

**Social Relationships and Hypertension in Late Life: Evidence from a Nationally Representative
Longitudinal Study of Older Adults**

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Abstract

Social relationships are widely understood to be important for sustaining and improving health and longevity in social species, but critical gaps in the literature remain. This study utilized longitudinal data on a nationally representative sample of older adults from the National Social Life, Health, and Aging Project (2005 – 2011) to examine of the effects of social integration and social support on change in systolic blood pressure and hypertension risk over time. Results show that while both social relationship dimensions have significant cardiovascular impacts, their relative importance differs by outcomes. Low social support was predictive of increase in systolic blood pressure; while low social integration was predictive of increase in risk of hypertension. The different roles of relationship characteristics in affecting cardiovascular outcomes suggest specific biophysiological stress response mechanisms that have important implications for both scientific understandings and effective prevention and control of a leading chronic condition in late life.

Word count: 149

INTRODUCTION

Understanding the roles of social connections in shaping health and well-being has been the focus of scientific inquiry since the late 1970s, and a wide body of research now provides overwhelming evidence that social relationships are critical for sustaining and improving health, functioning and longevity in social species. Research also suggests that social relationships may be particularly important to health in late life, as individuals transition into different social roles and experience more stressful life events such as loss of spouse or friends.

While research examining the health effects of social relationships has boomed in recent years, critical gaps in the literature remain. First, although social relations are generally conceptualized as multidimensional and their links to health thought to be multifaceted, few empirical analyses simultaneously incorporate multiple measures of distinct aspects of social relations in studies of large population based samples. It remains unknown whether social integration and social support are two independent processes that contribute to health risk, or whether they are interrelated. Second, while much research has documented the associations between social connections and self-reported health outcomes, the biobehavioral mechanisms underlying the observed links such as those related to physiological stress response in aging adults are not well specified or tested. Third, most extant findings regarding the associations between social relationships and health are based on cross-sectional studies. In sum, it remains unclear whether different dimensions of social relationships operate through similar or distinct mechanisms to affect physiological regulation and disease risk over time. The present study fills these gaps by conducting a longitudinal analysis of the effects of social integration and social support on change in systolic blood pressure and hypertension risk using panel data from a nationally representative sample of older adults in the U.S.

DATA AND METHODS

The data are from the National Social Life, Health and Aging Project (NSHAP), a nationally-representative longitudinal study of community-dwelling older adults aged 57-85 years in 2005 – 2006 (Wave 1) and followed up in 2010 – 2011 (Wave 2). In addition to the in-person interviews, the NSHAP also includes several biomarkers measured at Waves 1 and 2 for a subset of the sample. This study includes 1,264 individuals who had available longitudinal data for variables used in the analysis.

Blood pressure is the outcome of interest to this study as a strong physiological indicator of stress response. Hypertension is a potent risk factor for cardiovascular disease, heart attack, stroke, and kidney disease, all of which are strongly predictive of old age mortality. With approximately 67% of adults over the age of 60 having elevated blood pressure, hypertension plays a substantial role in shaping the morbidity trajectories in late life. We include both *systolic blood pressure (SBP)* and *hypertension* as the dependent variables, where hypertension is defined as having BP above the clinical cut points (SBP > 140 or DBP > 90 mmHg) or ever diagnosed with high BP.

We measured social relationships using two composite scales. *Social integration* reflects the structural dimension of social relationships and is a summary index of six measures of social connectedness: marital status, religious attendance, frequency of socializing with family and friends, frequency of volunteering, frequency of socializing with neighbors, and attendance at organized meetings. *Social support* measures the functional dimension of social connections and indicates how respondents feel about the quality of their social ties. The social support scale is a summary index of six measures of relationship quality: how often a respondent can open up to their spouse, family and friends; and how often a respondent can rely on their spouse, family, and friends. Each scale is included as a three-level categorical measure (1=lowest, 2=moderate, 3=highest) to capture the non-linearity in the physiological effects of social relationships.

We employed the longitudinal residual change model to examine the effects of social integration and social support at Wave 1 on change in the biomarker outcomes over time from Wave 1 to Wave 2.

We used the log transformed SBP (adjusting for the skewness of its distribution) to estimate OLS models and the dichotomous measure of hypertension to estimate logistic regression models. We assessed both the gross effects of social integration and social support by entering them separately in each model and the net effects by incorporating them jointly in the same model. All models adjusted for demographic characteristics (age, sex, and race), education, psychosocial stressors (perceived social stress scale and CES-D), health behaviors (anti-hypertensive medication use, smoking, physical activity, and drinking), and physical conditions (BMI and diabetes). All analyses were conducted in Stata 12 and adjusted for survey design effects and nonresponse using sampling weights.

RESULTS AND FINDINGS

While both social integration and support were significantly and negatively associated with log SBP and hypertension risk at baseline, results from the longitudinal analyses provide new findings regarding the nature and specificity of such associations. First, we found that respondents with the lowest level of social support at Wave 1 experienced a significant increase in log SBP from Wave 1 to 2 ($\beta=0.034, p<0.05$) compared to individuals with the highest level of support, whereas social integration had no effect on change in log SBP. Second, we found that both social integration and social support protected against the risk of hypertension, with the effects much stronger for social integration that remained significant when social support and all other covariates were controlled. Compared to the most socially integrated, respondents with the lowest level of integration at Wave 1 had a 75.3% increase (95% CI=[1.04, 2.99], $p<0.05$) in risk of hypertension from Wave 1 to 2. Social support also reduced the risk of hypertension, with respondents with moderate level of support having a 33.6% (95% CI=[0.95, 1.87], $p<0.1$) increase in risk of hypertension, compared to those with the highest level of social support. When social integration and social support were entered jointly in the models of change in hypertension risk, the effect of social support no longer holds, whereas social integration continued to significantly

predict a lower hypertension risk. The effect of social integration was partly mediated by social support and reduced to 64.9% (95% CI=[0.99, 1.20], $p<0.1$) in the final model. It is noteworthy that with the exception of BMI in the log SBP models and anti-hypertensive medication use in the hypertension models, none of the demographic, socioeconomic, health behavior, psychosocial stressor, or physical condition covariates affected respondents' change in the outcomes. That is, aside from taking anti-hypertensive medication, social integration and social support had the greatest effects on blood pressure related health change. This is powerful longitudinal evidence that highlights the critical nature of social relationships in protecting against physiological dysregulation and disease onset at older ages.

In sum, this study revealed new knowledge about the cardiovascular impacts of social relationships over time that is essential to understanding morbidity trajectories at older ages. Our finding that social integration is the predominant factor affecting change in risk of hypertension and social support the predominant factor affecting change in SBP suggests the specificity of the mechanisms through which social relationship stressors affect physical health markers. We discuss the finding in the biological context of endophenotype or quantitative physiological trait in relation to actual disease phenotype. Social support may dampen physiological arousal brought on by social environmental stressors manifest in the SBP change, whereas social integration may delay disease onset through behavioral mechanisms.