Depression and Somatic Symptoms Among Two Ethnic Groups in Israel: Testing Three Theoretical Models

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ABSTRACT

Introduction: This study examined three theoretical models of the relationship between depressive symptoms and somatic complaints among Bedouin Arab and Jewish college/university students in Israel. The functional model suggests that somatic complaints may precede depressive symptoms; the affect-dysregulation model suggests that depressive symptoms may precede somatic complaints; and the sociocultural model suggests that depressive symptoms are strongly linked to somatic complaints mainly in Western cultural contexts.

Method: One hundred and ninety individuals participated in the study, including 89 Bedouin Arab students and 101 Jewish students. Two assessment waves, one year apart, were employed. Participants completed measures regarding depression, somatic complaints and demographics.

Results: Bedouin Arabs reported higher levels of both depression (Time 1 and Time 2) and somatization (only Time 1) as compared to Jewish students. A multiple-group, cross-lagged SEM analysis provided support for the functional model among the Bedouin Arab and Jewish student: Somatic complaints prospectively predicted depression in both groups. However, support for the affect-dysregulation model was found only among the Bedouin Arab students, among whom depression prospectively predicted somatic complaints.

Conclusions: This study highlights cultural/ethnic similarities concerning the functional model and the cross-sectional associations between depression and somatization. However, these findings also underscore ethnic differences concerning the affect-dysregulation model.

INTRODUCTION

A high prevalence of depressive symptoms and somatic complaints has repeatedly been found among college/university students. Over the past 15 years, the incidence of depression has doubled among the college/university student population, with depression affecting 36% of male college/university students in the U.S. and 45% of females in that population, to the point that they found it difficult to function (1). The prevalence of somatic complaints among college students ranges from 15 to 60% (2). The prevalence of these mental health problems (depression and somatization) is particularly noteworthy among Arab young adults. For example, in Israel, the incidence of depression among the Arab minority has been shown to be almost three times that observed among the Jewish population. This difference between these populations is significant at most demographic and socioeconomic strata. Moreover, the Israeli National Health Survey of 2003–2004 found more expressions of emotional distress among Arabs, as compared to Jews (2-5).

The demographic composition of Israeli society provides a great opportunity to examine depression, somatization and their relationships in several different
cultural and ethnic contexts. The current study seeks to examine the cross-sectional and prospective relationships between depression and somatic complaints. We tested these relationships while considering three theoretical models — functional, affect-dysregulation and sociocultural — in two different cultural contexts (Bedouin Arab and Jewish).

Bedouin Arabs comprise 3.5% of the population of Israel and number about 300,000. This society has undergone a rapid process of transition, which has had effects in the cultural, social and financial domains. This process has sometimes clashed with the society’s cultural heritage (6). The majority of Bedouin Arabs (about 230,000) live in southern Israel (7) and this group is characterized by a young population (over 60% are under age 19) and high levels of poverty (6). Bedouin Arab society also differs from Jewish Israeli society in terms of language, religion, and other cultural characteristics (8). Bedouin individuals are part of a minority culture that is highly collectivistic, patriarchal and authoritarian, and differs greatly from the Jewish Israeli culture in terms of its emphasis on collectivistic values (9). Jewish individuals are part of the majority culture that emphasizes separation, independence, personal development and achievement more than Bedouin Arab society (10, 11).

Depression is a common mental health problem (12). In recent years, the incidence of depressive symptoms has been increasing among college students. A recent study has shown that, in Israel, Bedouin Arab students report higher levels of depression than Jewish students. The depression average scores of Bedouin Arab students exceed the cut-off point of 16, indicating a risk for clinical depression (3). Previous research has repeatedly shown that women are twice as likely as men to have high scores on self-report measures of depression symptom (13).

Somatization is the translation of emotional distress into physiological symptoms that have no identifiable physical cause (14). Somatization is widespread and studies have demonstrated its prevalence across cultures (15, 16). The tendency for individuals to somatize distress is commonly observed in countries with non-Western collectivistic cultures, such as Arab countries (17, 18). The prevalence of somatic complaints among college students in the United Kingdom was 15% to 39% (for gastrointestinal complaints and pains/aches, respectively). However, the rates of these somatic complaints were higher among college students in Egypt (22% for gastrointestinal complaints and 60% pains/aches) (2). Houghton et al. (19) found that females reported significantly higher levels of symptoms of somatization and depression, as compared to males.

**DEPRESSION–SOMATIZATION COMORBIDITY: THREE THEORETICAL MODELS**

Depressive symptoms and somatization are strongly associated with one another (20). Barkow and colleagues (21) studied the relationship between somatic complaints and depressive symptoms in primary health care settings in several countries across five continents. They found that the presence of non-medically explained back pain increased the likelihood of depression being present. Moreover, somatic complaints have been shown to be related to a greater prevalence of depression (22).

Three models related to the nature of the cross-sectional and prospective relationships between depressive symptoms and somatic complaints describe these relationships in three different ways: (a) according to the functional model, somatic complaints precede depressive symptoms; (b) according to the affect-dysregulation model, depressive symptoms precede somatic complaints; and (c) according to the sociocultural model, depressive symptoms are strongly linked to somatic complaints in Western cultural contexts, but this association is weaker in non-Western cultural contexts.

**THE FUNCTIONAL MODEL**

This model suggests that somatic complaints may precede depression (23). Bodily symptoms with unknown physical pathology have a great impact on individual functioning. Individuals suffer greatly from such symptoms and their quality of life is negatively affected (24). An analysis of the literature on the inter-relationship of somatization and depression yielded two basic conclusions: (a) somatic symptoms appear, in general, to be strongly associated with depression, and (b) the extent of somatic complaints and their effects on quality of life are the strongest predictors for the subsequent development of depression (25). It is likely that functional impairments (e.g., lower quality of life, decreased work function and increased utilization of health care services) greatly increase the risk of depression among individuals with somatic complaints (26). Kroenke et al. (27) found the number of physical symptoms present to be highly predictive of mood disorders and functional impairment. Overall, the presence of any physical symptom approximately doubled the likelihood that the patient had a mood disorder.

More support for this model has been obtained from several longitudinal studies which found that somatic
complaints may be an early symptom of depression or, at least, precede the manifestation of full-blown depression. For example, a study found that the presence of multiple somatic pain complaints at the baseline time-point had a direct effect on the risk of developing a depressive disorder by the time of a follow-up survey one year later (28).

THE AFFECT-DYSREGULATION MODEL
This model suggests the reverse relationship, that is, that depression may precede somatization (29, 30). Depression may exacerbate the pain and distress associated with physical health problems and may also adversely affect health outcomes. A study found that depressive symptoms increase the tendency to amplify somatic distress, as well as difficulties in identifying and communicating emotional distress (26).

There is evidence to suggest that depression can be a risk factor for the onset of somatic complaints. One study showed that subjects with depressive symptoms at a first assessment were more than twice as likely to have developed musculoskeletal pain eight years later, as compared with individuals who did not report any depressive symptoms at the first assessment (31). Another study found that the presence of major depression was a predictive factor for the onset of new headaches in young adulthood independent of whether or not subjects had suffered from headaches previously (32).

Overall, this model states that depressive symptoms at the baseline assessment will predict the levels of somatic symptoms among Bedouin Arab and Jewish students one year later.

THE SOCIOCULTURAL MODEL
Kleinman (33) proposed that when a culture values indirect somatic idiom of distress and discourages psychological idiom, somatization will serve as an expression of and a means of coping with distress. Therefore, somatization in those cultures is “a presentation of personal and interpersonal distress in an idiom of physical complaints together with an adaptive coping pattern of help-seeking” (33, p. 51).

Somatization in such a cultural context can yield constructive outcomes such as increased social support (33). Conversely, in the Western cultural context, distress is expressed and managed in psychological terms. Consequently, Kleinman (18) revealed that people in Western cultures have less experience in utilizing somatization as a coping style and thus direct those experiencing somatization to activities that have a primary goal of relieving bodily symptoms, such as seeking help from medical professionals.

According to the sociocultural model, culture influences the presence or absence of the adaptive value of somatization (18, 34, 35). Thus, in a collectivistic, non-Western cultural context (e.g., among Bedouin Arabs), somatic complaints will be adaptive, and we would expect to find a weak association between somatic complaints and depression. However, in an individualistic Western cultural context (e.g., among Israeli Jews), somatic complaints will be maladaptive and we would expect to find a strong cross-sectional association between somatization and depressive symptoms.

THE CURRENT STUDY
We designed a two-wave longitudinal study to test the predictions of the functional, affect-dysregulation and sociocultural models concerning the prospective relationships between depressive symptoms and somatic complaints among Bedouin Arab and Jewish students. Freshmen university/college students completed the self-report questionnaires in their native language (either Hebrew or Arabic) during the first month of their first academic year (Time 1) and again 12 to 14 months later (Time 2). The measures were designed to measure depressive symptoms, somatic complaints and demographics.

METHODS
PARTICIPANTS
Two hundred and seventeen students participated at Time 1 (110 Jewish student and 107 Bedouin Arab students). Attrition rates were 17% (18 students) and 8% (9 students) among the Bedouin Arab and Jewish students, respectively. Reasons for student attrition from the current study included students having left the university (9%, 2%); students having moved and changed their phone numbers, meaning that they could not be contacted (4%, 4%); students having transferred to a foreign university (2%, 0%) and students refusing to participate at the second survey time (2%, 2%), among the Bedouin Arab and Jewish students, respectively. Cross-tabulation analyses were conducted to examine the relations between attrition and demographic variables, culture, and gender. We found a statistically significant relationship between attrition status and culture: $\chi^2 (1, 216) = 4.39, p < 0.05$. More of the Bedouin Arab students dropped out of the study, as compared to the Jewish students. However, we did not find any statistically significant relationship
between attrition status and gender: χ²(1, 216) = 0.12, ns.

At Time 2, 190 individuals remained in the study, including 101 Jewish students with a mean age of 22.04 years (SD = 1.41) and 89 Bedouin Arab students with a mean age of 21.35 years (SD = 1.21). According to chi-square tests, significant differences between the two groups were found related to gender and parents’ education. Although both samples had a predominance of women participants, it was found that the proportion of women in the Bedouin Arab sample (70%) was higher than the proportion of women in the Jewish sample (54%). Moreover, group differences were also found in terms of fathers’ and mothers’ education. About half of the Bedouin mothers had not had any formal education and only 1.9% had earned a nonacademic diploma. In contrast, 29.6% of the Jewish mothers had a high school education (without any higher education) and more than half of them had earned a nonacademic diploma or academic diploma (52.5%). Similar differences were observed between the two samples for fathers’ education. A complete description of the demographic characteristics of the study population is presented in Table 1.

### PROCEDURE

The study began once approval was granted by the Ethics Committee of Ben-Gurion University of the Negev. At Time 1, participants completed the CES-D, PHQ-15, and demographic questionnaire. At Time 2, they completed the CES-D and the PHQ-15. At both Time 1 and Time 2, students also completed additional questionnaires regarding personality vulnerabilities, social support, coping strategies and adaptation to academic life (i.e., Depressive Experiences Questionnaire [DEQ, 36], Social Support Questionnaire-6 [SSQ-6, 37], MOS Social Support Survey [MOS, 38], Brief Coping Orientations to Problems Experienced Inventory [Brief COPE, 39], Ways of Coping Scale – Revised [WOC-R, 40], and the Student Adaptation to College Questionnaire [SACQ, 41]) The participants were informed that the purpose of the present study was to further understand their experiences and emotions during their studies at the university/college. At the end of the second wave of data collection, the students were fully debriefed as to the purpose of the study.

### MEASURES

The Center for Epidemiological Studies Depression Scale (CES-D)

This scale is a 20-item inventory of symptoms of depression (42). Respondents reported how frequently they had experienced different symptoms during the past week, using a 4-point Likert scale that ranged from zero (rarely or none of the time) to 3 (most or all of the time). Scores ranged from 0 to 60 and the stricter diagnostic cut-off point for depression was 23, indicating severe levels of depressive symptoms (43). The internal reliability of the CES-D, as well as its concurrent and construct validity, have been demonstrated in different cultural contexts (3, 43, 44). We used a Hebrew version (45) and an Arabic version (46) of the CES-D. In the current study, the Cronbach’s internal consistency alpha coefficients for the CES-D scores at Time 1 were .84 and .91 and at Time 2, they were .87 and .92, among Bedouin Arab and Jewish students, respectively.

### THE 15-ITEM SOMATIC SYMPTOM SEVERITY SCALE (PHQ-15)

Somatization was assessed using the 15-item Somatic Symptom Severity Scale (PHQ-15) from the Patient Health Questionnaire (27). Respondents reported on the frequency of symptoms experienced during the past month, using a 3-point Likert scale that ranged from zero (none of the time) to 2 (most of the time). Total scores for this measure can range from 0 to 30. The PHQ has been translated into numerous languages and has been examined in countries such as Saudi Arabia, Germany, and Belgium (47-49), thereby proving its potential for comparisons across ethnic groups. In the present study, we used a Hebrew and an Arabic version of the PHQ-15. In this study, the Cronbach’s

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### Table 1. Demographic characteristics: Differences between Bedouin Arab and Jewish students

<table>
<thead>
<tr>
<th></th>
<th>Bedouin Arabs (%)</th>
<th>Jews (%)</th>
<th>χ²</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>30.0% (27)</td>
<td>46.0% (46)</td>
<td>8.63*</td>
</tr>
<tr>
<td>Female</td>
<td>70.0% (62)</td>
<td>54.0% (55)</td>
<td></td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
<td></td>
<td></td>
<td>6.47</td>
</tr>
<tr>
<td>Single</td>
<td>83.0% (74)</td>
<td>94.0% (95)</td>
<td></td>
</tr>
<tr>
<td>Engaged</td>
<td>9.0% (8)</td>
<td>4.0% (4)</td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>8.0% (7)</td>
<td>2.0% (2)</td>
<td></td>
</tr>
<tr>
<td><strong>Mother’s education</strong></td>
<td></td>
<td></td>
<td>166.32***</td>
</tr>
<tr>
<td>Didn’t study</td>
<td>57% (45)</td>
<td>0% (0)</td>
<td></td>
</tr>
<tr>
<td>Completed elementary school</td>
<td>19.1% (17)</td>
<td>19% (19)</td>
<td></td>
</tr>
<tr>
<td>High school</td>
<td>28.1% (25)</td>
<td>29.6% (29)</td>
<td></td>
</tr>
<tr>
<td>Nonacademic diploma</td>
<td>2.2% (2)</td>
<td>20.8% (21)</td>
<td></td>
</tr>
<tr>
<td>Academic diploma</td>
<td>0% (0)</td>
<td>31.7% (32)</td>
<td></td>
</tr>
<tr>
<td><strong>Father’s education</strong></td>
<td></td>
<td></td>
<td>72.54***</td>
</tr>
<tr>
<td>Didn’t study</td>
<td>22.5% (20)</td>
<td>1% (1)</td>
<td></td>
</tr>
<tr>
<td>Completed elementary school</td>
<td>12.4% (11)</td>
<td>1% (1)</td>
<td></td>
</tr>
<tr>
<td>High school</td>
<td>51.7% (45)</td>
<td>36.6% (37)</td>
<td></td>
</tr>
<tr>
<td>Nonacademic diploma</td>
<td>5.6% (5)</td>
<td>22.8% (23)</td>
<td></td>
</tr>
<tr>
<td>Academic diploma</td>
<td>7.8% (7)</td>
<td>38.2% (39)</td>
<td></td>
</tr>
</tbody>
</table>

*p < .05; ***p < .001
internal consistency alpha coefficients for the PHQ-15 scores at Time 1 and Time 2 among the Bedouin Arab and Jewish students ranged from .82 to .72.

**DEMOGRAPHIC QUESTIONNAIRE**
Respondents were asked to report their gender, age, marital status, ethnicity/cultural group, parents’ education and institutional affiliation.

**STATISTICAL ANALYSIS**
A preliminary χ² analysis explored differences in sample characteristics between the two cultural groups. Three main sets of analyses were conducted. First, we subjected Time 1 and Time 2 levels of depression and somatization to a repeated-measure analysis of variance (ANOVA) to test for ethnic and gender differences in levels of depression and somatization at Time 1 and Time 2. Second, we computed zero-order correlations between depression (Time 1 and Time 2) and somatization (Time 1 and Time 2) among Bedouin Arab and Jewish students. Finally, a multiple-group, cross-lagged SEM analysis was performed with AMOS software (version 7.0; SPSS Inc., U.S.A. [50]; see also [51]) to examine the longitudinal associations between somatization and depression among Bedouin vs. Jewish students. Using the maximum-likelihood estimation to test how well the hypothesized model fit the observed variance-covariance matrix. AMOS generates a variety of indices for evaluating fit; models with chi-square/degrees of freedom ratios of less than two are considered acceptable. We also employed the Non-Normed Fit Index (NNFI) [52] / Tucker–Lewis Index [TLI], Comparative Fit Index [CFI, 53], and RMSEA index values from 0.00 and 0.08 are generally deemed acceptable [54]). Missing data were handled using full information ML (FIML) estimates (55).

**RESULTS**

**Ethnic and Gender Differences in Depression and Somatization at Time 1 and Time 2**
Means and standard deviations for depression and somatization are presented in Table 2, alongside F-values and effect sizes of gender and ethnicity.

Significant main effects were observed for both gender and ethnicity (ethnicity: F[1,189] = 44.06, p < .001, η² = .22; gender: F[1,189] = 6.00, p < .001, η² = .10). Bedouin Arabs reported higher levels of depression at Time 1 and Time 2, as well as higher levels of somatization at Time 1, as compared to the Jewish participants. However, they did not report higher levels of somatization at Time 2. As shown in Table 2, at both Time 1 and Time 2, the Bedouin Arab participants’ mean score on the CES-D was close to the stricter diagnostic cut-off point of 23 among both males and females. Among the Bedouin Arab group, at Time 1, 14 male participants (50%) and 37 females (60%) reported severe levels of depressive symptoms. One year later, 13 male Bedouin Arab participants (48%) and 29 female Bedouin Arab participants (47%) reported severe levels of depressive symptoms.

Among the Jewish group, at Time 1, eight male participants (16.7%) and nine females (17%) reported severe levels of depressive symptoms. One year later, six Jewish male participants (12.5%) and eight Jewish females (15.1%) reported severe levels of depressive symptoms.

Moreover, we found an effect for gender only on somatization at Time 1 and Time 2. Females reported higher levels of somatization and depression than males. No significant interactions between ethnicity and gender were found.

**Cross-sectional Association Between Depression (Time 1 and Time 2) and Somatization (Time 1 and Time 2) Among Bedouin Arab and Jewish Students**
We computed the correlation matrix for the Bedouin Arab and the Jewish samples separately (see Table 3). At Time 1 and Time 2, there were positive associations between depression and somatization among the Bedouin Arab and Jewish students.

**Table 2. Depression and somatization at Times 1 and 2: Means and standard deviations for each subgroup and effects of culture, gender, and Culture*Gender**

<table>
<thead>
<tr>
<th>Study variables</th>
<th>Bedouin Arab students</th>
<th>Jewish students</th>
<th>Culture effect</th>
<th>Gender effect</th>
<th>Culture*Gender</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Female (n = 62)</td>
<td>Male (n = 27)</td>
<td>Female (n = 53)</td>
<td>Male (n = 48)</td>
<td>F(1,189) (η²)</td>
</tr>
<tr>
<td>Depression Time 1</td>
<td>25.98 (12.64)</td>
<td>21.78 (10.28)</td>
<td>14.23 (9.02)</td>
<td>14.13 (9.60)</td>
<td>13.2*** (.07)</td>
</tr>
<tr>
<td>Somatization Time 1</td>
<td>10.31 (5.04)</td>
<td>8.19 (5.20)</td>
<td>7.34 (4.22)</td>
<td>3.94 (3.50)</td>
<td>6.76* (.04)</td>
</tr>
<tr>
<td>Depression Time 2</td>
<td>22.60 (13.22)</td>
<td>22.04 (13.88)</td>
<td>13.45 (7.68)</td>
<td>12.27 (8.34)</td>
<td>3.9* (.02)</td>
</tr>
<tr>
<td>Somatization Time 2</td>
<td>9.89 (4.93)</td>
<td>7.56 (5.87)</td>
<td>6.94 (4.44)</td>
<td>3.81 (2.90)</td>
<td>2.8 (.01)</td>
</tr>
</tbody>
</table>

Note. *p < .05; **p < .01; ***p < .001
η² - partial eta squared; .01 = small effect, 0.06 = medium-sized effect, 0.13 = large effect
Longitudinal Association Between Somatization and Depression as a Function of Cultural/Ethnic Group

The multiple-group, cross-lagged SEM analysis showed that the model fit the data very well ($\chi^2 = 2.32$; $\chi^2/df = 1.16$; NNFI = 0.94, CFI = 0.96, RMSEA = 0.04). The following statistically significant synchronous/cross-sectional associations were found: Depression and somatization were positively correlated at Time 1 ($r = 0.4$, $p < 0.001$) among Bedouin Arab and Jewish students (see Figure 1a and Figure 1b). Gender was found to be associated with somatization at Time 1 among the Jewish group ($r = 0.40$, $p < 0.001$), but not among the Bedouin Arabs ($r = 0.13$, ns). At Time 2, the “disturbances” of depression and somatization, that is, the variances in these variables that are not accounted for by incoming arrows, were also correlated ($r = 0.49$, $p < 0.001$, for Bedouin Arabs; $r = 0.30$, $p < 0.01$, for Jews).

For stability effects, Time 1 depression predicted Time 2 depression ($\beta = 0.50$, $p < 0.001$) among the Bedouin Arab group, but not among the Jewish group ($\beta = 0.16$, ns).

Somatization at Time 1 predicted somatization at Time 2 among both cultural groups (Bedouin Arabs: $\beta = 0.57$, $p < 0.001$; Jews: $\beta = 0.52$, $p < 0.001$). In this model, we found a direct effect of gender on somatization at Time 2 only among the Jewish group ($\beta = 0.18$, $p < 0.05$). Most importantly, among the Bedouin Arab students, statistically significant cross-lagged effects were found between depression at Time 1 and somatization at Time 2 ($\beta = 0.17$, $p < 0.05$) and between somatization at Time 1 and depression at Time 2 ($\beta = 0.18$, $p < 0.05$). However, a single significant cross-lagged effect was found among the Jewish group, between somatization at Time 1 and depression at Time 2 ($\beta = 0.24$, $p < 0.05$).

Based on Bentler and Mooijaart (56), we achieved the most parsimonious model by omitting nonsignificant structural paths. This model evinced an adequate fit ($\chi^2 = 3.78$; $\chi^2/df = 0.96$; NNFI = 0.94, CFI = 0.96, RMSEA = 0.03; see Figures 1a and 1b).

**DISCUSSION**

The present study aimed to examine three models concerning the cross-sectional and prospective relationships of depressive symptoms and somatization/somatic complaints among Bedouin Arab and Jewish college students. As expected, the results revealed the presence of severe mental health problems among Bedouin Arab students. Approximately 50% of the surveyed Bedouin Arab students (males and females) scored above the stricter diagnostic cut-off point of 23, indicating severe levels of depressive symptoms, as compared to 15% of
the Jewish students (males and females) (43). Previous comparisons of depressive symptoms among Jewish and Arab students have revealed a greater prevalence of depression and higher levels of depressive symptoms among Arab students (4).

In the current study, the differences in levels of depressive symptoms were also present one year after the initial assessment. Moreover, higher levels of somatization were observed among Bedouin Arabs in their first year of college/university studies. This finding is in line with the tendency to somatize distress that has been commonly observed in non-Western cultural contexts (17, 18). However, one year later, the differences in somatization levels between Bedouin Arab and Jewish students had become non-significant. The latter finding may be related to the intensive exposure to Jewish/Western culture during a year in college/university and increased similarity between the groups (57).

Following previous research, gender differences in somatization levels at Time 1 and at Time 2 were expected and found in this study. Women exhibited higher levels of somatization than men (19). However, we found no significant difference in the levels of depression among women as compared to men; contrary to the very common understanding that depression is more common among women (13). However, this unexpected finding supports the findings of a number of previous studies that have demonstrated no or limited gender differences in depression levels. Those studies included samples in which males and females were matched in terms of social determinants of depression (such as marital status and socio-economic status), similar to our student samples in which the majority of participants were single and the socio-economic backgrounds of the female and male students were similar within each cultural group (58-60). Furthermore, no or limited gender differences in depression were found among the cultural groups, underscoring high value for female role such as in Mediterranean countries (for a review of this topic, see 59).

The main aim of this study was to examine three models concerning the cross-sectional and prospective relationships between depressive symptoms and somatization. Our results are consistent with the functional model among the Bedouin Arab and Jewish students. The functional model posits that somatic complaints derail life functioning, which leads to depression (23, 29). We found that somatic complaints during the first month of the first year of college/university had a direct effect on depression levels one year later. This finding might be explained by the possibility that somatic complaints strongly affect the functioning and quality of life of the students from the two cultural groups.

Furthermore, the results of the current study provide support for the affect-dysregulation model only among the Bedouin Arab students. That model claims that depression may precede somatic complaints (29, 30). Depressive symptoms may increase the tendency to amplify somatic distress, as well as difficulties in identifying and communicating emotional distress (26). However, the results of this study do not support this model among the Jewish group. This finding may be explained by the low levels of depressive symptoms among the Jewish students as compared to their Bedouin Arab counterparts. More support for this statement is provided by the lack of a significant direct effect of depression at Time 1 on depression at Time 2 among the Jewish group.

Following the sociocultural model, stronger cross-sectional relationships between somatization and depression were expected among Jewish students (34, 35). However, we observed similar cross-sectional relationships between somatization and depression among Bedouin Arab and Jewish students. Moreover, at Time 2, a stronger relationship between somatization and depression was observed among the Bedouin Arab group. Thus, our results do not support the sociocultural model.

**Limitations and Directions for Future Research**

Although the methodology used in this study represents an advance over previous studies that relied on retrospective, global, cross-sectional self-reports, this study had some limitations and there are areas that warrant further attention in future research. First, our findings were based on self-report measures. Therefore, results could have been skewed by social desirability. In future studies with similar designs, it would be prudent to include a measure of social desirability to test the degree to which this variable may bias the results. In addition, further research using other methods of data collection (e.g., interview techniques, diaries, observer ratings) would be beneficial and important for evaluating the validity of the obtained findings. An additional limitation is related to the Bedouin Arab sample, which included a high percentage of female participants. Future research should include larger numbers of male and female participants in each cultural group. It is important that researchers test separately the three theoretical models among women and men in these cultural contexts. This kind of research may provide a special contribution to the professional lit-
erature because most of the previous research in this area has been conducted among predominantly or exclusively female samples, and also because different cultures are characterized by different gender roles. Moreover, other important variables should be included in these models such as personality vulnerabilities, social support and coping strategies. These variables may mediate and/or moderate the relationship between depressive symptoms and somatization. Finally, there is a need to employ more assessment waves to allow the sufficient evaluation of rank-ordered longitudinal changes, as well as the detection of prospective associations between depression and somatic complaints.

**CONCLUSION**

The importance of this study lies in its examination of three models concerning the cross-sectional and prospective relationships of depressive symptoms and somatization among Bedouin Arab and Jewish college students. The present study highlights the cultural/ethnic similarities concerning the functional model and the cross-sectional associations between these two mental health problems. However, this research also revealed ethnic differences concerning the affect-dysregulation model. This study underscores the need to draw and test potential pathways between somatic complaints and depressive symptoms, particularly among Bedouin Arabs.

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**Disclosure**

The authors report no proprietary or commercial interest in any product mentioned or concept discussed in this article.

**References**


DEPRESSION AND SOMATIC SYMPTOMS AMONG TWO ETHNIC GROUPS


55. Anderson TW. Maximum likelihood estimates for a multivariate normal distribution when some observations are missing. J Amer Stat Assoc 1957;52:200-203.


