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EXAMINING THE IMPORTANCE OF SLEEP IN A U.S.-MEXICO BORDER COMMUNITY

EXAMINANDO LA IMPORTANCIA DEL SUEÑO EN UNA COMUNIDAD FRONTERIZA EE. UU. – MÉXICO

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Received: April 6, 2011
Reviewed: July 21, 2011
Accepted: July 27, 2011

Abstract

In Mexican-American populations, little is known about the extent to which sleep duration is associated with health status, and whether relationships between sleep duration and acculturation are consistent with those found for other lifestyle behaviors and acculturation.

This cross-sectional study used data collected from the San Diego Prevention Research Center's first community survey. Data were collected from 672 Latino respondents sampled via random digit dialing.

In this primarily female sample (71%), there was a higher prevalence of several health conditions (high cholesterol, asthma, arthritis, and depression) among short (< 6 hours on a typical night) versus long (> 9 hours on a typical night) and mid-range sleepers. Sleep duration was not associated with obesity. Longer sleepers reported watching four

Resumen

En poblaciones mexicano-estadounidenses, poco se sabe hasta qué grado la duración del sueño está relacionada con el estado de salud, y si las relaciones entre la duración del sueño y aculturación son consistentes con las que se encuentran en otros comportamientos de estilo de vida y de aculturación.

Éste fue un estudio transversal utilizando información recabada de la primera encuesta comunitaria del Centro de Investigación para la Prevención de Enfermedades en San Diego. Se recabó información de 672 participantes latinos muestreados vía marcación telefónica aleatoria.

En esta muestra principalmente de sexo femenino (71%), hubo mayor preponderancia de varias afecciones de salud (colesterol alto, asma, artritis y depresión) entre las personas que duermen poco (< 6 horas en una noche común) comparadas con

more hours of TV compared to mid-range sleepers and three more hours compared with short sleepers. Short sleepers reported living in the U.S. for a greater number of years, and were less likely to complete the interview in Spanish, compared to mid-range and long sleepers.

Short sleepers exhibited a poorer health profile than long and mid-range sleepers; however, long sleepers exhibited more television watching. Additional research is needed on the extent to which these findings hold for other Latino subgroups.

Key words: Hispanic, sleep duration, acculturation.

las que duermen mucho (> 9 horas en una noche común) y las que duermen el rango medio de horas. La duración del sueño no estuvo relacionada con la obesidad. Las personas que duermen más tiempo reportaron ver cuatro horas más de televisión comparadas con las que duermen el rango medio, y tres horas más comparadas con las personas que duermen poco. Las personas que duermen poco reportaron vivir en los EE. UU. durante un mayor número de años y estaban menos inclinadas a completar la entrevista en español, comparadas con las personas que duermen el rango medio y las que duermen mucho.

Las personas que duermen poco mostraron un perfil de salud peor que las personas que duermen mucho y las del rango medio; sin embargo, las personas que duermen mucho mostraron más tiempo viendo televisión. Se requiere investigación adicional respecto al grado en que estos resultados aplican a otros subgrupos latinos.

Palabras clave: Hispanos, sueño, aculturación.

Introduction

The deleterious effects of too much or too little sleep on health are becoming increasingly evident. Short sleep duration (< 6 hours of sleep on a typical night) is associated with greater mortality from cardiovascular disease, whereas long sleep duration (> 9 hours of sleep on a typical night) is associated with non-cardiovascular mortality (Ferrie et al., 2007). Cross-sectional data from the Nurses' Health Study II determined that long sleep duration was associated with depression (Patel, Malhotra, Gottlieb, White, & Hu, 2006). A prospective population-based study determined that both short and long sleep duration were associated with a greater incidence of diabetes than mid-range sleep duration (Gangwisch et al., 2007). Similar findings were observed among Finnish women but not men (Tuomilehto et al., 2008). In addition, both long and short sleep duration were associated with increased risk for hypertension among adults (Gottlieb et al., 2006), elevated BMI and obesity among adults (Bjorvatn et al., 2007), and overweight/obesity among boys but not girls (Eisenmann, Ekkekakis, & Holmes, 2006). The consequences of poor sleep habits may be particularly relevant for occupational drivers given greater risk of motor vehicle accidents (Rey de Castro, Gallo, &

Loureiro, 2004). Despite this evidence, one study showed no relationship between sleep duration and quality of well-being (Jean-Louis, Kripke, & Ancoli-Israel, 2000). Resnick and colleagues suggest that the relationship between sleep and obesity may be indirect through lifestyle behaviors (Resnick, Carter, Aloia, & Phillips, 2006). Both short and long sleep duration are associated with spending more time watching TV (Basner et al., 2007), and short sleep duration is associated with lower levels of fruit and vegetable consumption and lower levels of physical activity (Stamatakis & Brownson, 2008). These findings suggest that sleep may be an important health behavior to consider for obesity prevention and control.

The extent to which sleep is associated with the health status of Latinos living in the U.S. is not yet known. Such knowledge may be important given that Hale and Do (2007) found that Hispanics (excluding Mexican-Americans) were at greater risk of short sleep duration than Whites. To fill this gap in knowledge we examined the relationship between sleep, health indicators such as obesity, and health behaviors in a Mexican immigrant/Mexican-American community in Southern California.

Because acculturation has been shown to be associated with healthy eating (Ayala, Baquero, & Klinger,

2008) and leisure-time physical activity (Evenson, Sarmiento, & Ayala, 2004), we hypothesized that it also would be related to sleep. The relationships between acculturation and these behaviors are complex (e.g., greater acculturation is associated with *less* fruit and vegetable intake but also reduced use of lard in food preparation [Ayala et al., 2008] and *more* physical activity [Evenson et al., 2004]), so we had no prior hypothesis about the direction of the relationship between sleep and acculturation.

Present study

The present study examined the prevalence of short and long sleep duration (compared with mid-range sleep) and whether short and long sleep duration were associated with health conditions among a sample of Mexican immigrant/Mexican-American adults living along the U.S.-Mexico border in California. Additional analyses examined the extent to which sleep duration was associated with diet, physical activity, and sedentary behavior. Finally, the relationship between sleep and acculturation was examined.

Methods

Study Design

A cross-sectional study was conducted using random digit dialing and included 672 Mexican/Mexican-American adults who agreed to participate in a one-time telephone interview in the language of their choice (Spanish or English). Adults who were 18 years of age or older and residents of the U.S.-Mexico border communities of South San Diego County were included. This study was approved by the institutional review boards of San Diego State University and the University of California, San Diego.

Procedures

The Social Science Research Laboratory at San Diego State University performed the random digit-dial telephone surveys. Participants were randomly sampled from a list of household telephone numbers of Hispanic surname residents located within five zip code regions in South San Diego County. A total of 13,368 telephone numbers were dialed; 36% ($n=4,756$) of the numbers were invalid and 29% ($n=3,899$) were never reached because the telephone was busy or there was no answer after 10 attempts. From the remaining 4,713 telephone numbers, 54% ($n=2,524$) were ineligible (e.g., not Latino/Hispanic), 25% ($n=1,200$) refused, and 8%

($n=379$) had incomplete data. Data were obtained from 610 of the randomly sampled respondents plus an additional 62 respondents using snowball sampling within the household. Verbal informed consent was obtained from the respondents following a brief description of the study. Interviews lasted an average of 42 minutes ($SD = 12$) and 59% were conducted in Spanish.

Measures

The telephone survey was comprised of questions pertaining to diagnosis and family history of health conditions, key health behaviors, and demographic and socio-cultural characteristics, including acculturation and migration. Constructs and scales included in the telephone interview were selected and approved by the San Diego Prevention Research Center Community Engagement Committee, a group of individuals representing organizations in our target communities. Scales that were not available in Spanish were translated into Spanish by a certified translator and then evaluated by a group of researchers for cultural equivalence. Pilot interviews helped to identify problematic questions (e.g., too many response options), and the survey was revised accordingly.

Sleep duration was measured using two questions from the Pittsburgh Sleep Quality Index: "During the past month, how many hours of actual sleep did you get at night on a typical week day? This may be different than the number of hours you spent in bed." and "During the past month, how many hours of actual sleep did you get on a typical weekend night?" Responses were grouped into three clinically meaningful categories based on previous research (Hale & Do, 2007): short sleep duration (< 6 hours/night), mid-range sleep duration (> 6 hours to < 9 hours), and long-sleep duration (> 9 hours/night).

Self-reported health conditions were assessed using questions derived from the Behavioral Risk Factor Surveillance System (Centers for Disease Control and Prevention [CDC], 2005a). Respondents provided information on whether they had been diagnosed with any of the following health conditions: diabetes, cardiovascular/stroke, hypertension, high cholesterol, asthma, cancer, arthritis, depression, and sleep disorders. In addition, respondents reported their weight and height which was used to calculate their body mass index (BMI; kg/m^2) and then used to categorize them as normal weight, overweight, and obese using CDC criteria.

Diet was assessed as follows: daily soda consumption, number of times per week the respondent eats

fast food, and number of times per day that the respondent eats fruits and vegetables (the latter two assessed separately and then combined into one composite score; CDC, 2005a).

Physical activity was measured using the International Physical Activity Questionnaire (IPAQ) telephone survey long-form which measures physical activity in the past seven days in five domains (Hallal & Victoria, 2004). Given the self-reported duration, frequency, and intensity of physical activity behavior from the IPAQ, a Metabolic Equivalent-minutes (MET-minutes) score can be calculated. Although all domains of activity were assessed, the present analyses are limited to leisure-time physical activity given its importance on health (CDC, 2005b) and occupational physical activity given its relevance in the Latino population (Marquez, Neighbors, & Bustamante, 2010).

Television-watching was assessed by asking two questions on the number of hours the respondent watches TV on a typical weekday and a typical weekend day. A mean score was computed across the two items to obtain a final score representing the mean number of hours that the respondent reports watching on a typical day.

Acculturation was assessed using a validated acculturation scale developed by Marin and Gamba (1996), as well as three proxy measures of acculturation including: language of interview; country of origin; and if foreign-born, years living in the U.S. The acculturation scale consisted of 12 items assessing English and Spanish language use and ethnic affiliation, with response options ranging from 1=mostly Spanish/similar ethnic group to 5=mostly English/different ethnic group than mine. For this study, a mean language acculturation score was obtained from eight of the 12 items related to language, with a higher acculturation score representing greater user of the English language.

Demographic variables considered in these analyses were based on their associations with sleep duration in previous studies (Hale & Do, 2007; Stamatakis & Brownson, 2008). Respondents were asked their age (open-ended), gender, marital status (recoded as married/living as married versus unmarried), education (recoded as high school education versus less), household size (sum of number of children and adults living in the home), employment status (recoded as employed versus unemployed), and income (open-ended).

Data Analysis

Data analysis was conducted using SPSS version 18. Alpha was set a priori at .05. Descriptive statistics were used to characterize the sample. Mean scores and standard deviations were calculated for the full sample, as well as by sleep duration category (short, mid-range, and long). Analyses examining the relationship between sleep, health status, health behaviors, and acculturation controlled for age and employment in all analyses given previous research (Stamatakis, Kaplan, & Roberts, 2007).

Results

Descriptive statistics of the study sample are reported in Table 1. Demographically, this sample was primarily female (71%), married (58%), and had at least a high school education (61%). Sleep duration on a typical weekday or weekend day during the past month ranged from 4 to 14 hours (mean on weekdays = 6.9 hours [SD = 1.4]; weekend days = 7.7 [SD = 1.7]). Using weekday reports, 38% of the sample was classified as short sleepers, 54% as mid-range sleepers, and 8% as long sleepers. Based on weekend day reports, 23% were short sleepers, 52% as mid-range sleepers, and 25% as long sleepers.

An examination of the correspondence between sleep duration classification on weekday versus weekend days indicated that sleep duration patterns matched among 62% of the sample; in other words, participants classified as short/mid/long sleepers on weekdays received a similar classification on weekend days. The most notable differences in sleep duration classification were among individuals who reported longer sleep on weekend days compared with weekdays (24%). Given these findings and to minimize Type I error, our sleep duration classification was based on the average sleep on weekdays and weekends days. This classification of sleep duration was confirmed with a second question assessing whether the respondents had ever been diagnosed with a sleep disorder. Forty-seven percent of short sleepers compared with 17% of mid-range and 6% of long sleepers reported a physician-diagnosed sleep disorder ($p < .001$).

A negative linear relationship was observed between sleep duration and age such that younger age was associated with longer sleep duration ($p < 0.001$). A greater percentage of long sleepers were unemployed compared with short and mid-range sleepers ($p < 0.01$). No other demographic variables were associated with sleep duration.

Table 1.
Demographic characteristics of total sample and by sleep duration classification

	Total Sample N=672	Short (< 6 hrs) 21.3% (n=141)	Mid-range 65.6% (n=434)	Long (> 9 hrs) 13.1% (n=87)	Sig.
Demographic factors					
Mean age (SD)	39.1 (13.3)	42.5 (13.2) ^a	39.4 (13.3) ^a	32.3 (11.6) ^b	.001
Mean monthly income (SD) ¹	3,031 (2,428)	3,043 (2,808)	3,015 (2,363)	3,097 (2,049)	n.s.
Mean household size (SD)	4.1 (1.9)	4.0 (1.8)	4.1 (1.9)	4.4 (2.0)	n.s.
Female gender	71.1% (471)	65.2% (92)	72.4% (314)	74.7% (65)	n.s.
Married	58.3% (385)	56.0% (79)	60.4% (261)	51.7% (45)	n.s.
High school education	61.1% (404)	65.0% (91)	59.9% (260)	60.9% (53)	n.s.
Employed	54.3% (358)	59.3% (83) ^a	55.6% (240) ^a	40.2% (35) ^b	.01
Acculturation					
Mean acculturation score (SD)	2.2 (0.9)	2.3 (0.9)	2.1 (0.9)	2.09 (0.8)	n.s.
Mean years in the U.S. (SD)	19.2 (12.3)	22.9 (12.7) ^a	18.9 (11.9) ^a	14.9 (12.2) ^b	.001
Foreign born	69.0% (457)	70.2% (99)	68.4% (297)	70.1% (61)	n.s.
Spanish language interview	58.6% (388)	48.9% (69) ^a	61.3% (266) ^b	60.9% (53) ^b	.05

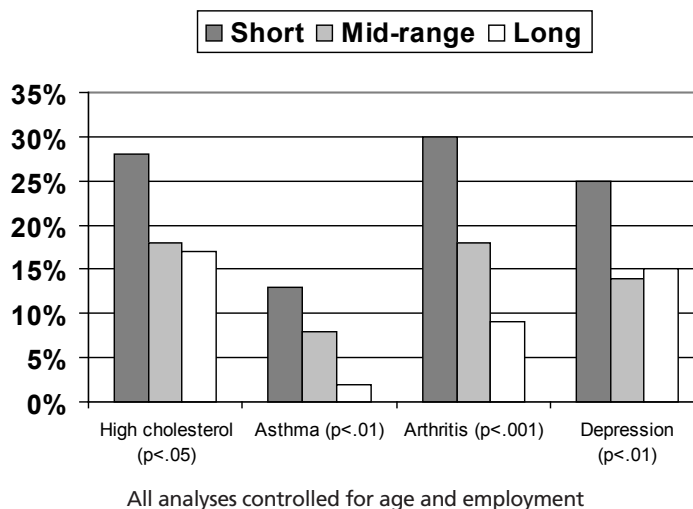


Figure 1. Prevalence of various self-reported physician-diagnosed health conditions by sleep duration classification (p-value)

Figure 1 depicts the relationship between sleep duration classification and self-reported physician-diagnosed health conditions, controlling for age and employment. A significant relationship was observed between sleep duration and high cholesterol ($p<.05$), asthma ($p<.01$), arthritis ($p<.001$) and depression ($p<.01$): in all cases, there was a higher prevalence of physician-diagnosed health conditions among short sleepers compared with both mid-range and long sleepers. There were no associations between sleep duration and physician-diagnosed diabetes, cardiovascular disease, hypertension, or cancer. In

addition, sleep duration was not associated with BMI category, although the prevalence of obesity was higher among short and mid-range sleepers compared with long sleepers.

As represented in Table 2, after controlling for age and employment, the only health behavior that differed between short, mid-range, and long sleepers was hours of television watched. Long sleepers reported watching TV almost four hours more than mid-range sleepers and nearly three hours more than short sleepers ($p<0.05$).

Table 2.
Obesity-related characteristics by sleep duration classification

	Total Sample	Short	Mid-range	Long	Sig.
	N=672	21.3% (n=141)	65.6% (n=434)	13.1% (n=87)	
Diet					
Mean daily soda (SD)	0.7 (1.1)	0.7 (1.2)	0.6 (1.0)	0.8 (1.5)	n.s.
Mean fast food per week (SD)	1.5 (1.9)	1.5 (1.7)	1.5 (2.0)	1.5 (1.6)	n.s.
Mean fruits & veggies per day (SD)	3.1 (2.1)	3.1 (2.1)	3.1 (2.2)	3.3 (1.9)	n.s.
Physical Activity					
Mean MET mins/wk of LTPA (SD)	1,134.7 (1,623.1)	1,192.4 (1,663.2)	1,108.2 (1,659.7)	1,172.2 (1,371.1)	n.s.
Mean MET mins/wk of OPA (SD)	5,530.8 (4,942.1)	6,519.7 (4,867.2)	5,384.6 (4,966.7)	4,461.9 (4,725.4)	n.s.
Sedentary behavior					
Mean hours TV on typical week (SD)	16.4 (12.4)	16.3 (13.5) ^a	15.8 (11.5) ^a	19.6 (14.4) ^b	.05

All analyses controlled for age and employment

In terms of acculturation, 59% of the sample completed the interview in Spanish and 69% were foreign born. The mean acculturation score was 2.2 on a 5-point scale suggesting low levels of acculturation. The only significant relationships observed were between sleep duration and years living in the U.S. and language of interview. There was a linear relationship between sleep duration and mean years living in the U.S.; respondents who had lived in the U.S. the longest reported the least sleep, followed by mid-range and long sleepers ($p < 0.001$). Similarly, a greater percentage of respondents who completed the interview in Spanish were categorized as mid-range or long sleepers compared with those who completed it in English ($p < 0.05$).

Discussion

In this population of Mexican immigrant/Mexican-Americans living in the border region of San Diego County, short sleep duration was associated with a higher prevalence of hypercholesterolemia, asthma, arthritis, and depression. Short sleepers were significantly older and more often employed compared with mid-range and long sleepers. Short and mid-range sleepers reported watching less TV in a typical week compared with long sleepers. Finally, short sleepers reported living in the U.S. for a greater number of years and were less likely to complete the interview in Spanish compared with mid-range and long sleepers. To our knowledge, this is the first published study of the relationships between sleep duration and health status among a community sample of Mexican immigrants/Mexican-Americans. The 21% prevalence of short sleep duration was similar to previous studies (e.g., 15% in Stamatakis

et al., 2007 and 20% in Tuomilehto et al., 2008). However, the study generated a number of findings that differed from previous studies. For example, short sleepers were older than mid-range and long sleepers, findings opposite to those of Stamatakis and Brownson (2008). In the present study, no associations were observed between sleep duration and income or education, diverging from the results of a previous study which found that the lowest income levels and not having a high school education were associated with short sleep duration (Stamatakis et al., 2007). Nevertheless, long sleep was highest among the unemployed, consistent with the Nurses' Health Study (Patel et al., 2006). Contrary to previous findings, no associations were observed between sleep duration and other lifestyle behaviors with the exception of television watching. Stamatakis and Brownson (2008) found an association between sleep duration and fruit and vegetable consumption that was not replicated in this study even after we re-examined the relationship using their operationalizations of sleep duration (short sleep < 7 hours/night) and fruit and vegetable consumption (1-2 servings, 3-4 servings, versus 5 or more servings). Yet the relationship between sleep duration and television watching supports the association Basner and colleagues found between sleep duration and hours of television watched per week. In their study, mid-range sleepers reported the least amount of television watched followed by short and then long sleepers (Basner et al., 2007). Finally, short sleep was associated with depression which differs from Patel and colleagues' (2006) findings that long sleep was associated with a greater prevalence of depression. These findings may be due to our sample characteristics as our study had fewer males compared with

previous studies. In addition given the cross-sectional nature of this and previous studies, the direction of these relationships is unknown. For example, it is possible that long sleep is associated with depression because depressed individuals sleep longer. It is also possible that short sleep is associated with depression given the consequences of lack of sleep.

This study has several limitations. First, because categories of sleep duration have been defined differently in previous studies (e.g., short sleep duration < 8 hours: Eisenmann et al., 2006; < 7 hours: Gangwisch et al., 2007; Stamatakis & Brownson, 2008; Stamatakis et al., 2007; < 6 hours: Tuomilehto et al., 2008) the most conservative approach was used in the present study. This may have limited our ability to find important relationships. Second, a greater percentage of participants had a high school education and reported a higher income compared with a previous sample studied in this region (Ayala et al., 2008) raising questions about the generalizability of the sample. Nevertheless, the respondents were recruited using the most rigorous sampling method available for telephone surveys. Third, the majority of respondents were female limiting our ability to generalize study findings to men. Fourth, all data are based on self-report. Among a group of mostly older adults, total estimated sleep time via self-report versus actigraphs differed by about 1 hour among 34% of the participants (Tworoger, Davis, Vitiello, Lentz, & McTiernan, 2005). We did not collect information on the respondents' medication use, caffeine intake and work shift, all of which may affect their sleep duration.

A growing body of evidence links acculturation with a variety of health behaviors, generally concluding that greater acculturation to the U.S. is associated with worse health behaviors (Lara, Gamboa, Kahramanian, Morales, & Bautista, 2005). These relationships are often dependent on how acculturation is operationalized (Ayala et al., 2008) and some researchers question the manner in which acculturation is measured (Abraído-Lanza, Armbrister, Flórez, & Aguirre, 2006) and others question its relevance altogether (Hunt, Schneider, & Comer, 2004). Nevertheless, based on an examination of the English language literature, we found no published studies examining the relationship between sleep duration and acculturation in Hispanics. The findings regarding years living in the U.S. and sleep duration parallel those in nutrition research which suggests that more years living in the U.S. can be detrimental to health.

Developing a better understanding of correlates of sleep is important from a public health perspective and is consistent with a recent call to action made by health professionals in Mexico to focus greater attention on sleep as a health behavior (De-La-Llata-Romero et al., 2011). Interventions promoting a healthy lifestyle have mostly focused on improving dietary behaviors, increasing leisure-time physical activity, and reducing sedentary behavior. Improving sleep health has generally been neglected in health promotion interventions, despite recent discovered associations with obesity and risk of chronic disease.

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