Cognition and Sleep among Chinese Couples: A Longitudinal Actor–Partner Interdependence Model Analysis

Abstract

Cognition is one of the factors that affect sleep duration. However, the existing literature considers this association solely at the individual-level. Using four waves (2011, 2013, 2015 and 2018) of the Chinese Health and Retirement Longitudinal Survey, this study applied actor-partner interdependence modeling to examine the dyadic associations between cognition ability and nightly sleep duration within middle-aged and older couples in China (N=3442 couples). Our results showed that, for both wives and husbands, higher levels of cognition ability were significant associated with longer sleep duration of the same person(*actor effect*). For wives whose husbands reported higher cognition ability reported longer sleep duration(*partner effects*), whereas not significant when it converse. Furthermore, an increase in cognition ability of a wife/husband at a particular time point was significantly associated with a longer sleep duration of his wife/her husband at the next time points(*partner effects*). The findings suggest that the cognition among middle-aged and older adults in intimate partnerships is associated with their sleep status. Sleep is a dyadic interpersonal process, and might better be treated as a couple-level phenomenon than an individual one, particularly for women.

Keywords: cognition ability, sleep duration, Longitudinal Actor–Partner Interdependence Model, older adults

Background

Old age is associated with cognitive impairment and shorter sleep duration. Considerable studies have found associations between sleep and cognitive function solely at the individual-level. However, sleep and cognition is a dyadic interpersonal process between couples. Examing whether cognition ability affects the sleep duration on a dyad-level, is very important for improving the sleep and health conditions for older adults.

Objectives

This paper aimed to examine the temporal dynamics of the association between sleep duration and cognition function and further explore the actor and partner effects that exist in the association between sleep duration and cognition function among Chinese middle-aged and older couples. We mainly focus on the effects of one's own and one's partner reported cognition ability on the sleep duration, and to answer: 1) how the average/time-specific **cognition ability of a person** affects the sleep duration of that same person; 2) how the average/time-specific **cognition ability of one's partner** affects one's own sleep duration; 3) to what extent the sleep duration on average/on a specific time point covaries between partners within a dyad.

Methods

Using four waves (2011, 2013, 2015, and 2018) of the Chinese Health and Retirement Longitudinal Survey(CHARLS)(N=3442), this paper uses the longitudinal actor-partner interdependence model in the SEM framework (L-APIM) to examine the actor effects and partner effects between husband and wife's cognition ability and their sleep duration. Furthermore, it also examines the average effects and specific effects of cognition ability on sleep duration. All the analyses conducted using an online application at http://fgisteli.shinyapps.io/Shiny LDD.

Results

Table 1 shows the results of the L-APIM for the effect of cognition ability on sleep duration. It found that husband/wife who report better cognition ability on average, also have a longer sleep duration(*average_actor effect*: Husbands: β=0.045, p=0.004; Wives: β=0.070, p=0.000). Furthermore, women whose husbands reported better cognition ability, report longer sleep duration (*average_partner effect:* Wives: β=0.032, p=0.040). However, the similar effect of the women on their male partners was not found to be significant(*average_partner effect:* Husbands: β=0.015, p=0.273). Both within men and women, an increase in the cognition ability on a specific time point is associated with his/her own and his wives/her husbands' longer sleep duration on the next time

point (*specific_actor effect*: Husbands: β=0.045, p=0.004; Wives: β=0.070, p=0.000; *specific_partner effect:* Husbands: β=0.015, p=0.273; Wives: β=0.032, p=0.040).

Table 2 provides additional information on sleep duration, such as its average variations between individuals, degree of correlation within couples on average and on specific time points. The variation for average sleep duration is 0.627 and 0.566 for husbands and wives, respectively. The correlation within couples of sleep duration on average is -0.90 and indicating a strong association between partners. The correlation of the fluctuations on different time points between husbands and wives is 0.76 means when the husbands have a longer sleep duration at a time point, the wives also tend to have a longer sleep duration at the same time point.

Conclusions

1) This study found that husbands' and wives' cognition ability does not only affect the nightly sleep duration of their own but also is associated with the sleep duration of his wives/her husbands.
2) Sleep is a dyadic interpersonal process, the sleep duration on average or the fluctuation on different time points within couples are highly dependent on their partners.

Table 1. Estimates of the fixed effects for cognition ability on sleep duration

	Estimate	S.E.	z-value	p-value	CI(95)-lower	CI(95)-upper
Effect on Husbands-outcome						
Intercept	9.463	0.058	162.347	<0.001	9.679	9.577
CAAH	0.045	0.016	2.846	0.004	0.014	0.076
CAAW	0.015	0.014	1.096	0.273	-0.012	0.043
CASH	0.277	0.028	10.012	<0.001	0.223	0.331
CASW	0.109	0.023	4.756	<0.001	0.064	0.154
Effect on Wives-outcome						
Intercept	9.265	0.058	158.642	<0.001	9.150	9.379
CAAW	0.070	0.014	1.977	<0.001	0.042	0.098
CAAH	0.032	0.016	2.055	0.040	0.001	0.063
CASW	0.112	0.023	4.909	<0.001	0.068	0.157
CASH	0.250	0.028	8.967	<0.001	0.196	0.305

Notes: S.E.: Standard errors; CI: Confidence interval; CA: Cognition ability; A: The time-averaged effect; S: The time-specific effect; H: Husband; W: Wives.

Table 2. Covariance parameters for cognition ability on sleep duration

	Estimate	S.E.	z-value	p-value	CI(95)-lower	CI(95)-upper
Between-couples						
$\tau^2 H$	0.627	0.275	2.279	0.023	0.088	1.166
$\tau^2 W$	0.566	0.264	2.140	0.032	0.048	1.084
$\tau^2 HW$	-0.595	0.049	-12.113	0.000	-0.692	-0.499
Within-couples						
σ^2 H	40.455	0.497	81.453	0.000	39.482	41.429
σ^2 W	41.199	0.505	81.635	0.000	40.210	42.188
σ^2 HW	31.075	0.441	70.470	0.000	30.211	31.939
Autocorrelation	-0.040	0.007	-5.722	0.000	-0.054	-0.026

Notes: S.E.: Standard errors; CI: Confidence interval; H: Husband; W: Wives.