

SLEEP FUNCTIONING AND PROBLEM BEHAVIORS:
THE SALIENCE OF PARENTAL WARMTH

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THE SALIENCE OF PARENTAL WARMTH

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THESIS ABSTRACT

SLEEP FUNCTIONING AND PROBLEM BEHAVIORS:

THE SALIENCE OF PARENTAL WARMTH

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Inadequate sleep functioning, such as low sleep quantity and poor sleep quality, appears prevalent across age groups, but is particularly detrimental during adolescence, and the consequences vary widely; they include problems in cognitive performance, internalizing problems, and externalizing problems. The current study examined the links between poor sleep functioning and four measures of externalizing or problem behaviors, namely smoking cigarettes, drinking alcohol, using illegal drugs, and engaging in deviant behaviors. Previous research has indicated a relationship between poor sleep functioning and problem behaviors, but the mechanisms remain poorly understood. Some work has suggested the quality of the parent-adolescent relationship, particularly parental warmth or closeness, as important in understanding this association, but no previous work has examined the links among parental warmth, sleep functioning, and problem behaviors.

The current study investigated these questions in a national probability sample of Swiss adolescents (n=7,664; mean age = 17.88 years). Participants' self-reported responses to measures of demographics, sleep quantity, sleep quality, cigarette use, alcohol use, illegal drug use, deviance, and parental warmth were analyzed using hierarchical regression analysis. Four hypotheses were formulated and tested: (1) direct effects of sleep functioning on problem behaviors, (2) direct effects of parental warmth on sleep functioning, (3) sleep functioning as a mediator in the relationship between parental warmth and problem behaviors, and (4) parental warmth as a moderator in the relationship between sleep functioning and problem behaviors.

Findings largely supported the hypotheses and provided evidence for significant relationships between (1) sleep functioning and all four problem behaviors and for (2) parental warmth and sleep functioning. In addition, (3) sleep functioning was also found to partially mediate the link between parental warmth and problem behaviors; parental warmth also maintained a significant direct relationship with problem behaviors, independent of sleep functioning. Finally, (4) parental warmth also moderated the relationship between sleep functioning and some of the problem behaviors. More specifically, parental warmth moderated the sleep quantity and deviance link, the sleep quality and smoking cigarettes link, and the sleep quantity and quality and using illegal drug use links. Findings are discussed in terms of their implications for prevention and intervention efforts and future work is suggested, including considering additional parent-adolescent relationship characteristics, such as parental control or monitoring, and aspects of attachment (security or emotion regulation).

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INTRODUCTION

An adequate amount of sleep is important during any stage of life, particularly during childhood and adolescence. The recommended amount of sleep for adolescents is 8.5 to 9 hours per night (Meltzer & Mindell, 2006), although studies have found that the average adolescent gets less than eight hours per night (e.g., Eliasson, Eliasson, King, Gould, & Eliasson, 2002; Wolfson & Carskadon, 1998). In one study, 63% of adolescents reported not getting enough sleep during the week (Mercer, Merritt, & Cowell, 1998). In addition to inadequate amounts of sleep, poor quality of sleep also directly contributes to not getting enough sleep at night. Sleep problems appear to be a global concern and find empirical support throughout the world in places including in Western Europe (Ohayon, Roberts, Zulley, Smirne, & Priest, 2000), and Iceland (Thome & Skuladottir, 2005), and Israel (Tikotzky & Sadeh, 2001). As many as 25% of adolescents suffer from a variety of sleep problems, such as difficulty falling asleep, waking often during the night, struggling to go back to sleep after waking during the night, and difficulty getting up in the morning (LeBourgeois, Giannotti, Cortesi, Wolfson, & Harsh, 2005; Mindell & Owens, 2003; Ohayon et al., 2000; Roberts, Roberts, & Chen, 2002); insomnia is less prevalent (4-5%; Roberts et al., 2002; Roberts, Roberts, & Duong, 2008).

Inadequate sleep functioning has been associated with a myriad of negative consequences for youth. Inadequate sleep functioning is defined by both sleep quantity and sleep quality in the current study. Sleep quantity is the amount of sleep received at

night, while sleep quality is determined by the prevalence of sleep problems. Therefore, a sufficient amount of sleep and low levels of sleep problems indicate good sleep functioning, while low amounts of sleep and a high prevalence of sleep problems indicate poor sleep functioning. Previous work has found consequences of poor sleep functioning to include anxiety and depression (Alfano, Beidel, Turner, & Lewin, 2006; Fredriksen, Rhodes, Reddy, & Way, 2004; Liu & Zhou, 2002; Roberts et al., 2002) poor health (Oginska & Pokorski, 2006; Steptoe, Peacey, & Wardle, 2006), and lower grades in school (Fredriksen et al., 2004; Shin, Kim, Lee, Ahn, & Joo, 2003; Wolfson & Carskadon, 1998). Additional potential consequences of inadequate sleep functioning include elevated rates of problem behaviors, including deviance and substance use, such as cigarettes, alcohol and illegal drugs. A number of studies provide evidence supporting this association; for example, sleep functioning and cigarette use (Andersen, Holstein, & Hansen, 2006; Giannotti, Cortesi, Sebastiani, & Ottaviano, 2002; Hawkins, 1992; Johnson & Breslau, 2001; Patten, Choi, Gillin, & Pierce, 2000; Wong, Brower, Fitzgerald, & Zucker, 2004), sleep functioning and illicit drug use (Hawkins, 1992; Johnson & Breslau, 2001; O'Brien & Mindell, 2005), sleep functioning and alcohol use (Gau et al., 2007; Giannotti et al., 2002; Hawkins, 1992; O'Brien & Mindell, 2005; Vignau et al., 1997), as well as sleep functioning and deviant behaviors such as theft and truancy (Vignau, et al., 1997). The current study conceptualizes problem behaviors as smoking cigarettes, drinking alcohol use, using illegal drugs, and engaging in deviance. In the current effort, the focus is on the link between sleep functioning and problem behaviors.

Although previous work exists to support the relationship between sleep functioning and problem behaviors, this is a relatively new finding and the mechanisms of this relationship remain unclear. One plausible mechanism for these links was developed by O'Brien and Mindell (2005); they propose that the relationship is largely a function of socialization processes in the home. More specifically, they suggest that the quality of the parent-adolescent relationship might influence these links. Recent research based on cross-sectional data has supported the idea that sleep functioning is associated with the parent-adolescent and parent-child relationship (Adam, Snell, & Pendry, 2007; Cousins, Bootzin, Stevens, Ruiz, & Haynes, 2007; Gau, Soong, & Merikangas, 2004; Owens-Stively, et al, 1997). For instance, Adams, Snell, and Pendry (2007) found that parental warmth positively predicted greater amounts of weekday sleep in school-aged children, while parental control was positively associated with amount of sleep in youth. Also, it has been proposed that a feeling of security is necessary for a child to sleep well, and the quality of the parent-child relationship is critical for a sense of security (Dahl & El-Sheikh, 2007).

There exists ample evidence of a relationship between the parent-adolescent relationship and a variety of problem behaviors (Adamczyk-Robinette, Fletcher, & Wright, 2002; Kuntsche, Gmel, & Rehm, 2006; Melby, Conger, Conger, & Lorenz, 1993; White, Johnson, & Buyske, 2000;), including work on alcohol use (Clark, Thatcher, & Maisto, 2005; Latendresse et al., 2008; Mogro-Wilson, 2008; Kosterman, Hawkins, Guo, Catalano, & Abbott, 2000;), on drug use (Broman, Reckase, & Freedman-Doan, 2006; Kuntsche et al., 2006; Macauley, Griffin, Gronewald, Williams, & Botvin, 2005), and on

deviance (Claes et al., 2005; Kuntsche et al., 2006; Wissink, Dekovic, & Meijer, 2006). In the current study, parental warmth will be an indicator of quality in the parent-adolescent relationship. When high levels of parental warmth are present, the quality of the relationship is also considered to be high. Parental warmth is also an important characteristic of a securely attached parent-adolescent relationship, along with high levels of responsiveness, as the parent and adolescent negotiate this time of transition for the youth (Allen & Land, 1999). Other qualities of a positive parent-adolescent relationship include high parental knowledge about the adolescent's whereabouts, low levels of parent-adolescent conflict, and high levels of parental supervision, discipline or monitoring (Fletcher, Steinberg, & Williams-Wheeler, 2004). Unfortunately, due to limitations in the data set, the focus will exclusively be on parental warmth; it does fit well with the current study though, due to the previous work that supports a link between sleep functioning, parental warmth, and problem behaviors.

The current study attempts to further clarify the associations among sleep functioning, the quality of the parent-adolescent relationship, and problem behaviors in a nationally representative sample of Swiss adolescents. The current study is organized by two competing models. One hypothesizes that sleep functioning mediates the effects by parental warmth (Figure 1), while the second hypothesizes that parental warmth moderates the link between sleep functioning and problem behaviors (Figure 2).

Figure 1. Mediation Model

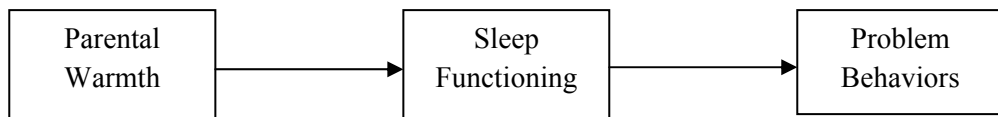
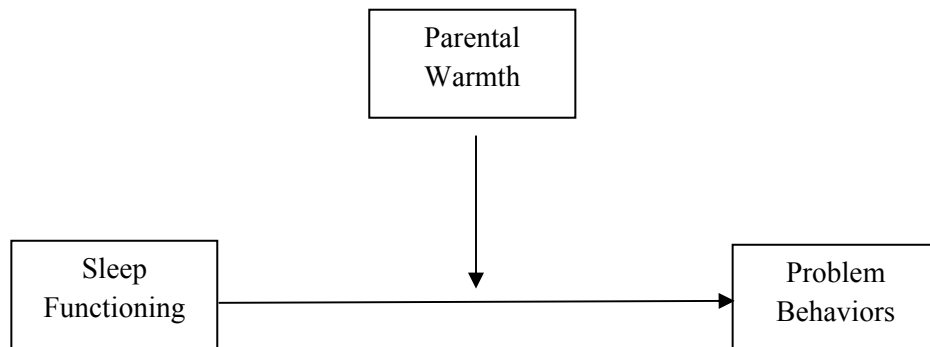


Figure 2. Moderation Model



LITERATURE REVIEW

An insufficient amount of sleep as well as poor sleep quality have been found to be associated with a host of adverse developmental consequences for both children and adolescents. They include mental health (e.g., Choquet, Kovess, & Poutignat, 1993; Gau et al., 2007; Liu, 2004; Liu & Buysse, 2005; Patten et al., 2000; Vignau et al., 1997; Wolfson & Carskadon, 1998), cognition (e.g., Dotto, 1996; Gozal & Pope, 2001; Meijer & van den Wittenboer, 2004; Sadeh, Gruber, & Raviv, 2002), physical health (e.g., Taber & Hurley, 2006; Spiegel, Leproult, & VanCauter, 1999), and behavior (e.g., Liu & Zhou, 2002; Urschitz et al., 2004). However, although links are established, the mechanisms to which sleep deprivation and problems affect youth are poorly understood.

One deleterious consequence of inadequate sleep includes problem behaviors. Although rates of adolescent problem behaviors are not a new finding, the link between sleep functioning and problem behaviors is a relatively new insight. Very little research has been conducted on the mechanisms of this relationship. One candidate explanation includes the quality of the parent-adolescent relationship. Studies have established that the parent-adolescent relationship influences rates of problem behaviors among adolescents; they have also established that sleep functioning is associated with the parent-adolescent relationship quality. However, no previous work has attempted to link sleep functioning, quality of the parent-adolescent relationship, and engagement in problem behaviors together, which is precisely the focus of the current effort. In the

current literature review, the following areas of scholarship will be examined. First, sleep functioning will be investigated. The current study conceptualizes sleep functioning, operationalized as sleep quantity and sleep quality; sleep quantity is assessed by the actual amount of sleep received during the night, while sleep quality is measured by the prevalence of sleep problems. Previous work conducted on the amount of sleep adolescents on average receive will be reviewed first, and then the prevalence of sleep problems that most often plague young people. Subsequently, negative consequences resulting from “dysfunctional” sleep will be briefly reviewed, followed by a more extensive discussion of problem behaviors. Problem behaviors in the current study include deviance and substance use (drug, cigarette, and alcohol use). Lastly, the possibility of the parent-adolescent relationship as a mechanism in the link between sleep functioning and problem behaviors will be examined. Again, parental warmth is used as an indicator of the quality of the parent-adolescent relationship. It is assumed that high levels of parental warmth imply a positive parent-adolescent relationship. Therefore, the associations among sleep functioning, the quality of the parent-adolescent relationship, and engagement in problem behaviors are studied in a national probability sample of Swiss adolescents.

Sleep Quantity Among Adolescents

Studies consistently show that youth do not get enough sleep. This problem is not endemic to the United States, but appears to be an issue around the world. During adolescence the recommended amount of sleep is 8.5 to 9 hours per night (Meltzer & Mindell, 2006). For instance, in a study of more than 100,000 Japanese adolescents,

28.7% of boys and 32.6% of girls reported average sleep durations of less than 6 hours per night (Ohida et al., 2004); similarly, a study of Chinese seventh-grade students reported the average sleep amount during the week to be around 7.5 hours (Gau et al., 2007; see also Lam & Yang, 2008). The International Health and Behavior Study, which included more than 17,000 young adult university students across 24 countries, found that 63% received 7-8 hours of sleep per night while 21% slept less than 7 hours per night and only 16% slept more than 8 hours per night (Steptoe et al., 2006). Consistent findings have been made in large and representative samples from Korea (Shin et al., 2003), and Italy (Manni et al., 1997), and Poland (Oginska & Pokorski, 2006). Studies in the United States provide the same evidence. For example, 63% of over 600 Midwestern adolescents reported not getting enough sleep during the week (Mercer et al., 1998) while in another Midwestern state, the average sleep time during the week was 7 hours 25 minutes (Gilman, Palermo, Kabbouche, Hershey, & Powers, 2007). Sixty-five percent of these participants reported sleeping less than 8 hours per night during the week, with another 10% reporting 6 hours or less.

In summary, youth appear to suffer from regular or chronic sleep deprivation during the school/work week. The recommended amount for this age group is 8.5 to 9 hours per night, but most adolescents report at least one hour less, about 7.5 to 8 hours, on average. Thus, the current study will assess sleep quantity in a nationally probability sample of Swiss youth. Next, sleep problems known to negatively affect sleep functioning will be examined.

Sleep Quality in Adolescence

Along with inadequate amounts of sleep, interruptions during the night due to sleep problems also affect adolescents' overall sleep functioning. They are also associated with a myriad of negative consequences, which will be discussed next. Common sleep problems include difficulty falling asleep, waking often during the night, struggling to go back to sleep after waking during the night, and difficulty getting up in the morning (Mindell & Owens, 2003), as well as excessive daytime sleepiness and considering oneself to not get enough sleep at night (Gilman et al., 2007; Ohida et al., 2004; Shin et al., 2003). Previous work suggests that sleep problems are prevalent among adolescents, but that the rates differ depending upon the type of problem. Almost 8,000 American adolescents participated in a longitudinal self-report study which discovered that 38% suffered from problems falling asleep and staying asleep "sometimes" while 14% suffered from these issues "often" (Patten et al., 2000). In addition, more than half (52%) of those suffering from sleep problems "sometimes" at baseline reported sleep problems "sometimes" at follow-up four years later; frequent sleep problems persisted four years later among 21% of the participants (for similar evidence, see Gilman et al., 2007).

Similar to problems related to sleep quantity, the incidence of sleep problems (sleep quality) also appears to be a problem in other countries. Ohida and colleagues (2004) reported findings from a national survey focused on the lifestyle of more than 100,000 middle school and high school students in Japan. Based on self-reports, 15.3% of boys and 16.0% of girls reported suffering from difficulties falling sleep, while 33.3% of

boys and 39.2% of girls reported suffering from excessive daytime sleepiness; 38.1% of boys and 39.0% of girls believed they did not get enough sleep at night. In a Korean self-report study of 3,871 high school students, almost 16% reported excessive daytime sleepiness (Shin et al., 2003).

In another study conducted in Taiwan on 2,463 first- through ninth-grade students, 44.5% reported at least one sleep problem in the past 6 months including 4.6% reporting difficulty falling asleep and 1.4% reporting waking up often during the night (Gau, 2006). An Italian study of 869 17-year-olds provided evidence that 16.5% of youth were considered poor sleepers because they reported suffering from sleep that did not leave them feeling refreshed often or always in the past 12 months (Manni et al., 1997). A longitudinal study of 1,146 10-13-year-old Canadian youth from Quebec found that nearly 60% had difficulties falling asleep at least sometimes, while 26% frequently woke up during the night (Lalonde et al., 2001). Lastly, 40% of 763 French high school students reported suffering “often” or “always” from at least one sleep problem, which included difficulty falling asleep, difficulty staying asleep, need for more sleep, early awakenings, and chronic sleeping pill intake (Vignau et al., 1997).

In conclusion, sleep problems appear to be quite prevalent among adolescents – almost 40% report suffering from excessive daytime sleepiness, almost 40% do not think they had enough sleep during the night, and up to 40% report experiencing difficulties falling asleep, while approximately 38% report awakening often during the night. However, it is important to note that when considering these rates, different methods and specific questions were used to collect this information. Some studies used established

measures with psychometric properties (e.g., School Sleep Habits Questionnaire, (Gilman et al., 2007) while others simply asked “do you have difficulty falling asleep at night”, “how many hours on average do you sleep at night”, or “do you feel excessively sleepy during the daytime” (e.g., Ohida et al., 2004). Finally, many studies reviewed used adolescent self-reports; a sizeable number also asked parents to rate their children’s sleep behaviors (e.g., Johnson & Breslau, 2001). The current study will assess both sleep quantity and sleep quality with adolescent self-reports, using both simple descriptors of sleep quantity as well as a scale of sleep behaviors which taps into a variety of sleep problems.

Consequences of Inadequate Sleep Functioning

Previous work has established that sleep functioning among adolescents is less than ideal. Combining the youth reporting inadequate amounts of sleep with those youth with sleep problems, the number of adolescents affected by sleep issues is astounding. Previous work has discovered a plethora of negative effects in different areas linked with inadequate sleep functioning, but a brief overview will be given here including cognitive functioning, internalizing behaviors, and externalizing problems. These effects are important and can decrease a person’s quality of life; however, they will only be briefly reviewed here because the current effort is not focused on a variety of consequences, but more specifically on problem behaviors. Nevertheless, they are important to review.

Cognitive functioning has been found to be negatively impacted by sleep dysfunction (e.g., Dotto, 1996; Gozal & Pope, 2001; Meijer & van den Wittenboer, 2004; Sadeh, Gruber, & Raviv, 2002). Specific links have been found with difficulties

concentrating (Gau et al., 2007; Ipsiroglu, Fatemi, Werner, Paditz, & Schwarz, 2002; Johnson, Roth, & Breslau, 2006; Le Blanc et al., 2007; Patten et al., 2000; Wolfson & Carskadon, 1998) and lower grades in school (Fredriksen et al., 2004; Shin et al., 2003; Wolfson & Carskadon, 1998). Poor sleep functioning has also been consistently found to be associated with internalizing problems, such as depression, anxiety, self-esteem and suicidal ideation. For instance, Wolfson and Carskadon (1998) discovered lower amounts of weekday sleep and depressive mood were associated in their sample of high school students; Breslau and colleagues (1996) also found that insomnia was a significant predictor of major depression in a longitudinal study of almost one thousand young adults. Other work has also linked anxiety to sleep dysfunction among adolescents (e.g., Alfano et al., 2006) as well as low self-esteem (e.g., Fredriksen et al., 2004; Roberts et al., 2002). Lastly, sleep dysfunction has also been associated with suicidal ideation in a number of studies on adolescents (e.g., Choquet et al., 1993; Gau et al., 2007; Liu & Buysse, 2005; Vignau et al., 1997).

Lastly, another consequence of sleep dysfunction is externalizing behavior problems. One study conceptualized behavioral problems to include being withdrawn, having attention problems, having social problems, and engaging in aggressive behaviors; based on a sample of 1,359 Chinese youth between the ages of 12 and 18, this study found that youth who slept less than seven hours per night were significantly more likely to suffer from each of these issues in comparison to youth who slept more than seven hours (Liu & Zhou, 2002; for a similar example refer to Gau et al., 2007).

Additional studies have considered how sleep functioning may be associated with aggression, impulsivity, or hostility, known correlates of problem behaviors or externalizing behaviors. A Brazilian study of school-aged children found that sleep problems were associated with increased levels of impulsivity (Medeiros, Carvalho, Silva, Prado, & Prado, 2005); another study found a link between sleep quality and measures of aggression and hostility in a sample of incarcerated males (Ireland & Culpin, 2006). Two groups of incarcerated males – juveniles aged 14-17 and young adults aged 18-20 – completed the Sleep Complaints Scale focused on amount of sleep, night awakenings, and amount of time to fall asleep both before and during their time in prison; they also filled out questionnaires about trait anger and impulsivity. Lower amounts of sleep and poor sleep quality were associated with aggression and hostility. These latter findings provide evidence in support of the sleep quality-problem behaviors link that will be studied in the current effort, as aggression or impulsivity are known correlates of a variety of problem behaviors. In conclusion, inadequate sleep functioning has been found to be consistently linked to a variety of adjustment problems in life, including anxiety and depression, but also aggression and impulsivity. These latter behaviors might in fact play an important role in how sleep functioning is associated with problem behaviors, which will be discussed next.

Sleep Functioning and Problem Behaviors

Another body of research has demonstrated correlational links between inadequate sleep functioning and problems behaviors, including deviance (Gau et al., 2007; Hawkins, 1992; Vignau, et al., 1997), smoking cigarettes (Giannotti et al., 2002;

Johnson & Breslau, 2001; O'Brien & Mindell, 2005; Ohida, et al., 2004; Patten et al., 2000;), drinking alcohol (Giannotti et al., 2002; Johnson & Breslau, 2001; O'Brien & Mindell, 2005; Ohida et al., 2004;), and using illegal drugs (Hawkins, 1992; Johnson & Breslau, 2001; O'Brien & Mindell, 2005). Previous work on these links is not extensive, however; especially lacking are studies that consider multiple problem behaviors in the same sample. This is important to note because past research suggests that problem behaviors cluster together. Hawkins (1992) found that adolescents who engage in problem behaviors were less likely to engage in healthy ones. Those adolescents who smoke cigarettes, use marijuana and hard drugs, drink alcohol, have sexual intercourse, and engage in physical fighting were less likely to engage in healthy behaviors, such as to receive adequate sleep at night. Therefore, the author concluded that problem behaviors tend to group with other problem behaviors while healthy behaviors group with other healthy behaviors.

An additional reason why this investigation is critical is the frequency of substance use among adolescents. Alcohol use is common among high school students - 72.2% of seniors reported having tried more than a few sips of alcohol while 55.1% reported having been drunk (Johnston, O'Malley, Bachman, & Schulenberg, 2008); Swiss adolescents show similar rates (Steinhausen, Eschmann, Heimgartner, & Metzke, 2008). Smoking cigarettes is less prevalent, but still common - 46% had tried it by 12th grade while 22% were regular users. In addition, marijuana is the most commonly used illicit drug with 41.8% of seniors reporting having tried it. Rates of other illicit drugs, known as "hard drugs" in many studies, range from 8.4% (hallucinogens) to 7.8%

(cocaine) to 6.5% (ecstasy) to 1.5% (heroin) among seniors in high school. The highest rates of hard drugs were found with amphetamines (11.4%) and inhalants (10.5%).

The current effort will examine the links between sleep functioning and a variety of problem behaviors in a large national probability sample of Swiss adolescents. Only a small number of studies exist and those that have considered two or more problem behaviors at the same time will be reviewed.

O'Brien and Mindell (2005) utilized the Youth Risk Behavior Survey and the Sleep Habits Survey to study 388 high school students. Youth reported their use of cigarette, alcohol, and marijuana, but also rated measures of sexual behaviors, and sleep functioning. Sleep patterns were found to be related to each of the problem behaviors. Students who suffered from large amounts of weekend delay, which is a difference between weekday bedtime and weekend bedtime, were more likely to report high levels of these problem behaviors. Similarly, associations were found between sleep quality and problem behaviors. One exception was the link between weekend delay and hard drug use, which was not significant. Additionally, amount of sleep on school nights was significantly associated with alcohol use.

In related work conducted in China (Gau et al., 2007) and Italy (Giannotti et al., 2002), being of an evening orientation (having a tendency to stay up late at night and sleep in the morning) was associated with problem behaviors. Youths classified as being of evening orientation slept less than adolescents who were classified as having a morning orientation, namely an average of 2 hours less per weekday. These Italian high school students also reported more frequent use of cigarette products and alcohol while

the Chinese 7th graders reported more substance use, aggressive behavior, and deviant behavior.

In addition to deficits in sleep quantity, sleep quality has also been found to be associated with problem behaviors. Sleep quality issues or problems, such as difficulty initiating sleep, suffering from excessive daytime sleepiness, and the perception of inadequate sleep at night have all been found to be associated with smoking cigarettes and drinking alcohol in Japanese adolescents (Ohida, et al., 2004) as well as U.S. youth based on a study which examined the U.S. National Household Survey on Drug Abuse (Johnson & Breslau, 2001). Specifically, those with sleep problems were over three times more likely to smoke. Similarly, sleep problems were associated with the number of days of substance use. These findings based on cross-sectional work have also been replicated in longitudinal studies; for instance, one study found that sleep problems were predictive of substance use nine years later (Wong et al., 2004). Interestingly, mother-rated sleep problems in their sons, between the ages of 3 and 5 years, was associated with early adolescent substance use such as cigarettes, alcohol, marijuana, and hard drugs.

To summarize, previous work suggests that sleep functioning influences likelihood of engaging in a variety of problem behaviors among adolescents. However, certain links between sleep functioning and problem behaviors, specifically cigarette use, alcohol use, and drug use, have more evidence than others, such as deviant behaviors. It is important to note that only a very small number of studies have been conducted on the relationship between sleep functioning and deviance. As mentioned, a few studies have found support for this link (e.g., Gau et al., 2007; Vignau et al., 1997). Previous work has

also found links between sleep functioning and aggression, impulsivity, and hostility, which are known correlates of deviant behaviors (e.g., Ireland & Culpin, 2006; Medeiros et al., 2005). Thus, it is expected that a positive association will be found between sleep functioning and deviant behaviors in the current study.

In conclusion, research on the links between sleep functioning (sleep quantity and quality) and problem behaviors exists; however, there are gaps in the literature regarding these links and these relationships are not entirely understood. Gaps include the lack of research conducted with a variety of problem behaviors in the same sample and inadequate knowledge on the specific association between sleep functioning and deviance. Of course additional third variables may be involved in the relationship between sleep functioning and problem behaviors. This could include personality traits, such as sensation-seeking, or specific aspects of the parent-adolescent relationship, such as parental warmth or parental control. Related to specific interest, but also availability of data, the current study focuses on the impact by the affective quality (warmth) of the parent-adolescent relationship on the sleep functioning-problem behavior link. In the following section, research on the association between the quality of the parent-adolescent relationship and sleep functioning will be examined, with specific focus on work that has tested potential effects by parental warmth. This will be followed by a brief discussion on the link between parental warmth and problem behaviors.

Sleep Functioning and the Parent-Adolescent Relationship

Family functioning plays an important role in both sleep quantity and quality. For example, one French study found that youth from divorced or separated parents were

twice as likely to be poor sleepers compared to adolescents from two biological parents (Vignau, et al., 1997). Such findings have led to further investigations on the relationships between family functioning and sleep. The current study examines the effects of the affective parent-adolescent relationship quality on sleep functioning, specifically parental warmth because of its developmental importance in attachment between parent and youth as well as in healthy psychosocial development (Gray & Steinberg, 1999). However, the associations between parental warmth and sleep functioning have not been thoroughly studied and the mechanisms remain unclear. Also, not much work has been conducted on adolescents; therefore, reviewing past work will include samples of children as well as adolescents.

One recent study by Adam and colleagues (2007) examined the link between the affective quality of the parent-adolescent relationship and sleep functioning, in a sample of 2,454 school-aged children (5-11-years-old) and adolescents (12-19-years-old) in the United States. The study utilized time diaries kept by the caregiver to measure sleep habits; caregivers completed a variety of questionnaires and interviews were also conducted to confirm answers from questionnaires and time diaries. Of importance for the current study, they measured parental warmth with the following items: “how many times in the last month have you: Told the child that you love him/her? Spent time with him/her doing favorite activities? Talked about things that interest him/her? Told him/her you appreciated something he/she did? Talked about other relationships, such as his/her friends? Talked about current events?” and “Talked with your child about his or his day?” The authors found that children who experienced higher parental warmth were more

likely to get higher quantity as well as quality of sleep during the week. They also found that parental rules related to sleep were associated with longer amounts of sleep.

In another study, children of lax and uninvolved parents were more likely to have sleep disturbances in a community sample of 52 four-year-olds (Owens-Stively, et al., 1997). Lastly, in a study which focused on substance-abusing adolescents, parental involvement was associated with early rise times; however, this study did not find the link between parental involvement and sleep quality (Cousins et al., 2007). Sleep functioning in this study was measured with an Actigraph (a watch-like device that measures movement during sleep) and a daily sleep diary; parental involvement, psychological distress and substance use were measured by questionnaires.

The study did find that psychological distress appeared to mediate the relationship; thus less involvement by parents was associated with poorer mental health which in turn was associated with poorer sleep quality. Together, these studies appear to suggest a link between an affectively positive parent-child or adolescent relationship and positive sleep functioning (both quantity and quality). Studies have shown that parental warmth, but also control, were related to sleep quantity (Adam et al., 2007); other work found being an involved parent was critical for sleep quality (Cousins et al., 2007; Owens-Stively et al., 1997). Again, however, research in this area is limited and a number of questions remain regarding this association, particularly given the inconsistent evidence found regarding parental warmth and control. The current study will contribute greatly to this area of research by focusing on parental warmth and its relationship with sleep functioning and problem behaviors in this group of adolescents. In the next section,

some relevant literature will be reviewed that examines the association between parental warmth and problem behaviors.

Parent-Adolescent Relationship and Problem Behaviors

O'Brien and Mindell (2005) theorized that the associations found between sleep functioning and problem behaviors might be due to a third variable, such as parenting. Links found in past research regarding sleep functioning and parent-adolescent relationship have been discussed. There was only a small amount of previous work conducted on that association. However, the relationship between problem behaviors and the parent-adolescent relationship have received much more attention. Therefore, the previous work most pertinent to the current study will be reviewed, which will include those that have focused on parental warmth within the parent-adolescent relationship in regards to the prevalence of problem behaviors.

The link between the parent-adolescent relationship and cigarette smoking has been well established in a plethora of studies (Adamczyk-Robinette et al., 2002; Fletcher et al., 2004; Melby et al., 1993; White et al., 2000). For example, a longitudinal study of more than 400 adolescents over four years reported that higher levels of parental warmth predicted less adolescent heavy smoking while higher levels of parental hostility predicted more adolescent heavy smoking (White et al., 2000). Meanwhile, nurturant/involved parenting, which consists of warmth and support, positive reinforcement, behavior tracking and setting standards, was related to less adolescent cigarette use; harsh/inconsistent parenting, which involves harsh discipline, hostility, and inconsistent discipline, was associated with more adolescent cigarette use (Melby et al.,

1993). This study took a social-developmental approach to investigate cigarette use among adolescents by surveying more than 200 adolescent boys, their parents and their siblings.

Mogro-Wilson (2008) reported on the results from a longitudinal study that supports the parental warmth and alcohol use link. This study was focused on familial characteristics among Latino families and their influence on adolescent alcohol consumption. It was found that increased parental warmth was associated with decreased alcohol use among these 1,887 adolescents over two years. Parental warmth was assessed by a single item, namely “most of the time, my mother/father is warm and loving toward me”, rated on a five-point scale. Other studies have also provided evidence supporting the link between the parent-adolescent relationship and alcohol use (e.g., Broman et al., 2006; Clark et al., 2005; Kosterman et al., 2000; Macaulay et al., 2005).

Parental warmth has also been found to be associated with illegal drug use. Broman and colleagues (2006) reported results from the Add Health project regarding parenting and drug use, including marijuana, inhalants and alcohol use. They focused on parental warmth and family acceptance and found higher levels of these parenting behaviors negatively affected drug use. This finding was consistent across African American, European American, and Hispanic adolescents. The strongest impact by parenting on drug use was found among Hispanic adolescents. Parental warmth was measured by adolescent reports, namely “most of the time...mother (father) is warm and loving toward you; you are satisfied with the way you and your mother (father) communicate; overall, you are satisfied with your relationship with your mother (father);

how close do you feel to your mother (father); and how much do you think (your mother or father) cares about you.” Furthermore, what another study considered to be a proactive parent with open communication was found to delay marijuana use as well as alcohol use, based upon results from an 8-year longitudinal study of more than 800 Seattle youth (Kosterman et al., 2000). Starting in 5th grade, youth were surveyed annually until age 18. Being a proactive parent included active monitoring of children with rules, discipline and rewards; open communication of beliefs against alcohol and marijuana use was also critical.

Evidence also exists supporting the impact of parental warmth on deviance (Claes et al., 2005; Simons & Conger, 2007; Wissink et al., 2006), but this relationship appears to be quite complex as parental supervision and discipline appear to be critical as well (e.g., Claes et al., 2005; Fletcher et al., 2004; Simons & Conger, 2007). For example, Simons and Conger (2007) reported results from the Iowa Youth and Families Project that parenting styles of both parents play a role in adolescent deviant behavior and substance use. Of 451 families, having two authoritative parents, who were high on warmth and discipline, was associated with more positive outcomes. When both parents were uninvolved, this predicted the “worst” developmental outcomes. This study focused on parenting styles rather than specific qualities or dimensions of the parent-adolescent relationship; thus, it is important to note that the parenting style high on parental warmth was associated with lower levels of deviance and substance use. In another study, the quality of the emotional bonds between adolescents and parents was found to have important effects on deviant behaviors based on a sample of 908 adolescents from

Canada, France, and Italy (Claes et al., 2005). However, mediators such as parental supervision, parental tolerance, and frequency of conflicts also played important roles in the relationship. Deviant behaviors in this study were similar to the ones in the current study - physically aggressive actions such as carrying weapons, as well as non-physically aggressive activities such as vandalism. The authors also took into consideration alcohol and drug use. The quality of the emotional bond between adolescent and parents was conceptualized by items regarding maternal and paternal bonding, namely “my mother understands my needs” or “I can count on my father if I need him.”

Fletcher and colleagues (2004) focused on problem behaviors similar to the ones in the current study - deviance, cigarette, alcohol and drug use – and examined how these were associated to parenting characteristics, including warmth, control, monitoring and knowledge in a sample of 2,568 high school students. Utilizing adolescent reports, parental warmth was measured by six items (e.g., “when you get a good grade, do your parents praise you”). Parental monitoring was considered to be the extent to which parents attempted to be informed about their adolescent’s activities and friendships, while parental knowledge was considered to be how accurate they were in their information. Parental control was the extent to which the parents, rather than the adolescents themselves, made decisions regarding key areas of the adolescent’s life. These items included curfew times, who their friends were, how they spent their money, whether or not they could drink alcohol and when they could start dating. They discovered complex relationships between parenting behaviors and problem behaviors. Parental warmth, control and monitoring predicted problem behaviors mediated through parental

knowledge. For example, those youth reporting higher levels of parental warmth were more likely to have more knowledgeable parents, which resulted in less problem behaviors. Parental control and monitoring were found to directly affect problem behaviors as well. Deviance in this study included behaviors such as using a phony ID, stealing, running away from home, getting into trouble with the police, bringing a weapon to school, fighting at school, and vandalizing school property. This study is a great example of the complexity of the relationship between qualities of the parent-adolescent relationship and problem behaviors.

In conclusion, these studies that examined the link between parent-adolescent relationship quality and problem behaviors found support for the link between parental warmth and problem behaviors. Previous work suggests that higher levels of parental warmth are associated with lower levels of problem behaviors, including cigarette use, alcohol use, illicit drug use, and other deviant behaviors. However, studies have also shown that other aspects of the parent-adolescent relationship, such as parental control and supervision, also play a strong role in influencing engagement in problem behaviors, especially deviance. Unfortunately, the current data set did not include these measures. Therefore, the quality of the parent-adolescent relationship will be operationalized and measured by parental warmth in the current investigation.

In addition to the links among sleep functioning, parental warmth, and problem behaviors, background variables that have been found to affect sleep functioning will also be included and examined in model tests. These include family structure, sex, socioeconomic status (SES), and ethnicity. Briefly, evidence supporting links between

these variables and sleep functioning will be discussed. For example, sex differences in sleep functioning have been reported (e.g., Gau, 2006; Oginska & Pokorski, 2006; Ohida et al., 2004; Patten et al., 2000; Russo, Bruni, Lucidi, Ferri, & Violani, 2007). However, the results of these studies are contradictory; one study found female youth to go to bed later on school nights and weekends, and to get less sleep time during the week (Gau, 2006), while another study found bedtime for males to be later (Russo et al., 2007). Evidence also exists that supports a link between family structure and sleep functioning; for instance, those with divorced or separated parents were found to be more likely to be poor sleepers (Vignau, et al., 1997; see also Kahn et al., 1989).

Previous work has also found links between ethnicity or SES and sleep functioning. Adam and colleagues (2007) found both ethnicity and SES to affect the sleep functioning of their sample of children and adolescents. Unfortunately, more work has been conducted on children than on adolescents regarding sleep functioning, SES and ethnicity (e.g., Crabtree et al., 2005; Rona, Li, Gulliford, & Chinn, 1998; Stein, Mendelsohn, Obermeyer, Amromin, & Benca, 2001). However, these studies suggest that it is important to consider SES and ethnicity in the current study which is focused on adolescents.

Examples of previous work conducted on the links between sleep functioning and problem behaviors, sleep functioning and parental warmth, and parental warmth and problem behaviors have been reviewed. The review has highlighted that although relationships exist among these constructs, no previous work has examined all three together. Thus, the current investigation will examine sleep quantity and quality in a

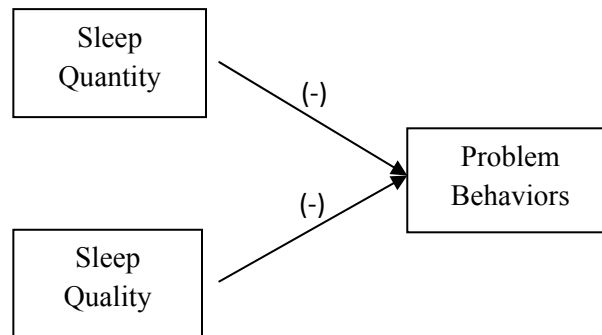
nationally representative sample of Swiss adolescents. Initial analyses will investigate the relationships between background variables (sex, developmental age group, family structure, educational track, socioeconomic status, language region, and by immigrant status) and sleep functioning. Next, direct effects between sleep quantity and quality, parental warmth, and problem behaviors will be computed. Lastly, the mechanisms underlying the relationships between sleep functioning, problem behaviors, and the quality of the parent-adolescent relationship are investigated through tests of competing mediation and moderation models. In the mediation model, sleep functioning is expected to be the mediator of the relationship between parental warmth and problem behaviors. This is expected largely based on findings that link pairs of the constructs (parental warmth and sleep functioning; between sleep functioning and problem behaviors; and between parental warmth and problem behaviors), but not all three. In addition, the moderation model focuses on parental warmth as the moderator between the relationship between sleep functioning and problem behaviors due to previous empirical work which has provided some evidence that low versus high levels of parental warmth will condition the relationship between sleep functioning and problem behaviors, where a positive relationship will buffer the effects by poor sleep functioning, while a negative one would exacerbate them. These models are discussed further subsequently.

RESEARCH QUESTIONS AND HYPOTHESES

Hypothesis 1

The current study will explore to what extent adolescent sleep functioning (considered by sleep quantity and sleep quality) is associated with problem behaviors (deviance, alcohol use, illicit drug use, and cigarette use).

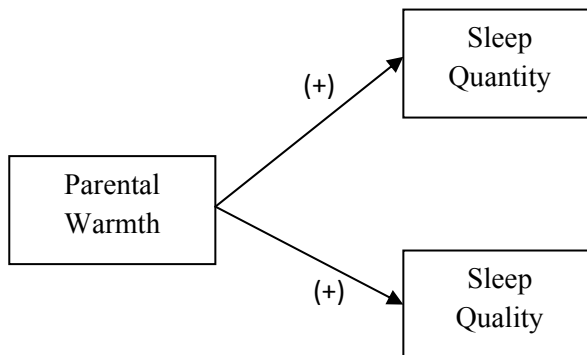
- a) It is expected that larger quantity of sleep will be negatively associated with problem behaviors.
- b) It is expected that higher quality sleep will be negatively associated with problem behaviors.



Hypothesis 2

To what extent is the quality of the parent-adolescent relationship (conceptualized as parental warmth) associated with adolescent sleep functioning (sleep quantity and sleep quality)?

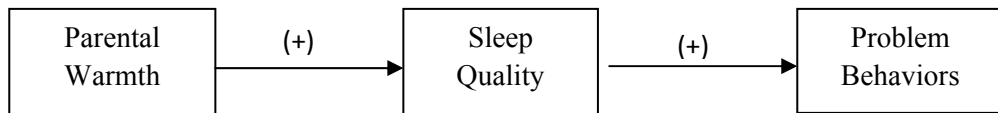
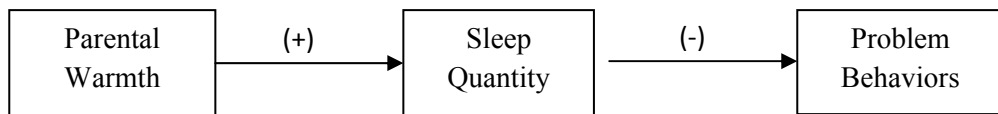
- a) It is expected that higher levels of parental warmth in the parent-adolescent relationship will be positively associated with sleep quantity in the adolescent.
- b) It is expected that higher levels of parental warmth will be positively associated with sleep quality in the adolescent.



Hypothesis 3

To what extent does sleep functioning (sleep quantity and sleep quality) affect the relationship between parental warmth and problem behaviors? In other words, are the effects of parental warmth mediated through sleep quantity or sleep quality on indicators of problem behaviors?

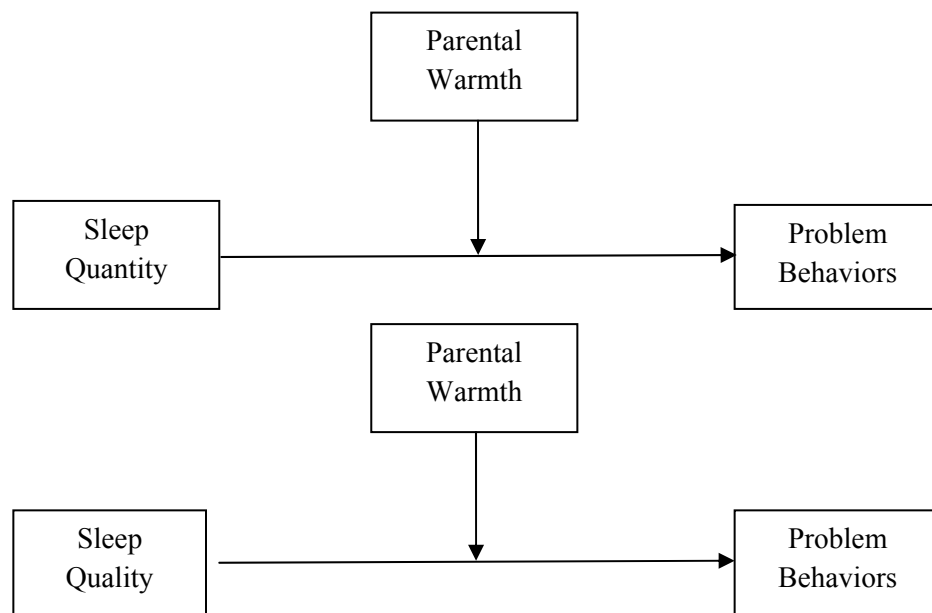
- a) It is expected that higher levels of parental warmth will be associated with larger sleep quantity, which will in turn be associated with less engagement in problem behaviors.
- b) It is expected that higher levels of parental warmth will be associated with higher sleep quality, which will in turn be associated with less engagement in problem behaviors.



Hypothesis 4

Lastly, to what extent is the relationship between sleep functioning and problem behaviors dependent upon the level of parental warmth? In other words, does the level of parental warmth moderate the association between sleep functioning and problem behaviors?

- a) It is expected that parental warmth will moderate the association between sleep quantity and problem behaviors; specifically, youth who report closer relations with parents will be less likely to engage in problem behaviors at all amounts of sleep than youth who report more distant relations with parents.
- b) It is expected that parental warmth will moderate the association between sleep quality and problem behaviors, in that youth who report high levels of parental warmth will be less likely to engage in problem behaviors at all levels of sleep quality compared to those with average or low levels of parental warmth.



METHODS

Sample and Procedures

In 1992-93, the Swiss Multicenter Adolescent Survey on Health (SMASH) survey was first conducted. It was conducted again in 2002 (SMASH02), and the current study is based on the data collected as part of this effort. SMASH02 is a nationally representative sample of Swiss students and apprentices. Apprentices are adolescents who pursue classroom education while also working on the job for 3 or 4 days a week in their respective “trade.” The three language areas in Switzerland (French, German, and Italian) were included. The original sample consisted of 8,740 students, but the current study was interested only in students between the ages of 16–20. In examining the sample, 245 did not reply regarding their age and were not used; 156 participants were under 16 and not used; 534 were over the age of 20 and not used; therefore, the final study sample included $N = 7,805$ students.

Nineteen out of the twenty-six cantons, or regions, of Switzerland agreed to participate in the study, which represents 80% of the population; 97.7% of all the invited classes participated, while 99.8% of the students and apprentices within these classes completed the survey. The sample of classes consisted of public vocational training schools and colleges; private schools were excluded. Other criteria included the need for

six or more students to be registered for the class, and the class needed to be recognized as a known course.

The questionnaire that was used for SMASH02 was an updated version of the original. Research from the decade between versions was taken into consideration, as well as results from pre-tests. The pre-tests consisted of groups of adolescents who filled out the questionnaire and then talked it over. Based on the discussion that included topics such as item wording, survey length, and any other problems encountered, appropriate changes were made to arrive at the final survey.

The surveys consisted of 565 items and were self-administered to gauge the health needs and use of health care services among these youths. Sections of the questionnaire included demographics, such as socioeconomic background and family structure, relationships with family members and peers, as well as information about physical activity and risk-taking. Risk-taking behaviors included sexual life activities, substance use, eating disorders, violent or law-breaking behavior, and suicidal events.

Measures

Complete versions of the following measures are included in Appendix A - D.

Demographics. Basic demographic variables examined included the sex and age of the adolescent participant. Socioeconomic status (SES) was assessed by one item regarding the adolescent's caregiver's highest educational level; answer choices included never went to school, in Switzerland or abroad; mandatory education (e.g., 9 years) or a few years of education; apprenticeship (9 years, plus 3 or 4 years apprenticeship training); business school or technical school; university or college; or I don't know. If

information for both parents was given, an average score was computed. Language region was determined by the canton in which the adolescent lived and included three choices – German, French and Italian. Two dummy coded variables were developed for this purpose – Language Region 1 was coded for the Italian speaking region, while Language Region 2 was coded for the French speaking region, and the German-speaking region was used as a reference group in each case. Immigrant status was ascertained by the origin of the adolescent’s parents as well as the place of birth of the adolescent. Eighteen options were available for the parents (Switzerland, Italy, Germany, France, Austria, Portugal, Spain, Turkey, Yugoslavia, Croatia, Macedonia, Other Western European Country, Other Eastern European Country, Near East Middle East, Africa, Asia, South/Central America, or North America/Australia), while a yes/no question was used to determine whether the adolescent was born in Switzerland. Again, two dummy variables were constructed – Immigration 1 represented first generation immigrants (neither parents nor youth were born in Switzerland), while Immigration 2 represented second generation immigrants. Native Swiss youth served as the reference group. Lastly, a question on family structure determined whether the adolescent resided in a two parent home or not. The answer options to the question “what is your parent’s present situation” included they are still together; they are divorced; father is dead; mother is dead; both are dead, or other situation. A dummy variable was developed where 1 was a two-parent family and 0 all other response options (details on all of these measures can be found in Appendix A).

Sleep Quantity. Sleep amount was measured by two open-ended questions for bedtime and wake time: “At what exact time (hour/minute) do you go to bed Monday-

Friday? At what exact time (hour/minute) do you get up Monday-Friday?” Participants provided the exact time for each of these questions. Based on this information, an exact amount of sleep was computed in hours (see Appendix B).

Sleep Quality. Sleep quality was measured by five items. One of the items asked “In the past 12 months, have you had trouble sleeping?” and was rated on a four-point Likert-type scale: 1 = never, 2 = sometimes, 3 = often, and 4 = always. The next four questions, rated on a similar four-point Likert-type scale, asked about sleep problems; for example, “how often do you feel tired, or feel the desire to fall asleep during the day?” (details on these scales can be found in Appendix B) A mean scale score was computed by averaging the answers to these questions.

Parental Warmth. Parent-adolescent relationship quality was measured with six questions rated on a four-point Likert-type scale, namely 1 = applies, 2 = somewhat applies 3 = somewhat does not apply, and 4 = does not apply. Youth were asked: “Here are the opinions of you about your parents. How are these applicable to you?” For example, they were asked to rate “My parents accept me the way I am” (see Appendix C for the complete scale). The items were reversed coded so that higher numbers represented higher parental warmth; they were averaged to compute a measure of parental warmth.

Cigarette Use. Youth were asked “do you smoke now?” with four answer choices: 1 = never, 2 = I quit smoking “X” months ago, 3 = once in a while and 4 = regularly. Higher scores indicate more cigarette use.

Alcohol Use. Alcohol use was measured by 1 item that was rated in a 5-point frequency scale, namely 1 = never, 2 = once in a while, 3 = once a week, 4 = multiple times each week, 5 = everyday, and 6 = multiple times each day. Adolescents were asked if they consumed alcoholic beverages, including wine, beer, strong alcoholic beverages such as Schnapps and Liquor, cocktails, and alcopops (lemonade or soda mixed with alcohol). Responses to these items were averaged to obtain a mean alcohol use score.

Illegal Drug Use. Adolescents were asked if in their lifetime they used any of the following drugs, with a yes (1) or no (0) answer format: Cannabis (marijuana, hash, weed); inhalants (glue, sniff); medications that made them feel high; ecstasy, speed, designer drugs, or other stimulants; LSD or hallucinogenic mushrooms; GHB (salty water, liquid ecstasy); cocaine or crack; heroin; a sedative without doctor's orders or methadone. Responses to these items were summed to obtain an illicit drug use score.

Deviant Behaviors. Six items were used to measure deviance. Individual questions focused on theft, vandalism, and assault (the complete scale can be found in the Appendix D). Youth rated a items on a three-point Likert-type scale, namely 1=never, 2=1-2 times, and 3=3 times or more. A mean deviance score was computed by averaging all the items. A higher score indicated higher levels of deviant behaviors.

PLAN OF ANALYSIS

The current study investigated the relationships between sleep functioning (quantity and quality), parental warmth and four different measures of problem behaviors through a series of hierarchical regression analyses. Initially however, descriptive statistics were computed for all main study constructs, including the Cronbach's alphas for scales as well as measures of skew for problem behaviors to ascertain whether any transformations were needed. Next, correlations were computed among the main study constructs, including key demographic variables to examine bivariate associations between constructs; this also included a determination whether any of the background variables needed to be used as statistical controls in subsequent analyses. Then, direct effects were tested. For these analyses, background variables (sex, SES, age, immigrant status, language region, and family structure) were entered in an initial step as statistical controls. Subsequent steps tested the hypothesized relationships. Indirect effects were tested following the method proposed by Baron and Kenny (1986). In these mediation models, background variables were again entered in an initial step. Finally, moderation effects were also tested in the regression framework, considering the effects by background variables, by computing product terms between standardized scores of the independent variable and the moderator variable (Baron & Kenny, 1986).

RESULTS

Preliminary Analyses

Due to missing data or extreme outliers (less than three hours of sleep per night) on sleep measures, an additional $n=141$ participants were removed from the study sample (120 due to missing the sleep quantity item; 13 reported less than three hours of sleep; 8 due to not replying to the sleep quality questions); therefore, the final study sample included $N = 7,664$ youth. The sample size varied in subsequent regression analyses due to additional missing data on study constructs (sample size range: 6,709-6,808).

Descriptive Statistics. Background information for the sample can be found in Tables 1 and 2. The average age of the sample was 17.88 years ($SD = 1.18$), consisted of 46.1% females (53.9% males) and were from a range of socioeconomic backgrounds ($M = 3.25$; $SD = 0.85$). Most of the sample (66.5%) was from the German-speaking region of Switzerland, with 26.0% from the French-speaking region, and 7.5% from the Italian-speaking region. More than half of the participants (59.5%) were native Swiss (both the adolescent and the parents were born in Switzerland); 25.1% were second-generation Swiss (adolescents born in Switzerland, but parents were born elsewhere), and 12.0% were first-generation Swiss (neither the adolescent nor the parents were born in Switzerland). Lastly, the majority of the sample reported living in a two-parent family (76.6%).

Table 1. Frequencies of Background Variables: Sex, Family Structure, Immigrant Status, and Language Region.

Variable	Frequency	Percent
Sex		
Male	4081	53.9
Female	3487	46.1
Total	7568	
Family Structure		
Parents together	5775	76.6
Parents separated or divorced	1424	18.9
Father deceased	201	2.7
Mother deceased	87	1.2
Both deceased	5	.1
Other	45	.6
Total	7568	
Immigrant Status		
Native Swiss	4504	61.6
2 nd Generation	1896	25.9
1 st Generation	911	12.5
Total	7311	
Language Region		
German	5032	66.5
French	1965	26.0
Italian	571	7.5
Total	7568	

Table 2. Means, Standard Deviations, Sample Sizes and Cronbach's α of Main Study Constructs.

	<i>M</i>	<i>SD</i>	Range	<i>N</i>	α
Background Variables					
Age	17.88	1.18	16-20	7568	
SES	3.25	.85	1-5	7162	
Sleep Functioning					
Sleep Quantity	7.65	1.01	3-14	7568	
Sleep Quality	3.04	.63	1-4	7568	.78
Problem Behaviors					
Cigarette Use	2.31	1.35	1-4	7482	
Alcohol Use	2.13	.74	1-6	7548	.81
Illegal Drug Use	1.03	1.39	0-12	7519	.68
Deviant Behaviors	1.14	.27	1-3	7549	.67
Parental Warmth	3.29	.62	1-4	7470	.87

Note: Sex, Immigrant Status, Language Region, and Family Structure are shown in Table 1. Cronbach's α is shown for the scales only

Sample participants reported an average of 7.65 hours ($SD = 1.01$) of sleep per night during the weekday (range: 3–14 hours); they also reported an average sleep quality score of 3.04 ($SD = .63$). Most youth reported a positive parent-adolescent relationship ($M = 3.29$; $SD = 0.62$). Almost half of the sample had never smoked cigarettes (47.9%), while 31.9% reported smoking regularly ($M = 2.31$; $SD = 1.35$). The average for alcohol use was 2.13 ($SD = 0.74$) with a range from 1-6. More than one-third of the sample reported never using illegal drugs (39.2%), while 41.4% reported using one kind of

Table 3. Correlations Among Demographic and Main Study Constructs.

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Sex	—													
2. Age	.06***	—												
3. Intact	.03*	-.04**	—											
4. 1 st Gen	.03**	.05***	.04***	—										
5. 2 nd Gen	.02	-.02	-.07***	-.22***	—									
6. SES	-.00	-.03*	-.03*	-.14***	-.01	—								
7. French	.02*	-.04***	-.02	.06***	.10***	-.01	—							
8. Italian	.03**	-.06***	-.01	.08***	.07***	-.06***	-.17***	—						
9. Slp Qual	.22***	-.02	.07***	-.06***	-.11***	-.01	.11***	-.01	—					
10. Slp Quan	-.23***	-.13***	.06***	-.03**	-.05***	-.05***	.07***	.04**	.04***	—				
11. P Warm	-.01	.01	.08***	-.09***	-.07***	.04***	-.06***	-.05***	.22***	.14***	—			
12. Cig Use	.04	.12***	-.13***	.01	.05***	-.02	.03*	-.03**	-.14***	-.19***	-.15***	—		
13. Alc Use	.28***	.02	-.03*	-.08***	.01	.06***	.08***	.06***	-.04***	-.22***	-.14***	.30***	—	
14. Drg Use	.15***	.15***	-.13***	-.03*	.11***	.08***	-.01	-.02	-.15***	-.26***	-.21***	.43***	.29***	—
15. Deviance	.26	-.02	-.06***	.03*	.07***	.04***	.00	-.01	-.09***	-.21***	-.21***	.21***	.37***	.37***

Notes: Intact = Two-parent family; 1st Gen = First Generation Immigrant; 2nd Gen = Second Generation Immigrant; French = French-speaking region; Italian = Italian-speaking region; Slp Qual = Sleep Quality; Slp Quan = Sleep Quantity; P Warm = Parental Warmth; Cig Use = Cigarette Use; Alc Use = Alcohol Use; Drg Use = Drug Use. *p ≤ .05; **p < .01; ***p < .001

illegal drug ($M = 1.03$, $SD = 1.39$). Lastly, more than half of the sample (64.0%) reported never engaging in deviant behaviors ($M = 1.14$; $SD = 0.27$).

Correlations among variables. Correlation analyses (see Table 3) show the relationships among all the variables, but of specific interest are the relationships between the background variables and the outcome variables of problem behaviors. Males were more likely to use alcohol and drugs, and to engage in deviance than were females, but sex was not significantly associated with cigarette use. Meanwhile, older participants were more likely to use cigarettes and illegal drugs, but age was not significant with alcohol use or deviance. Higher SES level was associated with more alcohol and drug use, and more deviance; however there was not a significant relationship with cigarette use. Participants from two-parent families were less likely to use cigarettes, drink alcohol, use illegal drugs, or engage in deviant behaviors. First-generation immigrants were less likely to drink alcohol, do drugs, or engage in deviance. However, there was not a significant association with cigarette use. Second-generation immigrants were more likely to smoke cigarettes, use illegal drugs, and engage in deviance, but there was not a significant association with alcohol use. Those participants from the French-speaking region were more likely to use cigarettes and alcohol; however, there were no significant associations with drug use or deviance. Those from the Italian-speaking region were less likely to use cigarette and drink alcohol but there was not a significant association with drug use or deviance. German-speakers were less likely to drink alcohol.

In addition to background variables and problem behaviors, correlations with sleep functioning and parental warmth were also of interest. More sleep was associated

with higher parental warmth, less cigarette, alcohol and drug use, and less engagement in deviant behaviors. Higher sleep quality was associated with more sleep, higher parental warmth, and fewer problem behaviors – less cigarette, alcohol, and drug use, and less deviance. Higher levels of parental warmth were also associated with fewer problem behaviors. Lastly, problem behaviors were all positively associated with each other – for

Table 4. Effects of Background Variables, Sleep Quantity, and Sleep Quality on Cigarette Use.

Step and Variables	b	SE	β	ΔR^2
Step 1				.038
Sex	.09	.03	.03***	
SES	-.05	.02	-.03**	
Age	.12	.01	.10***	
1 st Generation Immigrant	.01	.05	.00	
2 nd Generation Immigrant	.09	.04	.03*	
Two-parent family	-.32	.04	-.10***	
French-Speaking Region	.05	.04	.02	
Italian-Speaking Region	-.12	.06	-.02	
Step 2				
Sleep Quantity	-.21	.02	-.16***	.027
Step 3				
Sleep Quality	-.29	.03	-.14***	.017

Note. Regression coefficients in the table are from the final model step; only the added variables are shown at each model step.

example, those who smoke were more likely to drink, use drugs, and engage in deviant behaviors.

Hypothesis 1

Hypothesis 1 predicted that more nighttime sleep and fewer sleep problems would be negatively associated with problem behaviors (smoking cigarettes, drinking alcohol, using illegal drugs, and engaging in deviant behaviors). Hierarchical regressions were

Table 5. Effects of Background Variables, Sleep Quantity, and Sleep Quality on Alcohol Use.

Step and Variables	b	SE	β	ΔR^2
Step 1				.103
Sex	.38	.02	.26***	
SES	.03	.01	.03**	
Age	-.01	.01	-.01	
1 st Generation Immigrant	-.28	.03	-.13***	
2 nd Generation Immigrant	-.10	.02	-.06***	
Two-parent family	-.03	.02	-.02	
French-Speaking Region	.18	.02	.11***	
Italian-Speaking Region	.22	.03	.08***	
Step 2				
Sleep Quantity	-.12	.01	-.17***	.028
Step 3				
Sleep Quality	-.10	.01	-.09***	.007

Note. Regression coefficients in the table are from the final model step; only the added variables are shown at each model step.

used to test this for each of the four dependent variables (findings from these analyses can be found in Tables 4–7). In step 1, background variables were entered into the model, namely sex, SES, age, immigrant status, language region, and family structure. In step 2, sleep quantity was entered; results provided evidence that it was significantly associated with smoking cigarettes, drinking alcohol, using illegal drugs, and engaging in deviant

Table 6. Effects of Background Variables, Sleep Quantity, and Sleep Quality on Illegal Drug Use.

Step and Variables	b	SE	β	ΔR^2
Step 1				.076
Sex	.36	.03	.13***	
SES	.10	.02	.07***	
Age	.14	.01	.12***	
1 st Generation Immigrant	-.08	.05	-.02	
2 nd Generation Immigrant	.23	.04	.07***	
Two-parent family	-.29	.04	-.09***	
French-Speaking Region	-.07	.04	-.02	
Italian-Speaking Region	-.13	.06	-.03*	
Step 2				
Sleep Quantity	-.27	.02	-.20***	.042
Step 3				
Sleep Quality	-.33	.03	-.15***	.021

Note. Regression coefficients in the table are from the final model step; only the added variables are shown at each model step.

behaviors ($\beta = -.17$; $\beta = -.18$; $\beta = -.21$; $\beta = -.15$, respectively) and explained an additional 2.7%, 2.8%, 4.2%, and 1.9% of the variance, respectively.

In step 3, sleep quality was added to the model. Findings again provided evidence that it was significantly associated with problem behavior measures, net the effects by background variables and sleep quantity ($\beta = -.14$; $\beta = -.09$; $\beta = -.15$; $\beta = -.16$ for cigarette use, alcohol use, drug use and deviance, respectively). The construct accounted

Table 7. Effects of Background Variables, Sleep Quantity, and Sleep Quality on Deviance.

Step and Variables	b	SE	β	ΔR^2
Step 1				.081
Sex	.14	.01	.23***	
SES	.01	.00	.04***	
Age	-.01	.00	-.06***	
1 st Generation Immigrant	.02	.01	.03*	
2 nd Generation Immigrant	.02	.01	.04***	
Two-parent family	-.03	.01	-.05***	
French-Speaking Region	-.02	.01	-.04***	
Italian-Speaking Region	-.03	.01	-.03*	
Step 2				
Sleep Quantity	-.03	.00	-.13***	.019
Step 3				
Sleep Quality	-.06	.01	-.16***	.022

Note. Regression coefficients in the table are from the final model step; only the added variables are shown at each model step.

for an additional 1.7%, 0.7%, 2.1%, and 2.2% of unique variance, respectively. Therefore, findings provided support for Hypothesis 1. Additionally, some interesting findings were made related to the effects by background variables that are important to note. Males were more likely to engage in all four problem behaviors. Lower SES youth were more likely to use cigarettes, while higher SES youth were more likely to use alcohol, illegal drugs, and engage in deviant behaviors. As would be expected, older participants were more likely to use cigarettes and illegal drugs; however, younger participants in the current sample were more likely to engage in deviant behaviors. First- and second-generation immigrant youth were less likely to use alcohol than native Swiss adolescents, but more likely to engage in deviant behaviors. Adolescents from two-parent homes were less likely to smoke cigarettes, to report using illegal drugs, or to engage in deviant behaviors. Lastly, youth from French and Italian-speaking regions were more likely to drink alcohol as compared to adolescents from the German-speaking region; however, they were less likely to engage in deviant behaviors than those from the German-speaking region. Youth from the Italian-speaking region were also less likely to engage in illegal drug use than the other regions.

Hypothesis 2

Hypothesis 2 predicted that higher levels of parental warmth in the parent-adolescent relationship would be positively associated with sleep quantity and sleep quality. Step 1 in hierarchical regressions entered background variables into the model, while step 2 added parental warmth. Findings indicated that parental warmth was significantly related to both sleep quantity and sleep quality ($\beta = .13$; $\beta = .21$,

respectively) and explained an additional 1.6% and 4.3% of the variance, respectively (see Tables 8 and 9).

Table 8. Effects of Background Variables and Parental Warmth on Sleep Quantity.

Step and Variables	b	SE	β	ΔR^2
Step 1				.087
Sex	-.45	.02	-.23***	
SES	-.07	.01	-.06***	
Age	-.10	.01	-.11***	
1 st Generation Immigrant	-.14	.04	-.05***	
2 nd Generation Immigrant	-.11	.03	-.05***	
Two-parent family	.13	.03	.06***	
French-Speaking Region	.23	.03	.10***	
Italian-Speaking Region	.22	.05	.06***	
Step 2				
Parental Warmth	.21	.02	.13***	.016

Note. Regression coefficients in the table are from the final model step; only the added variables are shown at each model step.

Again, some findings related to background variables require some discussion. Adolescent females were more likely to report sleeping longer, while male youth were more likely to report fewer sleep problems. Younger participants, youth from lower SES, from two-parent families, and native Swiss were more likely to sleep longer and better. In addition, youth from French- and Italian-speaking regions were apparently more likely to sleep longer as compared to German-speaking youth.

Table 9. Effects of Background Variables and Parental Warmth on Sleep Quality.

Step and Variables	b	SE	β	ΔR^2
Step 1				.088
Sex	.29	.01	.23***	
SES	-.02	.01	-.03**	
Age	-.02	.01	-.04***	
1 st Generation Immigrant	-.15	.02	-.08***	
2 nd Generation Immigrant	-.14	.02	-.10***	
Two-parent family	.06	.02	.04***	
French-Speaking Region	-.14	.02	-.10***	
Italian-Speaking Region	.00	.03	.00	
Step 2				
Parental Warmth	.21	.01	.21***	.043

Note. Regression coefficients in the table are from the final model step; only the added variables are shown at each model step.

Hypothesis 3

The third hypothesis predicted that the effects of parental warmth on problem behaviors would be mediated through sleep functioning. Based on Baron and Kenny (1986), four steps in the regression analyses were followed to test for mediation: In the first step, a significant relationship between the independent and dependent variables needed to be established. In the second step, a significant relationship between the independent and mediating variables needed to be established. In the third step, a hierarchical regression analysis was used where the independent and mediating variables predicted the dependent variables. Lastly, the strength of this relationship was compared

between the independent variable and the dependent variable, with and without the mediator as part of the model. If the relationship between the independent variable and the dependent variable was no longer significant once the mediator is entered, then this provided evidence of full mediation. It was also possible to find evidence of partial mediation where the relationship of interest did not disappear, but rather simply diminished in magnitude.

Table 10. Direct and Indirect Effects of Background Variables, Parental Warmth and Sleep Quantity on Cigarette Use.

Step and Variables	b	SE	β	ΔR^2
Step 1				.037
Sex	.00	.03	.00	
SES	-.04	.02	-.02	
Age	.12	.01	.10***	
1 st Generation Immigrant	.00	.05	.00	
2 nd Generation Immigrant	.12	.04	.04***	
Two-parent family	-.32	.04	-.10***	
French-Speaking Region	.07	.04	.02	
Italian-Speaking Region	-.14	.06	-.03*	
Step 2				
Parental Warmth	-.32	.03	-.14***	.020
Step 3				
Parental Warmth	-.28	.03	-.12***	.020
Sleep Quantity	-.21	.02	-.16***	.022

Note: Sobel statistic = -7.42, $p < .001$.

In the initial step, evidence was found that parental warmth was significantly associated with cigarette use, alcohol use, illegal drug use, and deviance ($\beta = -.14$; $\beta = -.15$; $\beta = -.20$; $\beta = -.20$, respectively); it explained 2.0%, 2.1%, 3.9%, and 4.0% of the variance, respectively (see Tables 10–13). In step 2, the relationship between parental warmth and sleep quantity was statistically significant ($\beta = .13$). In step three, parental

Table 11. Direct and Indirect Effects of Background Variables, Parental Warmth and Sleep Quantity on Alcohol Use.

Step and Variables	b	SE	B	ΔR^2
Model 1				.104
Sex	.36	.02	.24***	
SES	.03	.01	.03**	
Age	.00	.01	.00	
1 st Generation Immigrant	-.28	.03	-.12***	
2 nd Generation Immigrant	-.09	.02	-.06***	
Two-parent family	-.02	.02	-.01	
French-Speaking Region	.19	.02	.11***	
Italian-Speaking Region	.21	.03	.08***	
Model 2				
Parental Warmth	-.18	.01	-.15***	.021
Model 3				
Parental Warmth	-.15	.01	-.13***	.021
Sleep Quantity	-.11	.01	-.16***	.022

Note: Sobel statistic = -8.17, $p < .001$.

warmth and sleep quantity were both entered; once the effects by sleep quantity were controlled, the effects by parental warmth on problem behaviors decreased, but remained statistical significant for each of the four problem behavior measures, namely cigarette use, alcohol use, illegal drug use, and deviance ($\beta = -.12$; $\beta = -.13$; $\beta = -.18$; $\beta = -.19$,

Table 12. Direct and Indirect Effects of Background Variables, Parental Warmth and Sleep Quantity on Illegal Drug Use.

Step and Variables	b	SE	β	ΔR^2
Model 1				.077
Sex	.27	.03	.10***	
SES	.12	.02	.07***	
Age	.15	.01	.13***	
1 st Generation Immigrant	-.09	.05	-.02	
2 nd Generation Immigrant	.26	.04	.08***	
Two-parent family	-.29	.04	-.09***	
French-Speaking Region	-.05	.04	-.01	
Italian-Speaking Region	-.17	.06	-.03**	
Model 2				
Parental Warmth	-.45	.03	-.20***	.039
Model 3				
Parental Warmth	-.40	.03	-.18***	.039
Sleep Quantity	-.26	.02	-.19***	.033

Note: Sobel statistic = -8.17, $p < .001$.

respectively). Baron and Kenny (1986) recommended the Sobel test as a follow-up test, to determine whether the observed changes were statistically significant or significantly different from zero; a significant Sobel test provided evidence of partial mediation. Based on the findings of these tests, sleep quantity was a significant mediator in the relationship between parental warmth and cigarette use (Sobel statistic = -7.42, $p < .001$), in the relationship between parental warmth and alcohol use (Sobel statistic = -7.60, $p < .001$),

Table 13. Direct and Indirect Effects of Background Variables, Parental Warmth and Sleep Quantity on Deviance.

Step and Variables	b	SE	β	ΔR^2
Model 1				.082
Sex	.19	.01	.23***	
SES	.01	.00	.05***	
Age	-.01	.00	-.05***	
1 st Generation Immigrant	.02	.01	.03*	
2 nd Generation Immigrant	.03	.01	.05***	
Two-parent family	-.03	.01	-.05***	
French-Speaking Region	-.02	.01	-.03*	
Italian-Speaking Region	-.03	.01	-.03**	
Model 2				
Parental Warmth	-.08	.01	-.20***	.040
Model 3				
Parental Warmth	-.08	.01	-.19***	.040
Sleep Quantity	-.03	.00	-.12***	.014

Note: Sobel statistic = -10.5, $p < .001$.

in the relationship between parental warmth and illegal drug use (Sobel statistic = -8.17, $p < .001$), and in the relationship between parental warmth and deviance (Sobel statistic = -10.5, $p < .001$). Similar findings were made in initial model steps for the mediation analyses that included sleep quality instead of quantity; parental warmth was

Table 14. Direct and Indirect Effects of Background Variables, Parental Warmth and Sleep Quality on Cigarette Use.

Step and Variables	b	SE	β	ΔR^2
Step 1				.037
Sex	.18	.03	.07***	
SES	-.03	.02	-.02	
Age	.14	.01	.12***	
1 st Generation Immigrant	-.01	.05	-.00	
2 nd Generation Immigrant	.11	.04	.03**	
Two-parent family	-.33	.04	-.10***	
French-Speaking Region	-.01	.04	-.00	
Italian-Speaking Region	-.18	.06	-.04**	
Step 2				
Parental Warmth	-.32	.03	-.14***	.020
Step 3				
Parental Warmth	-.26	.03	-.12***	.020
Sleep Quality	-.27	.03	-.13***	.014

Note: Sobel statistic = -8.27, $p < .001$.

significantly associated with all four problem behavior measures (see Tables 14–17). In step 2, the relationship between parental warmth and sleep quality was statistically significant ($\beta = .21, p < .001$). In step 3, parental warmth and sleep quality were both entered; once the model controlled for sleep quality, parental warmth effects decreased, but maintained significant associations with cigarette use, alcohol use, illegal drug use

Table 15. Direct and Indirect Effects of Background Variables, Parental Warmth and Sleep Quality on Alcohol Use.

Step and Variables	b	SE	β	ΔR^2
Step 1				.104
Sex	.43	.02	.30***	
SES	.04	.01	.04***	
Age	.01	.01	.02	
1 st Generation Immigrant	-.27	.03	-.12***	
2 nd Generation Immigrant	-.09	.02	-.06***	
Two-parent family	-.03	.02	-.02	
French-Speaking Region	.15	.02	.09***	
Italian-Speaking Region	.18	.03	.07***	
Step 2				
Parental Warmth	-.18	.01	-.15***	.021
Step 3				
Parental Warmth	-.16	.01	-.13***	.021
Sleep Quality	-.08	.01	-.07***	.004

Note: Sobel statistic = -7.48, $p < .001$.

and deviance ($\beta = -.12$; $\beta = -.13$; $\beta = -.17$; $\beta = -.18$, respectively). Based on Sobel tests, sleep quality was a partial mediator in the relationship between parental warmth and cigarette use (Sobel statistic = -8.27, $p < .001$); alcohol use (Sobel statistic = -7.48, $p < .001$), illegal drug use (Sobel statistic = -8.78, $p < .001$), and deviance (Sobel statistic = -4.86, $p < .001$).

Table 16. Direct and Indirect Effects of Background Variables, Parental Warmth and Sleep Quality on Illegal Drug Use.

Step and Variables	b	SE	β	ΔR^2
Step 1				.077
Sex	.47	.03	.17***	
SES	.13	.02	.08***	
Age	.17	.01	.14***	
1 st Generation Immigrant	-.10	.05	-.02	
2 nd Generation Immigrant	.24	.04	.08***	
Two-parent family	-.30	.04	-.09***	
French-Speaking Region	-.14	.04	-.05***	
Italian-Speaking Region	-.22	.06	-.04***	
Step 2				
Parental Warmth	-.45	.03	-.20***	.039
Step 3				
Parental Warmth	-.39	.03	-.17***	.039
Sleep Quality	-.29	.03	-.13***	.016

Note: Sobel statistic = -8.78, $p < .001$.

Table 17. Direct and Indirect Effects of Background Variables, Parental Warmth and Sleep Quality on Deviance.

Step and Variables	b	SE	β	ΔR^2
Step 1				.082
Sex	.15	.01	.29***	
SES	.02	.00	.05***	
Age	-.01	.00	-.04***	
1 st Generation Immigrant	.02	.01	.02*	
2 nd Generation Immigrant	.02	.01	.04***	
Two-parent family	-.03	.01	-.05***	
French-Speaking Region	-.03	.01	-.05***	
Italian-Speaking Region	-.04	.01	-.04***	
Step 2				
Parental Warmth	-.08	.01	-.20***	.040
Step 3				
Parental Warmth	-.07	.01	-.18***	.040
Sleep Quality	-.05	.01	-.13***	.014

Note: Sobel statistic = -4.86, $p < .001$.

Hypothesis 4

The final hypothesis tested whether the level of parental warmth moderated the association between sleep functioning and the four measures of problem behaviors. It was expected that parental warmth would moderate this link in that when higher levels of

parental warmth are present, youth will report less engagement in problem behaviors at all levels of sleep functioning, compared to average and low levels of parental warmth.

To test this moderation model, both independent and moderating variables were centered; next, interaction terms were computed with these centered variables where the

Table 18. Moderation Effects of Parental Warmth on the Relationship Between Sleep Quantity and Cigarette Use.

Step and Variables	B	SE	β	ΔR^2
Step 1				.037
Sex	.00	.03	.00	
SES	-.04	.02	-.02*	
Age	.12	.01	.10***	
1 st Generation Immigrant	.00	.05	.00	
2 nd Generation Immigrant	.12	.04	.04**	
Two-parent family	-.32	.04	-.10***	
French-Speaking Region	.07	.04	.02	
Italian-Speaking Region	-.14	.06	-.03*	
Step 2				
Sleep Quantity	-.21	.02	-.16***	.028
Step 3				
Parental Warmth	-.28	.03	-.13***	.015
Step 4				
Parental Warmth * Sleep Quantity	-.03	.02	-.01	.000

Note. Regression coefficients in the table are from the final model step; only the added variables are shown at each model step.

moderator and independent variables were multiplied (parental warmth*sleep quantity and parental warmth*sleep quality). Next, hierarchical regression analyses were completed that included background variables as controls, main effects, and interaction effects. In step 1, background variables were entered, followed by sleep quantity in step

Table 19. Moderation Effects of Parental Warmth on the Relationship Between Sleep Quantity and Alcohol Use.

Step and Variables	B	SE	β	ΔR^2
Step 1				.104
Sex	.36	.02	.24***	
SES	.03	.01	.03**	
Age	.00	.01	.00	
1 st Generation Immigrant	-.28	.03	-.12***	
2 nd Generation Immigrant	-.09	.02	-.06***	
Two-parent family	-.02	.02	-.01	
French-Speaking Region	.19	.02	.11***	
Italian-Speaking Region	.21	.03	.08***	
Step 2				
Sleep Quantity	-.12	.01	-.16***	.028
Step 3				
Parental Warmth	-.15	.01	-.13***	.016
Step 4				
Parental Warmth * Sleep Quantity	-.02	.01	-.01	.000

Note. Regression coefficients in the table are from the final model step; only the added variables are shown at each model step.

2; in step 3, parental warmth was entered, and lastly, the interaction term parental warmth*sleep quantity was entered. Model tests of Hypothesis 1 established the significant associations between sleep quantity and problem behaviors (betas ranging from -.12 to -.19), while model tests of Hypothesis 3 established the associations between

Table 20. Moderation Effects of Parental Warmth on the Relationship Between Sleep Quantity and Illegal Drug Use.

Step and Variables	B	SE	β	ΔR^2
Step 1				.077
Sex	.27	.03	.10***	
SES	.12	.02	.08***	
Age	.15	.01	.13***	
1 st Generation Immigrant	-.09	.05	-.02	
2 nd Generation Immigrant	.26	.04	.08***	
Two-parent family	-.29	.04	-.09***	
French-Speaking Region	-.04	.04	-.01	
Italian-Speaking Region	-.17	.06	-.03**	
Step 2				
Sleep Quantity	-.26	.02	-.19***	.043
Step 3				
Parental Warmth	-.39	.03	-.17***	.030
Step 4				
Parental Warmth * Sleep Quantity	-.08	.02	-.04***	.001

Note. Regression coefficients in the table are from the final model step; only the added variables are shown at each model step.

parental warmth and problem behaviors (betas ranged from -.14 to -.20); therefore, these results will not be reviewed here again (see Tables 18–21 for specifics). Findings from the analyses that added the interaction terms in the fourth model step provided evidence that it was significantly predictive of drug use and deviance ($\beta = -.04$; $\beta = -.06$,

Table 21. Moderation Effects of Parental Warmth on the Relationship Between Sleep Quantity and Deviance.

Step and Variables	B	SE	β	ΔR^2
Step 1				.082
Sex	.12	.01	.23***	
SES	.01	.00	.05***	
Age	-.01	.00	-.05***	
1 st Generation Immigrant	.02	.01	.03*	
2 nd Generation Immigrant	.03	.01	.05***	
Two-parent family	-.03	.01	-.05***	
French-Speaking Region	-.02	.01	-.03*	
Italian-Speaking Region	-.03	.01	-.03**	
Step 2				
Sleep Quantity	-.03	.00	-.12***	.020
Step 3				
Parental Warmth	-.08	.01	-.18***	.033
Step 4				
Parental Warmth * Sleep Quantity	-.02	.00	.06***	.003

Note. Regression coefficients in the table are from the final model step; only the added variables are shown at each model step.

respectively), but not cigarette use or alcohol use ($\beta = -.01$; $\beta = -.01$, respectively). Next, post-hoc tests were completed to decompose the significant moderation effects found for drug use and deviance (see Table 22). To do so, a slope was calculated in an initial step at three different levels of the moderator (parental warmth, one standard deviation below the mean [low], at the mean, and one standard deviation above the mean [high]) based on the unstandardized regression coefficients from sleep functioning as a predictor and the interaction terms.

Table 22. Regression Slopes Depicting the Association Between Sleep Functioning and Problem Behaviors at Different Levels of Parental Warmth.

		Moderator: Parental Warmth		
Predictor	Outcome	High	Medium	Low
Sleep Quantity	Illegal Drug Use	-0.21***	-0.26	-0.31***
Sleep Quantity	Deviance	-0.02**	-0.03***	-0.04***
Sleep Quality	Cigarette Use	-0.35***	-0.28***	-0.20***
Sleep Quality	Illegal Drug Use	-0.35***	-0.30***	-0.24***

Examination of these slopes indicated that sleep quantity was negatively associated with illegal drug use at low and high levels of parental warmth (slopes = -0.21 & -0.31, $p < .001$), but unrelated at the mean (slopes = -0.26, *ns*). In addition, slope tests also indicated that sleep quantity was associated with lower levels of deviance at each of the parental warmth levels (slopes = -0.04, -0.03, & -0.02, $p < .001$; for low, mean, and high, respectively). Figures were generated to visually display the findings of these slope tests (see Figures 3 and 4).

Figure 3. Moderation by Parental Warmth on the Relationship Between Sleep Quantity and Illegal Drug Use.

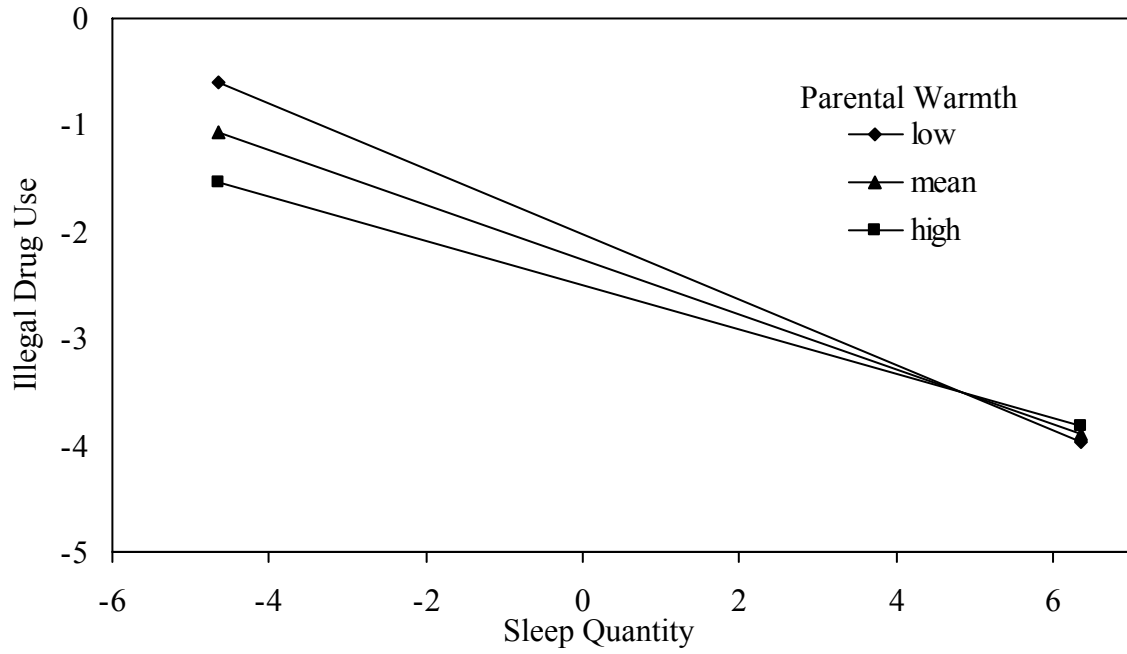
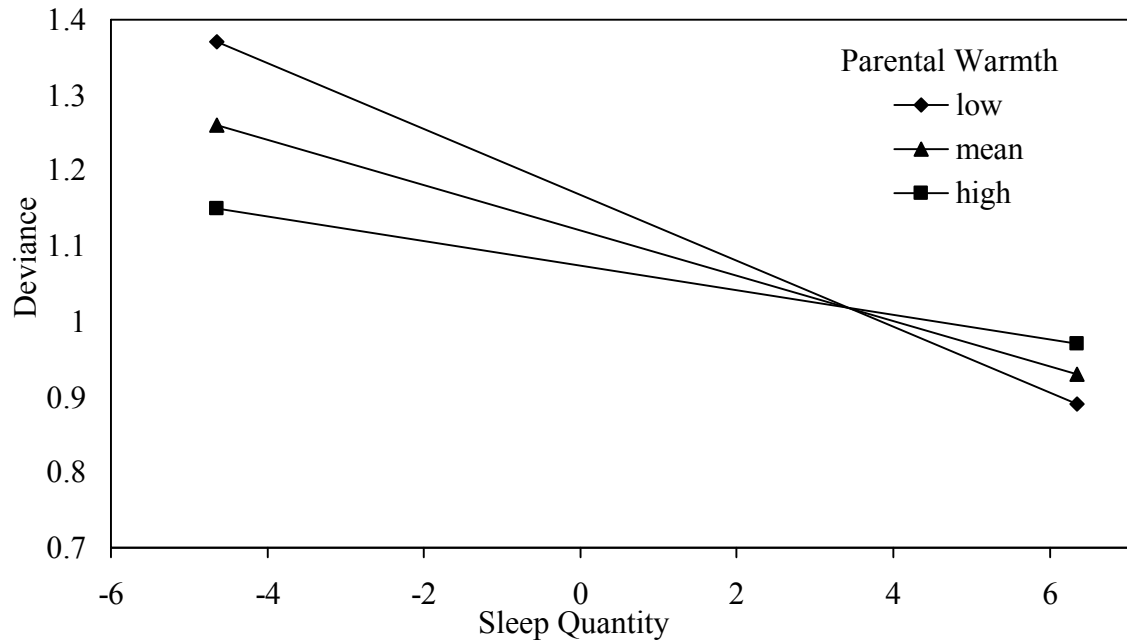


Figure 4. Moderation by Parental Warmth on the Relationship Between Sleep Quantity and Deviance.



The same procedure was completed for sleep quality as the independent variable. In step 1, background variables were entered; in step 2, sleep quality was entered; in step 3, parental warmth was entered, and lastly, the interaction term sleep parental warmth*sleep quality was entered. Again, Hypothesis 1 established the significant

Table 23. Moderation Effects of Parental Warmth on the Relationship Between Sleep Quality and Cigarette Use.

Step and Variables	b	SE	β	ΔR^2
Step 1				.037
Sex	.18	.03	.07***	
SES	-.03	.02	-.02	
Age	.13	.01	.12***	
1 st Generation Immigrant	-.00	.05	.00	
2 nd Generation Immigrant	.11	.04	.03**	
Two-parent family	-.33	.04	-.10***	
French-Speaking Region	-.01	.04	-.00	
Italian-Speaking Region	-.19	.06	-.04**	
Step 2				
Sleep Quality	-.28	.03	-.13***	.021
Step 3				
Parental Warmth	-.28	.03	-.13***	.013
Step 4				
Parental Warmth*Sleep Quality	-.12	.04	-.04**	.001

Note. Regression coefficients in the table are from the final model step; only the added variables are shown at each model step.

associations between sleep quality and problem behaviors (which were negative; betas ranged from -.07 to -.14), while Hypothesis 3 established the associations between parental warmth and problem behaviors (which were negative; betas ranged from -.13 to -.18, $p < .001$); therefore, they will not be discussed in detail again (please see Tables 23–

Table 24. Moderation Effects of Parental Warmth on the Relationship Between Sleep Quality and Alcohol Use.

Step and Variables	b	SE	β	ΔR^2
Step 1				.104
Sex	.43	.02	.30***	
SES	.04	.01	.04***	
Age	.01	.01	.02	
1 st Generation Immigrant	-.27	.03	-.12***	
2 nd Generation Immigrant	-.09	.02	-.06***	
Two-parent family	-.03	.02	-.02	
French-Speaking Region	.15	.02	.09***	
Italian-Speaking Region	.18	.03	.07***	
Step 2				
Sleep Quality	-.08	.01	-.07***	.009
Step 3				
Parental Warmth	-.16	.01	-.13***	.016
Step 4				
Parental Warmth*Sleep Quality	-.01	.02	-.00	.000

Note. Regression coefficients in the table are from the final model step; only the added variables are shown at each model step.

26 for specifics). The interaction term was significantly associated with cigarette use and drug use ($\beta = -.04, p < .01$; $\beta = -.03, p < .05$, respectively), but not alcohol use or deviance ($\beta = -.00, ns$; $\beta = .00, ns$, respectively).

Table 25. Moderation Effects of Parental Warmth on the Relationship Between Sleep Quality and Illegal Drug Use.

Step and Variables	b	SE	β	ΔR^2
Step 1				.077
Sex	.47	.03	.17***	
SES	.13	.02	.08***	
Age	.17	.01	.14***	
1 st Generation Immigrant	-.09	.05	-.02	
2 nd Generation Immigrant	.24	.04	.08***	
Two-parent family	-.30	.04	-.09***	
French-Speaking Region	-.14	.04	-.05***	
Italian-Speaking Region	-.23	.06	-.04***	
Step 2				
Sleep Quality	-.30	.03	-.14***	.027
Step 3				
Parental Warmth	-.40	.03	-.18***	.028
Step 4				
Parental Warmth*Sleep Quality	-.09	.04	-.03*	.001

Note. Regression coefficients in the table are from the final model step; only the added variables are shown at each model step.

Post-hoc tests were then conducted to further explain examine the moderation effects by parental warmth on the link between sleep quantity and cigarette use as well as and alcohol use (see Table 22). An examination of the slopes at low, mean, and high

Table 26. Moderation Effects of Parental Warmth on the Relationship Between Sleep Quality and Deviance.

Step and Variables	b	SE	β	ΔR^2
Step 1				.082
Sex	.15	.01	.29***	
SES	.02	.00	.05***	
Age	-.01	.00	-.04***	
1 st Generation Immigrant	.02	.01	.02*	
2 nd Generation Immigrant	.02	.01	.04***	
Two-parent family	-.03	.01	-.05***	
French-Speaking Region	-.03	.01	-.05***	
Italian-Speaking Region	-.04	.01	-.04***	
Step 2				
Sleep Quality	-.05	.01	-.13***	.025
Step 3				
Parental Warmth	-.07	.01	-.17***	.029
Step 4				
Parental Warmth*Sleep Quality	.00	.01	.00	.000

Note. Regression coefficients in the table are from the final model step; only the added variables are shown at each model step.

levels of parental warmth indicated that sleep quality was negatively associated with cigarette use, across all levels of parental warmth (slopes = -0.20, -0.28, & -0.35, $p < .001$; low, mean, and high, respectively). Regarding sleep quality and drug use, examination of the slopes indicated that sleep quality was negatively associated with illegal drug use across all three levels of parental warmth (slopes = -0.24, -0.30, & -0.35, $p < .001$; low, mean, and high, respectively). Figures 5 and 6 display these findings graphically.

Figure 5. Moderation by Parental Warmth on the Relationship Between Sleep Quality and Cigarette Use.

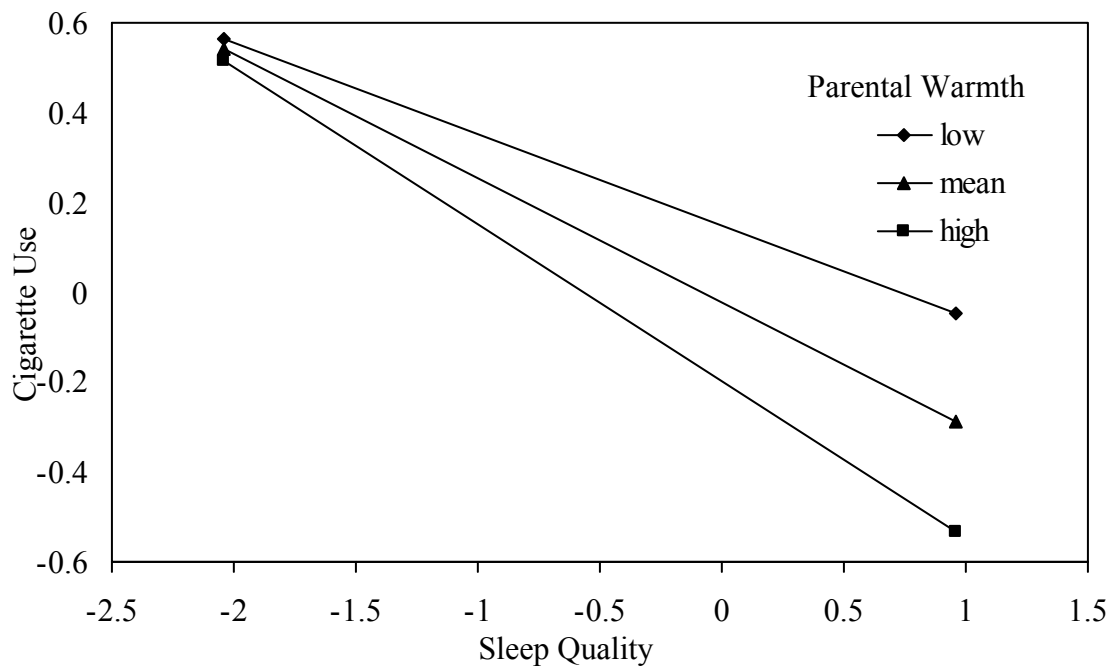
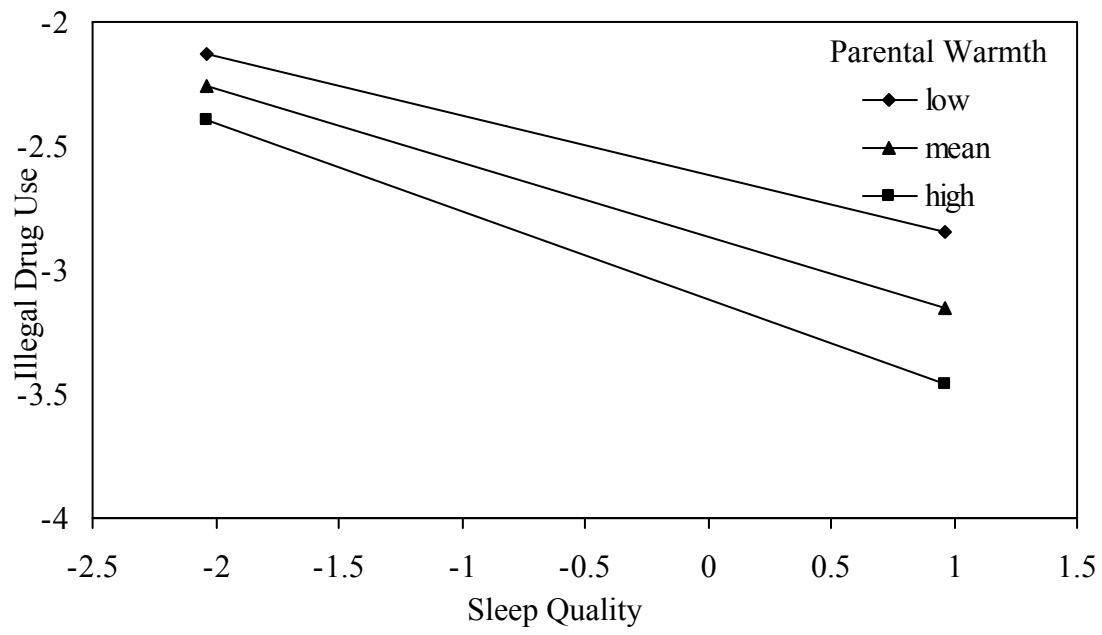


Figure 6. Moderation by Parental Warmth on the Relationship Between Sleep Quality and Illegal Drug Use.



DISCUSSION

Although the links between parental warmth and sleep functioning as well as between sleep functioning and problem behaviors have been studied, no studies have extensively tested the relationships among sleep functioning, parental warmth, and problem behaviors. The major focus of the current study was to investigate these complex relationships in a national probability sample of Swiss adolescents, while considering potential effects by background variables. This study tested direct and indirect effects among variables: the direct effects of sleep functioning on problem behaviors, which were significant and negative; the direct effects of parental warmth on sleep functioning, which were significant and positive; the indirect effects of sleep functioning as a mediator in the relationship between parental warmth and problem behaviors, which were significant, and lastly, conditioning effects by parental warmth on the relationship between sleep functioning and measures of problem behaviors, which were significant for some of the problem behavior measures. In the subsequent sections, main study findings will be discussed in greater detail.

Sleep Functioning in a Swiss National Probability Sample

The recommended amount of sleep for adolescents is between 8.5 and 9 hours per night (Meltzer & Mindell, 2006); however, less than eight hours per night is often reported by adolescents based on previous work (e.g., Eliasson et al., 2002; Wolfson &

Carskadon, 1998). In the current study based on Swiss youth, the average amount of sleep was 7.65 hours per night during the weekday; the reported range of sleep was substantial, from 3 to 14 hours per night, although it is worth noting that the majority of youth (81%) reported seven hours or more. A similar study by Steptoe, Peacey and Wardle (2006) examined sleep duration in a sample of more than 17,000 university students around the world, and almost two-thirds of those youth (63%) self-reported receiving seven to eight hours of sleep per night compared to only half of the current study participants (50%); less than a quarter of youth in the study (21%) by Steptoe and colleagues slept less than seven hours, compared to 19% in the current sample. Lastly, one-third of the current sample slept more than eight hours, while Steptoe and colleagues reported only 16% of their youth slept that long.

Based on a subjective rating scale, sleep quality also appeared to be fairly high in the current sample; youth reported average sleep quality of 3.04 based on a scale ranging from 1 to 4, where 1 indicated poorest quality and 65% of youth rated their sleep quality as three or above. At the same time, findings from the current study support previous evidence that sleep problems are quite common among adolescents. Most adolescents reported some sleep problems; for example, 14% reported “always” suffering from excessive daytime sleepiness, while 36% reported suffering from it “often”. Other work has provided evidence of excessive daytime sleepiness in nearly half of the sample of more than 100,000 Japanese adolescents (40%, Ohida et al., 2004). Reports on difficulties falling asleep were comparable to rates found in previous work; 8% of youth in the current study indicated they “always” had problems falling asleep, while 16%

reported “often”. A study by Patten and colleagues (2000) on 7,960 youth (2000) provided evidence that 38% had problems falling asleep “sometimes”, while 14% reported “often”. Finally, reports about waking frequently at night were lower in the current study compared to previous work: in the current effort, 5% indicated that they “always” awoke during the night, while 12% endorsed “often”. In contrast, in a study by Laberge and colleagues (2001) on 1,146 young adolescents, 26% of adolescents reported “frequently” waking up at night.

Exploratory analyses on the associations between sleep functioning and background variables provided additional interesting insights. Comparatively younger participants slept longer and reported better sleep quality than older participants. Much of previous scholarship on the relationship between SES and sleep functioning has been confounded by race/ethnicity, and it has been conducted mostly on children (e.g., Crabtree et al., 2005). This work provided evidence that youth of higher SES reported better sleep functioning than youth of average or lower SES (Adam et al., 2007). In contrast, findings from the current study indicated that youth from lower SES reported more sleep as well as higher quality sleep (fewer problems) in comparison to youth from higher levels of SES. It is worth noting however that none of the previous efforts focused on SES were conducted on national probability samples.

Previous research has also indicated important sex differences in both sleep quantity and quality (e.g., Oginska & Pokorski, 2006); the evidence from previous studies has been inconsistent regarding the relationship between sex and sleep functioning. In the current study, adolescent females slept longer, while adolescent males slept better; these

findings are similar to ones by Vignau and colleagues (1997) based on a sample of 763 French high-school students where 51% of adolescent females reported sleep problems, but only 34% of adolescent males did. Finally, family structure has also been linked to differential sleep functioning, where youth from divorced or separated families were more likely to report poorer sleep functioning (e.g., Vignau, et al., 1997), namely youth reported less sleep as well as lower quality sleep. Findings from the current sample support this previous evidence.

Prevalence of Problem Behaviors Among Swiss Adolescents

One of the main foci of the current study was the relationship between sleep functioning and problem behaviors – smoking cigarettes, drinking alcohol, using illegal drugs, and engaging in deviant behaviors. In the current sample, 48% of the participants reported never having smoked a cigarette, while 4% used to smoke but have quit, 15% sporadically smoked, and 32% smoked regularly. These rates appear slightly higher than ones reported from a similar U. S. study called the Monitoring the Future Project, which was based on U.S. high school students; 22% of those youth reported smoking regularly (Johnston et al., 2008).

On alcohol use, only 7% reported never drinking, while 18% of seniors in high school from the Monitoring the Future Project reported drinking a few sips or less of alcohol (Johnston et al., 2008). Even though a lower percentage of Swiss youth never drank, it is important to note that the majority (90%) only drank an average of once per week or less. On illegal drug use, 40% of participants reported never having used illegal drugs, while 41% used one type of drug, and only 9% reported using two types of drugs;

meanwhile, 42% of U. S. seniors reported having tried marijuana, based on the Monitoring the Future Project. Lastly, 64% of participants reported never engaging in any of type of deviant behavior, while only a modest 2% reported committing a deviant act twice or more.

Sleep Functioning, Parental Warmth and Problem Behaviors: Tests of Direct Effects

Hypothesis 1 examined the relationship between sleep functioning and problem behaviors. This relationship has not been well studied, particularly with a focus on a number of different problem behavior indicators. Explanations may include that these problem behaviors simply detracted or interfered with receiving an optimal amount of sleep. Previous work has also proposed that the link can be explained by the fact that substances are used as self-medication or as a coping mechanism, although this explanation does not speak to the sleep functioning-deviance link. Some research has found support for the idea that substances are used to self-medicate in order to address sleeping difficulties or to deal with excessive daytime sleepiness. One review examined previous work on the relationship between alcohol use and sleep functioning, with a consideration of differences between alcoholics and non-alcoholics (Roehrs & Roth, 2001). For non-alcoholics, both low and high amounts of alcohol consumption improved sleep quality in the first part of the night; thus, difficulties falling asleep may be addressed by alcohol use, although this seems unlikely given the age of the sample, the low rates of heavy drinking among the sample and the fact that almost all youth resided at home with their parent or parents. Giannotti and colleagues (2002) found some support that youth use tobacco to counteract daytime sleepiness. Additionally, even though

research on sleep functioning and illegal drug use is sparse, a study by Boys, Marsden, and Strang (2001) examined reasons for drug use among 364 youth between the ages of 16 and 22; almost all youth sampled reported using drugs as a depressant to relax (96.7%), while a large proportion of youth also indicated that they used drugs as a stimulant to keep awake at night while socializing (95.9%). Future work should examine the motives behind why adolescents engage in substance, whether they are self-medicating to deal with sleep difficulties.

It is also plausible that substance use itself leads to sleep problems. For example, in their review of alcohol use and sleep functioning literature, Roehrs and Roth (2001) found that high doses of alcohol negatively affected sleep in the second half of the night and intensified suffering from excessive daytime sleepiness. Wetter and Young (1994) found that smokers may be more likely to suffer from lower sleep quality because of nightly nicotine withdrawal or due to increased breathing problems while another study found that those with sleep problems were over three times more likely to smoke (Johnson & Breslau, 2001). The current study hypothesized and tested whether sleep functioning affected problem behaviors; however, because the study was not a longitudinal or experimental, causality cannot be inferred.

Another possible explanation for the relationship between sleep functioning and problem behaviors is that substance use might be a way to cope with stressful issues or to regulate their emotions or affect, of course related to the idea of self-medication. A study by Nishith, Resick, & Mueser (2001) found that sleep problems were related to drinking, but only when drinking alcohol was used as a coping mechanism for dealing with

negative affect; interestingly sleep quality was unrelated to drinking for pleasure or for socializing. However, these findings were based on data from rape victims suffering from post-traumatic stress disorder. Other work has also supported that smoking cigarettes is used as a coping mechanism; stress was found to be a major influence in explaining smoking (Koval & Pederson, 1999). Another study found that stress and type of coping mechanism was related to smoking (Wills, 1986). Lastly, in some previous work on adolescents, 86.8% of youth reported using drugs to alleviate depressed mood (Boys et al., 2001), again supporting the idea of illegal drug use as a coping mechanism. It is worth noting that although previous work has examined smoking cigarettes and illegal drug use as coping mechanisms, it has not been researched in relation to sleep functioning. It is possible that what is influencing substance use could also affect sleep functioning. Future work should examine this possibility, namely that stress or poor emotion regulation might precipitate substance use as a coping mechanism, and that this same stress may also directly affect sleep functioning.

Thus far, explanations about the relationships between sleep functioning and different types of substance use have been entertained; however, these have not included the sleep functioning-deviance link. It is likely that the above explanations about self-medication, stress, and coping are unrelated to deviance. Very little work exists on the sleep functioning-deviance link; however, related scholarship may provide some insights into possible explanatory mechanisms. For instance, a number of individual differences have been linked to both sleep functioning and deviance. Aggressive behaviors and impulsivity have been found to be associated with sleep quantity and quality based on

community samples (e.g., Liu & Zhou, 2002; Medeiros et al., 2005); additional work on incarcerated males also provided evidence that aggression and hostility were linked to sleep quality (Ireland & Culpin, 2006). Another study on violent and nonviolent offenders has also provided evidence that physiological measures of sleep functioning, namely the length of delta waves, differed between the two groups (Lindberg et al., 2003). However, additional work is needed in this area, specifically utilizing polysomnography to more fully examine sleep functioning.

Hypothesis 2 examined the relationship between parental warmth and sleep functioning. Parental warmth had a significant, positive effect on both sleep quantity and quality, although the magnitude of this effect was larger on sleep quality than sleep quantity. The association between parental warmth and sleep functioning has not been clearly established in the previous literature, because little work has been conducted on adolescents (e.g., Adam et al., 2007). The link between parental warmth and sleep functioning could be influenced by other aspects of the parent-adolescent relationship not assessed or tested in the current effort, such as parental control; for example, Adam and colleagues (2007) found that parental control was positively related to sleep quantity among adolescents. Another possible influence could be that low parental warmth is an indicator of an insecure attachment to parents – previous work has found a sense of security to be important in sleep functioning in children (Dahl & El-Sheikh, 2007).

Part of hypothesis 3 examined the associations between parental warmth and problem behaviors. Parental warmth was significantly related to all four problem behaviors, such that higher levels of parental warmth were associated with less

engagement in smoking, drinking, drugs, and deviance. This was expected, and these findings support previous work – higher levels of parental warmth predicted less smoking in one study (White et al., 2000), while Mogro-Wilson (2008) found that increased parental warmth decreased alcohol consumption in a longitudinal study of adolescents. In addition, parental warmth was found to affect illegal drug use (Broman et al., 2006) and deviance (Simons & Conger, 2007). However, a previous study on 2,568 high school students suggested that these relationships may involve additional aspects of parenting – parental control, monitoring, and knowledge were also associated with problem behaviors (Fletcher et al., 2004). It remains unclear however which aspect of parenting has a stronger impact. Future work should expand on these findings to include these additional dimensions of the parent-adolescent relationship to determine their salience.

The Salience of Parental Warmth on the Link Between Sleep Functioning and Problem Behaviors

Hypothesis 3 examined sleep functioning as a mediator in the relationship between parental warmth and problem behaviors, and discovered that both sleep quantity and sleep quality acted as partial mediators. In the current study, parental warmth influenced the adolescent's sleep functioning and the adolescent's sleep functioning affected his/her engagement in problem behaviors; however, parental warmth maintained an independent, direct effect on problem behaviors.

Although no previous work exists that has a direct bearing on these findings, there exists previous research that supports a possible explanation for these findings and links. Previous work suggests that it is in the parent-child/adolescent relationship that emotion

regulation is learned (Kobak, Cole, Ferenz-Gillies, Fleming, & Gamble, 1993). In the Kobak and colleagues study, less dysfunctional anger and less avoidance were seen in problem solving among mothers and adolescents with secure attachment relationships. Again, low parental warmth may represent an insecure attachment and poor emotion regulation on the part of the adolescent; therefore, in the current sample, youth reporting lower levels of parental warmth would feel less secure, which in turn would affect sleep functioning; in effect, low parental warmth would affect engagement in problem behaviors through poor emotion regulation. Future work should examine the role of attachment in the parent-adolescent relationship and how it pertains to emotion regulation and using substances as coping mechanisms.

Hypothesis 4 examined parental warmth as a moderator in the relationship between sleep functioning and problem behaviors. Interestingly, alcohol use was the only problem behavior whose relationship with sleep functioning remained unchanged by level of parental warmth. This could be explained by the fact that although smoking cigarettes and drinking alcohol during adolescence are viewed as problems, they tend to be quite common during adolescence (Basen-Engquist, Edmundson, & Parcel, 1996), and thus, unrelated to socialization experiences. In effect, perhaps the normalcy of alcohol use contributes to it not being influenced by parental warmth.

Moderation analyses tested the conditioning effects by parental warmth on the relationship between sleep functioning and cigarette use. Sleep quality was significantly and negatively related to cigarette use at all three levels of parental warmth, but the strength of this relationship differed. For those youth who reported high levels of parental

warmth, the association between sleep functioning and cigarette use was strongest, while at low parental warmth, the association was the weakest out of the levels of parental warmth. Parental warmth did not have a conditioning effect on the relationship between sleep quantity and cigarette use however.

Findings from model tests indicated that parental warmth had a particularly strong effect on illegal drug use. It was a moderator on the relationship between sleep functioning (quantity and quality) and illegal drug use which was not found for any of the other problem behaviors. Sleep quality was significantly and negatively related to illegal drug use at all levels of parental warmth, but the strength of these relationships differed. For those youth who reported high levels of parental warmth, sleep quality had the strongest effect on their illegal drug use. However, for sleep quantity and illegal drug use as moderated by parental warmth, the relationship was significant and negative at high and low levels of parental warmth, but unrelated at average parental warmth. And the relationship was strongest for those reporting low parental warmth.

Parental warmth was also a significant moderator in the relationship between sleep quantity and deviance. Sleep quantity was significantly and negatively related to deviance at all levels of parental warmth. For youth who reported low levels of parental warmth, sleep quantity had the strongest effect on deviant behaviors while for those youth who reported high parental warmth, sleep quantity had the weakest relationship with deviant behaviors.

In summary, the mediation model showed that parental warmth influenced sleep functioning, which in turn influenced problem behaviors. However, parental warmth also

had a direct impact on problem behaviors, independent of sleep functioning.

Additionally, parental warmth conditioned the relationship between sleep functioning and problem behaviors. From the moderation model, the different levels of parental warmth influenced the strength of association between sleep functioning and problem behaviors.

This study began to clarify the associations between parental warmth, sleep functioning, and problem behaviors – clearly, additional work needs to be completed to further explain these links, particularly longitudinal work to be able to infer causality. Youth who reported low levels of parental warmth and poor sleep functioning also reported the highest levels of problem behaviors. Thus, they are at greatest risk for problem behaviors, which also has implications for prevention or intervention efforts.

Conclusions and Limitations

The current study was characterized by a number of strengths, including the fact that the sample was a national probability sample of Swiss adolescents; thus, findings can be generalized to all Swiss youth as a group. Of course they also have implications for youth in other Western countries. The study also tested multiple different types of problem behaviors and generally shows, with some exceptions, that the relationships were quite similar across these outcomes. Finally, the study is unique in that it examined the interplay between parental warmth, sleep functioning, and problem behaviors.

The study also contained a number of inherent shortcomings. Multiple dimensions of the parent-adolescent relationship have been linked to both sleep functioning and problem behaviors (e.g., Adam et al., 2007; Fletcher et al., 2004), such as parental control, parental monitoring, and parental knowledge. However, the study did not include

measures of these dimensions, which is a shortcoming. Testing the importance of additional dimensions would certainly shed some light on the salience of parenting more globally on both sleep functioning and on problems behaviors. Secondly, the current study utilized subjective self-reports to measure both sleep quantity and quality. An alternative would have been actigraphy, which is more objective. Actigraphy utilizes a watch-like device that is worn on the wrist to measure sleep through movement (Sadeh & Acebo, 2002). It has been found to be reliable regarding the time when the participants falls asleep, his/her sleep quality, and waking during the night. At the same time, this option is much more time consuming and costly, particularly for such a large national probability sample. In addition, some work has provided evidence of unreliability when the device is only used for one night (Tworoger, Davis, Vitiello, Lentz, & McTiernan, 2005). Furthermore, given that the sample was drawn from the a general population and thus form a low risk group, measures of problem behaviors were quite low in frequency, and thus the data may also have suffered from restriction of range issues. It is also important to note that although most results were statistically significant, many of them were quite modest in magnitude. Lastly, the current study was based on cross-sectional data only, that were not experimental in nature, and therefore, causality cannot be inferred. Future work needs to focus on providing evidence that can infer causality.

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APPENDIX A

Demographic Information

Sex.

What is your sex?

1=female or 2=male

Age.

What is your current age?

Respondents selected one category that corresponded to their age (in years).

Socioeconomic status (SES).

Which education level did your parent (father or mother), step-parent (step-mom or step dad) or boyfriend or girlfriend of your parent achieve and with which you spent most of time?

1=never went to school, in Switzerland or abroad; 2=mandatory education (i.e., 9 years) or a few years of education; 3=apprenticeship (9 years, plus 3 or 4 years apprenticeship training; 4=business school or technical school; 5=university or college; and 6=I don't know

Language Region.

Which canton do you reside in?

1=German speaking, 2=French speaking, and 3= Italian speaking

Immigrant status.

a. What is the origin of your parents (country/region)?

1=Switzerland, 2=Italy, 3=Germany, 4=France, 5=Austria, 6=Portugal, 7=Spain,
8=Turkey, 9=Yugoslavia, 10=Croatia, 11=Macedonia, 12=Other Western European
Country, 13=Other Eastern European Country, 14=Near East Middle East, 15=Africa,
16=Asia, 17=South/Central America, and 18=North America/Australia

b. Were you born in Switzerland?

1=yes or 2=no

Family structure.

What is your parent's present situation?

1=they are still together, 2=they are divorced, 3=father is dead, 4=mother is dead, 5=both
are dead, and 6= other situation

APPENDIX B

Sleep Functioning

Sleep Amount.

At what exact time (hour/minute) do you go to bed Monday-Friday?

At what exact time (hour/minute) do you get up Monday-Friday?

Sleep Problems.

- a.) How often do you feel tired, or feel the desire to fall asleep during the day?
- b.) How often do you difficulty falling asleep in the evening?
- c.) How often do you wake up during the night?
- d.) How often do you have uneasy sleep (such as nightmares)?

1 = never, 2 = sometimes, 3 = often, and 4 = always

In the past 12 months, have you had trouble sleeping?

1 = never, 2 = sometimes, 3 = often, and 4 = always

APPENDIX C

Parental Warmth

Here are the opinions of you about your parents. How are these applicable to you?

- a.) My parents accept me the way I am
- b.) I tell my parents about my problems and difficulties
- c.) My parents understand me
- d.) I trust my parents
- e.) My parents can tell when I am sad
- f.) My parents trust me

1 = Applies, 2 = Applies Somewhat, 3 = Somewhat Does Not Apply, and 4 = Does Not Apply

APPENDIX D

Problem Behaviors

Cigarette Use

a. Do you smoke now?

1=Never, 2= I quit smoking X months ago, 3=Once in a While, and 4=Regularly

Alcohol Use

Do you drink alcoholic beverages?

a.) Wine

b.) Beer

c.) Strong alcoholic beverages (Schnapps, Liquor, etc)

d.) Cocktails

e.) Alcopops (lemonade or soda mixed with alcohol)

1 = Never, 2 = Once in a While, 3 = Once a Week, 4 = Multiple Times Each Week, 5 =
Everyday, and 6 = Multiple Times Each Day

Drug Use

Have you in your lifetime consumed one of the following substances?

a.) Cannabis (or marijuana, hash, weed)

b.) Inhalants (glue, sniff)

- c.) Medications that made me feel high
- d.) Ecstasy, speed, designer drugs, or other stimulants
- e.) LSD, hallucinogenic mushrooms
- f.) GHB (salty water, liquid ecstasy)
- g.) Cocaine or crack
- h.) Heroin
- i.) A Sedative without doctor's orders
- j.) Methadone

0 = no and 1 = yes

Deviance

Here is a list of things that are prohibited by law but that sometimes occur anyway.

Which one of these things have you yourself done during the past 12 months?

- a.) Intentionally destroyed something that did not belong to you (phone booth, street light, car, barriers, or chairs in a movie theater)
- b.) Ever stolen something or taken it along
- c.) Attacked an adult
- d.) Lit something on fire
- e.) Forcefully taken or stolen a person's purse, wallet, or cell phone
- f.) Carried a weapon

1 = Never, 2 = 1-2 Times, and 3 = 3 Times or More