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The Relation Between Discrimination, Sense of Coherence and Health Varies According to Ethnicity; A Study Among Three Distinct Population Groups Living in Israel

The relation between discrimination, sense of coherence and health varies according to ethnicity; a study among three distinct populations in Israel.

Running title: Discrimination, sense of coherence and health in different ethnic groups

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Abstract

Self-reported experiences of discrimination and sense of coherence (SOC) have been found to be associated with health. A face-to-face survey of Long Term Jewish Residents (LTJR), Arabs and former Soviet Union (fSU) immigrants in Israel was performed. Respondents reported their physical and mental health (SF12), self-reported experiences of discrimination, SOC and socioeconomic status. Multivariable logistic regressions and bootstrapping path analyses were performed. Discrimination was associated with health after adjusting for all other variables. SOC was also associated with health. SOC did not mediate the strong association between discrimination and health among Israeli LTJR, but was a significant mediator among Arabs and fSU immigrants. Discrimination seems to have a direct effect on health only among the majority and not among minority populations. High levels of SOC may reduce the negative effects of discrimination on health by serving as a coping resource, however only among minorities.

Key words: Discrimination, sense of coherence, ethnicity, minorities, Israel

Background

A large body of research has investigated the association between perceived ethnic discrimination and various measures of physical and mental health. The strongest and most consistent findings show a negative association between perceived discrimination and mental health and self-rated health in oppressed racial groups (1-5). Discrimination is suggested to be a stressor among individuals that experience discrimination (6) and this may increase use of addictive substances (7-9), may influence risk behaviors, prevent lifestyle changes and increase prevalence of hypertension (10-12). Furthermore, in a study measuring the length of telomeres (repetitive DNA sequences that protect the end of the chromosome and shorten with every replication, the shorter they are the shorter life expectancy is), it was demonstrated that those reporting higher rates of discrimination had shorter telomeres suggesting discrimination may affect health by accelerating biological aging (13). Studies have tried to identify individual and social attributes that may serve as a resource for resilience, by which the negative effects of perceived discrimination can be reduced. One such individual attribute is derived from the Salutogenic frame-work where sense of coherence (SOC) and general resistance resources may help people cope with stress caused by discrimination (14). SOC refers to an enduring attitude of how people view life and how they use their resistance resources to maintain health. SOC constitutes three dimensions: comprehensibility, manageability and meaningfulness (14). Studies suggest that people with higher levels of SOC had a better quality of life in a large range of populations (15). Higher perceived discrimination or rejection experiences were associated with reduced SOC and higher levels of psychological distress indicating that SOC may partially mediate the relationship of discrimination and psychological distress (16, 17). High SOC may

reduce the ill effects of discrimination and serve as a resource for coping with discrimination. Discrimination may also decrease the levels of SOC by reducing the ability to perceive one's environment as comprehensible, manageable, or meaningful, therefore increasing stress and the ill effects of stress (16).

Studies have found variations in the association between health and discrimination in different population groups (1, 2, 18-24). These inconsistencies in the association between discrimination and health may be due to the different populations and health measures used in the studies (25). Further research needs to identify variables that may explain these variations.

Three distinct large populations reside in Israel: long term Jewish residents (LTJR), Arabs, and immigrants from former Soviet Union (fSU). In 2012 the LTJR Israeli population consisted of 63% of the population and about 20% of the Israeli population were Arabs. The Arab community is largely an underprivileged minority with a history of disadvantage in income, education and employment. To some extent, the Arabs in Israel suffer from prejudice and discrimination (26-30). The third group immigrated to Israel from the former Soviet Union (fSU) after 1990 and consists of 17% of the total Israeli population and are mostly Jewish. This immigrant population is assimilating into the Israeli Jewish culture (31). These three populations serve as a unique context to explore the potential influence of discrimination on health, since all groups receive national healthcare and welfare services. Discrimination and health have been assessed in these three population groups. Arabs reported high rates of perceived discrimination and low levels of health, however there was no association between discrimination and health (22). FSU immigrants reported the highest levels of discrimination and lower levels of health, and discrimination was associated only with physical health, whereas among LTJR discrimination was associated with both mental and physical health even though rates of discrimination were low (22).

This study purported to test the hypothesis that SOC mediates the association between discrimination, mental and physical health and that the relation between discrimination, SOC, and health is moderated by ethnicity.

Methods

A cross-sectional survey of 899 participants, including three ethnic groups, were randomly interviewed face to-face to evaluate the association between discrimination, SOC and ethnicity. The respondents were Israelis aged 30 to 65 years stratified by:1) Long-term Jewish residents (LTJR) (n=402) that were born in Israel or immigrated to Israel before 1990; 2) Arab Muslims (n=296), living in northern and central Israel; and 3) Immigrants from the former Soviet Union (fSU) that immigrated after 1989 (n=201). Bedouins, although Muslim, were excluded as their culture and lifestyle differs from the larger Muslim community in Israel and so were Christian Arabs as this is a small population and it would be difficult to interview a random sample. The study was conducted between June 2012 and March 2013 and was approved by the Ethical Review Board of the University of Haifa, Israel.

The sampling process is described in Appendix I.

The interviews were conducted in three languages, Hebrew, Arabic and Russian by trained interviewers from each of the communities.

Measures

The questionnaire included items measuring **demographics,** such as gender, age, education, employment, subjective socioeconomic status (SSS) (32, 33), marital status, self defined ethnicity, country of birth and year of immigration.

Physical and mental health were measured with the SF12, that assesses quality of life (34-36). Scores were dichotomized into good physical and mental health (80-100) and poor physical and mental health (<80) as the distribution of the variable was skewed towards good health, this type of dichotomization has been used often previously (37) . Mental and physical health were coded 1 for good health and 0 for poor health. When used as a dependent variable for logistic regression analyses self-reported mental and physical health were coded 1 for "poor" health and 0 for "not poor" health.

Self reported experiences of discrimination were evaluated with Krieger's measure of EOD (Experiences of Discrimination) (38, 39). Chronbach's alpha was calculated to be 0.93. The continues scale ranged from 1-4. The scale was divided into three categories: no reported discrimination (1=0), low discrimination (1=1-2) and high discrimination (>2) (39). No discrimination includes people that never reported feeling discrimination, low reported discrimination included those reporting at least once feeling discrimination and the high discrimination category includes respondents reporting a mean frequency of more than 2.

Sense of coherence (SOC) was measured using Antonovsky's measure of ten items (14, 40, 41). Chronbach's alpha for the ten item scale was 0.76. A mean score was calculated for each respondent.

Further description of variables is presented in Appendix I.

Statistical analysis

A series of multivariable linear and logistic regression models were used within a path analytical framework to assess whether relations between physical/mental health and

SOC represented a mediation and/or moderated-mediation relationship. Due to the cross-sectional nature of our study, we report associations throughout the manuscript, but in keeping with the typical language used in mediation analyses, we refer to these associations as direct or indirect "effects". The use of this word does not necessarily imply causation.

We hypothesized that discrimination affects health and SOC was a mediator in that relationship. The directionality of the interrelationship between discrimination, SOC, and mental/physical health may differ from that hypothesized here, but the focus of the current study is to test only our hypothesized associations. We also tested whether ethnicity moderated the relationship between discrimination, SOC, and mental/physical health. All models controlled for demographic variables and all regression procedures were performed using the PROCESS macro in SPSS (Hayes, 2013). Further description of the statistical methods is presented in Appendix.

Results

Age, education, and employment status varied significantly by ethnicity with Arab participants being the youngest, least educated and having the highest unemployment rate (Table 1). Subjective socioeconomic status (SSS) also varied significantly by ethnicity with LTJR reporting the highest levels. Most of these demographic differences are descriptive of Israeli society.

LTJR reported the highest mean levels of physical and mental health which were significantly different across ethnicities ($p<0.001$) (Table 2). The highest rate of discrimination was reported among Arabs where 66.7% reported high discrimination and the lowest rate among LTJR where only 9.5% of them reported high discrimination. Among fSU immigrants 12.0% reported high discrimination. The

differences between LTJR, Arabs and fSU immigrants was significant and so was the difference between the fSU immigrants and Arabs ($p<0.001$). SOC was significantly higher among LTJR compared to the other two groups ($p<0.001$), however there was no significant difference between fSU immigrants and Arabs (Table 2).

There was a significant negative correlation between discrimination and physical and mental health, indicating that respondents reporting higher levels of discrimination reported worse health (r_s=-0.25 and -0.24 respectively) (Table 3). In addition, there was a positive correlation between SOC and physical and mental health, suggesting that participants with better SOC reported better health (r_s=0.26 and 0.38 respectively) (Table 3).

Table 4 summarizes multivariable logistic regression models that assess the relationship between discrimination and SOC on physical and mental health, after controlling for demographic variables. For each dependent variable, two multivariable models were run, one including ethnicity, the other without ethnicity. Both low and high levels of reported discrimination were inversely associated with physical health in the two models, and high levels of reported discrimination were inversely associated with mental health in the two models. SOC was positively associated with physical and mental health ($p < 0.001$). Ethnic differences were observed only for fSU, who had 63% greater odds of poor physical health compared to LTJR ($p=0.043$)

Figure 1 illustrates a hypothetical model in which SOC is suggested to mediate the relationship between discrimination and physical and/or mental health as suggested in the introduction. The direct effect in this relationship represents discrimination directly affecting health while the indirect effect indicates that discrimination affects SOC which, in turn, affects health. For individuals reporting low levels of discrimination, neither the

direct effect (OR=1.11, p=0.52) nor the indirect effect (OR= 1.04) of discrimination on physical health were significant (table 5). For individuals reporting high levels of discrimination, the direct effect of discrimination made them approximately twice as likely to report poor physical health than individuals who did not report discrimination (OR=2.04, p=0.0002) and the indirect effect of the discrimination resulted in a 23% increase of reporting poor physical health (OR= 1.23, 95%CI=1.11,1.38) compared with individuals who did not experience discrimination. The results were similar for mental health, with non-significant direct (OR=0.88, p=0.42) and indirect (OR= 1.06) effects for individuals reporting low levels of discrimination. Individuals reporting a high level of discrimination had an odds ratio of 2.00 (p=0.0001) associated with the direct effect of discrimination and an odds ratio of 1.36 (95%CI=1.23,1.56) associated with the indirect effect of discrimination (Table 5).

We then tested whether ethnicity moderated the mediation effect of SOC on the association of physical- and mental-health and discrimination, a phenomenon known as moderated mediation or conditional indirect effects. This concept is illustrated in Figure 1 with the dashed lines and the results of the analysis are summarized in Table 5. For both physical and mental health, the direct effect of reported discrimination on health was only statistically significant for LTJR. In both cases LTJRs reporting high perceived discrimination had more than 5 times the odds of poor health compared to those not reporting perceived discrimination (p's $\leq$0.01). For physical health, an SOC-mediated association between discrimination and health, i.e., an indirect effect, was observed among both fSU immigrants and Arab residents. The fSU immigrants that reported a high level of discrimination had 83% (95% CI; 1.23-3.29) higher odds of poor physical health and the Arab residents that reported a high level of discrimination had had 9% (95% CI; 1.00-1.28) higher odds of poor physical health

compared to individuals not reporting discrimination. No significant indirect effects were observed among LTJR.

The effect of discrimination on mental health was mediated by SOC for LTJR and fSU immigrants. Via this indirect effect, fSU immigrants that reported high levels of discrimination had more than twice the odds to have poor mental health compared to those reporting no discrimination (95% CI; 1.36-4.24). Only the LTJR residents that reported low levels of discrimination demonstrated a mediated, indirect effect, with these individuals having 15% higher odds of having poor mental health (95% CI; 1.04-1.34). The indirect effect was responsible for Arabs reporting high levels of discrimination being 16% more likely to report poor health than those who did not, although this result was just outside of statistical significance as the 95% confidence interval was just large enough to contain and odds-ratio of 1.

In this statistical analysis p-values are not obtained from this boot-strapping technique, 95% confidence intervals are, confidence intervals that do not include the value of 1.00 indicate statistically significant associations at an alpha of 0.05.

The mediating effect of SOC differs depending on ethnicity. SOC is not a significant mediator between discrimination and physical health among LTJR but is significant among fSU and Arabs. On the other hand, SOC is a significant mediator between discrimination and mental health in LTJR and fSU immigrants, but only in individuals reporting low levels of discrimination in the first group, and is nearly significant among Arabs.

Discussion

In this study we hypothesized and showed that SOC mediates the association between self reported experiences of discrimination and mental and physical health. However, this mediation is moderated by ethnicity. SOC has been suggested to be a resource to encounter the negative effects of discrimination (16, 17). People reporting perceived discrimination seem to view the world as less comprehensible, manageable and meaningful, implying lower SOC. For individuals with low SOC the world they encounter may seem more stressful. These results are in agreement with two other studies looking at SOC and discrimination (16) or stigma experiences (17). Our study looked at both a majority population and two different types of minority populations in Israel, fSU immigrants and Arabs.

Our hypothesis was that SOC mediates the association between discrimination and health, implying a causal effect of discrimination on SOC. However, a different approach may be suggested, where SOC has a causal effect on discrimination, individuals with high levels of SOC may not perceive life events as acts of discrimination. Therefore, individuals with high SOC will report less discrimination, whereas those with low SOC will report higher levels of discrimination. Longitudinal studies of discrimination, SOC, health, and ethnicity can help elucidate the etiologic pathway to poor physical and mental health. Another approach may be taken where health may affect SOC and/or discrimination, where ill health may cause people to view the world as less comprehensible, manageable and meaningful and also perceive higher levels of discrimination. For determining the directionality of the model further research is needed.

Ethnic discrimination among minority populations is not atypical, however, we also found ethnic discrimination among the majority population (LTJR). This can be attributed to certain groups descending from Mizrahi Jews (Jews from Middle Eastern and North African countries). These groups often express discrimination against them, this has served as a national discourse in the media for many years (42).

In the majority population in this study (LTJR) we found a strong association between discrimination and health compared to the two minorities. This majority population reported the lowest rates of discrimination, and SOC did not serve as a mediating factor between discrimination and physical health. However, SOC did serve as a mediating variable among Arabs and fSU immigrants. SOC may serve as a coping mechanism where those with higher SOC are better adept at coping with the stress caused by discrimination events. SOC may be more effective when it is high, as among LTJR, more so compared to the minorities, where it is lower.

Among individuals from the minority group with the highest levels of discrimination (Arabs), discrimination was not associated directly with health. This replicates our results from 6 years earlier (22). This broad based reporting of discrimination among Arabs (two thirds of the respondents) suggests perceived discrimination is the norm, as opposed to the situation among LTJR and fSU immigrants. In situations where discrimination is the norm, the proverb "sorrow shared is sorrow halved" may be correct, as when most people suffer discrimination it is not perceived as stressful in the same way it is in other populations where the individual perceives himself as being singled out for who he/she is. This may explain the lack of direct effect observed for health. In addition, as discrimination experiences seem to be common among Arabs they may learn to anticipate and prepare for injustice, thereby mitigating the effect of the discrimination. They may have adapted more proactive coping

mechanisms to protect health in addition to SOC (43, 44). In addition, the meaning of perceived discrimination may differ for Arabs compared to LTJR and therefore not have a similar effect on health.

A similar result was observed for fSU immigrants where discrimination was not associated directly with physical/mental health but there was a significant indirect association via SOC. This suggests SOC is an important resource regarding health among minorities, maybe more so than among majority populations.

As expected, SOC was significantly lower among the minority populations in this study. Minorities often are not familiar with how to manipulate or steer themselves within the majority society and institutions that are run by the majority, thereby decreasing SOC. Similar findings have been reported among other minority groups (45, 46). In Israel, SOC was reported to be lower in Arab-Bedouins compared to Jews (47). Furthermore, SOC contributed to explaining stress reactions among Jewish adolescents but not among the Arab-Bedouin group. Therefore, it cannot be generalized that SOC is a resource for stress reduction in all population groups. SOC was related to health in all the three ethnic groups in this study, whereas discrimination was related directly to health only among Jews. This suggests SOC may be a more generalizable measure associated with health than reported discrimination. These results, if subsequently found to be causal in nature, suggest that improving SOC among Arabs and fSU immigrants may decrease health inequalities that have been reported between these three population groups in Israel (33).

In another study looking at direct and indirect effects of discrimination on health, the authors found that discrimination was both directly and indirectly associated with health, mediated by self esteem and the degree to which people place the

responsibility for inequalities on social institutions and structures(i.e., structural awareness) (44).

As we cannot rule out variations in the directionality of the model hypothesized, we suggest that public health focus efforts to decrease discrimination and increase SOC, as SOC may also affect discrimination and discrimination may affect health.

Limitations: This study is based on a cross sectional survey and therefore causality cannot be inferred. Levels of stress, that may explain how discrimination and SOC affect health, were not measured, therefore, we only assume discrimination and SOC affect stress. Health was also a self-reported measure and further research should try and use more objective measures of health.

In addition, the variation in response rates to the survey, in the three population groups, may bias results. However, the study populations' characteristics correspond well with the characteristics of the respective groups in the Israeli society (48). This study did not include Christian Arabs, this group is a small group and it is more difficult to attain a random large enough sample to analyze. Their levels of discrimination and SOC may not resemble those of the Muslim population. Though our statistical models controlled for some factors that may differ by ethnicity (age, sex, education, employment status, SSS, and marital status), other unmeasured factors may not be distributed equally across the three population groups under study and may bias the associations measured. This warrants further investigation to understand if our results are valid or artifacts that can be attributed to problems in studying and comparing various ethnic groups.

In addition, there is a need for longitudinal studies that include objective measures of health and stress in other populations with ethnic diversity.

New contribution to the literature: Among minority populations, SOC may serve as a mediator in the relation between discrimination and health, while discrimination does not seem to be directly associated with health; this latter finding is in contrast with the results for the majority population. It seems that the observed associations between discrimination, SOC, and health cannot be generalized to all ethnic groups and that the structure of their relationship is complex. Increasing SOC and decreasing discrimination could serve as an effective way to improve both population-level mental and physical health.

Figure 1. Mediation and moderated mediation (dashed) models.

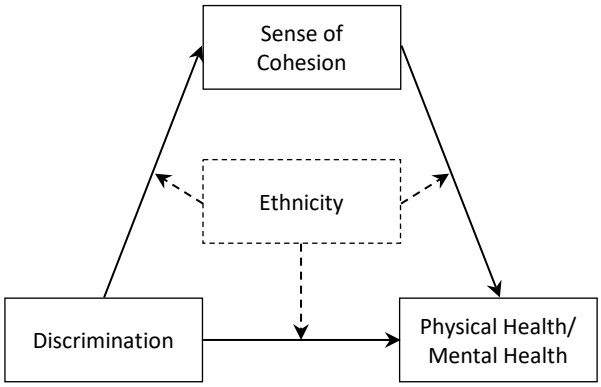

Figure 1. Mediation and Moderated Mediation (Dashed) Models

Tables

Table 1. Characteristics of study population by ethnicity, percent, mean and standard deviation Israel, 2012-2013. Chi square and ANOVA significance tests.

	LTJR[a]	fSU[b]	Arabs	
Variables	n = 402	n = 201	n = 296	p-values
Age Mean (SD)	46.2 (10.7)	47.3 (11.77)	42.8 (9.4)	0.002[c]
30-39 (%)	32.80	35.30	42.9	
40-49 (%)	29.90	23.40	30.7	
50-65 (%)	37.30	41.30	26.4	
Sex (%)				0.30[c]
Men	48.90	46.80	53.4	
Women	51.10	53.20	46.6	
Education (%)				<0.001[c]
Less than high school	16.30	15.60	37.2	
High school graduate[e]	52.40	60.30	29.7	
Academic degrees	31.30	24.10	33.1	
Employment (% Unemployed)	11.70	14.90	30.7	<0.001[c]
SSS[f] (Mean (SD))	6.34 (1.48)	4.57 (1.71)	5.41 (2.30)	<0.001[d]
Marital status (%Married)	81.10	80.60	86.5	0.12[c]

[a] Long-term Jewish Residents

[b] Former Soviet Union Jewish Residents

[c] p-values from chi-square tests

[d] p-values from ANOVA tests

[e] Includes residents with vocational certificates

[f] Subjective Socioeconomic Status

Table 2. Physical and mental health, discrimination, and sense of coherence by ethnicity, mean and distribution (standard deviation). Chi square and ANOVA significance tests.

		LTJR[a] N=402	fSU[b] N=200	Arabs N=296
Physical health (Range 1-100)	Mean*	88.49 (23.10)	78.36 (29.55)	79.35 (30.30)
	Good (>80)	79.2%	62.2%	66.9%
	Poor (<79)	20.8%	37.8%	33.1%
Mental health (Range 1-100)	Mean*	74.25 (19.77)	65.92 (26.19)	67.11 (25.13)
	Good (>80)	48.5%	36.5%	37.0%
	Poor(<79)	51.5%	63.5%	63.0%
Discrimination (Range 1-4)	Mean*	1.30 (0.51)	1.45 (0.49)	2.35 (0.65)
	High (>2)	9.5%	12.0%	66.7%
	Low (1-2)	34.0%	63.0%	30.0%
	Non (0)	56.5%	25%	3.3%
Sense of coherence (Range 1-7)	Mean*	4.84 (1.01)	4.45 (1.03)	4.34 (0.92)

*$p<0.001$

[a] Long-term Jewish Residents

[b] Former Soviet Union Jewish Residents

Table 3. Correlations between physical and mental health, discrimination and sense of coherence* (Spearman coefficients)

	Physical health	**Mental health**	**Discrimination**	**Sense of coherence**
Physical health	1	0.66**	-0.25**	0.26**
Mental health	-	1	-0.24**	0.38**
Discrimination	-	-	1	-0.30**
Sense of coherence	-	-	-	1

*all variables were in their continuous form

**p<0.0001

Table 4. Logistic Regression Model of Poor* Physical and Mental Health

Physical Health						
	Model 1			**Model 2**		
Variables	**OR**	**p**	**95% CI**	**OR**	**p**	**95% CI**
Discrimination						
None	1	-	-	1	-	-
Low	**2.17**	0.001	(1.40,3.36)	**2.04**	0.002	(1.29,3.21)
High	**3.40**	<0.001	(2.11,5.49)	**3.54**	<0.001	(2.03,6.18)
Sense of Cohesion	**0.70**	<0.001	(0.58,0.84)	**0.71**	<0.001	(0.59,0.85)
Age	**2.08**	<0.0001	(2.04,2.11)	**1.08**	<0.001	(1.06,1.09)
Education						
< H.S	1	-	-	1	-	-
H.S.	1.03	0.886	(0.68,1.58)	0.95	0.808	(0.61,1.47)
> H.S	0.88	0.631	(0.53,1.47)	0.82	0.456	(0.49,1.38)
Employment	**0.47**	0.001	(0.53,1.47)	**0.44**	<0.001	(0.28,0.69)
Gender	**2.20**	0.013	(0.30,0.73)	**1.52**	0.019	(1.07,2.16)
Marital status	1.28	0.331	(0.50,1.28)	0.81	0.384	(0.50,1.30)
SSS[a]	1.01	0.071	(0.83,1.01)	0.95	0.315	(0.86,1.05)
Ethnicity						
LTJR[b]	-	-	-	1	-	-
fSU[c]	-	-	-	**1.63**	0.043	(1.01,2.61)
Arab[d]	-	-	-	1.03	0.896	(0.63,1.70)
Mental Health						
	Model 1			**Model 2**		
Variables	**OR**	**p**	**95% CI**	**OR**	**p**	**95% CI**
Discrimination						
None	1	-	-	1	-	-
Low	1.32	0.13	(0.92,1.89)	**1.36**	0.115	(0.93,1.99)
High	**2.36**	<0.001	(1.56,3.57)	**2.74**	<0.001	(1.62,4.62)
Sense of Cohesion	**0.55**	<0.001	(0.47,0.65)	**0.55**	<0.001	(0.47,0.65)
Age	**1.05**	<0.001	(1.04,1.07)	**1.05**	<0.001	(1.04,1.07)
Education						
< H.S	1	-	-	1	-	-
H.S.	0.92	0.694	(0.61,1.38)	0.88	0.544	(0.58,1.33)
> H.S	0.70	0.136	(0.44,1.12)	0.68	0.112	(0.43,1.09)
Employment	1.24	0.340	(0.80,1.93)	1.17	0.506	(0.74,1.84)
Gender	1.25	0.161	(0.92,1.70)	**1.24**	0.174	(0.91,1.69)
Marital status	0.66	0.058	(0.43,1.02)	**0.68**	0.075	(0.44,1.04)
SSS[a]	**0.90**	0.016	(0.82,0.98)	0.90	0.032	(0.82,0.99)

Ethnicity						
LTJR[b]	-	-	-	1	-	-
fSU[c]	-	-	-	1.07	0.763	(0.69,1.65)
Arab[d]	-	-	-	0.82	0.402	(0.51,1.31)

Bold values indicates statistically significance at α=0.05.

* The dependent variables were coded 1 for “poor” health and 0 for “not poor” health. Odds ratios indicate odds of a poor health outcome.

[a] Subjective Socioeconomic Status

[b] Long-term Jewish Residents

[c] Former Soviet Union Jewish Residents

Table 5. Conditional Direct Effects and SOC-mediated Indirect Effects of Discrimination on Odds of Poor* Physical and Mental Health

Physical Health					
Ethnicity	**Direct Effects (OR)**	**95% CI**	**p-value**	**Indirect Effect (OR)**	**95% CI**
Low Discrimination					
All	1.11	(0.80,1.55	0.52	1.04	(0.98,1.12)
LTJR	1.35	(0.79,2.31)	0.28	1.07	(0.99,1.23)
fSU	1.28	(0.62,2.65)	0.51	1.02	(0.81,1.28)
Arab	0.78	(0.43,1.41)	0.42	0.94	(0.8,1.02)
High Discrimination					
All	**2.04**	(1.41,2.95)	0.0002	1.23	(1.11,1.38)
LTJR	**5.42**	(2.51,11.71)	<0.001	1.09	(0.96,1.34)
fSU	0.67	(0.22,2.03)	0.47	**1.83**	(1.23,3.29)
Arab	1.56	(0.86,2.81)	0.14	**1.09**	(1.00,1.28)
Mental Health					
Ethnicity	**Direct Effects (OR)**	**95% CI**	**p-value**	**Indirect Effect (OR)**	**95% CI**
Low Discrimination					
All	0.88	(0.65,1.20)	0.42	1.06	(0.96,1.17)
LTJR	0.99	(0.63,1.55)	0.95	**1.15**	(1.04,1.34)
fSU	1.26	(0.62,2.57)	0.53	1.03	(0.75,1.41)
Arab	0.66	(0.37,1.18)	0.16	0.89	(0.7,1.06)
High Discrimination					
All	**2.00**	(1.41,2.85)	0.0001	**1.36**	(1.23,1.56)
LTJR	**5.35**	(1.98,14.48)	0.001	**1.23**	(1.08,1.52)
fSU	2.15	(0.55,8.47)	0.27	**2.17**	(1.36,4.24)
Arab	1.49	(0.85,2.62)	0.17	1.16	(0.99,1.48)

Direct and indirect effects odds ratios for poor health stratified by level of discrimination with no discrimination as the referent level.

Bold values indicate statistically significant effects

* The dependent variables were coded 1 for "poor" health and 0 for "not poor" health. Odds ratios indicate odds of a poor health outcome.

Compliance with ethical standards:

All the authors declare that they have no potential conflict of interest.

Ethical approval: Before performing the study the study was approved by the Ethical Review Board of the University of Haifa, Israel. All interviewees gave informed consent before commencing the interview and were told they could stop the interview at any stage.

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Appendix

Methods

Sampling process: A multi-stage sampling process was employed by sampling towns and then households within the towns taking into account the geographical area (north, center or south), and socioeconomic level of the town and its size. The towns were chosen randomly from a list that was divided by their socioeconomic level. The samples were selected separately for LTJR, fSU immigrants and Arabs and consisted of 12 Jewish towns, 12 Arab towns and 9 towns with a high concentration of fSU immigrant residents. In each town, the interviewers selected dwelling units at random. Interviews were performed during the early hours of the evening. The response rates were: 42% among the LTJR; 73% among the fSU immigrants and 83% among Arabs.

Questionnaire

The questionnaire included items assessing discrimination, SOC, ethnic identity, mental and physical health, health behaviors and socio-demographic measures. The questionnaire was translated from Hebrew to Russian and Arabic and back-translated into Hebrew for accuracy of the translations. The questionnaire was pretested with 15 respondents from each sample group and adaptations of the questionnaire were made for each group.

Measures

Demographics

Gender was reported by the interviewers as either male (1) or female (2). All other variables were self-reported. Participants reported their age, education, employment, subjective socioeconomic status (SSS), and marital status. Education was coded as:

did not graduate high school (1), high school and professional certificate (2), and academic degrees (3). Employment was dichotomized as: employed (1) and unemployed (0). Subjective socioeconomic status (SSS) was measured using a ten rung ladder where 1 was the lowest rung on the socioeconomic ladder and 10 was the highest (1); this measure has been used previously in Hebrew and Arabic (2). Marital status was reported as married or living with a spouse (1); and single, divorced or widowed (0). Participants were also asked to define their ethnicity as Jewish or Arab and to report their country of birth and year of immigration, if not born in Israel; responses to these questions were used to generate a variable for the three population groups.

Physical and mental health- The SF12 was used to assess quality of life (3-5). Six questions assessed physical health and another six questions assessed mental health. Scores for each item were transformed to range from 0 (indicating poor health) to 100 (indicating optimal health). Mean scores were calculated for each of the 6 physical- and mental-health items separately. Scores were then dichotomized into good physical and mental health (80-100) and poor physical and mental health (<80) as the distribution was skewed towards optimal health.

Self reported experiences of discrimination: Krieger's measure of EOD (Experiences of Discrimination) was used to measure discrimination (6, 7). Ten possible areas of discrimination were presented and the respondent was asked to report the frequency of discrimination felt on the grounds of ethnicity, from frequently (4) to never (1). The areas were: at school; getting hired or getting a job; at work; getting housing; getting medical care; getting service in a store or restaurant; getting credit, a bank loan, or a mortgage; when approaching a national authority or institution; on the street or in public settings; from the police or in the courts. "When

approaching a national authority or institution" was added to the original measure. A mean measure was calculated for each respondent; this was then recoded into three categories, no reported discrimination (1=0), low discrimination (1=1-2) and high discrimination (>2)(7). No discrimination includes people that never reported feeling discrimination, low reported discrimination included those reporting at least once feeling discrimination and the high discrimination category includes respondents reporting a mean frequency of more than 2.

Sense of coherence (SOC) was measured using Antonovsky's measure with ten items. The response scale ranged from very frequently (1) to never (7). Four of the items were reversed so a higher score corresponded with better SOC (8-10). For example, the scale included such questions as "How often do you have confusing thoughts and ideas?" and "Do you have a feeling that things you are involved in your daily life do not have meaning". Chronbach's alpha for the ten item scale was 0.76. A mean score was calculated for each respondent.

Statistical analysis

To test bivariate differences between the sample groups, chi square and ANOVA tests were performed. Correlations between physical health, mental health, SOC, and discrimination were examined using Spearman coefficients. Logistic regression models were used to assess the association between discrimination and physical/mental health while controlling for demographic variables described above. This analysis was performed both with and without ethnicity as a dummy-coded variable.

A series of multivariable linear and logistic regression models were used within a path analytical framework to assess whether interaction between physical/mental health

and SOC represented a mediation and/or moderated-mediation (with ethnicity as the moderator) relationship. To address the categorical nature of the discrimination variable, it was dummy-coded and the analysis was run separately for the low discrimination and high discrimination variables. In the logistic regression model outlined above, discrimination's coefficient represents its direct effect on physical/mental health. An additional ordinary least squares regression model assessed the association between discrimination and SOC. The product of discrimination's coefficient in this model and SOC's coefficient in the logistic model represents the indirect effect of discrimination on physical/mental health. To make inferences about the statistical significance of indirect effects, bias-corrected bootstrapping was performed with 5,000 bootstrap trials. While p-values are not obtained from this boot-strapping technique, 95% confidence intervals are and confidence intervals that do not include the value of 1.00 are considered statistically significant. These analyses were then repeated with ethnicity added as a dummy-coded, potential moderator variable. Ethnicity-discrimination and ethnicity-SOC interaction terms were included to assess moderation. All models controlled for demographic variables mentioned above and all regression procedures were performed using the PROCESS macro in SPSS (11).

An alpha level of <.05 was adopted as the criterion for Type I error.

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