnographic fieldwork. The link between these kinds of observations and the resulting measurement tool can be ambiguous. In the case of the derivation of measures of cultural consonance used here, there is an unbroken empirical chain that leads from the discourse of the members of the community to the quantification of individual behaviors. This deriva-

tion of the measures ensures, probably more effectively than any other approach, that the individual behaviors measured are culturally meaningful. It also decreases the likelihood that the measured variables are really indirect measures of some other factor.

The comparison of the 1991 and the 2001 results are instructive. While the association of cultural consonance in these two domains and arterial blood pressure is generally the same, there are some differences. Blood pressure is not as high in the lowest categories of cultural consonance in 2001 as it was in 1991, and, for the sample as a whole, a lower proportion of the variance is allocated to the cultural consonance variables in 2001 than in 1991. These two differences can be understood in terms of the changing socioeconomic circumstances in the neighborhoods in the intervening ten years. Some of these changes have already been described for the poorest neighborhood. That neighborhood lost some of its poorest members. This opened up houses for purchase by persons from other areas who had the resources to buy houses there (but not elsewhere). There also has been real growth in incomes over the intervening years for poorer segments of Brazilian society. The *Plano Real*, an economic plan to stabilize Brazilian currency and end hyperinflation, was introduced shortly after we completed data collection in 1993. By using the US dollar as the new currency's (the *real*) standard, and by artificially maintaining a 1:1 exchange rate (which continued until the global fiscal crisis of 2000), inflation in Brazil was tamed. This meant real income growth, especially within the lower-income population, not primarily as a function of rising wages but rather because lower inflation made their incomes go farther (Averbug, 2002; Rezende, 1998). This in turn made more of the culturally-valued lifestyle elements available to the lower class group, as well as increased the economic resources upon which entry into systems of mutual social support can depend. In other words, becoming more culturally consonant became possible for more people.

At the same time, the success of the *Plano Real* depended on a tightening of federal spending. This meant a gradual reduction of entitlements (in employment tenure, guaranteed wage increases, and retirement benefits) that differentially affect the middle class (Luz, Mendonça, & Brandão, 2002). Thus, comparing our 1991 and 2001 samples, we see increases in family incomes and cultural consonance in lifestyle across all of the neighborhoods, *except* in the traditionally middle class neighborhood.³

³The comparative data on income were presented earlier. Data for cultural consonance in lifestyle can be roughly compared, although not precisely, because the same items were not used in the two scales. Nevertheless, in the poorest neighborhood, cultural consonance in lifestyle increased from

What this amounts to, in other words, is a gradual increase in economic resources for most people, but with a middle class squeeze. A result of this, in statistical terms, is a restriction in the range of variation in cultural consonance, as some people become more, and others less, able to act on their shared cultural models (Fern & Monroe, 1996, p. 97). Restricting the range of variation in the data leads directly to a reduction in the variance explained by the variables most affected by that range restriction (Achen, 1982; O'Grady, 1982). Therefore, while the associations of cultural consonance and blood pressure are highly significant in the 2001 data, and the magnitude of the blood pressure differences are quite large (on the order of 12 mm Hg of systolic blood pressure comparing the lowest and highest tertiles of cultural consonance in lifestyle and social support combined), the variance accounted for is smaller as an indirect result of macrosocial processes.

The specific nature of this range restriction, involving as it does a middle class squeeze, may also help to account for another slight anomaly in the data. There is an odd increase in blood pressure among persons who are highest in cultural consonance in lifestyle and in cultural consonance in social support. The commitment to the social support system, and to the reciprocal obligations entailed in the system, is a powerful one in the middle class in Brazil. At the same time, the middle class in Brazil is powerfully committed to its lifestyle (O'Dougherty, 2002). The economic squeeze on the middle class may make these competing motives more difficult to reconcile for some persons, leading to a particular kind of middle class stress that is evident in blood pressure.

The results of the 2001 study may also have been altered by changes affecting the Afro-Brazilian respondents in these neighborhoods. Brazil is a racially-stratified society, although the number of categories used and the assignment of individuals to particular racial categories is very fluid, as demonstrated in Harris's (1970) classic early work on the topic. In two previous papers, we found that the association of darker skin color in Brazil with higher blood pressure was a socioculturally-mediated, as opposed to biologically-mediated, process, in which darker-skinned persons who demonstrated greater cultural consonance in turn had blood pressures as low or lower than lighter-skinned persons (Dressler, 1991b; Dressler et al., 1999). These results suggest that the association of skin color and

(footnote continued)

.37 in 1991 to .53 in 2001; in the working class the corresponding figures are .64 and .67; for the middle class neighborhood cultural consonance in lifestyle was .71 in 1991, declining to .64 in 2001; and, in the upper middle class neighborhood, cultural consonance in lifestyle remained steady at .82.

blood pressure is an artifact of how skin color in a racially-stratified society can limit life chances (James, de Almeida-Filho, & Kaufman, 1991).

In 1991, about 20% of the sample was Afro-Brazilian,⁴ and all but three of these individuals lived in the *favela*. In 2001, only about 10% of the sample was Afro-Brazilian. Where did the Afro-Brazilians go? We surmise that Afro-Brazilians were overrepresented among those persons leaving the poorest neighborhood and returning to other *favelas*, due primarily to the marginal economic position of darker-skinned persons in Brazilian society. Afro-Brazilians would have been at greater risk with respect to attaining the measure of economic stability required to remain in the new neighborhood.

This again affects the range of variability in the data. In the 1991 data, we could estimate a component of variance associated with the interaction of cultural consonance and skin color because there was a sufficient sample of darker-skinned Brazilians for that estimate to be valid. In the 2001 data, however, due to the small number of Afro-Brazilian respondents, this component of variance cannot be estimated. Instead, the small number of darker-skinned Brazilians contribute variation in blood pressure that, in essence, cannot be accounted for in this sample. For this reason, excluding Afro-Brazilians from the sample improves the fit of the

statistical model (and in fact leads Fig. 1 to resemble Fig. 2 more closely).

Finally, the greatest amount of blood pressure variance associated with cultural consonance is found among persons over 40 years of age. The mean blood pressure differences between categories of cultural consonance are correspondingly larger (with differences nearing 20 mm Hg) in this age group. This was examined because of Henry and Cassel's (1969) suggestion that this lack of consonance should demonstrate a larger effect over time. There are probably two aspects to the effects of cultural consonance. We argued earlier in this paper that cultural consonance in these two domains is associated with social interaction. In essence, lifestyle represents social distinction in mundane social interactions, while social support represents affiliation, two dimensions of social interaction that are probably phylogenetically old in our species. Individuals seen by others to be more marginal on these dimensions probably enjoy less satisfying mundane social interactions. At the same time, individuals who are lower in cultural consonance no doubt experience a persistent feeling of being shut out in one's own society that is likely to be stressful. And, indeed, lower cultural consonance in lifestyle and cultural consonance in social support are associated with higher perceived stress, more depressive symptoms, and a lower sense of control in life (Dressler, Balieiro, & Dos Santos, 2002). Both of these effects will be compounded over time. Arline Geronimus (1992) uses the concept of "weathering" to describe how stressful events and circumstances, persisting over time, can lead to sustained strain in psychological and physiologic systems. This process may be operating here. Individuals who are, in a real sense, at the fringes of the space of cultural meaning framing mundane social interactions will have that cultural marginality demonstrated to them, consciously and unconsciously, in large and small ways, over decades. It is this cultural weathering that may ultimately take its toll on health.

It is interesting, too, that this process of cultural weathering is not mediated by psychological distress (which is consistent with all of our previous findings). Neither perceived stress nor other psychological variables mediate the association of cultural consonance with blood pressure. It may be that, as far as psychophysiological responses to cultural consonance are concerned, there is a distinct somatic mode of attention, in which the body "understands" the lack of cultural consonance in a way that the mind does not (see Csordas, 1993; Oths, 1999).

Including, these results show that the association of cultural consonance and arterial blood pressure can be replicated after a period of ten years, using more precise methods. It is worth noting once more the value of long-term fieldwork in medical anthropology,

⁴Space precludes an extensive discussion of race and ethnicity in Brazil. "Afro-Brazilian" is used here to describe darker-skinned Brazilians, to whom the terms *moreno* or *pardo* (both can be glossed "brown") or *preto* or *negro* (both glossed "black") would be applied. But, Afro-Brazilian is a term rarely encountered in everyday speech in Brazil, except among academics or the politicized. Furthermore, in some areas of Brazil, lumping *morenos* or *pardos* under the category of Afro-Brazilian would be questionable, although it makes sense in smaller Paulista cities because of the relatively smaller number of darker-skinned persons in the South of the country. In our previous research, we used direct observer ratings by the nurse taking the blood pressures to classify persons. In each of those studies about 20% of the sample was classified as *pardo* or *preto*, a figure roughly consistent with Brazilian census data for the state of São Paulo. We used the same observer rating here, with about 10% of the sample classified as *pardo* or *preto*. But, given the ambiguity in the assignment of persons to skin color categories (Harris, 1970), our immediate concern was that there was observer error. We had other research assistants re-classify respondents, and although there was substantial agreement among the ratings (Kendall's $\tau = .70, p < .001$), this did increase the proportion of Afro-Brazilians to 14%; however, we are continuing to use the original observer ratings because using the second set made only a slight difference in the results, and because the first observer was the only one to see and rate every person in the sample. While the exact numbers may change depending on who is the observer, we believe that we have identified a basic social process influencing the results.

coupled with a mixed qualitative–quantitative methodology, for understanding biocultural processes. The comparison of the two sets of data across the span of 10 years helps us to recognize the changes in the range of variability in the 2001 data and, more importantly, to understand the social processes that underlie those changes.⁵

With this replication, we now have three examples of the combined and interactive effects of cultural consonance in lifestyle and cultural consonance in social support on arterial blood pressure. These studies all demonstrate the importance of cultural dimensions of everyday life for health, independent of other social, psychological and dietary factors.

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⁵Gravlee (personal communication) points out, quite correctly, that the comparison of the two time periods offers us the possibility of better interpreting the results, but not of actually testing the inferences made regarding the changes over the two time periods. This would require a true prospective design, in which we actually followed-up the same individuals at two points in time. Longitudinal research can be carried out in a variety of ways, only one of which (sequential cross-sectional surveys) is illustrated here. Each longitudinal design has advantages and disadvantages. Our main point is that research that systematically examines variation over time is extremely helpful in understanding biocultural processes.

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