The Importance of Perceived Network Support for Negative Life Events and Sleep Disruption: A Longitudinal Fixed-Effects Analysis

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"Lay down last night Lord I could not get no rest.
My mind was wandering like the wild geese in the west"
-Robert Hunter

Introduction

Sleep is an important aspect of overall well-being for physical and emotional health as well as the ability to function in daily life. Occasional loss of sleep may be due to temporal situations, but chronic sleep disorders are seen to result from physical and psychosocial status and changes. Physical pain, depression, anxiety and stress are reasons that may trigger chronic sleep disorders, and these sleep problems may continue for years. Insufficient sleep is associated with a variety of poor outcomes, such as reduced overall health, greater use of healthcare services, greater work absenteeism, higher risk of morbidity (Irwin et al., 2016; Gangwisch et al. 2007), obesity (Ogilvie and Patel, 2017) and mortality. With one-third of American adults reporting less than 7 hours of sleep per night (CDC 2017), it is important to understand the set of factors surrounding sleep quality and quantity. Despite the awareness that social relationships can have an impact on the causes of sleep disorders (Stafford et al. 2017), little research has connected the existence of sleep disruption with relationship and life event status changes, or the availability of network support. Because insomnia can be a chronic and long-term condition, it is important to understand factors that reduce the severity of its effects. Medical treatments in the form of drugs that specifically should not be used over the long term are a mismatch for chronic sleep disorders (Roth and Roehrs 2003), so identifying behavioral and situational factors associated with sleep quality over time may be more fruitful.

Social networks are often relied upon during times of need, including major life transitions and events. The resources and support that social ties provide during transitions are inherently crucial for a variety of factors, including ability to maintain a sense of normalcy during unexpected events, ability to recover (i.e., resiliency) from negative events, as well as overall mental and physical well-being. For example, the loss of a job or romantic partner may become particularly traumatic for an individual who also lacks a support system from family and friends compared to someone with strong support network. Indeed, recent research has demonstrated that supportive social ties are associated with fewer sleep issues among individuals (Matsumoto et al 2015; Chung 2017).

To date, few studies examine causal relationships between negative life events, network support, and sleep disruption. Therefore, the purpose of the current study was to examine associations between negative life events, network support, and sleep disruption in two distinct phases of the life span.

Data and Methods

We take advantage of a unique and rich set of panel data from the University of California Berkeley Social Networks Study (UCNets; see Fischer and Lawton 2017), which consists of three waves of data collected between 2015 and 2018. The sample population is drawn from six counties in the San Francisco Bay Area, and from two age cohorts at the time of enrollment: ages 21-30 and 50-70 years old. There were 1,159 cases in Wave 1, 1,033 in Wave 2, and 973 in Wave 3. Most of the older adults were enrolled in the study using an address-based sampling methodology for an invitation, followed by a telephone or web survey screener. The younger cohort proved difficult to reach, and two-thirds were recruited using a Facebook advertisement strategy.

Measures

Sleep Disruption

To assess sleep disruption, we asked participants the following question: "About how many nights in the week do you find yourself waking up in the middle of the night and not easily able to fall back asleep?" Responses ranged in whole numbers from 0 to 7 nights.

Independent Variables

Negative Life Events. Respondents were asked a variety of questions at each wave to assess whether they had experienced a significant life event or transition within the past year, including four negative events: the death of a close tie, a major break in a relationship, trouble paying bills, or problems at work or school. For two of the items (trouble paying bills and break in relationship), the survey asked participants whether this was still a current problem. Each of the four events (two of which are considered 'persistent'), are coded 0 for 'No' and 1 for 'Yes' at each wave.

Perceived social support. Respondents were asked to indicate whether they feel they have adequate levels of network support using a variety of measures. First, participants were asked the following question, first for family, and then for friends: "If you had a serious problem, like a life-threatening illness or possibly losing your home, do you feel that you have some [relatives/friends] that you can rely on to help? Response categories were dichotomized as "definitely have" versus all other response options: "probably have, might have, or probably don't have." Respondents were then asked three questions about whether they wished they had more people 1) to talk with about personal concerns, 2) to get together with socially, and 3) who could help with things like work around the home. Response options for each of the three questions were "wish I knew more" or "I know enough already". Relationship status was also used to assess support, and was dichotomized as either having a significant other (e.g., partnered, married) or not (i.e., never married, divorced).

Analytic Approach

Fixed effects modeling procedures were used to assess associations between negative life events, social support, and sleep disruption. Fixed effects models are widely considered the "gold standard" for causal inference from panel data (Halaby 2004; Vaisey & Miles 2017, p. 5), as they control for all unmeasured time-invariant unit characteristics (e.g., respondent personality traits

that could confound the associations under analysis) by modeling the effects of *within-individual changes between waves* on the dependent variable, rather than conflating within- and between-individual patterns. Using this approach, we examine bivariate associations between negative life events and sleep disruption. While the statistical efficiency of these models is reduced, they compensate for this inefficiency through their capacity to isolate causal relationships.

Negative binomial regression was used to account for the skewed distribution of the number of nights respondents reported trouble staying asleep. Allison's (2009) hybrid procedure for negative binomial fixed effects regression was applied, meaning that sleep problems were modeled as a function of deviations between respondents' average independent variable scores across waves and their independent variable scores within a given wave. Given our use of fixed effects modeling, the observations were "person-years" to enable study of within-individual change over time. The data set included 3,477 person-years over three waves of data collection, and sampling weights based on the demographic composition of Wave 1 were applied to all models.

Measures of social support were tested as direct effects on sleep disruption within the negative binomial models, but no relationships were found, so these analyses are not presented. These measures of social support were then tested as moderators of identified associations between negative life events and sleep. Since categorical variables with more than two levels cannot be incorporated into negative binomial fixed effects models using Allison's (2009) procedure, moderation was not assessed through the inclusion of interaction terms (which would have more than four levels), but through the construction of separate models for respondents reporting different levels of social support.

Results

In general, older adults report greater number of nights with trouble staying asleep than younger adults, with the number of nights with trouble sleeping slightly decreasing over time for older adults (Table 1). Results indicate the causal relationship between a persisting 'break' with a close tie and sleep disruption only approaches statistical significance (b = .18, 95% CI: -.05, .41; $p<0.2$), as does problems at work or school (b = .54, 95% CI: -.20, 1.28; $p<0.2$, Table 2). Of interest, however, is that these relationships appear to be patterned by the perception of available support within the network. Specifically, a major break in a relationship was associated with greater trouble staying asleep among respondents who wished for more confidants (b = .50, 95% CI: .16, .84; $p<0.01$), but was not associated with sleep among those who reported having enough confidants (b = -.08, 95% CI: -.39, .23; n.s.). Similarly, problems at work or school were marginally associated with a greater number of nights with trouble staying asleep among respondents who wished for more social companions (b = .84, 95% CI: -.08, 1.76; $p<0.1$), but was not associated with sleep among participants who reported having enough social companions (b = .33, 95% CI: -.92, 1.60; n.s.). Finally, contrary to previous findings, there were no direct relationships between social support and sleep disruption (not shown).

Limitations

A weakness of these data is that missing from the measurements is whether the respondent – or the respondent's partner – has sleep apnea or snores, a measurement of pain, and possible sources of sleep disruption (neighbors, traffic). Additionally, while we conceptualize relationship

status as a provision of support, being married or partnered could also be associated with disrupted sleep because the partner has trouble sleeping. This may be why we see greater sleep disruption (approaching statistical significance) among partnered and married respondents. Therefore, it is challenging with the current data to assess whether relationships status, net of partners' sleep quality, has any association with respondents' sleep. Third, we used the mathematical procedures recommended in Vaisey and Miles (2017) to test key assumptions of fixed effects modeling, namely the assumption of consistent time trajectories and the assumption of unidirectional causation with no selection into treatment. This latter set of tests explore whether reciprocal or reverse causation may be in play. While neither assumption was violated to a statistically significant degree, tests for reciprocal causation in the relationship between sleep problems and a persisting break in a close relationship approached statistical significance ($p=.15$), suggesting that the time order of these variables may be in question. As such, the results should be interpreted with caution. Furthermore, tests for reciprocal causation are highly sensitive to misspecification in the lag period of causal effects, so reciprocal or reverse effects occurring over a shorter time span than one year are not captured by our analyses. Finally, many of the findings approached, but did not meet the criteria for statistical significance ($p<0.05$). While the debate around the utility of p-values wages on, the broader point we seek to make is a larger sample size among a more nationally-represented population may yield more robust findings on causal relationships between negative life events, network support, and sleep disruption.

Conclusions

Despite these limitations, the current study provides a unique opportunity to examine causal relationships between negative life events, highly specified measures of network support, and sleep disruptions among both younger and older adults. The data indicate specific types of negative life events, namely a chronic break in a relationship and problems with work or school may cause sleep disruptions, and further that these associations are buffered by the availability of specific types of support roles within the broader network, including social companions and confidants. More broadly, by examining the potential for networks to buffer the impact of stressful events on sleep disruption, we contribute to the growing body of literature, and provide evidence for specific mechanisms, linking social networks with health.

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Table 1. Weighted Sample Characteristics (UCNets, Wave 1, 2015)

	21-30 Years Old (N=475)	50-70 Years Old (N=637)
	Percentage or Mean (SD)	
Average Nights with Difficulty Sleeping Across Waves		
Wave 1	1.33 (.14)	1.93 (.13)
Wave 2	1.45 (.18)	1.88 (.13)
Wave 3	1.31 (.15)	1.68 (.13)
Frequencies of Ever Reporting Negative Life Events (Waves Pooled)		
Death of Close Tie	56.7%	72.9%
Persisting Break with Close Tie	55.1%	41.4%
Persisting Trouble Paying Bills	36.3%	18.1%
Problems at Work or School	98.5%	100%
Indicators of Social Support at Wave 1		
Respondents who wish for more confidants	30.9%	26.2%
Respondents who wish for more social companions	65.0%	46.9%
Respondents who wish for more practical helpers	31.2%	26.8%
Partnered or married	64.8%	70.8%
Family available in crisis	89.8%	81.9%
Friends available in crisis	84.0%	81.9%
Demographics at Wave 1		
Female	50.9%	53.8%
Race/Ethnicity		
White	40.0%	58.1%
Black	9.1%	9.2%
Latino	22.2%	11.4%
Asian	27.7%	20.9%
Other	0.8%	0.4%
Marital Status		
Married	23.0%	58.8%
Separated/Divorced/Widowed	4.0%	22.5%
Never Married	73.0%	14.7%
Educational Attainment		
Less than Bachelor's	58.7%	55.1%
Bachelor's Degree	29.5%	25.3%
More than Bachelor's	11.8%	19.6%
Personal Income		
Less than $15,000	40.0%	19.3%
$15,000-$34,999	24.7%	19.8%
$35,000-$59,999	15.4%	15.9%
$60,000-$99,999	11.1%	21.0%
$100,000+	8.8%	24.0%
Employment Status		
Employed Full/Part-Time	66.7%	50.2%
Retired/Unemployed/Other	33.3%	49.8%

Table 2. Within-individual effects of negative life events as moderated by network support on sleep disruption

Bivariate Effects of Negative Life Events	
Negative Life Events	b (95% Confidence Interval)
Recent Death of Close Tie	-.03 (-.24, .17)
Persisting Break with Close Tie	.18* (-.05, .41)
Persisting Trouble Paying Bills	.15 (-.18, .48)
Problems at Work or School	.54* (-.20, 1.28)
Bivariate Effects of Life Events when Moderated by Social Support Measures	
Negative Life Events	b (95% Confidence Interval)
Persisting Break with Close Tie	
Respondents who wished for more confidants	.50**** (.16, .84)
Respondents who did not wish for more confidants	-.08 (-.39, .23)
Persisting Break with Close Tie	
Respondents who wished for more people to socialize with	.30*** (.02, .58)
Respondents who did not wish for more people to socialize with	-.02 (-.41, .36)
Persisting Break with Close Tie	
Respondents who wished for more practical helpers	-.11 (-.49, .26)
Respondents who did not wish for more practical helpers	.34*** (.05, .63)
Persisting Break with Close Tie	
Partnered or married respondents	.20* (-.07, .48)
Unpartnered respondents	.12 (-.30, .55)
Persisting Break with Close Tie	
Respondents with family available in crisis	.19* (-.07, .45)
Respondents without family available in crisis	.04 (-.48, .56)
Persisting Break with Close Tie	
Respondents with friends available in crisis	.12 (-.16, .39)
Respondents without friends available in crisis	.34* (-.07, .75)
Work or School Problems	
Respondents who wished for more confidants	.61* (-.32, 1.54)
Respondents who did not wish for more confidants	-.16 (-.88, 1.21)
Work or School Problems	
Respondents who wished for more people to socialize with	.84** (-.08, 1.76)
Respondents who did not wish for more people to socialize with	.34 (-.92, 1.60)
Work or School Problems	
Respondents who wished for more practical helpers	.71 (-.49, 1.91)
Respondents who did not wish for more practical helpers	.45 (-.56, 1.47)
Work or School Problems	
Partnered or married respondents	.59* (-.26, 1.42)
Unpartnered respondents	.43 (-1.07, 1.93)
Work or School Problems	
Respondents with family available in crisis	.57* (-.19, 1.33)
Respondents without family available in crisis	.52 (-1.82, 2.86)
Work or School Problems	
Respondents with friends available in crisis	.47 (-.38, 1.32)
Respondents without friends available in crisis	.89* (-.44, 2.21)

*p<.2, **p<.1, ***p<.05, ****p<.01