SOCIAL SUPPORTS, PERCEIVED STRESS, AND HEALTH: THE BLACK EXPERIENCE IN MEDICAL SCHOOL—A PRELIMINARY STUDY

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Black medical students perceived significantly more stressors than white medical students in a predominantly white medical school environment (P=0.001). Black medical students perceived fewer social supports than white medical students, but not significantly fewer (P=0.224). There was no significant difference between mean systolic and diastolic blood pressure levels for the low and high stress groups (P=0.302 and 0.844, respectively). The total degree of perceived stressors did not predict systolic and diastolic blood pressure when controlling for potential confounders (0.05<P<0.1). The interaction of total degree stressors and total degree of social supports did not significantly predict systolic and diastolic blood pressures when controlling for potential confounding variables (P>0.25 and 0.1<P<0.25, respectively).

Research on animals and humans suggests that psychosocial stress and social supports can interact to determine health outcomes under various circumstances. It is thought by some researchers that psychosocial stressors can result in an increased incidence of deleterious health outcomes. If there are adequate social supports available, however, there may be little or no effect of the stressors on health. The association between social supports and stressors may depend on the type of social supports and the individual perception of the stressors.

This study represents a preliminary attempt to determine possible relationships among stressors, social supports, and health outcome. Specifically, the project compares the degree of social supports and perceived stressors of a group of black medical students to that of a group of white medical students who share the same educational environment—a predominately white medical school with few black faculty and administrators. The study also looks at whether the degree of social supports has any positive effect on the interaction between perceived stressors and a specific health outcome—mean systolic and diastolic blood pressure.

For purposes of this study the definition of social supports is taken from Kaplan, Cassel, Gore[1]:

> the 'metness' or gratification of a person's basic and social needs (approval, esteem, succorance, etc) through environmental supplies of social support . . . [and] the relative presence of psychosocial stressor is defined as any external force that increases the susceptibility of the group in question to a host of adverse health outcomes, due to its effects on the social environment or directly on the individual.[1]

REVIEW OF THE LITERATURE

Psychosocial Stressors and Health Outcome

It is easy to maintain animals in a controlled environment and to simplify and manipulate that environment experimentally to produce various health outcomes; this is, of course, much more difficult with human subjects. Ethical and humane considerations limit the degree of experimentation. There are observations and epidemiological studies, however, which suggest that stressful stimuli can lead to overt physical harm to humans and that there is a relationship between the development of illness and the degree of social supports available.

Human societies develop certain cultural standards that represent principles and rules which are accepted as true, valid, and fundamental to the

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maintenance of the society as a cohesive and supportive group. These principles, which usually involve significant events such as birth, marriage, aging, death, and the critical stages of public enterprise, have been termed "cultural canons" by Henry and Ely.[2] These canons are important for the establishment of appropriate support systems in any society. They serve as mechanisms for diminishing the adverse effects of psychosocial stessors. Where there is a breakdown of the canons through isolation, rapid cultural change, social disorganization, etc, the individuals in the society are at a greater risk to be negatively affected by stressful stimuli.

A number of studies support the theory that psychosocial stress is related to disease outcome according to whether there are adequate social supports available. The social support systems intimately relate to the "cultural canons" that are established by a society or cultural group. These canons give the group the principles that are necessary to meet the demands of the environment through a network of social affiliations and customs. A breakdown in this network, perhaps because of migration to different environments or rapid environmental changes, exposes the group to the full force of environmental stresses and increases the likelihood of greater physical and mental illness.

Over 20 years ago Holmes[3] noted that in Seattle, tuberculosis occurred at a higher rate in ethnic minorities who were unaccepted in their residential neighborhoods. This was as true in affluent upper level socioeconomic neighborhoods as in middle and low income areas. The tuberculosis rate was also higher in people who had significant life changes (in marital or occupational status or in place of residence) and lived alone. Rahe et al[4] reported a positive relationship between the incidence of sudden death (myocardial infarction) and high life-change scores among a Finnish population over a six-month period. Significant life changes, whether they involve marriage, occupation, residence, death, or illness of a family member, are related to changes in social affiliations and loss of established buffers to counteract stressful situations.

In a retrospective study, Nuckolls et al[5] looked at complications of pregnancy and the social attributes of a group of women. The study showed that women who scored high on the Holmes-Rahe life change measure and low on the psychosocial asset scale (ego strength, adaptability, marital stability, religious affiliation, extent of family economic and emotional support, social resources in terms of friendship patterns, and extent to which the pregnancy was desired and confidently anticipated) had more complications of pregnancy than those women who scored low on the Holmes-Rahe life change measure and high on the psychosocial asset scale.

Nesser et al[6] attempted a direct examination of the relationship of social disorganization and stroke mortality in the black population of North Carolina. They found that there was a stepwise rise in stroke mortality rates by counties as the counties had increasing levels of social disorganization. Syme and Berkman[7] have suggested that persons in socially unstable and lower class groups have higher morbidity and mortality rates for almost every disease or illness. Cassel[8] asserts that those people who are most likely to be adversely affected by stressful situations are those who have marginal status in society (eg, ethnic minorities), who are likely to be rejected by the dominant majority group, and persons who have high sustained rates of residential and occupational mobility, broken homes, and isolated living circumstances. These groups may be expected to lack the social supports that serve to mitigate the effects of psychosocial stress on health.

Psychosocial Stressors and Blood Pressure

Psychosocial stressors are associated with various types of health problems. Hinkle[9] states that there is no special category of human disease that seems to occur particularly during clusters of stressful situations. Elevated blood pressure, however, is one health variable that has been studied in association with psychosocial stress. Ecological and cross-sectional studies suggest that elevated blood pressure is related to cultural incongruity and changes in social conditions. Gutman and Benson[10] report that environmental conditions requiring continuous behavioral adjustments and social change are perhaps most effective in producing substantial elevations in blood pressure.

The Tokelau Island migrant study[11] has found that migrants who left their native islands, which

are fairly well isolated from Western civilization, and settled in New Zealand have higher systolic blood pressure and borderline hypertension according to their degree of interaction with the European way of life. In a similar study, Scotch et al[12] found that adaptational stress was associated with urbanization of rural Zulu adults and was a significant factor in the high prevalence of hypertension.

Page[13] has stated that when persons from nonwesternized societies assimilate into Western culture, they begin to show a rise in blood pressure with age and a change in serum lipids. Acculturation of such persons into Western culture affects virtually all aspects of their lives—religion, diet, moral and social values, economic status, housing, living conditions, and education. The social supports of such persons' native culture may not protect them from the stressors that are encountered in a new society.

Theories on the Physiology of Psychosocial-Stressor-Induced Elevated Blood Pressure

The studies discussed above offer descriptive evidence that psychosocial stressors are implicated in the development of various disease states, particularly hypertension; however, none of them give any physiologic evidence for this association.

Cassel[14] theorizes that psychosocial stressors are not etiologic agents which lead to certain disease states, but rather that they increase the susceptibility of the organism to pathogenic agents via the neuroendocrine system. In the case of hypertension, Henry and Cassel[15] propose a connection between blocked aspirations, social dissonance, and uncertainty about satisfying behavioral urges and the development of essential hypertension by means of physiological changes initiated by the defense alarm system. Chronic stressful psychosocial stimuli can lead to constant activation of the defense alarm system, which is directly connected to the neuroendocrine system. If this system is chronically stimulated, pathophysiologic changes can eventually occur because of alterations in the normal levels of neuroendocrine transmitters and hormones.

Obrist's[16] research with animals and humans offers support for the Cassel and Henry theories. His studies suggest that the beta adrenergic sympathetic system directly stimulates the myocardium and causes an increase in cardiac output in stressful situations. This increase in cardiac output is associated with an increase in systolic blood pressure, but not in diastolic pressure, which is related to increases in peripheral resistance. (One may speculate, however, that if stress is chronic and the increase in cardiac output is persistent, then the peripheral vascular resistance would eventually increase over time and lead to a chronic elevation of the diastolic blood pressure.) Obrist found that these changes varied with the type of individual and individual psychological responses to stress stimuli. Hyperactive individuals had a much greater response than hypoactive individuals, and the beta adrenergic response was more appreciably evoked and sustained when the subject controlled the stressor with some degree of success. Those individuals who realized that they had no control or felt that the task was too difficult did not experience the sustained activation of the beta adrenergic system.

It is possible that those people who constantly attempt to exert control over a hostile and uncontrollable environment will experience a sustained arousal of the defense alarm system, which will increase their susceptibility to disease because of the constant stimulation of the neuroendocrine system and a constant change in the normal physiologic process. Those people who accept the conditions of the hostile environment and/or have adequate social supports are least likely to be affected deleteriously by the environment.

The Black Experience in the United States and Blood Pressure

Health statistics for the US black population indicate that blacks have higher death rates than whites for the eight major causes of death, including cardiovascular diseases.[17] Correlating these statistics with the black socioeconomic standing in the United States from the period of slavery until the present can lead to the conclusion that blacks have been stressed by uncontrollable and partially controllable factors[18,19] making them more susceptible to disease processes of all kinds, including hypertension. The status of black people has made them susceptible to a large variety of diseases.

A number of studies have reported that the prevalence of hypertension is greater among blacks than whites in the United States.[20-22] There are differences in blood pressure levels and hyper-

tension rates among blacks in various environmental situations; however, Harburg[23] looked at differences in blood pressure among blacks, and between black and white groups from high and low stress census tracts in Detroit. The census tracts were scored for high and low stress based on residential and family instability, crime, population density, and economic deprivation. Blood pressure levels were higher for black men of all ages in the high stress areas, particularly for younger black men (25-39 years). There was no significant difference between the blood pressure levels of white men in the high and low stress areas. In fact, black men in the low stress areas did not have significantly higher blood pressure levels than white men in either the low or high stress areas.

The prevalence of high blood pressure and associated mortality are apparently related to the socioeconomic status of blacks in both rural and urban areas of the United States.[21] There is an inverse relationship between socioeconomic status and blood pressure and hypertension-related diseases. Those in lower socioeconomic strata have higher prevalence of elevated blood pressure, while the converse is true for those in the higher socioeconomic groups. Tyroler[21] states that this relationship also tends to hold in white groups. However, when blacks are compared to whites in each socioeconomic group, blacks have the highest blood pressure levels and hypertension-related mortality and morbidity.

The studies cited suggest that US blacks are at a greater risk for high blood pressure levels and its related problems. There is, however, some indication that while blacks are at a greater risk than whites in all socioeconomic strata and stress areas for developing hypertension, blacks are at less risk when conditions are improved. People who live in social environments conducive to the development of strong social supports and customs, which mitigate the effects of psychosocial stress, are less susceptible to the deleterious effects of stressful stimuli.

Sources of Stress in the Medical School Environment

Studies by Boyles and Coombs,[24] Gottheil,[25] and Funkenstein[26] indicate that the academic and social atmosphere in medical school leads to poor learning experiences and impedes personal development of the medical student. Funkenstein states that the most frequent characterization of medical schools by medical students is as a "dehumanizing experience," resulting from an overwhelming amount of material to learn, sharp competition among students, and faculty who do not treat students as adults.

Becker,[27] Merton,[28] and Funkenstein[29] suggest that ambiguity in medical school is another stressful phenomenon for students. The ambiguity becomes apparent to new medical students trying to orient themselves to the medical school environment and to determine the appropriate directions and emphasis to place on the work presented to them. There is no guide to help them establish learning priorities in the ever increasing amount of materials that are presented in the basic science curriculum, or what materials are necessary for the practice of clinical medicine. There is ambiguity in being isolated in medical school for the first two years with little exposure to other members of the health care team, yet learning that these are people with whom the physician will have to work eventually. The evaluation process merely adds to the already ambiguous situation. The basic science years are filled with standardized tests to evaluate progress, and do not prepare students for the change to subjective evaluations in the clinical years.

Benne[30] describes the socialization process that occurs in the medical school, which integrates the role of the physician into the self-concept of the students. The student learns to think, feel, act, and work as a doctor by observing the faculty and professional staff. Gottheil[31] states that, "Important cues about how a physician is expected to behave are derived from...[behavior] the student sees or does not see in the medical center." The cues may be contradictory to the student's form of reasoning, problem-solving, and methods of dealing with people. Reconciling such discrepancies is likely to be stressful for most students. This difference presents another area of stress for the students.

Students must take an active and independent part in their medical education if they are to become physicians who can solve many of their patients' problems independently. Faculty should encourage this process through example and direct interaction with students, by stimulating problem-solving and thought-provoking educational topics and exercises. Where this approach is lack-

ing, students experience increased stress, particularly as their training nears an end.

While there are stress-inducing problems that are applicable to all medical students, some seem to be unique to certain groups. An unpublished survey of black medical students by the Office of Medical Studies at the University of North Carolina School of Medicine in 1973 noted that for these students the major areas of stress at the medical school were the insensitivity of the medical school environment to the black cultural background, financial problems, lack of black role models who understood their needs, negative faculty attitudes toward black students, and poor academic preparation for medical school. Faculty attitudes and a lack of role models were agreed on unanimously.

Student perception of faculty attitudes also has been identified as a problem for black students in academic difficulty at the University of Rochester School of Medicine and Dentistry.[32] The students perceived that the faculty considered them intellectually inferior to white students and evaluated them differentially.

RATIONALE AND HYPOTHESES

The literature suggests that social support systems are an important means of filtering out the effects of psychosocial stressors on health, yet most of the studies cited do not ascertain to what degree people perceive the stressors and social supports in their environment and how this perception is related to health outcome. Stahl et al[33] theorize that one's perception of stressful stimuli is important for the final effects that the stimuli have on individual health outcome. In other words, what is a stressful stimulus to some may be perceived as non-stressful by others.

This study attempts to compare the perceived stress and social supports of a racial minority group in a predominantly white medical school with that of the racial majority group. If black medical students perceive more stress and fewer social supports, then this information can be used to help improve the environment for black medical students. If both groups perceive the environment to be stressful with few social supports, then environmental changes should be beneficial for both groups, if the changes take into account any problems that are unique to each group—eg, different cultural backgrounds.

The study also attempts to examine the association between perceived stress, social supports, and blood pressure level. Previous studies indicate that the blood pressure levels of blacks tend to be higher than those of whites across age and social strata. This study examines whether there are any differences in the relationship of perceived stress and blood pressure, and whether social supports have any mitigating effect within the two groups. If there are associations, then this study would support the theory that psychosocial stress is associated with adverse health outcomes and that certain environmental buffers such as social supports serve to mitigate this adverse association.

Hypotheses

The study tests the following hypotheses: (1) black medical students perceive more stressors than white medical students; (2) black students perceive fewer social supports at the medical school than white students; (3) the degree of perceived stressors is directly related to the mean blood pressure level; and (4) a high degree of social support counteracts the effects of stressors on the health outcome (ie, those people who have high perceptions of psychosocial stressors and adequate social supports have better health outcomes than those who have the same perception of stressors, but few social supports).

METHOD AND MATERIALS

Subjects

Subjects for this study were volunteers from a first year class at the University of North Carolina School of Medicine at Chapel Hill. There were 160 students in this class (48 women, 112 men), 20 of whom were black (9 women, 11 men). A self-administered questionnaire was passed out to all 160 students one week before the end of classes for the year. Completed questionnaires were returned by 104 students (65 percent), who became the volunteer group. The race, sex, and age distributions of this group are listed in Tables 1 and 2.

Data Collection

The self-administered questionnaire given to each student contained three sections. The first section was designed to obtain socioeconomic data, while the second assessed the perceived so-

TABLE 1. RACE AND SEX DISTRIBUTION

Sex	Race: Black	Race: White	Total (Percent)
Male	10	59	69 (66)
Female	9	26	35 (34)
Total	19 (18%)	85 (82%)	104

TABLE 2. AGE DISTRIBUTION BY RACE AND SEX

Age (years)	Race and Sex: BW	WW	BM	WM	Total (Percent)
21		3	1	3	7 (6.7)
22	3	8	2	15	28 (26.9)
23	1	5	3	17	26 (25.0)
24	2	1		9	12 (11.5)
25	1	3		7	11 (10.6)
26		1	2	2	5 (4.8)
27		1		3	4 (3.8)
28		2		2	4 (3.8)
29		2			2 (1.9)
30			1	1	2 (1.9)
31	1		1		2 (1.9)
33	1				1 (1.0)
Total	**9**	**26**	**10**	**59**	**104**

$\bar{X}_{age}=23.9$
$\bar{X}_{BW}=25.1$
$\bar{X}_{WW}=23.8$
$\bar{X}_{BM}=24.7$
$\bar{X}_{WM}=23.6$
BW=Black women
WW=White women
BM=Black men
WM=White men

cial supports available at school to each participant. The third section measured the number and degree of perceived stressors.

The socioeconomic data consisted of variables that are potential confounders of blood pressure level, including age, sex, height, weight, family history of hypertension, and parental income. A recent study by Tyroler et al[34] has shown a positive association between the level of blood pressure and weight using a quetelet index:

$$\frac{\text{weight (lb)}}{\text{height}^2\text{ (in)}}$$

In another report, Tyroler[21] cites several studies that show a relationship between parent-offspring and sibling-sibling blood pressure levels, as well as studies that find an association between socioeconomic status and blood pressure. Socioeconomic status in this study was determined from parental income.

The social support section of the questionnaire was taken from the House et al study[35] on perceived job stress and social supports in blue collar workers. The items were modified by the investigator to be applicable to the medical school environment.

The questions on the perceived stressors were based on the literature presented above on stress in the medical school environment. Internal consistency analysis was performed on these measures to assess their reliability.

Each student who completed and returned the

TABLE 3. DISTRIBUTION OF MEAN DIASTOLIC BLOOD PRESSURE (DBP) BY RACE AND SEX

DBP (mm HG)	Race and Sex BW	WW	BM	WM	Total
50		1		1	2
53		1		2	3
54	1				1
55	1	1			2
57		1			1
58		3		6	9
59		1			1
60		3	1	1	5
63	1	4		6	11
65		4	1	6	11
67				1	1
68	1	2	1	7	11
69	1				1
70		2	2	8	12
72				1	1
73		1	1	1	3
75	1		1	12	14
78	2		1	2	5
79			1		1
80		2		4	6
83				1	1
88	1				1
95			1		1
Total	9	26	10	59	104

$\bar{X}_{DBP}=67.99$
$\bar{X}_{BW}=79.78$
$\bar{X}_{WW}=64.27$
$\bar{X}_{BM}=73.3$
$\bar{X}_{WM}=68.46$

questionnaire was contacted by the investigator, and arrangements were made to record the student's blood pressure levels. The investigator obtained a systolic and diastolic blood pressure reading from each student in the sitting position and one minute later in the standing position. A Tycos precalibrated portable sphygmomanometer was used to record the blood pressure levels.

Blood pressures of 74 students were taken during the reading period before final examinations during the hours of 8:00 AM to 5:00 PM at the medical school. Four students' blood pressures were recorded at their home during this time. Blood pressures of 25 students were taken the last day of the three-day examination period between 8:00 AM and 5:00 PM at the medical school, and one student's blood pressure was recorded the following day at noon.

The right arm of each student was used to take the pressures. It was not necessary to use different blood pressure cuff sizes. The sitting and standing blood pressure readings were used to obtain the mean diastolic and systolic blood pressure for each student. The first and fifth Korotkoff sounds were used for the measurement of the systolic and diastolic blood pressures, respectively. The frequency distribution of mean systolic and diastolic blood pressures is listed in Tables 3 and 4.

Data Analysis

A total degree of perceived stressors score (TDOS) and a total degree of perceived social sup-

TABLE 4. DISTRIBUTION OF MEAN SYSTOLIC BLOOD PRESSURE (SBP) BY RACE AND SEX

SBP (mm HG)	Race and Sex				
	BW	WW	BM	WM	Total
77	1				1
79		1			1
89	1	2			3
90		2		1	3
92		1			1
93		2			2
94				1	1
95		1	1		2
98	2	3		2	7
99				1	1
100	2	4		4	10
103			1	3	4
105		4		6	10
110	1	4	1	5	11
112			1		1
113			1	1	2
115			2	8	10
118				5	5
120			1	6	7
123	1	1		2	4
125			1	4	5
128		1		2	3
130	1			5	6
133				1	1
135				1	1
138				1	1
140			1		1
Total	9	26	10	59	104

$\bar{X}_{SBP}=110.16$
$\bar{X}_{BW}=102.78$
$\bar{X}_{WW}=100.58$
$\bar{X}_{BM}=114.8$
$\bar{X}_{WM}=118.09$

port score (TSS) were calculated* for each individual who participated in the study. Each TDOS was calculated by adding the scores given to each of the 18 items on the stress section of the questionnaire. The TSS was similarly calculated by adding the scores given to each social support item of the questionnaire. A high TSS and TDOS indicated a high degree of perceived social support and a high degree of perceived stressors, respectively.

*All calculations were made using the Statistical Package for the Social Sciences on an IBM OS/360 MVT Rel 21.8 Hasp II Ver 3.1.

To test the hypothesis that the black medical students perceive more stressors than white medical students, a two-tailed Student T test was used to analyze the difference between the mean TDOS of the black and white medical students. The same method was used to test the hypothesis that the number of perceived social supports is less for blacks than whites at the medical school.

The median TDOS for the entire study group was 17.5. Therefore, a TDOS of 17 or less was considered to be a low perceived stressor score and a TDOS of 18 or more was considered high. Similarly, the median TSS was 38.5, and a TSS of 38 or less was considered high. To test the hypoth-

esis that the degree of perceived stressors is directly related to the mean blood pressure, the study group was divided into a high-stress and low-stress group by using the above criteria for high and low TDOS and TSS. The Student T test was used to test the difference in mean diastolic and systolic blood pressure between the high stress and low stress groups.

To test the hypothesis that a high degree of social supports counteracts the effects of stressors on the blood pressure level, the subjects were redivided into a group with high TDOS and high TSS and a group with high TDOS and low TSS. The Student T test was also used to test the difference in mean systolic and diastolic blood pressure between these groups.

Regression analysis was used to determine if TDOS significantly predicts diastolic and systolic blood pressure level, while controlling for the potential confounders: sex, race, age, quetelet index, family history of hypertension, and parental income. Regression analysis was also used to determine if the interaction of TDOS with TSS significantly predicted systolic and diastolic blood pressure level when the above variables were controlled along with TDOS and TSS.

In the opinion of the investigator, improving social supports and decreasing stressors should have a positive effect on the student body even if there is no true significant difference in the perception of stressors and social supports among black and white medical students. Therefore, the significance level was set at a = 0.1.

RESULTS

The reliability coefficient a's for the social support and stressor sections of the questionnaire were 0.85856 and 0.84647, respectively. These results are relatively high and suggest that these instruments have good internal consistency.

The mean TDOS for blacks was significantly higher than the mean TDOS for whites, 25.7895 compared to 18.0585 (P=0.0010). The TSS for blacks was lower than the TSS for whites, but not significantly lower, 36.0 compared to 39.30 (P=0.224) (Tables 5 and 6).

There was no significant difference between mean systolic and mean diastolic blood pressure levels for the low and the high stress groups. The mean systolic blood pressures for the low and high TDOS groups were 111.3654 mmHg and 108.5 mmHg, respectively (P=0.302). The mean diastolic pressures were 67.8269 mmHg and 68.1538 mmHg, respectively (P=0.844).

The mean systolic blood pressure for the group with a high TDOS and a low TSS was 107.8571 mmHg, compared to 109.333 mmHg for the group with a high TDOS and a high TSS (P=0.727). The mean diastolic blood pressure for the former group was 69.50 mmHg, compared to 66.5833 for the latter group (P=0.243).

TDOS did not significantly predict mean systolic and diastolic blood pressures when using regression analysis after the potential confounders (race, sex, age, quetelet index, family history of hypertension, and parental income) were controlled. The F values of TDOS for systolic and diastolic blood pressure were 3.870 and 3.462, respectively (df 1,96, $0.05<P<0.1$). Sex did significantly predict systolic blood pressure ($F=11.336$, df 1,96, $0.001<P<0.005$), but not diastolic blood pressure ($F=1.608$, df 1,96, $P>0.25$). Race did not significantly predict blood pressure; however, the F value and significance level of race in predicting diastolic blood pressure were comparable to that of TDOS ($F=3.811$, df 1,96, $0.05<P<0.1$). None of the other potential confounders of blood pressure level significantly predicted systolic and diastolic blood pressure.

The interactions of TDOS with TSS (TDOS-TSS) did not significantly predict systolic and diastolic blood pressure. The F value of TDOS-TSS for systolic blood pressure was 0.218 (df 1,94, $P>0.25$), compared to an F value of 2.611 (df 1,94, $0.1<P<0.25$) for diastolic blood pressure. Sex and quetelet index did significantly predict systolic blood pressure. The F value for sex was 11.164 (df 1,94, $0.001<P<0.005$) and the F value for the quetelet index was 4.379 (df, 1,94, $0.025<P<0.05$). None of the potential confounders significantly predicts diastolic blood pressure; however, the F value for race was comparable to the F value for race in predicting diastolic blood pressure before the interaction of TDOS-TSS was considered ($F=3.941$, df 1,94, $0.05<P<0.1$).

DISCUSSION

Reliability of Stressor and Social Support Questionnaire

This study has sought to measure the perceived social supports and stressors of black and white

TABLE 5. DISTRIBUTION OF TDOS BY RACE AND SEX

	Race and Sex				
TDOS	**BW**	**WW**	**BM**	**WM**	**Total**
3		1			1
4				1	1
5				1	1
6				2	2
7				2	2
8				1	1
9		1		4	5
10		1		5	6
11				2	2
12	1	3		1	5
13				3	3
14		1		3	4
15		1	1	4	6
16		3	2	4	9
17		3		2	5
18		1		3	4
19		1		1	2
20	1				1
21		1	2	4	7
22		1		2	3
23				1	1
24	1	1	1	3	6
25	1			1	2
26	1			2	3
27			1	2	3
28		1		1	2
29			1		1
30				2	2
31		1		2	3
32	2	1			3
33			1	1	2
35	1	1			2
37		1			1
38		1			1
39	1	1			2
43			1		1
Total	9	26	10	59	104

$\bar{X}_{TDOS}=19.47$
$\bar{X}_{BTDOS}=25.79$
$\bar{X}_{WTDOS}=18.06$

medical students in a predominantly white medical school with few black faculty, administrators, and students. The main objectives were to discover if there were any differences in the perception of social supports and stressors between the blacks and whites, to see if the mean blood pressure of the group perceiving greater stress (high TDOS) was higher than the blood pressure of the group perceiving lower stress (low TDOS), and to see if the group perceiving greater stress and few social supports (high TDOS, low TSS) had a higher blood pressure than the group perceiving greater stress and many social supports (high TDOS, high TSS).

For the sake of accurate conclusions, it is important that the instruments used to measure stressors and social supports are accurate and measure what they are intended to measure. This generally requires that an instrument be reliable

TABLE 6. DISTRIBUTION OF TSS BY RACE AND SEX

	Race and Sex				
TSS	**BW**	**WW**	**BM**	**WM**	**Total**
11			1		1
14		1			1
18				1	1
20		1		1	2
22		1		1	2
23	1				1
24			1		1
25		1		1	2
26				1	1
27				1	1
28		2		1	3
29				2	2
30	1				1
31	1		1	1	3
32			1	1	2
33		1		1	2
34		2	1	1	4
35	1	1	1	4	7
36		3	1	6	10
37	1	1		1	3
38				2	2
39	1	1		2	4
40			1	2	3
41				4	4
42		3		3	6
43			1	1	2
44	1			2	3
45				2	2
46				1	1
47		2		4	6
48	1	1		2	4
49		1		1	2
50				4	4
51				1	1
53		2			2
54		1		1	2
55			1	3	4
56	1				1
57		1			1
Total	9	26	10	59	104

$\bar{X}_{TSS}=38.62$
$\bar{X}_{BTSS}=36.00$
$\bar{X}_{WTSS}=39.20$

and consistent; in other words, that it measures with little or no error, that the results are reproducible, and that the items on the instrument are homogeneous.

The items used on the stressor and social support scales were chosen after examination of the literature and consultation with medical school faculty, students, and administrators, thus giving them face validity. There has been no repeat administration of the instrument, so there is no guarantee that the results are reproducible; however, the a-coefficients of 0.85856 and 0.84547 suggest that the instrument did have good internal consistency.

TDOS and TSS of Black and White Medical Students

In this study black medical students had higher perceived stressor scores than white medical students. This finding supports the first hypothesis of the study. It is likely that a minority group would experience more stress in an environment composed predominantly of a majority group of different social and cultural background. Reasons for this perception of stress might be related to cultural dissonance, lack of role models, or feelings of insignificance. The pressure of such stressors might well result in interference with academic performance as well as in lowered self-esteem. The specific nature and source of the perceived stressors would need to be determined before action could be taken to remove the stressors.

While the black students had higher perceived stressor scores, their perception of social supports did not significantly differ from white medical students in this study. The TSS of the blacks was lower than that of the whites (36 compared to 39.2), however. Even though the blacks perceived more stressors, they had apparently managed to find fairly adequate social supports to help filter out the effects of the perceived stressors. It would be interesting to investigate the sources of social supports utilized by the black students. It is possible that these sources are different than those utilized by whites. If black students are shown to rely on each other and on sources outside of the medical school, an imporvement of social supports within the school may be important for black students.

TDOS/TSS and Blood Pressure

There were no significant differences in systolic and diastolic blood pressure among the high and low stress groups. Neither were there significant differences in diastolic and systolic blood pressure levels for the group with high TDOS and high TSS compared to the group with high TDOS and low TSS. This should not, however, be taken as a refutation of the study's general working hypotheses that the degree of perceived stressors is directly related to the mean blood pressure level, and that a high degree of social supports counteracts the effects of stressors on health outcome. The subjects of this study were young men and women (mean age 23.9 years) who were health conscious and relatively active physically; this could possibly account for similarities in blood pressure levels. First year medical students may not have been exposed to the known stressors of medical school long enough to have significant physiological manifestations. Of course, the stressors of medical school may make the students susceptible to a variety of health outcomes; therefore, a specific outcome such as blood pressure elevation may be too limited to measure stress differences significantly.

Blood pressure elevation was chosen as the health outcome to be measured in this study because of its known relationship to stress and because of the relative ease with which it can be measured. The method of recording the pressures, however, must be considered as a possible factor contributing to the lack of significant differences. There is no interobserver bias as all readings were taken by the investigator. While the investigator may have selectively rounded off the values of the recordings, such an error would be distributed throughout the study group and would probably not affect the blood pressure data differentially for either group. More importantly, the recordings were not taken at the same time of day, on the same day, in the same location, or during the same time of the examination reading period.

TDOS and TSOD-TSS did not significantly predict either systolic or diastolic level when regression analysis was performed with the potential confounders controlled. Therefore, one can reasonably conclude that TDOS and TDOS-TSS were not related to blood pressure level in this study group. Higher order terms and different models were not examined; however, a more rigorous analysis may find a significant association between TDOS, TDOS-TSS, and blood pressure.

Suggestions for Future Research

This investigation should be considered a preliminary study only. Clearly, it is not complete enough to discount a significant relationship between stress in medical school and deleterious health outcomes, and possible beneficial effects of social supports. It is important that the sources of perceived stressors and social supports in medical schools be determined, so that changes can be made to render the environment more conducive to success for all medical students. The social support and stressor instrument used in this study should be more rigorously tested and modified to

assure its precision and accuracy. A larger group more representative of the general academic population should be studied; if significant differences do exist between high and low stress groups, then they may be more evident with a larger study group.

Accurate assessment of the perceptions of stressors and social supports of people in various life situations and their possible effects on health has important implications for the quality of life. A decrease in stressors and improvement of social supports may improve productivity as well as health outcomes. More extensive research might examine the change in health and productivity of groups of people in environments in which there has been conscious effort to increase social supports and to decrease stressors.

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