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Pubertal development, sleep problems, and alcohol use: A commentary

Maria M. Wong, Ph.D.
Idaho State University

Abstract

Background—This commentary discussed the study conducted by Pieters, Van Der Vorst, Burk, Wierers, & Engles (2010) on the relationships among puberty dependent sleep regulation and alcohol use in adolescents. The goal of this commentary is to underscore the significance of the study and discussed some of the unaddressed questions in the area.

Methods—The significance of the study and unaddressed questions are discussed.

Results—Pieters et al. (2010) provided valuable data to understanding the relationships among puberty, sleep problems, and alcohol use. Questions regarding the relationship between puberty and sleep problems, the possible reciprocal relationships among circadian phase preference, sleep problems and alcohol use, mediators and moderators of such relationships, as well as potential gender differences on these relationships were discussed.

Conclusions—To understand the relationships among pubertal development, sleep problems, and alcohol use, researchers need to be aware of the physiological changes that take place in puberty, as well as the psychosocial factors that are associated with such changes. Important mediators and moderators of the relationships among these constructs also need to be identified. Longitudinal design may be useful in this regard.

Keywords

Sleep problems; alcohol use; puberty; circadian phase preference; adolescence

This commentary discussed the study conducted by Pieters, Van Der Vorst, Burk, Wierers, and Engles (2010) on the relationships among puberty dependent sleep regulation and alcohol use in adolescents. The goal of this commentary is to underscore the significance of the study and highlight some of the unaddressed questions in the area.

Pieters et al. (2010) studied 431 Dutch adolescents in a cross-sectional study and reported that pubertal development predicted circadian phase preference and sleep problems, which in turn predicted alcohol use. Additionally, pubertal development also directly predicted alcohol use. These relationships hold even after controlling for gender, education, and psychopathology. The authors argued that both puberty and sleep problems are important factors explaining alcohol use in adolescence.

This study presents findings on an important area of research, i.e., how pubertal development may be related to sleep regulation and alcohol use in adolescence. Very few studies have directly examined how puberty may be related to both sleep problems and

alcohol use in adolescence. The results suggest that puberty may increase the risk for both sleep problems and alcohol use among adolescents.

The association between alcohol use and sleep has been well documented among some adults (Roehrs and Roth, 2001). As sleep problems and alcohol use could mutually affect one another (Brower, 2001), it is unclear whether sleep problems cause alcohol use, or alcohol use caused sleep problems. To untangle this cause and effect issue, longitudinal studies are needed. Longitudinal studies in both children and adults now suggest that sleep problems may developmentally precede onset of alcohol use and alcohol problems (Ford and Kamerow, 1989; Roberts et al., 2008; Wong et al., 2004, 2009, 2010; see Shibley et al., 2008 for a review).

This study contributes to existing research by drawing attention to the importance of pubertal development. Structural equation modeling analyses showed that pubertal development had both direct and indirect effects (via circadian phase preference and sleep problems) on alcohol use. Thus pubertal development may increase the risk of sleep problems and alcohol use.

Even though structural equation modeling analyses confirmed the authors' hypothesis, other competing theories are also possible. The cross-sectional nature of the study does not allow us to understand the temporal and causal relationships among the variables. To fully understand the relationships among these variables, the following questions need to be addressed by future studies.

First, what is the relationship between pubertal development and sleep problems? Past research has suggested that puberty causes phase delay, i.e., a preference towards later bedtime (Carskadon et al., 1993; 2004; Dahl and Lewin, 2002). Does phase delay necessarily result in sleep problems? Phase delay probably leads to a sleep debt when adolescents have to get up early to go to school. Many adolescents may sleep more on weekends to compensate for their lack of sleep on weekdays. Differences in bedtime as well as time in bed between weekdays and weekends may contribute to the development of sleep problems, particularly among those who are vulnerable, e.g., those who have a problem regulating their sleep in early childhood.

However, among those who start school later in the day or those who have a more flexible schedule (e.g., those who home school), phase delay may not necessarily lead to sleep problems. Future studies could examine the effects of puberty on sleep problems in different social groups and cultures, comparing groups who have rigid weekday school schedule vs. those with more flexible schedules.

Second, In addition to phase delay, does puberty result in other physiological changes that may increase the likelihood for the development of sleep problems? Pubertal development may be associated with the need to sleep more (Carskadon et al., 2004; Dahl and Lewin, 2002). Thus many adolescents may need to rest as much as, if not more than prepubertal children. Again, this physiological need may not necessarily lead to problems. However, a number of psychosocial factors such as a decrease in parental monitoring, an increase in school demands, an increase in autonomy in decisions about when to go to bed and what to do before going to bed, and cultural values that emphasize on academic achievement may all contribute to a decrease in sleep time among adolescents. Future research could examine the longitudinal relationship between pubertal development and sleep problems. Puberty may interact with psychosocial factors to affect sleep problems. For instance, puberty may be related to sleep problems only among those adolescents with low parental monitoring.

Third, is there a reciprocal relationship among circadian phase preference, sleep problems, and alcohol use? While a preference for later bed time may lead to sleep problems and alcohol use, it is also possible that alcohol use affects circadian phase preference and sleep problems. Experimental research shows that alcohol use disrupts sleep (Roehrs and Roth, 2001). Regular alcohol use and abuse have long term effects on sleep habits and problems among adults (Brower, 2001; Roehrs and Roth, 2001). Alcohol use probably also has long term effects in adolescents, whose brain is still rapidly developing. Adolescents who use alcohol regularly may develop a preference for later bedtimes because drinking often occurs in parties and social activities in late evenings. Going to bed late and getting up late the next morning may contribute to having trouble sleeping the following night. For those who over drink or binge drink regularly, alcohol may have an even more detrimental effect on sleep. While circadian preference and sleep problems may be risk factors for early alcohol use in adolescents, it is likely that alcohol use also affects circadian preference and sleep problems. Longitudinal studies of these constructs will shed light on the reciprocal relationships among circadian preference, sleep problems, and alcohol use.

Fourth, what are the important mediators that explain the relationship between sleep problems and alcohol use? It is still unclear what processes may explain this relationship. The authors pointed out that sleep problems may negatively affect executive functioning, which may lead to an increase in the use of alcohol and other substances. In the adult literature on sleep, there is evidence that sleep deprivation adversely affects cognitive processes related to executive functions, .e.g, the ability to suppress a prepotent response (Chuah et al., 2006), to detect error and to engage in error remedial action (Tsai et al., 2005). Children whose sleep is restricted perform poorly on tasks that require sustained attention and behavioral inhibition (Sadeh et al., 2002, 2003). A recent study by our group found that adolescent response inhibition, a component of executive functioning, partially mediated the effect of childhood sleep problems and alcohol and drug related problems in young adulthood (Wong et al., 2010). Thus executive functions appear to be an important mediator that may explain the relationship between sleep problems and alcohol use. More studies are needed to understand whether sleep problems have long term effects on executive functions and substance use.

Fifth, although no gender differences are reported in the Pieters et al. (2010) study, it is unclear whether gender interacts with puberty to affect sleep problems and substance use. On the average, girls mature earlier than boys. May this difference affect the risk of developing sleep problems and substance use in the long run? Additionally, the timing of puberty appears to have a different effect on boys than on girls (Kaltiala-Heino et al., 2003; Taga et al., 2006). Future studies could examine whether timing of puberty affect sleep and alcohol use in boys and girls differently.

In sum, the study by Pieters et al. (2010) provided valuable data to understanding the relationships among puberty, sleep problems and alcohol use. This is an exciting area of study, with many questions left unanswered. To understand the relationships among pubertal development, sleep problems, and alcohol use, researchers need to be aware of the physiological changes that take place in puberty, as well as the psychosocial factors that are associated with such changes. Important mediators and moderators of the relationships among these constructs also need to be identified. Longitudinal design may be useful in this regard.

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