Published in final edited form as:
J Youth Adolesc. 2015 February ; 44(2): 346–361. doi:10.1007/s10964-014-0156-1.

Mexican American Adolescents' Sleep Patterns: Contextual Correlates and Implications for Health and Adjustment in Young Adulthood

Sally I-Chun Kuo[1], **Kimberly A. Updegraff**[1], **Katharine H. Zeiders**[1], **Susan M. McHale**[2], **Adriana J. Umaña-Taylor**[1], and **Sue A. Rodríguez De Jesús**[1]

Sally I-Chun Kuo: Sally.Kuo@asu.edu; Kimberly A. Updegraff: Kimberly.updegraff.asu.edu; Katharine H. Zeiders: Katharine.Zeiders@asu.edu; Susan M. McHale: x2u@psu.edu; Adriana J. Umaña-Taylor: Adriana.Umana-Taylor@asu.edu; Sue A. Rodríguez De Jesús: sarodri3@asu.edu

[1]Arizona State University

[2]The Pennsylvania State University

Abstract

Late adolescence is a period of substantial risk for unhealthy sleep patterns. This study investigated the contextual correlates and health and adjustment implications of sleep patterns among Mexican American youth (*N* = 246; 51% female). We focused on Mexican American youth because they represent a large and rapidly increasing subgroup of the U.S. population that is at higher risk for health and adjustment problems; this higher risk may be explained, in part, by sleep patterns. Using data from 7 phone diary interviews conducted when youth averaged 18 years of age, we assessed average nighttime sleep duration and night-to-night variability in sleep duration. Guided by socio-ecological models, we first examined how experiences in the family context (time spent and quality of relationships with parents, parents' familism values) and in extra-familial contexts (school, work, peers) were related to sleep duration and variability. The findings revealed that time spent in school, work, and with peers linked to less sleep. Further, conflict with mothers was related to greater sleep variability. Next, we tested the implications of sleep in late adolescence for health (perceived physical health, body mass index) and adjustment (depressive symptoms, risky behaviors) in young adulthood. These findings indicated that more sleep variability predicted relative decreases in health and increases in risky behaviors, and shorter sleep duration predicted relative decreases in poorer perceived health for males. The discussion highlights the significance of the transition to young adulthood as a target for sleep research and the importance of studying sleep within its socio-cultural context.

Correspondence should be addressed to Sally I-Chun Kuo, T. Denny Sanford School of Social and Family Dynamics, Arizona State University, Tempe, AZ, 85287-3701. Telephone: 480-965-6669. sally.kuo@asu.edu.

Authors' Contributions

SK participated in the study's conception, performed the analyses, interpreted the data, and drafted the manuscript. KU participated in the study's conception, design and coordination, assisted with the interpretation of the data, and helped draft the manuscript. KZ participated in the study's conception, interpretation of the data, and helped draft the manuscript. SM participated in the study's design and coordination and provided feedback on the manuscript. AU participated in the study's design and coordination and provided feedback on the manuscript. SR participated in the study's coordination, helped with the interpretation of data, and provided feedback. All authors have read and approved the final manuscript.

Keywords

adolescence; sleep; health; Mexican Americans; sociocultural context

Introduction

Adolescence is a developmental period characterized by substantial change in patterns of sleep, including declines in average duration of nighttime sleep, increases in sleep disturbances, and more irregularities in sleep patterns (Dahl & Lewin, 2002). As such, it is not surprising that adolescents are one of the most sleep deprived age groups in the U.S. (Wolfson & Carskadon, 2003). Within the second decade of life, late adolescence appears to be a particularly high risk period for unhealthy sleep patterns. National data indicate that nearly 70% of high school students report insufficient sleep on school nights, with the highest prevalence of sleep deprivation among 12th graders (Eaton et al., 2010). Despite the findings that inadequate and irregular sleep patterns may peak in late adolescence, we know relatively little about sleep and its implications for health and adjustment during this period, particularly among ethnic minority youth. Toward these ends, this study examined Mexican American youth's sleep patterns and their contextual correlates in late adolescence (about age 18) and the associations between sleep and both physical health and psychosocial adjustment in young adulthood (about age 20).

Recent findings using a national sample indicate that average sleep duration is about 7.3 hours per night among 18-year-olds in the U.S. (Maslowsky & Ozer, 2014). There is, however, some research suggesting that Mexican American adolescents and adults report slightly longer nightly sleep duration than individuals from other ethnic backgrounds (Fuligni & Hardway, 2006; Hale & Do, 2007). Further, some evidence suggests that the average night-to-night variation in sleep duration in adolescence and young adulthood is roughly an hour across a two-week period (Dillon et al., 2014; Fuligni & Hardway, 2006). In this study, our focus was on two dimensions of sleep, average nighttime sleep *duration* and night-to-night *variability* in sleep duration, which were derived from bedtime and wake-up time data collected during seven diary phone calls. Sleep duration provides information about the amount of youth's average nighttime sleep, whereas night-to-night variability assesses the regularity in youth's sleep habits. Shorter sleep duration and greater variability are both indicative of poor sleep hygiene. Both dimensions are important for understanding sleep patterns in late adolescence and may have unique implications for physical health and psychosocial adjustment (Acebo & Carskadon, 2002; Dahl & Lewin, 2002).

A focus on the sleep patterns of *Mexican American* youth is warranted for several reasons. First, research documenting ethnic/racial differences in children's and adolescents' sleep patterns (Adam, Snell, & Pendry, 2007; Moore et al., 2011; Roberts, Roberts, & Chen, 2000) underscores the need to further investigate correlates of sleep patterns within different ethnic/racial contexts. Cultural ecological frameworks (Bronfenbrenner & Morris, 2006; García Coll et al., 1996) posit that human development is embedded in a larger sociocultural context, and that findings based primarily on studies of majority youth may not generalize to youth from other cultural backgrounds. Perceptions and practices around sleep are often

culturally specific; for instance, in Latino cultures, sleep is often viewed as positive and necessary (Domino, 1986; Loredo et al., 2010). It is thus important to study ethnic minority samples to determine whether processes that have been identified in studies of majority youth also apply to ethnic minority adolescents. Studying minority youth also allows for investigations of sociocultural factors that may be unique to particular socio-cultural groups (Umaña-Taylor, 2009). Second, we focused on Mexican American youth because they are a large and rapidly growing segment of the U.S. population and a relatively young group, with more than 30% under the age of 18 (U.S. Census Bureau, 2013). As such, the well-being of these youth represents a significant public health concern. Despite the size and growth of the Mexican American population, however, we know little about the nature and implications of their sleep patterns, particularly in late adolescence. Third, research on health disparities documents that Mexican Americans face higher risk for some types of physical and mental health problems compared to their non-Latino White counterparts (e.g., self-rated physical health; National Center for Health Statistics, 2013; obesity; U.S. Department of Health and Human Services [USDHHS], 2013; depression; Anderson & Mayes, 2010; Roberts, Roberts, & Chen, 1997; externalizing symptoms; Centers for Disease Control and Prevention [CDC], 2006; Eaton et al., 2008). These higher risks, in combination with this population's underutilization of medical and mental health services (National Center for Health Statistics, 2013), points to the importance of identifying activities, such as sleep, that are correlated with Mexican American youth's health and adjustment. A better understanding of the role of sleep in the well-being of Mexican American youth may inform efforts to improve this group's long-term physical health and psychosocial adjustment outcomes.

Research on the role of ethnicity/race in sleep patterns primarily documents differences as a function of group status (e.g., Adam et al., 2007; Moore et al., 2011); less often, scholars have examined ethnic/racial differences in the *correlates* of sleep (Fuligni & Hardway, 2006), or considered the *sociocultural* processes that explain variations in sleep patterns within a single ethnic/racial group. Using data from the first phase of the present study, we documented family and sociocultural correlates of sleep patterns in early to middle adolescence and concurrent associations between sleep and youth adjustment (McHale, Kim, Kan, & Updegraff, 2011). In this study, we extend our earlier research to examine the contextual correlates of sleep in *late adolescence* and the *longitudinal* implications of sleep for health and adjustment across late adolescence and young adulthood, addressing two goals. First, we examined how family and extra-familial experiences in late adolescence were related to Mexican American youth's average sleep duration and variability in sleep duration. Second, controlling for health and adjustment in late adolescence, we tested whether sleep duration and variability predicted physical health (i.e., body mass index, perceived health status) and psychosocial adjustment (i.e., depressive symptoms, risk-taking behaviors) two years later, in young adulthood.

Correlates of Sleep Patterns in Late Adolescence

From an ecological perspective, sleep patterns emerge as a function of a complex interplay among biological, family, and socio-cultural factors (Bronfenbrenner & Morris, 2006; Carskadon, 2002; Dahl & Lewin, 2002). It is well-documented that, as children enter puberty, biological changes in their circadian rhythms contribute to a shift toward later

bedtimes and waking times and more irregular sleep patterns (Carskadon, 2002). Although adolescents actually need *more* sleep than preteens (Carskadon, 1990), they stay up later than children—and older adolescents stay up later than younger adolescents—in part because they are under increasing pressure to juggle demands emanating from multiple contexts (Carskadon, 2002).

Early high school start times and increasing academic and social demands make it difficult for adolescents to obtain adequate nightly sleep. Cross-sectional findings indicate that time spent on academics, extracurricular activities, paid work, and with peers is associated with less sleep in *early to middle adolescence* (Carskadon, 2002; Fuligni & Hardway, 2006; Maume, 2013). We know less about the associations between contextual characteristics and experiences and dimensions of sleep during *late adolescence* (Fuligni & Hardway, 2006), a period of intense academic demands, and increased participation in paid work and socializing with peers. In this study, we examined how time spent in extra-familial contexts that characterize late adolescence, specifically, school, work, and peers, were associated with nighttime sleep duration and variability. Because time is a finite resource, more time spent in these different contexts may be associated with shorter sleep duration.

Extra-familial contexts are increasingly salient in adolescence, but parents remain important (Steinberg, 2001). Mexican American families, in particular, are characterized by values and practices that promote close relationships among family members (Cauce & Domenech-Rodríguez, 2002). For example, familism values (*familismo*) emphasize interdependence, closeness, and support among family members (Cauce & Domenech-Rodríguez, 2002). As such, parent-youth relationships may be especially influential in Mexican American adolescents' daily activities, including their sleep. Indeed, some research suggests that time spent with parents is linked positively to adolescents' sleep duration. For example, Mexican American adolescents' time spent with fathers in early to middle adolescence was concurrently associated with longer average sleep duration (McHale et al., 2011). In addition, greater time spent at meals, possibly a proxy for shared family time, was associated with longer sleep duration in childhood and adolescence in a general population sample (Adam et al., 2007). Although time spent in different contexts has been linked to sleep during earlier developmental periods, we know almost nothing about the family correlates of sleep in late adolescence. Accordingly, in this study we examined shared time with family members as a potential correlate of sleep; we expected that family time would be associated with longer and less variable sleep duration, given that it reflects close family ties and results from regular family routines and activities.

In addition to family time, the affective quality of family relationships has been linked to sleep patterns in childhood and early adolescence (Dahl & Lewin, 2002). Feelings of warmth and intimacy with parents are critical for creating a secure environment that is conducive to healthy sleep patterns (Dahl & Lewin, 2002). Indeed, parental warmth has been related to fewer sleep disturbances in early adolescence (Maume, 2013), although findings have been inconsistent (Adam et al., 2007). Conversely, family conflict may trigger feelings of anxiety and threat that disrupt sleep. For example, conflicts with mothers and fathers were associated with more variability in sleep in early adolescence (McHale et al., 2011), and parental anger was linked to inadequate sleep in young children (Smaldone,

Honig, & Byrne, 2007). Collectively, these findings highlight the need to examine both positive and negative dimensions of parent-youth relationships in sleep patterns in late adolescence.

Given that the majority of families in this cultural context include two parents (U.S. Census Bureau, 2013) and that a growing body of work highlights mothers' and fathers' unique roles in Mexican American families (Cabrera & García Coll, 2004), we studied adolescents' relationship experiences with mothers *and* fathers. Because Mexican American culture is characterized by more traditional gender roles that highlight mothers' home and caregiving roles (Cauce & Domenech-Rodríguez, 2002), we tested whether relationships with mothers were more strongly linked to adolescents' sleep. In addition, as noted, Mexican American cultural values emphasize family closeness, obligations, and interdependence (Sabogal, Marín, Otero-Sabogal, Marín, & Perez-Stable, 1987). Our earlier study showed that parents' familism were associated with more healthful sleep in early adolescence (McHale et al., 2011), and thus we examined whether mothers' and fathers' familism values were associated with sleep in late adolescence.

Implications of Sleep Patterns for Health and Adjustment in Young Adulthood

Our second goal was to test the longitudinal associations between nighttime sleep duration and variability in late adolescence and health and psychosocial adjustment two years later, in young adulthood. Research documents the role of sleep in adolescent health and well-being (Institute of Medicine, 2006), primarily relying on cross-sectional designs and with limited attention to cross-time associations between sleep and well-being, to the period of young adulthood, or to ethnic/racial minority populations. Further, existing longitudinal research has examined sleep *duration* and youth health and adjustment (Lumeng et al., 2007; Snell, Adam, & Duncan, 2007), but we also know little about whether sleep *variability* predicts youth outcomes (Acebo & Carskadon, 2002; Fuligni & Hardway, 2006). This study focused on Mexican American youth's sleep and four outcomes in young adulthood: self-reported physical health, body mass index (BMI), depressive symptoms, and risky behaviors. We focused on these four indicators because studies have shown that Mexican American youth face more health and adjustment problems than European American youth, including a higher risk for problems such as overweight/diabetes (USDHHS, 2013), depressive symptoms (Anderson & Mayes, 2010; Roberts et al., 1997), and externalizing behaviors (CDC, 2006; Eaton et al., 2008). Identifying links between sleep and these outcomes may inform culturally appropriate prevention and intervention programs for Mexican American youth.

Physical health—Sleep duration has been linked to several dimensions of physical health, consistent with the idea that insufficient and irregular sleep can diminish the body's regulatory abilities (Dahl, 2002), increase health risk behaviors (e.g., physical inactivity; McKnight-Eily et al., 2011; poor nutrition; Chen, Wang, & Jeng, 2006), which in turn impact physical health. Longer average sleep duration has been linked concurrently to lower BMI (McHale et al., 2011), for example, and in national samples predicts lower rates of overweight status (Lumeng et al., 2007; Snell et al., 2007), possibly because insufficient sleep is associated with poorer nutrition (Chen et al., 2006) and less physical activity

(McKnight-Eily et al., 2011). Our testing of the longitudinal associations between sleep patterns and BMI in the current study was motivated by these findings. We also extended this work to examine how sleep was related to a more general measure of self-reported physical health. Some bivariate associations link inadequate sleep in childhood and adolescence to lower ratings of health (Smaldone et al., 2007), and research also has shown that sleep patterns are associated with susceptibility to common cold and illness in adolescence/adulthood (Cohen, Doyle, Alper, Janicki-Deverts, & Turner, 2009; Orzech, Acebo, Seifer, Barker, & Carskadon, 2014). Further, a body of evidence links self-reported health to health service utilization and mortality (DeSalvo, Bloser, Reynolds, He, & Muntner, 2006). Thus, examining the links between sleep patterns and perceived health may provide insights about the implications of sleep for overall health.

Psychosocial adjustment—The role of adolescent sleep in psychosocial adjustment has received substantial scholarly attention. Unhealthy sleep patterns can result in psychological distress, including negative mood as well as sleepiness and fatigue (Dahl, 1999). There also is cross sectional evidence that fewer hours of sleep in adolescence is associated with more internalizing problems, including depressive symptoms and negative mood (Fuligni & Hardway, 2006; Pasch Laska, Lytle, & Moe, 2010; but see, Moore et al., 2009). In addition, greater night-to-night variability in sleep duration has been linked to more depressive symptoms in early and middle adolescence, after accounting for sleep duration (McHale et al., 2011; Fuligni & Hardway, 2006). These cross-sectional and short-term longitudinal findings suggest that both sleep duration and variability may have longer term implications for depressive symptoms.

Finally, some literature shows that less sleep and more variability in sleep may hinder cognition, including executive function and decision-making (Durmer & Dinges, 2005). Thus, lower sleep duration has been linked to higher levels of risk-taking (McHale et al., 2011; O'Brien & Mindell, 2005; Pasch et al., 2010) and delinquent behaviors (Peach & Gaultney, 2013) concurrently in early to middle adolescence, especially for males. In combination, these studies point to the potential risks associated with sleep difficulties in early to middle adolescence. Rarely have sleep-adjustment links been examined with longitudinal data, however, and thus we built on prior research to measure the longitudinal links between sleep duration and variability in late adolescence and depressive symptoms and risk-taking behaviors in young adulthood. Examining the roles of both sleep duration and night-to-night variability in these health and adjustment outcomes allowed us to compare their relative influence, as these dimensions of adolescent sleep may have different impacts on youth well-being in young adulthood.

The Present Study: Our first study goal was to examine how familial and extra-familial activities and experiences were linked to sleep patterns in late adolescence among Mexican American youth, an understudied ethnic group that is at risk for sleep disturbances (Roberts et al., 2000) and at greater risk than youth from other ethnic backgrounds for health issues (USDHSS, 2013), depressive symptom (Anderson & Mayes, 2010; Roberts et al., 1997), and externalizing behaviors (CDC, 2006; Eaton et al., 2008). We hypothesized that time at work, at school, and with peers would relate to less sleep duration and greater night-to-night

sleep variability. In contrast, we expected that time spent with family would relate to longer sleep duration and less variability. Further, we expected that parent-adolescent emotional intimacy and stronger parents' familism values would relate to longer sleep duration and less nightly variability, whereas parent-adolescent conflict would relate to less sleep duration and more variability.

To address our second goal, we tested whether longer sleep duration and less sleep variability in late adolescence predicted better self-rated physical health, lower BMI, fewer depressive symptoms, and fewer risk-taking behaviors in young adulthood, controlling for earlier health and adjustment. For both goals, we included family SES as a covariate given its links with sleep patterns (McHale et al., 2011). Further, as prior work suggests that the correlates of sleep and implications may differ for girls and boys, we tested youth gender as a moderator of the links between contextual characteristics and sleep (e.g., Maume, 2013) and sleep and youth health and adjustment (e.g., Peach & Gaultney, 2013).

Method

Participants

Data came from a larger longitudinal study of 246 Mexican American families (Updegraff, McHale, Whiteman, Thayer, & Delgado, 2005) designed to examine the role of family, gender, and cultural socialization processes in adolescents' psychosocial functioning from early adolescence to young adulthood. Eligible families included those that met the following criteria: 7th graders (i.e., target adolescents) and an older sibling living at home with biological mothers and biological or long-term adoptive fathers (i.e., at least 10 years); mothers who were of Mexican origin (although not required, 93% of fathers also were of Mexican descent); and fathers who worked at least 20 hours/week for pay. We targeted families with 7th graders and at least one older adolescent sibling, given that adolescence is a period marked by substantial increases in adjustment problems and a salient developmental period for gender and cultural socialization. Further, we focused on two-parent families with employed fathers given our interest in the unique roles of both mothers and fathers in these family dynamics, as fathers are largely overlooked in studies of ethnic minority families (Cabrera & García Coll, 2004).

To recruit families, letters and brochures describing the study (in English and Spanish) were sent to families, and follow-up telephone calls were made by bilingual staff to determine eligibility and interest in participation. Families' names were obtained from junior high schools in five school districts and from five parochial schools in and around a southwest metropolitan area. Letters were sent to 1,856 families with a Hispanic 7th grader who was not learning disabled (i.e., had a significant cognitive/learning impairment that would prevent participation in the interviews), but contact information was incorrect for 396 families (21%) and repeated attempts to find updated information via the school records and public listings were unsuccessful. Thus, we were able to contact 1,460 families, including 146 (10%) who refused to be screened, 880 who were ineligible (59.5%), and 421 (30.5%) who were eligible. Families were ineligible for the following reasons: no older sibling currently in the home (n = 448/880; 51%); no father in the home (n = 245/880; 28%); mother not of Mexican origin (n = 115/880; 13%); mother not present in the home (n =

59/880; 7%); and father not working 20 hours/week (*n* = 13/880; 1%). Of those eligible (*n* = 421), 284 (67%) agreed to participate, 95 (23%) refused, and we were unable to re-contact the remaining 42 families (10%) who were eligible to schedule an interview. Interviews were completed by 246 families.

At Phase 1 (2002–2003), families represented a range of socioeconomic levels, with an annual median income of $40,000. The percentage that met federal poverty guidelines was 18.3%, similar to the 18.6% of two-parent Mexican American families living in poverty in the county from which the sample was drawn (U.S. Census Bureau, 2000). A majority of parents had been born outside the U.S. (70%), whereas most adolescents had been born in the U.S. (62%). Retention rates were 91%, 75%, and 70% for Phases 2 through 4, respectively. Attrition analyses revealed that participating families reported higher maternal education and family income at Phase 1 as compared to non-participating families at Phase 3 (maternal education *M* = 10.62; *SD* = 3.80 versus *M* = 9.48; *SD* = 3.45; family income *M* = $59,517; *SD* = $48,395 versus *M* = $37,632; *SD* =$28,606, respectively) and Phase 4 (maternal education *M* = 10.75; *SD* = 3.75 versus *M* = 9.35; *SD* = 3.53; family income *M* = $59,136; *SD* = $46,674 versus *M* = $41,635; *SD* =$39,095, respectively); all analyses controlled for family SES (i.e., a composite of parent education and family income at the onset of the study).

Given the current study's focus on the transition to young adulthood, and because some measures of interest (physical health, time spent at work and school) were collected only at the latter two phases, we focused on data from target adolescents, mothers, and fathers at Phases 3 and 4 (P3, P4), which occurred approximately 5 and 7 years after Phase 1 (the onset of study). Adolescents' average age at P3 was 17.72 years (*SD* = .57) and at P4 was 19.60 years (*SD* = .66). Most adolescents (51% female) reported being in school (80.5%) and working some hours to earn money (65.5%) at P3. By P4, most adolescents reported being at work (63.6%) and being enrolled in post-secondary education classes (46%). Almost all adolescents reported living at home (94.9%) at P3, whereas 67.3% reported living at home by P4. For simplicity, we refer to Phase 3 and Phase 4 as Time 1 (T1) and Time 2 (T2), respectively, from this point forward.

Procedures

Data were collected via two methods. First, home interviews lasting two to three hours were conducted separately with adolescents and their mothers and fathers. At the beginning of the home interview at T1, informed consent forms (for T1 and T2) were read to parents and youth (age 18 or older) in the language of their choice (English or Spanish). After parents signed consent forms (for themselves and any minor children), assent forms were read aloud to youth under the age of 18 and their assent was obtained. Interviews were then conducted separately with each family member in their preferred language, with bilingual interviewers reading all questions aloud and entering responses into laptop computers.

At the conclusion of the home interviews, the seven nightly phone calls were scheduled with family members as follows: three weekday calls and one weekend day call with adolescents and mothers; three weekday calls and one weekend day call with adolescents and fathers; and one weekday call with mothers, fathers, and adolescents. Thus, adolescents participated

in all seven phone calls (five weekday and two weekend day evenings), and each parent participated in four phone calls (three weekday evenings and one weekend day evening). Phone calls were scheduled to capture the full range of weekdays (Monday-Thursday) and weekend calls included both a Saturday and a Sunday, to the extent possible, depending on each family's schedule. Then, during the three to four weeks following the home interviews, family members were contacted for their telephone interviews, which used a cued-recall approach to collect daily diary data (McHale, Crouter, & Bartko, 1992). Specifically, each family had an activity list (left with the family at the home interview) that included 86 different activities grouped into categories (e.g., household tasks, personal activities, athletics, extracurricular activities, and so on). Adolescents were guided through the activity list, and for each activity they participated in, they were asked to report the duration of the activity (in minutes) and who else participated. Phone calls lasted an average of 10 to 15 minutes per family member each night. At T1, families received $125 for participating in home interviews and an additional $125 for participating in the phone calls. At T2, each family member received $75 for his/her participation in the home interview and $75 for his/her participation in the phone calls. The University's Institutional Review Board approved all procedures.

Measures

The measures were forward-translated to Spanish and back-translated to English by separate individuals for the local Mexican dialect. Final versions were compared and discrepancies were resolved by the research team.

Sleep duration (T1; phone assessment)—Information about sleep was collected from adolescents during each of the seven nightly phone calls, which focused on activities during the 24-hour period that ended at 5pm on the evening of the call (i.e., 5pm to 5pm). At the onset of each call, adolescents were asked "What time did you go to sleep last night?" and "What time did you get up this morning?" Sleep duration was calculated by subtracting wake time from bedtime for each phone call and then creating the average sleep duration score across the seven phone calls.

Sleep variability (T1; phone assessment)—Night-to-night variability (i.e., within-person variation in the nightly duration of sleep) was derived by calculating a linear trajectory of each adolescent's nightly sleep duration across the 7 days using a standard regression. This yielded an estimate of the error in the linear slope line for each adolescent, which reflected how much each adolescent's sleep duration varied across the days (Arriaga, 2001). This estimate represents the average distance that the observed values (sleep durations for each of the 7 days) fall from the regression line, with higher values indicating greater sleep variability across the 7 days (i.e., greater average distance of the observed points from the fitted line).

Parent-adolescent intimacy (T1; home interview)—Using a measure developed by Blyth and Foster-Clark (1987) to assess emotional intimacy in interpersonal relationships, mothers and fathers rated each of eight items, such as "How much does (adolescent's name) come to you for advice or support?" Items were rated on a five-point scale, ranging from 1=

Not at all to 5 = *Very much*, and averaged, with higher scores indicating more intimacy. Cronbach's alphas were .81 for mothers' and .82 for fathers' reports.

Parent-adolescent conflict (T1; home interview)—Mothers and fathers reported on the frequency of conflict with adolescents during the past year (ranging from 1 = *Not at all* to 6 = *Several times a day*) regarding 12 topics (e.g., chores, curfew, family obligations) using a measure adapted for Mexican American families (Smetana, 1988). A sample item is, "How often in the past year have you had disagreements or differences of opinion with (adolescent's name) about talking back or being disrespectful?" Items were averaged to create the scale score, with higher scores indicating more frequent conflicts. Cronbach's alphas were .82 for mothers and .84 for fathers.

Parents' familism values (T1; home interview)—Mothers' and fathers' familism values were assessed using the 16-item familism subscale of the Mexican American Cultural Values Scale (Knight et al., 2010). Sample items include "It is always important to be united as a family" and "Children should be taught that it is their duty to care for their parents when their parents get old" were rated on a five-point scale, ranging from 1 = *Strong disagree* to 5 = *Strongly agree*. Items were averaged to create familism scores for mothers and fathers, with higher scores indicating stronger familism values. Cronbach's alphas were .80 for mothers and .85 for fathers.

Time spent in familial and extra-familial contexts (T1; phone assessment)—Phone call data were used to calculate the time that adolescents spent in four different social contexts, including family, peer, school, and work. To estimate time spent with family and with peers, we used data collected on adolescents' involvement in daily activities from the phone interviews. For these calls, adolescents were provided with a list of 86 activities and asked to report on whether they participated in each activity during the targeted 24-hour period, the duration of the activity in minutes, and their companions (e.g., mother, father, sibling, peer). We aggregated across all 86 activities across the seven phone calls to calculate adolescents' total *time spent with family members* (i.e., parents and/or siblings) and *time spent with peers* (i.e., one or more peers) in minutes, and these scores were converted to hours. An index of inter-reporter reliability, the correlation between two siblings' reports of their shared activities, suggested that youth's reports were reliable, $r = .79$, $p < .001$.

Time spent at school and *at work* also was calculated from the phone call data. During each phone call, adolescents reported on total number of hours spent at school and at a paid job in the targeted 24-hour period. We added each adolescent's total time spent at school across the seven phone calls and divided by the number of days he/she attended school to create a daily average of time spent at school. Using the same procedure, we also calculated adolescents' daily average of time spent at work.

Physical health (T1, T2; home interview)—Adolescents rated their physical health with the following five-point item from National Study of Adolescent Health (Wade, Pevalin, & Vingilis, 2000): "Think about the last 12 months. In general, would you say your health is poor, somewhat good, good, very good, or excellent?" Higher scores indicated better physical health.

Body mass index (T1, T2; home interview)—We used adolescents' reports of height and weight to calculate body mass index (BMI) percentile scores. Height and weight were converted to age and sex specific BMI percentiles using the most recent CDC growth charts (Kuczmarski et al., 2000) and the anthropometry component in Epi Info 2000 software.

Depressive symptoms (T1, T2; home interview)—We used the 20-item Center for Epidemiological Studies Depression Scale (Radloff, 1977) to measure depressive symptoms in the past month. Adolescents rated the frequency of symptoms on a 4-point scale, with items scored from 0 (*Rarely or none of the time*) to 3 (*Most of the time).* Cronbach's alphas = .80 and .77, for T1 and T2, respectively). Higher scores indicated higher levels of depressive symptoms.

Risky behaviors (T1, T2; home interview)—Adolescents rated the frequency with which they engaged in each of 24 risky behaviors in the past year (e.g., skip a day of school, got drunk or high) on a 4-point scale (*Never* to *More than 10 times*) using a measure developed for ethnically diverse youth (Eccles & Barber, 1990). Cronbach's alphas were .87 for T1 and T2.

Family socioeconomic status (onset of study; home interview)—Family SES at the onset of the study (five years prior to T1) was calculated using mothers' and fathers' reports of their highest education level and annual household income. Income was transformed to correct for skewness and all three variables were standardized and then averaged (α = .75).

Results

Analytic Approach

To address our study goals, a series of regression analyses were conducted in Mplus Version 7.0 (Muthén & Muthén, 1998–2012). First, to examine the concurrent associations between contextual factors (i.e., family relationship qualities and familism values, extra-familial experiences) and youth's sleep, two regression models were estimated in which T1 contextual experience factors were linked to T1 sleep duration and sleep variability, respectively, with adolescent gender and family SES included as covariates. Second, to examine how adolescents' sleep patterns predicted adjustment over time, we conducted four residualized change regression analyses in which T1 sleep duration and sleep variability predicted T2 physical health, BMI, depressive symptoms, and risky behaviors. We controlled for adolescent gender, family SES, and T1 levels of health and adjustment. In all analyses, missing data were accounted for using full information maximum likelihood (FIML; Enders, 2010). Using just those youth without missing data (i.e., listwise deletion) yielded the same pattern of results to those reported below.

Gender moderation was tested using multi-group analyses by youth gender. Specifically, youth gender was taken out of regression models (where it had been modeled as a covariate) and was used as a grouping variable (0 = male; 1 = female). Multi-group analyses were further followed up using chi-square difference tests if a coefficient was significant for one group (males or females) and not for the other group or when coefficient signs differed

between the two groups. Specifically, we compared the fit of the model in which the path coefficient of interest was constrained to be equal across groups to the model in which the path coefficient was free to vary across groups. A significant chi-square test would suggest differences by youth gender (i.e., moderation).

Descriptive Analyses

Table 1 presents the descriptive information for each study variable, and Table 2 presents bivariate correlations. On average, adolescents reported 8.18 hours of sleep per night, and the estimated sleep variability was about 1.51 hours across the 7 days. These two dimensions of sleep were not highly correlated.

Links between Adolescents' Sleep and Experiences in Family and Extra-familial Contexts

Results of regression analyses for Goal 1 are presented in Table 3. For sleep duration, no family measures emerged as significant correlates, but there were significant extra-familial correlates: time spent with peers, at work and at school all negatively linked to youth's hours of sleep, and there were no gender differences in these linkages. For sleep variability, mother-youth conflict was a significant positive correlate. In contrast, father-youth intimacy, $p = .09$, was a trend-level negative correlate of sleep variability. In terms of extra-familial experiences, time at school was negatively related to sleep variability, but time with peers, $p = .08$, was a trend level positive correlate. Gender did not moderate these links.

Longitudinal Links between Adolescents' Sleep Patterns and their Health and Adjustment

Table 4 presents the longitudinal associations between sleep patterns in late adolescence and young adults' health and psychosocial adjustment two years later. In all these analyses, the Time 1 index of health/adjustment was controlled so that we could determine whether sleep was a unique predictor of young adult outcomes. For perceived physical health, T1 sleep variability predicted poorer T2 physical health, after accounting for T1 physical health. For sleep duration, we found that gender moderated its association with physical health, $\chi^2\Delta(1) = 5.18$, $p < .05$: for males the association was significant and positive ($\beta = .25$, $SE = .12$, $p < .05$), whereas for females, the association was non-significant ($\beta = -.13$, $SE = .10$, *ns*). For BMI, there was a negative association between T1 sleep duration and T2 BMI, $p = .06$, such that less sleep was a trend level predictor of higher BMI, after accounting for prior BMI. Sleep variability was not associated with BMI. For depressive symptoms, sleep variability and duration did not emerge as significant predictors, and no gender differences were observed. Finally, for risky behaviors, sleep duration was not a significant predictor, but sleep variability was a significant positive predictor of risky behaviors at T2. Gender did not moderate this association.

Discussion

Late adolescence is a period of risk for the development of unhealthy sleep patterns as a result of insufficient and irregular sleep patterns (Eaton et al., 2010), but we know relatively little about the correlates and implications of sleep during this period, especially among ethnic minority youth. Contributing to our understanding of sleep, this study documented the links between: (a) familial and extra-familial experiences and youth's average sleep *duration*

and sleep *variability* in late adolescence, and (b) between sleep patterns in late adolescence and physical health and psychosocial adjustment in young adulthood. Our work also extends the literature in its focus on *Mexican American* youth, a young, large, and rapidly growing segment of the U.S. population (U.S. Census Bureau, 2013) who are disproportionately affected by health and adjustment problems (e.g., CDC, 2006; National Center for Health Statistics, 2013) and who underutilize medical and mental health services (National Center for Health Statistics, 2013). Notably, this sample of Mexican American youth averaged about eight hours of sleep per night at Time 1, less than the recommended nine to ten hours a night for this age group (National Heart, Lung, and Blood Institute, 2012), but somewhat consistent with prior findings (Carskadon & Acebo, 2002; Fuligni & Hardway, 2006; Maslowsky & Ozer, 2014). Also consistent with existing literature (Dillon et al., 2014; Fuligni & Hardway, 2006), their sleep varied about one and a half hours across the seven days, providing some evidence of irregularity in their sleep patterns.

Correlates of Mexican American Youth's Sleep Patterns in Late Adolescence

Our first goal was to identify familial and extra-familial experiences that were associated with average nightly *duration* and night-to-night *variability* in sleep duration in late adolescence. Consistent with the prior studies of primarily European American youth suggesting that youth are under pressure to manage increased demands from *multiple* contexts (e.g., Carskadon, 2002), we found that the more time Mexican American youth in this sample spent at work and at school and socializing with peers, the less they slept at night, on average. These results add to findings linking daily demands and sleep duration in early to middle adolescence (e.g., Carskadon, 2002; Fuligni & Hardway, 2006), suggesting that time spent in extra-familial contexts may take away from the time youth have available to sleep. Interestingly, however, although time spent at school was associated with less sleep duration, it also was linked to less variability in sleep across nights. The demands of school may reduce the amount of time youth have available to sleep, but the school schedule may promote consistency in youth's daily routines, including their sleep times, and thus, help facilitate the maintenance of a more regular sleep schedule. Further, given that prior literature also has linked organized and structured extracurricular activities to better youth well-being (Feldman & Matjasko, 2005), a direction for future research is to examine whether sleep mediates the association between involvement in organized activities and positive development. In addition, future research also should extend this work beyond a focus on time spent in different settings to consider how the demands and structures of extra-familial contexts (e.g., timing of class schedules, work hours/ shifts) are linked to sleep patterns in late adolescence.

Experiences in extra-familial contexts become increasingly salient across adolescence, but family remains important (Steinberg, 2001). This may be especially true in Mexican American families wherein there is a strong emphasis on family support, loyalty, and interdependence (Cauce & Domenich-Rodríguez, 2002). Thus, we considered how extra-familial and familial experiences and parents' familism values, examined in the *same* models, were associated with sleep duration and variability. Building on prior evidence that the affective quality of the family context plays a role in adolescents' sleep (e.g., Adam et al., 2007; Dahl & Lewin, 2002; Maume, 2013), we examined how both positive and

negative qualities of parent-youth relationships, as well as the amount of time spent with family (i.e., mothers, fathers, siblings) and parents' familism values, were associated with youth's sleep patterns. Mother-adolescent conflict (as rated by mothers) predicted *more* variability in sleep, consistent with evidence that a negative family climate hinders healthy sleep (e.g., McHale et al., 2011; Smaldone et al., 2007). Further, higher levels of father-adolescent intimacy (as rated by fathers) were marginally associated with less sleep variability.

The overall pattern linking familial and extra-familial experiences to sleep in late adolescence highlights the utility of examining the socio-ecological correlates of sleep in a multi-dimensional way. It is notable that the time in different *extra-familial* contexts, but not time spent with family, was associated with *less* sleep. It may not be surprising that more time in extra-familial contexts relates to fewer hours of sleep because time is finite. Yet, time spent with family did not relate to less sleep. In other words, some uses of time are less conducive to getting a good night's sleep than others. Family time, for example, may reflect greater parental involvement in adolescents' lives and supervision of their daily activities and habits, including sleep. The lack of association between family time and sleep duration also may be attributable to differences in the nature of activities that youth engaged in with family versus in extra-familial settings.

Our findings also contributed to the literature in documenting that conflict with mothers is an important correlate of sleep variability in late adolescence among Mexican American youth. Notably, this association emerged when positive and negative qualities of adolescents' relationships with mothers and fathers and measures of family and extra-familial time use were included in the model. Given that Mexican culture has a strong emphasis on emotional closeness within the family (Cauce & Domenich-Rodríguez, 2002), problems in mother-adolescent relationships may be particularly problematic for adolescents' daily functioning, including their sleep. The salience of conflict with *mothers* may further reflect the more traditional division of parenting roles (Cauce & Domenich-Rodríguez, 2002), with mothers as the primary caregivers in this cultural context. Contrary to our expectation that parents' familism values would relate to more healthful sleep patterns and to concurrent links between familism values and sleep in early adolescence (McHale et al., 2011), we found no association between parents' familism values and sleep patterns in late adolescence. Additionally, contrary to the concurrent positive association between family time and sleep duration in early adolescence (McHale et al., 2011), time spent with family was not linked to sleep patterns in late adolescence. The inclusion of parent-youth relationships marked by both behavioral level indicators (i.e., intimacy, conflict, time spent together) and parents' familism values in the same models highlighted the unique significance of the behavioral qualities of family relationships in sleep patterns during this developmental period.

Sleep in Late Adolescence and Health and Adjustment in Young Adulthood

Findings pertaining to our second goal contributed to research on the implications of sleep patterns in late adolescence to health and adjustment two years later, in young adulthood (Institute of Medicine, 2006). We focused on indicators of physical health and psychosocial

adjustment given prior cross-sectional work (McHale et al., 2011; O'Brien & Mindell, 2005; Smaldone et al., 2007). Extending this work, we used a longitudinal design to study how sleep duration and variability in late adolescence predicted relative changes in health and adjustment across a two-year period. The results provided compelling evidence that more *sleep variability* in late adolescence explained individual differences in perceived health status and risky behaviors in young adulthood, after taking into account prior levels of health and adjustment, average sleep duration and demographic factors.

These findings of longitudinal links between sleep variability and perceived health further our knowledge of sleep as a factor in young adults' global health status. This linkage is important because perceived physical health status is a strong predictor of all-cause mortality as well as health service utilization (DeSalvo et al., 2006). Prior research also shows that perceived health is linked concurrently to a range of health indicators, including health behaviors, symptoms, and functions (Fayers & Sprangers, 2002). Our findings also showed that sleep duration was positively linked to males', but not females', perceived physical health. This result is consistent with some prior research on adolescent overweight status showing that male youth were more sensitive to short sleep duration than females (Knutson, 2005), and it adds to the literature in documenting that sleep duration explained individual differences in a broad indicator of physical health status for young men. Relatedly, research has suggested gender differences in other dimensions of sleep (e.g., latency, efficiency; Johnson, Roth, Schultz, & Breslau, 2006). It is possible that these other dimensions of sleep, not measured in this study, may differ between males and females and may have explained why there was no effect of sleep duration on global health status for females. Thus, replication of these findings is important, and future studies should explore *processes* through which gender may have implications for sleep-health linkages.

With respect to BMI, results were in the predicted direction based on prior research (McHale et al., 2011; Snell et al., 2007), but at the trend level ($p = .06$). Research documents the stability of BMI across adolescence (Crimmins et al., 2007) and that stability may increase with age (Hesketh, Wake, Waters, Carlin, & Crawford, 2004). Indeed, in this sample, the cross-time correlation in BMI was very high, $r = .87$, meaning that the variation left to explain was quite limited. Given this pattern, our conclusion is that shorter sleep duration in late adolescence is a risk factor for increases in BMI in young adulthood, though this finding merits replication.

Neither sleep duration nor variability were linked to depressive symptoms across the transition to young adulthood, contrary to our prediction. Some prior studies also have failed to document this association (Moore et al., 2009). It may be that in community-based samples, associations between sleep and negative mood or fatigue emerge on a more immediate, daily basis (Fuligni & Hardway, 2006). Sleep-depression links also may be more apparent when individuals exhibit more extreme sleep difficulties, such as insomnia or hypersomnia (Liu et al., 2007), which may be less common in a community-based sample during late adolescence. In terms of risky behavior, our results are consistent with cross-sectional evidence showing that sleep variability relates to risky behaviors (McHale et al., 2011) and also extends to show longer term implications of sleep variability on risky behaviors in young adulthood, even controlling for risky behaviors two years earlier.

Notably, when two dimensions of sleep were included in the analysis, our results indicated sleep variability uniquely explained individual differences in risky behaviors in young adulthood, above and beyond average sleep duration.

Viewed together, our results linking sleep patterns in late adolescence to health and adjustment in young adulthood provide some important insights. First, *multidimensional* measures of sleep should be included in future studies given that different dimensions of sleep may relate to different aspects of physical health and psychosocial adjustment. Second, the fact that sleep patterns in late adolescence predicted both physical health *and* psychosocial adjustment in young adulthood highlights the continued importance of sleep for well-being during this developmental period. Sleep patterns in late adolescence may lay the foundation for adulthood, and thus, be important in shaping individuals' overall health and adjustment in the adulthood years. Given that parents' orchestration of their children's sleep, such as through setting and enforcing bedtime, is likely to decline as youth age (Carskadon, 2002), and that sleep patterns and habits established in adolescence are likely to persist across adulthood (Dahl & Lewin, 2002), examining the role of adolescent sleep on well-being in subsequent developmental periods deserves further empirical attention. Importantly, most research on sleep and health and adjustment relies on cross-sectional data (McHale et al., 2011; O'Brien & Mindell, 2005; Smaldone et al., 2007). This study provided stronger evidence of the implications of sleep by using a longitudinal design and controlling for earlier health and adjustment. The transition to young adulthood involves major changes in social roles and often is characterized by high levels of stress, and these factors may affect later health and adjustment. It is possible that sleep, as a significant "health behavior," seems to explain how individuals adjust to the new demands and expectations of young adulthood. Thus, sleep may play a particularly important role in health and adjustment during the transition to young adulthood.

Future longitudinal work should also explore physiological mechanisms that may underlie the links between sleep and health and adjustment outcomes. For example, research suggests that sleep deprivation and night-to-night variability in sleep relate to increases in levels of inflammatory markers (Okun et al., 2011), and thus, may help to explain sleep-health linkages. Other research suggests that sleep patterns relate to brain functioning (Telzer, Fuligni, Lieberman, & Galván, 2013), such that poor sleep may impair decision making and executive functioning (Durmer & Dinges, 2005), and these processes, too, may mediate sleep-risky behavior associations.

Limitations and Future Directions

Some limitations of our study imply directions for future research. We focused on a community-based sample of two-parent Mexican American families in a specific geographic context. Our findings may be most relevant to immigrant populations, as the parents were predominantly Mexico-born. Replicating findings with larger samples in other geographic regions and other family structures/backgrounds will be important. Relatedly, although our ethnic homogenous design was a strength of this study, future studies should also utilize national samples with diverse racial and ethnic backgrounds to test whether ethnicity, per se, moderates the associations between sleep and well-being observed in this study. Sleep

patterns, which are a central activity of adolescents' daily lives, may have more deleterious impacts for youth from predominately immigrant, ethnic minority families given the accumulation of stressors and adverse conditions that these youth may face.

Our study used self-reports of sleep/wake times to assess two sleep dimensions, and, although self-reports are correlated with more objective measures (Werner, Molinari, Guyer, & Jenni, 2008), future research on ethnic minority youth should include objective assessments. Future research also should assess additional dimensions of sleep, such as the number of times individuals wake up during the night, difficulties falling asleep, and whether sleep is perceived as sufficient. We also relied on self-reports of height and weight, which, while an important and efficient research tool (Stommel & Schoenborn, 2009), may be subject to bias. Finally, our study design and measures meant that we could not draw causal conclusions or determine the mechanisms linking sleep and well-being. More consideration of the reciprocal associations and underlying mechanisms is an important future direction as are the use of experimental designs that test the effects of interventions designed to improve sleep hygiene.

Conclusion

Our study advanced understanding of the correlates of sleep patterns in late adolescence and health and adjustment implications of such patterns in several key ways. We extended research on adolescent sleep to ethnic minority youth by focusing on Mexican American youth, a large and rapidly growing segment of the U.S. population (U.S. Census Bureau, 2013), who face substantial health and adjustment risks (Anderson & Mayes, 2010; Eaton et al., 2008; Roberts et al., 1997; USDHSS, 2013). Studying Mexican American youth provides insights about the correlates of sleep patterns within this sociocultural context; these findings can inform public health policy and the development of prevention programs aimed at promoting the well-being of this large, growing subgroup in the U.S. We also contributed to the literature by examining two dimensions of sleep, average nightly duration and night-to-night variability (Acebo & Carskadon, 2002; Dahl & Lewin, 2002), and testing both their correlates and their differential impacts on health and adjustment. Features of our research design also provided for stringent tests of the associations of interest, including our use of a multi-method, multi-informant, short-term longitudinal design, and assessments of health and adjustment at two time points in development that have been understudied in prior research on sleep.

At the most general level, our study provided support for sociocultural models of adolescent sleep (Carskadon, 2002) by demonstrating that experiences in both family and extra-familial settings in late adolescence were related, though quite differently, to dimensions of sleep among Mexican American youth. Our findings suggest that time spent in extra-familial settings had negative implications for sleep duration, whereas the affective quality of family relationships had positive implications for sleep variability. In addition, our study provided longitudinal evidence for the role of sleep on well-being from late adolescence to young adulthood, by documenting the impact of sleep on both physical health and psychosocial adjustment across a two-year period and highlighting the role of night-to-night variability in these links. Future research on adolescent sleep will benefit from considerations of

adolescents' sleep in its social ecological contexts, examinations of different dimensions of sleep on health and adjustment longitudinally, and identification of mechanisms underlying the associations between sleep and well-being.

Acknowledgement

We are grateful to the families and youth who participated in this project, and to the following schools and districts who collaborated: Osborn, Mesa, and Gilbert school districts, Willis Junior High School, Supai and Ingleside Middle Schools, St. Catherine of Siena, St. Gregory, St. Francis Xavier, St. Mary-Basha, and St. John Bosco. We thank Ann Crouter, Mark Roosa, Nancy Gonzales, Roger Millsap, Jennifer Kennedy, Leticia Gelhard, Melissa Delgado, Emily Cansler, Lorey Wheeler, Shawna Thayer, Devon Hageman, Norma Perez-Brena, Ji-Yeon Kim, Lilly Shanahan, Chun Bun Lam, Megan Baril, Anna Solmeyer, and Shawn Whiteman for their assistance in conducting this investigation. Funding was provided by NICHD grants R01HD39666 (Kimberly A. Updegraff, PI) and R01-HD32336 (Ann C. Crouter & Susan M. McHale, Co-PIs) and by the Cowden Fund to the T. Denny Sanford School of Social and Family Dynamics at ASU.

Biographies

Sally I-Chun Kuo received her Ph.D. in Developmental Psychology from the Institute of Child Development, University of Minnesota. She is a postdoctoral scholar in the T. Denny Sanford School of Social and Family Dynamics at Arizona State University. Her research focuses on close relationships and the development of competence in adolescence and young adulthood.

Kimberly A. Updegraff earned her Ph.D. in Human Development and Family Studies at the Pennsylvania State University. She is a Professor in the T. Denny Sanford School of Social and Family Dynamics at Arizona State University. Her research focuses on family, gender, and cultural socialization processes in Mexican American families.

Katharine H. Zeiders earned her Ph.D. in Family and Human Development at Arizona State University. She is a postdoctoral scholar in the T. Denny Sanford School of Social and Family Dynamics at Arizona State University. Her research focuses on sociocultural stressors, physiological processes and cultural values in the lives of Mexican-origin youth.

Susan M. McHale received her Ph.D. in Developmental Psychology from the University of North Carolina at Chapel Hill. She is Professor of Human Development and Director of the Social Science Research at the Pennsylvania State University. Her research focuses on family relationships, roles, and activities, how these are linked to the broader ecology of the family, and their implications for youth adjustment and development.

Adriana J. Umaña-Taylor is a Professor of Family and Human Development at Arizona State University in the T. Denny Sanford School of Social and Family Dynamics. She received her Ph.D. in Human Development and Family Studies from the University of Missouri-Columbia. Her work has focused largely on ethnic identity formation, familial socialization processes, culturally informed risk and protective factors, and psychosocial functioning.

Sue A. Rodríguez De Jesús earned her M.S. in the Family and Human Development Department of the T. Denny Sanford School of Social and Family Dynamics at Arizona

State University. Her main area of research focuses on family processes, adolescent and young adult development, with an emphasis on gender and cultural socialization among ethnic minority youth.

References

Acebo, C.; Carskadon, MA. Influence of irregular sleep patterns on waking behavior. In: Carskadon, MA., editor. Adolescent sleep patterns: Biological, social, and psychological influences. New York: Cambridge University Press; 2002. p. 220-235.

Adam EK, Snell EK, Pendry P. Sleep timing and quantity in ecological and family context: A nationally representative time-diary study. Journal of Family Psychology. 2007; 21:4–19. [PubMed: 17371105]

Anderson ER, Mayes LC. Race/ethnicity and internalizing disorders in youth: A review. Clinical Psychology Review. 2010; 30:338–348. [PubMed: 20071063]

Arriaga XB. The ups and downs of dating: Fluctuations in satisfaction in newly formed romantic relationships. Journal of Personality and Social Psychology. 2001; 80:754–765. [PubMed: 11374747]

Blyth DA, Foster-Clark F. Gender differences in perceived intimacy with different members of adolescents' social networks. Sex Roles. 1987; 17:689–718.

Bronfenbrenner, U.; Morris, PA. The bioecological model of human development. In: Damon, W.; Lerner, RM., editors. Handbook of child psychology, Vol. 1: Theoretical models of human development. 6th ed.. New York: John Wiley; 2006. p. 793-828.

Cabrera, N.; García Coll, C. Latino fathers: Uncharted territory in need of much exploration. In: Lamb, ME., editor. The role of father in child development. 4th ed.. New York: Wiley & Sons; 2004. p. 98-120.

Carskadon MA. Patterns of sleep and sleepiness in adolescents. Pediatrician. 1990; 17:5–12. [PubMed: 2315238]

Carskadon, MA. Factors influencing sleep patterns of adolescents. In: Carskadon, MA., editor. Adolescent sleep patterns: Biological, social, and psychological influences. New York: Cambridge University Press; 2002. p. 4-26.

Carskadon MA, Acebo C. Regulation of sleepiness in adolescents: update, insights, and speculation. Sleep. 2002; 25:606–614. [PubMed: 12224839]

Cauce, AM.; Domenich-Rodríguez, M. Latino families: Myths and realities. In: Contreras, J.; Neal-Barnett, A.; Kerns, K., editors. Latino children and families in the United States: Current research and future directions. Westport, CT: Praeger Publishers; 2002. p. 3-25.

Centers for Disease Control and Prevention. Surveillance Summaries, June 9. MMWR. 2006; 55 (No. SS-5).

Chen M-Y, Wang EK, Jeng Y-J. Adequate sleep among adolescents is positively associated with health status and health-related behaviors. BMC Public Health. 2006; 6:59–66. [PubMed: 16524482]

Cohen S, Doyle WJ, Alper CM, Janicki-Deverts D, Turner RB. Sleep habits and susceptibility to the common cold. Archives of Internal Medicine. 2009; 169:62–67. [PubMed: 19139325]

Crimmins NA, Dolan LM, Martin LJ, Bean JA, Daniels SR, Lawson ML, Woo JG. Stability of adolescent body mass index during three years of follow-up. The Journal of Pediatrics. 2007; 151:383–387. [PubMed: 17889074]

Dahl, RE. The consequences of insufficient sleep for adolescents: Links between sleep and emotional regulation. In: Wahlstrom, KL., editor. Adolescent sleep needs and school start times. Bloomington, IN: Phi Delta Kappa; 1999.

Dahl, RE. The regulation of sleep-arousal, affect, and attention in adolescence: Some questions and speculations. In: Carskadon, MA., editor. Adolescent sleep patterns: Biological, social, and psychological influences. New York: Cambridge University Press; 2002. p. 269-284.

Dahl RE, Lewin DS. Pathways to adolescent health: Sleep regulation and behavior. Journal of Adolescent Health. 2002; 31:175–184. [PubMed: 12470913]

DeSalvo KB, Bloser N, Reynolds K, He J, Muntner P. Mortality prediction with a single general self-rated health questions: A meta-analysis. Journal of General Internal Medicine. 2006; 21:267–275. [PubMed: 16336622]

Dillon HR, Lichstein KL, Dautovich ND, Taylor DJ, Riedel BW, Bush AJ. Variability in self-reported normal sleep across the adult age span. Journal of Gerontology, Series B: Psychological Science and Social Science. 2014 Advance online publication.

Domino G. Sleep habits in the elderly: A study of three Hispanic cultures. Journal of Cross-Cultural Psychology. 1986; 17:109–120.

Durmer JS, Dinges DF. Neurocognitive consequences of sleep deprivation. Seminars in Neurology. 2005; 25:117–129. [PubMed: 15798944]

Eaton DK, Kann L, Kinchen S, Shanklin S, Ross J, Hawkins J, Wechsler H. Youth Risk Behavior Surveillance --- United States, 2007. MMWR Surveillance Summaries. 2008 Jun 6.57:1–131. (SS04).

Eaton DK, McKnight-Eily LR, Lowry R, Perry GS, Presley-Cantrell L, Croft JB. Prevalence of insufficient, borderline, and optimal hours of sleep among high school students – United States, 2007. Journal of Adolescent Health. 2010; 46:399–401. [PubMed: 20307832]

Eccles, JS.; Barber, B. Risky behavior measure. University of Michigan; 1990. Unpublished scale

Enders, CK. Applied missing data analysis. New York, NY: The Guilford Press; 2010.

Fayers PM, Sprangers MA. Understanding self-rated health. Lancet. 2002; 359:187–188. [PubMed: 11812551]

Feldman AF, Matjasko JL. The role of school-based extracurricular activities in adolescent development: A comprehensive review and future directions. Review of Educational Research. 2005; 75:159–210.

Fuligni AJ, Hardway C. Daily variations in adolescents' sleep, activities, and psychological well-being. Journal of Research on Adolescence. 2006; 16:353–378.

García Coll C, Crnic K, Lamberty G, Wasik BH, Jenkins R, García HV, McAdoo HP. An integrative model for the study of developmental competencies in minority children. Child Development. 1996; 67:1891–1914. [PubMed: 9022222]

Hale L, Do DP. Racial differences in self-reports of sleep duration in a population-based study. Sleep. 2007; 30:1096–1103. [PubMed: 17910381]

Hesketh K, Wake M, Waters E, Carlin J, Crawford D. Stability of body mass index in Australian children: A prospective cohort study across the middle childhood years. Public Health Nutrition. 2004; 7:303–309. [PubMed: 15003138]

Institute of Medicine. Sleep disorders and sleep deprivation: An unmet public health problem. Washington, DC: The National Academies Press; 2006.

Johnson EO, Roth T, Schultz L, Breslau N. Epidemiology of DSM-IV insomnia in adolescence: Lifetime prevalence, chronicity, and an emergent gender difference. Pediatrics. 2006; 117:e247–e256. [PubMed: 16452333]

Knight GP, Gonzales NA, Saenz DS, Bonds DD, Germán M, Deardorff J, Updegraff KA. The Mexican American cultural values scale for adolescents and adults. Journal of Early Adolescence. 2010; 30:444–481. [PubMed: 20644653]

Knutson KL. Sex differences in the association between sleep and body mass index in adolescents. The Journal of Pediatrics. 2005; 147:830–834. [PubMed: 16356441]

Kuczmarski RJ, Ogden CL, Grummer-Strawn LM, Flegal KM, Guo SS, Wei R, Johnson CL. CDC growth charts: United States. Advance Data from Vital Health Statistics. 2000:1–27. [PubMed: 11183293]

Liu X, Buysse DJ, Gentzler AL, Kiss E, Mayer L, Kapornai K, Kovacs M. Insomnia and hypersomnia associated with depressive phenomenology and comorbidity in childhood depression. Sleep. 2007; 30:83–90. [PubMed: 17310868]

Loredo JS, Soler X, Bardwell W, Ancoli-Israel S, Dimsdale JE, Palinkas LA. Sleep health in U.S. Hispanic population. Sleep. 2010; 33:962–967. [PubMed: 20614856]

Lumeng JC, Somashekar D, Appugliese D, Kaciroti N, Corwyn RF, Bradley RH. Shorter sleep duration is associated with increased risk for being overweight at ages 9 and 12 years. Pediatrics. 2007; 120:1020–1029. [PubMed: 17974739]

Maslowsky J, Ozer EJ. Developmental trends in sleep duration in adolescence and young adulthood: Evidence from a national United States sample. Journal of Adolescent Health. 2014; 54:691–697. [PubMed: 24361237]

Maume DJ. Social ties and adolescent sleep disruption. Journal of Health and Social Behavior. 2013; 54:498–515. [PubMed: 24311758]

McHale, SM.; Crouter, AC.; Bartko, WT. Traditional and egalitarian patterns of parental involvement: Antecedents, consequences, and temporal rhythms. In: Featherman, D.; Lerner, R.; Perlmutter, M., editors. Life-span development and behavior, Vol. II. New York: Erlbaum; 1992. p. 49-81.

McHale SM, Kim JY, Kan M, Updegraff KA. Sleep in Mexican-American adolescents: Social ecological and well-being correlates. Journal of Youth and Adolescence. 2011; 40:666–679. [PubMed: 20668925]

McKnight-Eily LR, Eaton DK, Lowry R, Croft JB, Resley-Cantrell L, Perry GS. Relationships between hours of sleep and health-risk behaviors in US adolescent students. Preventive Medicine. 2011; 53:271–273. [PubMed: 21843548]

Moore M, Kirchner L, Drotar D, Johnson N, Rosen C, Ancoli-Israel S, Redline S. Relationships among sleepiness, sleep time, and psychological functioning in adolescents. Journal of Pediatric Psychology. 2009; 34:1175–1183. [PubMed: 19494088]

Moore M, Kirchner HL, Drotar D, Johnson N, Rosen C, Redline S. Correlates of adolescent sleep time and variability in sleep time: The role of individual and health related characteristics. Sleep Medicine. 2011; 12:239–245. [PubMed: 21316300]

Muthén, LK.; Muthén, BO. Mplus user's guide. 7th ed.. Los Angeles, CA: Muthén & Muthén; 1998–2012.

National Center for Health Statistics. Summary health statistics for the U.S. population: National Health Interview Survey, 2012. National Center for Health Statistics. Vital and Health Statistics. 2013; 10

National Heart, Lung, and Blood Institute. How much sleep is enough?. 2012. Retrieved from https://www.nhlbi.nih.gov/health/health-topics/topics/sdd/howmuch.html

O'Brien EM, Mindell JA. Sleep and risk-taking behavior in adolescents. Behavioral Sleep Medicine. 2005; 3:113–133. [PubMed: 15984914]

Okun ML, Reynolds CF III, Buysse DJ, Monk TH, Mazumdar S, Begley A, Hall M. Sleep variability, health-related practices and inflammatory markers in a community dwelling sample of older adults. Psychosomatic Medicine. 2011; 73:142–150. [PubMed: 21097658]

Orzech KM, Acebo C, Seifer R, Barker D, Carskadon MA. Journal of Sleep Research. 2014; 23:133–142. [PubMed: 24134661]

Pasch KE, Laska MN, Lytle LA, Moe SG. Adolescent sleep, risk behaviors, and depressive symptoms: Are they linked? American Journal of Health Behavior. 2010; 34:237–248. [PubMed: 19814603]

Peach HD, Gaultney JF. Sleep, impulse control, and sensation-seeking predict delinquent behavior in adolescents, emerging adults, and adults. Journal of Adolescent Health. 2013; 53:293–299. [PubMed: 23672770]

Radloff LS. The CES-D scale: A self-report depression scale for research in the general population. Applied Psychological Measurement. 1977; 1:385–401.

Roberts RE, Roberts CR, Chen YR. Ethnocultural differences in prevalence of adolescent depression. American Journal of Community Psychology. 1997; 25:95–110. [PubMed: 9231998]

Roberts RE, Roberts CR, Chen IG. Ethnocultural differences in sleep complaints among adolescents. Journal of Nervous and Mental Disease. 2000; 188:222–229. [PubMed: 10789999]

Roberts RE, Roberts CR, Chen IG. Functioning of adolescents with symptoms of disturbed sleep. Journal of Youth and Adolescence. 2001; 30:1–18.

Sabogal F, Marín G, Otero-Sabogal R, Marín BV, Perez-Stable E. Hispanic familism and acculturation: What changes and what doesn't? Hispanic Journal of Behavioral Sciences. 1987; 9:397–412.

Smaldone A, Honig JC, Byrne MW. Sleeping in American: Inadequate sleep and relationships to health and well-being of our nation's children. Pediatrics. 2007; 119:S29–S37. [PubMed: 17272582]

Smetana JG. Adolescents' and parents' conceptions of parental authority. Child Development. 1988; 59:321–335. [PubMed: 3359858]

Snell EK, Adam EK, Duncan GJ. Sleep and the body mass index and overweight status of children and adolescents. Child Development. 2007; 78:309–323. [PubMed: 17328707]

Steinberg L. We know some things: Parent-adolescent relationships introspect and prospect. Journal of Research on Adolescence. 2001; 11:1–19.

Stommel M, Schoenborn CA. Accuracy and usefulness of BMI measures based on self-reported weight and height: Findings from the NHANES & NHIS 2001–2006. BMC Public Health. 2009; 9:421. [PubMed: 19922675]

Telzer EH, Fuligni AJ, Lieberman MD, Galván. The effects of poor quality sleep on brain function and risk taking in adolescence. NeuroImage. 2013; 71:275–283. [PubMed: 23376698]

Umaña-Taylor AJ. Research with Latino early adolescents: Strengths, challenges, and directions for future research. Journal of Early Adolescence. 2009; 29:5–15.

Updegraff KA, McHale SM, Whiteman SD, Thayer SM, Delgado MY. Adolescent sibling relationships in Mexican American families: Exploring the role of familism. Journal of Family Psychology. 2005; 19:512–522. [PubMed: 16402866]

U.S. Department of Health & Human Services. The Office of Minority Health. Obesity and Hispanic Americans. 2013. Retrieved from http://minorityhealth.hhs.gov/templates/content.aspx?ID=6459

U.S. Census Bureau. Projections of the total resident population by 5-year age groups, race, and Hispanic origin with special age categories: Middle series, 2001 to 2005. Washington, DC: U.S. Census Bureau, Population Division; 2000.

U.S. Census Bureau. The Hispanic population in the United States: 2012. 2013. Retrieved from http://www.census.gov/population/hispanic/data/2012.html

Wade TJ, Pevalin DJ, Vingilis ER. Revising student self-rated physical health. Journal of Adolescence. 2000; 23:785–791. [PubMed: 11161339]

Werner H, Molinari L, Guyer C, Jenni OG. Agreement rates between actigraphy, diary, and questionnaire for children's sleep patterns. Archives of Pediatrics & Adolescent Medicine. 2008; 162:350–358. [PubMed: 18391144]

Wolfson AR, Carskadon MA. Understanding adolescents' sleep patterns and school performance: A critical appraisal. Sleep Medicine Reviews. 2003; 7:491–506. [PubMed: 15018092]

Table 1

Means, Standard Deviations, and Ranges for Study Variables

	Mean (*SD*)	Range
Family SES	−0.01 (0.83)	−2.12 – 2.12
Mothers' familism values	4.40 (0.37)	3.13 – 5.00
Fathers' familism values	4.48 (0.38)	3.44 – 5.00
Mother-youth intimacy	4.01 (0.62)	2.25 – 5.00
Father-youth intimacy	3.70 (0.64)	1.63 – 5.00
Mother-youth conflict	2.27 (0.73)	1.00 – 4.58
Father-youth conflict	2.13 (0.69)	1.00 – 5.58
Family time – 7 day total hours	15.65 (12.89)	0.00 – 71.25
Peer time – 7 day total hours	13.87 (10.02)	0.00 – 42.37
Work time – daily average hours	4.13 (3.44)	0.00 – 12.16
School time – daily average hours	4.96 (2.66)	0.00 – 11.00
T1 Sleep duration (nightly)	8.18 (1.09)	4.70 – 11.86
T1 Sleep variability	1.52 (0.87)	0.25 – 6.68
T1 Physical health	3.54 (1.04)	1.00 – 5.00
T2 Physical health	3.53 (1.02)	1.00 – 5.00
T1 BMI	24.95 (5.14)	15.49 – 41.63
T2 BMI	25.63 (5.31)	15.82 – 42.91
T1 Depressive symptoms	13.27 (9.43)	0.00 – 46.00
T2 Depressive symptoms	13.59 (8.88)	0.00 – 48.00
T1 Risky behaviors	1.54 (0.42)	1.00 – 2.84
T2 Risky behaviors	1.49 (0.41)	1.00 – 3.48

Note. T1 = Time 1, T2 = Time 2; SES = Socioeconomic status; BMI = body mass index.

J Youth Adolesc. Author manuscript; available in PMC 2016 February 01.

Table 2

Bivariate Correlations Between Study Variables (N = 246)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
1. Family SES																				
2. M fam val T1	−.15*																			
3. F fam val T1	.35***	.21*																		
4. Mintimacy T1	−.07	.02	.09																	
5. Fintimacy T1	−.17*	.08	.31***	.28***																
6. M conflict T1	−.09	.06	.03	−.43***	−.20*															
7. F conflict T1	.08	−.05	−.01	−.32***	−.16	.41***														
8. Fam time T1	.09	.22*	.03	.14	.07	−.07	−.08													
9. Peer time T1	.24**	−.07	−.08	−.06	−.25**	−.02	.05	.04												
10. Work time T1	−.27***	.04	.01	−.01	−.02	.17*	.10	−.22**	−.16											
11. Sch time T1	.13	.05	−.01	.02	.06	−.13	−.07	.01	.04	−.31***										
12. Sleep dur T1	−.05	−.13	.11	.03	−.03	.10	.10	.02	−.15*	−.18*	−.22**									
13. Sleep var T1	.12	−.13	−.05	−.13	−.25**	.25**	.09	−.09	.18*	.03	−.18*	.12								
14. Ph health T1	.18*	.15	.06	.11	−.06	−.09	−.22*	.25**	.11	−.24**	.04	−.07	−.03							
15. Ph health T2	.10	−.02	.02	.05	−.11	−.06	−.14	−.02	.09	−.11	−.03	−.03	−.15	.44*						
16. BMI T1	−.13	.09	−.02	.02	.09	.15	−.01	.02	.03	.02	−.14	.05	.07	−.12	−.18*					
17. BMI T2	−.15	.06	.05	−.05	.08	.18	.02	−.00	.04	.06	−.10	−.05	.00	−.16*	−.24**	.87***				
18. Depress T1	−.07	.04	.05	−.13	−.07	.31***	.24**	−.10	−.02	.18*	−.04	.01	.14	−.40***	−.30***	−.11	−.07			
19. Depress T2	−.03	.03	−.07	−.13	−.07	.25**	.21*	.06	−.09	.12	−.22*	.06	.13	−.17*	−.22**	−.10	−.06	.43***		
20. R behav T1	.14	−.12	−.06	−.26***	−.23**	.29***	.25**	−.29***	.13	.05	−.24**	.04	.09	−.10	−.07	.10	.12	.13	.15	
21. R behav T2	.17*	−.02	−.21*	−.17*	.31***	.19*	.15	−.32***	.18*	.05	−.08	−.04	.20*	−.07	−.11	.08	.13	.05	.03	.76*

Note. SES = Socioeconomic status; T1 = Time 1, T2 = Time 2; M = Mother; F = Father; fam val = Familism values; Mintimacy = Mother intimacy; Fintimacy = Father intimacy; Fam = Family; Sch = School; Sleep dur = Sleep duration; Sleep var = Sleep variability; Ph health = Physical health; BMI = Body mass index; Depress = Depressive symptoms; R behav = Risky behaviors.

*$p \leq .05$,

** $p \leq .01$,

*** $p \leq .001$.

Table 3

Results of Regression Models Testing Links Between Family and Extra-familial Experiences and Sleep Patterns in Late Adolescence (N = 246)

	Sleep Duration				Sleep Variability			
	b	***SE***	**β**	**95% CI**	***b***	***SE***	**β**	**95% CI**
Covariates								
Gender	0.22	0.17	0.10	[−0.11, 0.56]	0.25	0.14	0.15†	[−0.01, 0.52]
Family SES	−0.06	0.12	−0.04	[−0.28, 0.17]	0.12	0.09	0.12	[−0.06, 0.30]
Correlates								
Mother-youth intimacy	0.22	0.17	0.12	[−0.11, 0.54]	0.05	0.13	0.04	[−0.20, 0.30]
Father-youth intimacy	−0.13	0.16	−0.07	[−0.45, 0.20]	−0.22	0.13	−0.16†	[−0.47, 0.04]
Mother-youth conflict	0.16	0.14	0.10	[−0.13, 0.44]	0.33	0.11	0.28**	[0.11, 0.55]
Father-youth conflict	0.16	0.16	0.10	[−0.15, 0.46]	−0.08	0.12	−0.06	[−0.32, 0.16]
Mothers' familism values	−0.34	0.26	−0.12	[−0.86, 0.18]	−0.15	0.2	−0.06	[−0.55, 0.25]
Fathers' familism values	0.35	0.27	0.12	[−0.17, 0.87]	0.12	0.21	0.05	[−0.29, 0.53]
Time with family	0.00	0.01	−0.05	[−0.02, 0.01]	−0.01	0.01	−0.12	[−0.02, 0.00]
Time with peers	−0.02	0.01	−0.20*	[−0.04, −0.01]	0.01	0.01	0.13†	[−0.00, 0.03]
Time at work	−0.11	0.03	−0.35**	[−0.16, −0.06]	−0.01	0.02	−0.04	[−0.05, 0.03]
Time at school	−0.12	0.03	−0.28**	[−0.18, −0.05]	−0.06	0.02	−0.17*	[−0.10, −0.01]
R^2	0.21				0.20			

Note. Gender: 1= female, 0 = male; *SE* = Standard Error; SES = Socioeconomic status.

† $p \leq .10$,

* $p \leq .05$,

** $p \leq .01$,

*** $p \leq .001$.

Table 4

Results of Residualized Change Regression Models Testing Sleep Patterns in Late Adolescence (T1) as Predictors of Health and Adjustment Outcomes in Young Adulthood (T2; N =246)

	T2 Physical Health			
	b	***SE***	**β**	**95% CI**
Gender	−0.09	0.15	−0.05	[−0.39, 0.20]
Family SES	0.05	0.10	0.04	[−0.14, 0.24]
T1 Physical health	0.40	0.08	0.41***	[0.25, 0.55]
T1 Sleep duration	0.01	0.07	0.01	[−0.13, 0.15]
T1 Sleep variability	−0.19	0.10	−0.17*	[−0.39, 0.00]
R^2	0.21			
	T2 BMI			
	b	*SE*	β	95% CI
Gender	0.00	0.46	0.00	[−0.89, 0.90]
Family SES	−0.25	0.30	−0.04	[−0.83, 0.34]
T1 BMI	0.90	0.04	0.87***	[0.81, 0.98]
T1 Sleep duration	−0.44	0.23	−0.09†	[−0.89, 0.01]
T1 sleep variability	−0.22	0.31	−0.04	[−0.93, 0.38]
R^2	0.77			
	T2 Depressive Symptoms[a]			
	b	*SE*	β	95% CI
Gender	2.21	1.33	0.12	[−0.39, 4.81]
Family SES	−0.14	0.82	−0.01	[−1.75, 1.46]
T1 Depressive symptoms	0.42	0.08	0.44***	[0.27, 0.56]
T1 Sleep duration	0.49	0.76	0.06	[−0.99, 1.98]
T1 Sleep variability	0.56	1.10	0.05	[−1.59, 2.71]
R^2	0.24			
	T2 Risky Behaviors			
	b	*SE*	β	95% CI
Gender	−0.04	0.05	−0.05	[−0.14, 0.05]
Family SES	0.02	0.03	0.04	[−0.04, 0.08]
T1 Risky behaviors	0.73	0.06	0.73***	[0.61, 0.84]
T1 Sleep duration	−0.02	0.02	−0.07	[−0.07, 0.02]
T1 Sleep variability	0.08	0.03	0.16*	[0.02, 0.14]
R^2	0.62			

Note. Gender: 1 = female, 0 = male; SE = Standard Error; SES = Socioeconomic status; T1 = Time 1, T2 = Time 2; BMI = Body mass index.

† $p \leq .10$,

* $p \leq .05$,

** $p \leq .01$,

*** $p \leq .001$.

[a] The findings remained the same when the sleep-specific item in the depressive symptoms measure was removed.