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Individuals' perceptions of social support from family and friends are associated with lower risk of sleep complaints and short sleep duration

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ABSTRACT

Objective: To examine whether individuals' perceptions of social support (SS) from partners, other family members, and friends are associated with risk of sleep complaints and short sleep duration.
Methods: A cross-sectional and prospective study with 1,688 community dwelling adults from the Retirement and Sleep Trajectories study. Four annual, self-administered questionnaires were mailed to participants in the year 2010-2014. Self-reports of individuals' perceptions of SS were obtained at the baseline survey. Sleep quality and duration were self-reported on each of the four surveys over the follow-up. Associations were examined with mixed-effect models, controlling for confounders.
Results: In fully adjusted analyses, compared with those reporting low SS from their partner, the risk of reporting more than 1 sleep symptom was significantly lower among those with intermediate (relative risk, RR = 0.68; 95% confidence interval, CI = 0.53-0.87) and high SS (RR = 0.61; 95% CI=0.48-0.77). Similarly, relative to those with low SS, those reporting high SS from family (RR = 0.74; 95% CI = 0.57-0.94) and friends (RR = 0.73; 95% CI = 0.58-0.92) had lower risk of having more than 1 sleep symptom. Compared with those with low, intermediate (RR = 0.70; 95% CI = 0.52-0.96), and high SS (RR = 0.63; 95% CI = 0.48-0.84) from partners, intermediate (RR = 0.76; 95% CI = 0.59-0.97) and high SS (RR = 0.69; 95% CI = 0.51-0.92) from family and high SS (RR = 0.74; 95% CI = 0.56-0.99) from friends were associated with lower risk of short sleep (≤6 h).
Conclusion: The perception of higher SS from relatives and friends is independently associated with lower risk of poor sleep quality and short sleep duration. Future research and intervention studies should test whether strengthening social relationships can positively effect sleep health.

Introduction

Individual social support (SS) relates to bonding relationships with a spouse or partner, with other family members, and with close friends and is conceptually constituted by structural and functional dimensions.[1,2] The structural dimension is the number of friends or family members and the frequency of interactions with them, whereas the functional or cognitive dimension is defined as the perception of having someone to ask for help when needed, to consult regarding personal problems and important matters, and to provide emotional support.[1,3] Both dimensions have been related to self-rated health,[4,5] lower frequency of depressive symptoms,[6,7] and mental health distress.[8] As overall good health is positively related to SS,[5,9] it is reasonable to speculate that high SS could affect sleep by, for example, reducing the impact of stressful situations and, consequently, could act as a protective factor against stress-related sleep disturbances. However, although there are several studies relating low SS and higher frequency of sleep difficulties,[10] most of the evidence comes from cross-sectional analyses.[3,5,11-21] Moreover, the longitudinal studies that address this relationship do not show consistent findings,[10,12,22] and neither of the analyses consider mental health status, an important potential effect modifier or confounding factor of the possible association between SS and sleep.[17]

Furthermore, associations between individuals' perceptions of SS and sleep duration vary in accordance with the method used to measure sleep duration.[10] Although total sleep time was not associated with SS when measured by actigraphy,[11,20,21] a consistent

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relationship was found when habitual sleep duration was self-reported.[5,12,18-20] Mental health conditions could potentially confound these findings; although all those authors adjusted their analyses for sociodemographic and lifestyle variables, only a single study was controlled also for perceived health,[12] an indicator of general mental and physical health conditions, in addition to other variables.

The present study aims to analyze the cross-sectional and prospective relationships between sleep quality and duration (outcome variables) with individuals' perceptions of SS separately from partners, other family members, and friends. We examined separately the specific network members (spouse/partners, family, and friends) because SS provenient from each of those relationships could have different influence on sleep and, thus, this could partially explain inconsistency among the available evidence.[17,20] Furthermore, we explored associations of depression and health-related quality of life as potential confounders of these associations. We hypothesized that high SS from all groups would have a protective effect on the risk of sleep complaints and short sleep duration and that mental conditions would act as confounding factors on these associations.

Participants and Methods

Design and participants

The present study comprises a supersample of participants from the Wisconsin Sleep Cohort study[23] who were enrolled in the Retirement and Sleep Trajectories (REST) study.[24] These subjects were ~25–60 years old in 1988 at the time of the initial recruitment into the cohort and were 46–82 years old at the beginning of the REST study in 2010. The REST study aimed to evaluate the longitudinal association of retirement with sleep duration and quality, and the data were obtained using four annual mailed questionnaires (baseline and follow-up years 1, 2, and 3). Study protocols and informed consent documents were approved by the Institutional Review Board of the University of Wisconsin, and all study participants provided informed consent.

Study variables

Sleep

Sleep-related items were assessed at baseline and all follow-up surveys. Sleep quality was evaluated by the participants in accordance with the frequency of each of the following sleep complaints: difficulty getting to sleep, waking up during the night and having a hard time getting back to sleep, waking up repeatedly during the night, not feeling rested during the day no matter how many nightly hours of sleep, and feelings of excessive daytime sleepiness. The answers were registered as never (0); rarely, once a month (1); sometimes, 2-4 times a month (2); often, 5-15 times a month (3); or almost always, >15 times a month (4). Each sleep complaint was considered present when its frequency was assigned a score of 3 (often) or 4 (almost always).

The following question was used to estimate subjective sleep duration: "On workdays (or on a weekday if you do not work), over the past month, how many hours and minutes do you think you actually slept? This may be different than the number of hours you spent in bed." Subjective sleep duration was also collected for the weekend, and a weighted average of sleep duration throughout the week was obtained as follows: (5 * sleep duration on weekdays + 2 * sleep duration on weekend days)/7.

Social support

On the baseline survey, SS items were assessed using questions from the Midlife in the United States (MIDUS).[14] To obtain information about SS from friends, participants were asked (a) "How much do your friends really care about you?" (b) "How much do your friends understand the way you feel about things?" (c) "How much can you rely on them for help if you have a serious problem?" and (d) "How much can you open up to them if you need to talk about your worries?" These questions were also asked regarding other family members (not including the spouse or partner). For SS from the spouse or partner (hereafter called "partner"), we repeated the first four questions with respect to the partner and additionally included "How much does she/he appreciate you?" and "How much can you relax and be yourself around her or him?" For all questions, the participant was asked to choose one of the four response options: (1) not at all, (2) a little, (3) some, or (4) a lot.[14] The sum of values for support from friends and family (range: 4 to 16) and from the partner (range: 6 to 24) were separately categorized in quartiles to recode the SS in three levels: low (quartile 1), intermediate (quartiles 2 and 3), and high (quartile 4). These SS scales have been associated with diverse health outcomes and biomarkers in the context of different relationships (i.e., with the partner, family, and friends).[14,21,25,26] The authors of the MIDUS reported an internal consistency of SS variables as high for family ($\alpha = .82$), friends ($\alpha = .87$), and spouse/partner ($\alpha = .91$).[25]

Covariates

Several sociodemographic, lifestyle, and health variables were included to control for their potentially confounding effect[3,5,16,18,21,27] on the main study association: age (years), gender (male *vs.* female), educational level (up to high school *vs.* higher level), marital status, smoking status (current smoker *vs.* former or never smoker), alcohol consumption (number of drinks/week), caffeine intake (number of caffeinated beverages/day), working status (work full time for pay, work part time for pay, and not working for pay), and self-reported weight and height (used to calculate the body mass index in kg/m^2). A list of major life events (memory deterioration, death of a close family member, and major personal injury or illness, among others) was presented, and the participants noted if any of these events occurred in the previous year and how stressful they were.[28] Finally, the following indicators of mental health conditions were also assessed as covariates: self-rated health (excellent, very good, good, fair, and poor), depression (Center for Epidemiologic Depression Scale (CES-D)[29] $\geq$ 16 and/or reported currently taking antidepressant drugs), and health-related quality of life (mental and physical summary scales of the 12-item Short Form Survey (SF-12)).

Statistical analysis

Descriptive analyses comprised absolute and relative frequencies of categorical variables and mean and standard deviation of continuous variables. Correlations among each of the SS indices and between each of the indices and sleep were examined.

To examine associations between SS at baseline and sleep over the follow-up period, low SS was defined as the reference category which was compared with intermediate and high support for each group of contacts, i.e., partner, family, and friends. Worse sleep quality was considered as having more than 1 sleep complaint (out of five possible complaints) in each of the 3 follow-up surveys. Nighttime short sleep duration was defined as six hours or less per night. Models were built separately for support from partner (only for those married or those who reported living with a partner), family, and friends: sleep problem (more than one sleep complaint or short sleep duration) was the dependent variable and SS was the independent variable of primary interest.

Initially, we evaluated cross-sectional associations between SS and sleep problems at baseline. Next, to maximize power by using

Table 1
Baseline characteristics of the study participants

Characteristics at baseline	Answered questions about support from	
	Partner (n = 1262)	Family and friends (n = 1669)
Sociodemographic		
Age (years), mean ± SD	62.7 ± 6.9	62.8 ± 6.9
Female, n (%)	589 (46.7)	877 (52.5)
Married, n (%)	1133 (89.8)	1135 (68.0)
Highest school level up to 12th grade/high-school graduate, n (%)	226 (17.9)	313 (18.8)
Non-white, n (%)	37 (3.3)	49 (3.4)
Lifestyle		
Current smoker, n (%)	87 (6.9)	127 (7.6)
Alcohol intake (number of drinks/week), mean ± SD	4.7 ± 6.5	4.5 ± 6.3
Caffeine intake (number of caffeine beverages/day), mean ± SD	2.6 ± 2.1	2.6 ± 2.3
Physical activity in leisure time (MET-hours/week), mean ± SD	27.3 ± 30.6	26.2 ± 29.7
BMI (kg/m^2), mean ± SD	29.3 ± 6.3	29.5 ± 6.6
Currently working full time for pay, n (%)	451 (35.7)	575 (34.4)
Daily contact with a family member (except those living together), n (%)	-	530 (31.8)
Daily contact with a friend, n (%)	-	531 (31.8)
Major life events in previous year		
Number of major life events, mean ± SD	2.6 ± 2.2	2.6 ± 2.2
Stressful level of life events (ranged from 0 to 5), mean ± SD	2.5 ± 0.8	2.2 ± 1.2
Health status		
Excellent or very good self-rated health, n (%)	678 (53.7)	848 (50.8)
Depression, n (%)	281 (22.3)	408 (24.4)
SF-12 Mental Summary Score, mean ± SD	51.7 ± 8.7	51.5 ± 8.9
SF-12 Physical Summary Score, mean ± SD	48.5 ± 9.9	48.0 ± 10.4
Sleep		
Sleep duration (hours/night), mean ± SD	7.1 ± 1.0	7.0 ± 1.1
Short sleep duration (≤6 h), n (%)	197 (15.6)	299 (17.9)
Number of sleep complaints, mean ± SD	1.3 ± 1.3	1.3 ± 1.3
More than 1 complaint, n (%)	473 (37.5)	635 (38.0)
Social support		
Partner (6 questions)		
Score, mean ± SD	22.3 ± 2.8	
Low (6-21), n (%)	295 (23.4)	-
Intermediate (22-23), n (%)	330 (26.1)	-
High (24), n (%)	637 (50.5)	-
Partner (4 questions to match the analyses for family and friends)		
Score, mean ± SD	14.7 ± 2.0	
Low (4-11), n (%)	97 (7.7)	-
Intermediate (12-15), n (%)	496 (39.3)	-
High (16), n (%)	669 (53.0)	-
Family		
Score, mean ± SD		13.6 ± 2.5
Low (4-11), n (%)	-	290 (17.4)
Intermediate (12-15), n (%)	-	955 (57.2)
High (16), n (%)	-	424 (25.4)
Friends		
Score, mean ± SD		12.8 ± 2.7
Low (4-11), n (%)	-	452 (27.1)
Intermediate (12-15), n (%)	-	868 (52.0)
High (16), n (%)	-	349 (20.9)

all available data, mixed-effect generalized linear regression models with repeated measures were used to estimate associations of baseline SS with sleep and covariate data from all four surveys while accounting for the use of multiple observations per subject; the resulting regression coefficients represent weighted averages of cross-sectional (baseline SS predicting baseline sleep characteristics) and longitudinal (baseline SS predicting sleep characteristics 1, 2, and 3 years later) associations. Note that we examined within-subject correlations between baseline sleep characteristics (e.g., short sleep duration and number of sleep problems) and follow-up (1, 2, and 3 years later) sleep characteristics. The correlations of baseline to first follow-up between sleep variables ranged from 0.47 to 0.59 and the correlations of baseline to third follow-up ranged from 0.41 to 0.56. Thus, we observed a slight decay (within subject) of sleep variable correlations over time, as might be expected. Based on these observations and comparisons of models that used only baseline (cross-sectional) data with models that used all available data, we judged that the additional power obtained by using multiple sleep observations per subject more than offset potential power attenuation due to using outcome (sleep) information removed in time (up to 3 years) from baseline SS assessments. That is, the use of longitudinal sleep observations enhances parameter estimate precision, but perhaps at a slight conservative (to the null) bias in estimating SS-sleep associations. Also note that as we only had baseline data for our primary independent variables (SS), we could not decompose between-subject (cross-sectional) and within-subject (longitudinal) effects — although in comparing models that used only baseline data with those that used all available data, we found no evidence that cross-sectional and longitudinal effects varied substantially; thus, the use of multiple observations per subject was primarily to enhance precision.

Finally, to examine whether associations between SS and sleep outcomes changed over three years of follow-up (from basline to 4th survey), we constructed a latent growth curve model that included a time*SS interaction to test whether the association between SS and sleep changed over time.

Covariates were progressively added to regression models. The first adjusted model included the following covariates: age, gender, marital status, smoking status, alcohol intake, and physical activity in leisure time; the second model included all previous covariates and the occurrence of major life events as well as the participant-reported level of stressfulness of those events, BMI, depression, self-rated health, and mental and physical summary scores of health-related quality of life. Finally, to examine potential moderation effects, we tested interactions between SS and sex, age, and depression by adding interaction terms to the second set of models.

Regression analyses were performed with SAS software using PROC GENMOD (version 9.4, SAS Institute Inc., Cary, NC, USA).

Results

A total of 2427 questionnaires were mailed in the first year, and 1838 respondents (76%) returned a survey. The number of individuals who answered with information on SS at baseline was 1262 for those who were married or had partner and 1669 for family and friend support items. Baseline characteristics of the study participants are presented in Table 1. Overall, the mean age of the sample was 63 years, about half perceived their health as excellent or very good, a quarter reported diagnosed depression or used antidepressants, and the mean sleep duration was about 7 hours per night (Table 1). Among those who answered questions about SS from the partner, 89.8% were married, a third were working full time for pay, 15.6% reported short sleep duration, and 37.5% reported more than one sleep complaint at baseline (Table 1). Table 2 includes descriptive statistics for each of the four sleep outcomes by survey year. Supplemental Table 1 (in the Supplementary Materials) shows the correlation between each of the SS variables and the sleep variables.

No significant interactions between SS and age, sex, or depression were observed ($p > 0.05$), so no stratified analyses are presented. The results for cross-sectional analyses are very similar to the following results of the analyses with data from all 4 years of study, although with wider confidence intervals. Results from the mixed-effect models adjusted for sociodemographic and lifestyle covariates are shown in Figure 1 and indicate that the risk of more than one reported sleep complaint was lower among those with intermediate and high SS from the partner and with high SS from other family members or friends.

The risk of short sleep duration is presented in Figure 2. Compared with the perception of low SS, intermediate and high SS from the partner and from other family members and high SS from friends were associated with a lower risk of short sleep duration (6 or less hours/night). These associations were adjusted for sociodemographic, lifestyle, major stressful life events, and mental health status confounders (depression and health-related quality of life).

In our latent growth curve analyses of baseline SS predicting within-subject change in sleep outcomes, we did not find evidence of significant changes over time in the association between SS and sleep duration ($p > 0.6$ for interactions of SS parameters with time). We observed limited evidence of an association between baseline SS and within-subject trends in sleep complaints for support from the partner ($p = 0.01$) and support from friends ($p = 0.02$), such that there was a slight decrease in the SS-sleep complaints association over time.

Table 2
Sleep outcomes by REST survey year

Sleep outcome	Year	Answered questions about support from			
		Partner		Family/Friends	
		N	Statistics	N	Statistics
Sleep duration (hours/night), mean ± SD	1	1262	7.1 ± 1.0	1669	7.0 ± 1.1
	2	1219	7.0 ± 1.0	1606	7.0 ± 1.1
	3	1168	7.1 ± 1.0	1541	7.1 ± 1.0
	4	1121	7.1 ± 1.1	1480	7.1 ± 1.1
Short sleep duration (≤6 h), n (%)	1	1262	197 (15.6)	1669	299 (17.9)
	2	1219	212 (17.4)	1606	305 (19.0)
	3	1168	188 (16.1)	1541	267 (17.3)
	4	1121	180 (16.1)	1480	258 (17.4)
Number of sleep complaints, mean ± SD	1	1262	1.3 ± 1.3	1669	1.3 ± 1.3
	2	1219	1.2 ± 1.2	1606	1.2 ± 1.3
	3	1168	1.2 ± 1.2	1541	1.2 ± 1.2
	4	1121	1.1 ± 1.2	1480	1.1 ± 1.2
More than 1 complaint, n (%)	1	1262	473 (37.5)	1669	635 (38.1)
	2	1219	438 (35.9)	1606	573 (35.7)
	3	1168	376 (32.2)	1541	513 (33.3)
	4	1121	332 (29.6)	1480	453 (30.6)

Note: Overall number of survey responses: 4770 for partner analyses and 6295 for family/friend analyses.

Discussion

In this study, greater levels of SS from a partner, family, and friends were associated with a lower risk of sleep complaints and lower risk of short sleep duration among older adults. This is consistent with our hypothesis and confirms most previously published evidence.[10] Moreover, this study extends the present literature regarding SS and sleep owing to the multiple observations per subject and adjustment for self-rated health, depression, and mental health-related quality of life, in addition to several potential sociodemographic and lifestyle confounders.

Our results showed that having an intermediate or highly supportive relationship with spouses or partners was most consistently associated with lower risk of both sleep complaints and short sleep duration when compared to the perception of low SS from the partner. These results remained significant even after considering the possible confounding effects of gender and marital status, as well as relevant life events over the follow-up period and the presence of depression or poor mental health.

These findings are consistent with findings from other studies of this association. Lack of perceived partner responsiveness was related to worse sleep quality in US older adults in the MIDUS study.[21] In another study of adults from Hong Kong and Taiwan, Nomura et al.[3] measured SS as the availability of people to consult with regarding personal problems and found that those who could not consult with a partner when there was a need had a higher risk of having sleeping difficulties.[3] Kent et al.[17] reported a borderline association ($p = 0.06$) between having a "significant supportive other" and better sleep quality, although this was presented as ancillary analyses controlling only for sociodemographic variables.

In addition, our results showing that support from a partner is associated with lower risk of short sleep duration is consistent with the only other study, to our knowledge, that has investigated this association.[18] In that study, Glenn et al.[18] found a 30% increased odds for sleep duration ≤ 6 hours in US adults from the National Health and Nutrition Examination Survey (NHANES), where lower SS was defined by having emotional and financial support, close friends, religiosity, and marital status.

Our findings that support from a partner is associated with better and longer sleep are consistent with a study of women from the Study of Women's Health Across the Nation (SWAN) Sleep Study that found that compared with those married during the 8-year follow-up period, those who were consistently unmarried had longer polysomnography-assessed sleep latency and higher sleep fragmentation index and time awake after sleep onset, as measured with actigraphy.[30] Although there is some evidence regarding the

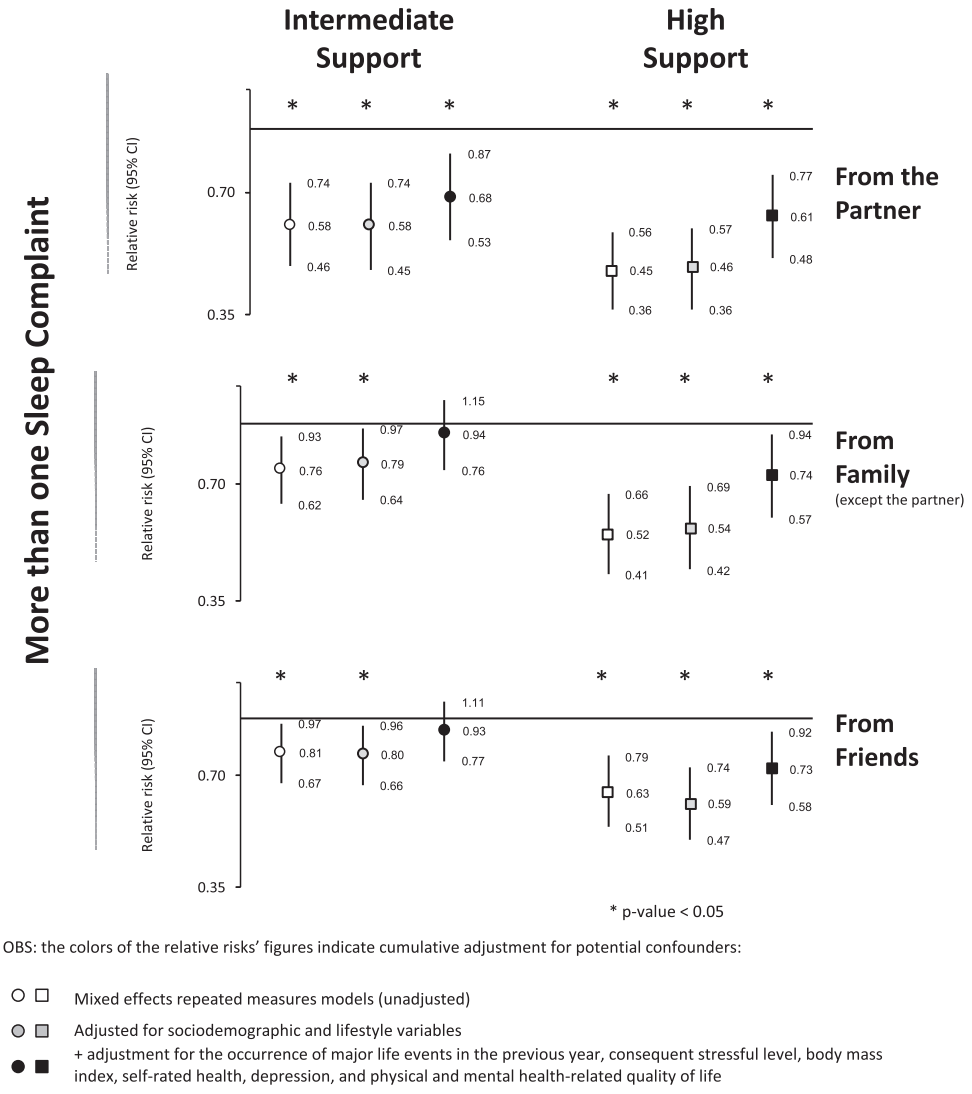

Fig. 1. Relative risks and 95% confidence intervals for associations between social support from partners, other family members, and friends and reporting more than one sleep complaint.

implications of marital quality in sleep and vice versa,[31] more research is required to gain a better understanding on the mechanisms behind that associations.

In addition to being associated with partner support, we also found that sleep quality was associated with high SS from other family members and friends. However, in contrast to what was found for the relationship with the partner, in the case of relationships with other family member and friends, the intermediate support category was not significantly associated with a different risk of sleep complaints compared with low support after considering the occurrence of major stressful life events, depression, and indicators of mental status as confounders. These results are consistent with other studies.[14,17,20] Kent et al.[17] observed better sleep quality among those who reported a higher number of supportive family members (other than the spouse). Ailshire et al.[14] also reported that lower frequency of difficulties getting to sleep and maintaining sleep was associated with higher SS from family members among US adults in the MIDUS study. This finding was also recently confirmed by Chung,[20] who also found that better sleep quality, as measured by the Pittsburgh Sleep Quality Index (PSQI), was associated with greater SS from both family members and friends.

In the present study, the association between SS and short sleep duration was statistically significant in fully adjusted models when we considered the support from the partner and family. In a cross-sectional analysis by Sinokki et al.,[12] short sleep duration was associated with a lower number of people who could provide SS when needed. This was also observed by Nieminen et al.,[5] Glenn et al.,[18] and Willians et al.[19] based on different questions to assess perceived SS. Consistent with these studies, our findings also showed significant associations of SS from the partner, from family, and from friends with short sleep in models considering a wide array of confounders.

Some mechanisms have been proposed to explain why SS is related to better sleep. Going to bed with a supportive (trusted and secure) partner provides the opportunity to detach from stressful situations of the day before falling asleep.[31] Another explanation could be that SS provides a sense of protection against social isolation.[32] The sense of belonging and connectedness may be a buffer against psychological distress and encourage the adoption of positive health behaviors.[31]

Some methodological strengths and limitations must be considered in the interpretation of the present findings. The major strengths of the study were the population-based nature of this large sample of adults, multiple observations per participant, and a comprehensive

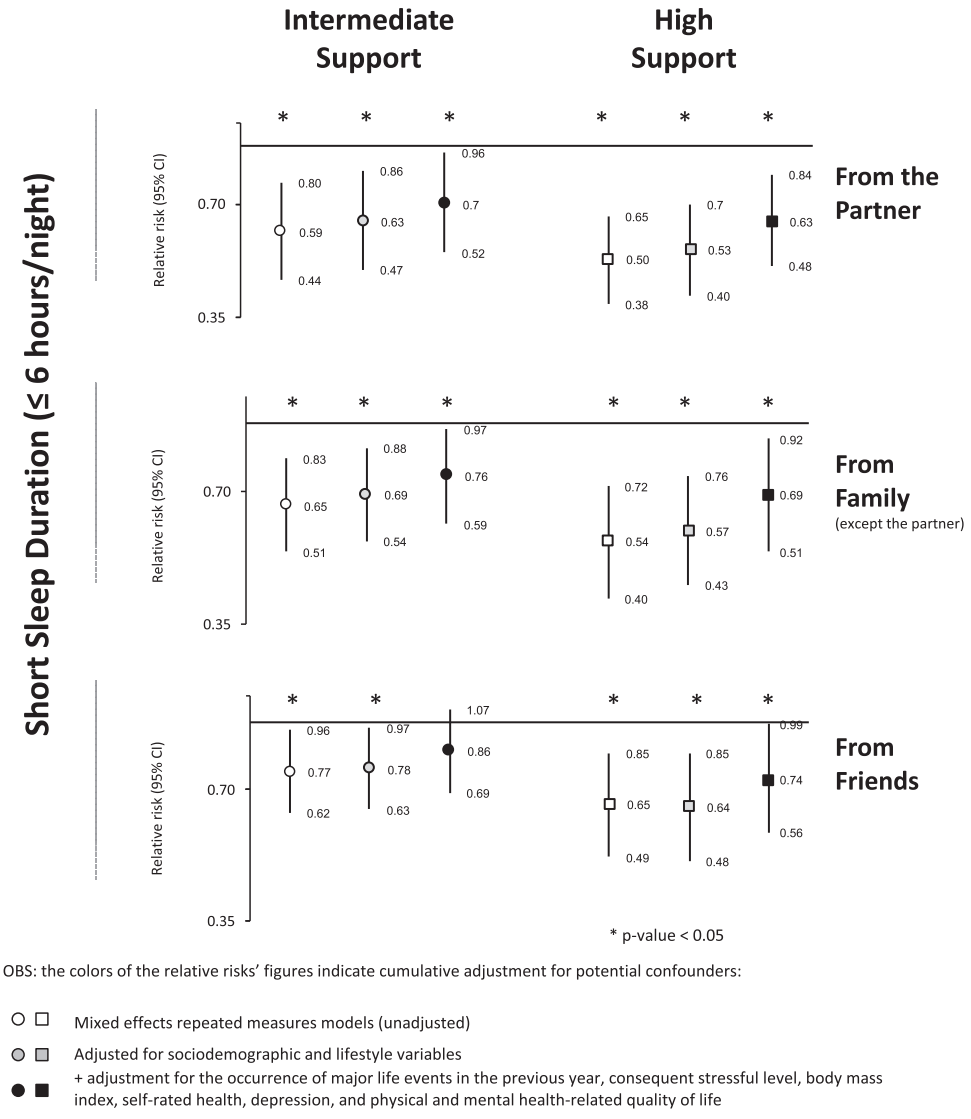

Fig. 2. Relative risks and 95% confidence intervals for associations between social support from partners, other family members, and friends and short sleep duration.

array of covariates available to control for confounding. One limitation was that information about SS was collected only at baseline. We acknowledge that social relationships are produced through dynamic processes,[33] and longitudinal studies are still required for better understanding the effect of changes in SS on sleep. Importantly, we analyzed functional SS and considered six questions of functional SS for partners and four questions for family and friends, which are more detailed than single questions used in other studies[3,5,13,19,34] and more comprehensive than others that considered only structural SS [12,15] An additional limitation is that the relationship between SS and sleep could be bidirectional, as better sleep could promote greater social functioning and, thus, leads to a better perception of SS[35]; we were not able to address potential bidirectionality. Furthermore, disturbed sleep may negatively affect the perception of SS.[33] However, because information on SS was available in the present study only at baseline, we were not able to explore the effects of sleep on SS. Residual confounding cannot be ruled out because some conditions related to both sleep and SS were not available for the present analyses, such as anxiety and pain; nevertheless, many potential confounders have been included: major stressful life events, depression, self-rated health, and health-related quality of life. Finally, it is important to note that the demographics of the sample — in particular the older age and the retirement status of many participants — may have bearing on generalizing the findings to other populations.

Conclusions

This study found that greater levels of SS from the partner, from family, and from friends are associated prospectively with lower risk of sleep complaints and short sleep duration. This underscores the potential importance of addressing these social relationships in the promotion of sleep quality and prevention of sleep disturbances among older adult populations. In addition to other evidence-based recommendations, such as promoting exercise[36] and avoiding the intake of caffeinated beverages,[37] this study suggests that, if causally associated, preserving good and supportive social relationships with relatives and friends may be a potential strategy to maintain good sleep quality.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.sleh.2019.08.013.

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