# Sleep, Television, Texting and Computer Habits and Overweightness in Schoolchildren and Adolescents

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***Chapter 2***

# SLEEP, TELEVISION, TEXTING AND COMPUTER HABITS AND OVERWEIGHTNESS IN SCHOOLCHILDREN AND ADOLESCENTS

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## ABSTRACT

This chapter provides a synthesis of three earlier published studies (Garmy et al. 2012[a]; Garmy et al. 2012[b]; Garmy et al. 2013) (survey I) as well as previously unpublished results from a survey conducted in 2013 among students aged 16 (survey II).

*Objective:* The aim was to investigate the effects of sleep, television use and texting and computer habits on overweight, enjoyment of school and feelings of tiredness at school in school-age children and adolescents.

*Methods:* This cross-sectional study was conducted in Sweden on schoolchildren aged 6, 7, 10, 14 and 16. A questionnaire which had been satisfactorily tested for validity and reliability was distributed to the children (n=3011 in survey I; n=204 in survey II).

*Results:* Children who slept less than the median length of time reported enjoying school to a lesser degree. Fewer hours of sleep were found to be associated with having a bedroom television, using the

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television or computer more than 2 hours a day, being tired at school, and having difficulties in sleeping and waking up. Overweight and obesity were found in 15.8% of the study population; obesity alone was found in 3.1%. Relationships between lifestyle factors and overweight were studied using multivariate logistic regression analysis. Having a bedroom television and using the television more than 2 hours per day were found to be associated with overweight, but using the computer more than 2 hours a day was not. About 61% of the students aged 16 reported checking Facebook or social media at least once a day, and 27% reported doing so more than 10 times a day. One fourth of the students aged 16 had a habit of sending or receiving text messages at night at least once a week. Texting at night and frequent checking of Facebook and social media sites were related to sleep problems.

*Conclusions:* Educating schoolchildren and their parents regarding matters of optimal sleep and how media habits affect sleep, overweight and learning is considered an important task.

## BACKGROUND

Children's sleep problems need to be taken seriously. Longitudinal studies have shown that lack of sleep in children increases the risk of mental illness in adult age (Gregory et al. 2008). It is important for health and medical care professionals to have a finely-tuned instinct about this issue. Although we are aware of sleep's fundamental role in a child's physical and mental health, we also know that all children have periods when they sleep badly, and parents should not need to be concerned unnecessarily. In adults there is a connection between obesity and extremely short or long periods of sleep. This relationship is not as pronounced in children, but a newly published study by Spruyt et al. (2011) shows that children with obesity are at risk of developing irregular sleeping habits, are less likely to catch up on their sleep at weekends and have shorter periods of sleep. In combination, this will have adverse consequences on their metabolism. Lack of sleep affects the immune defence system, memory retention, learning capability, growth, insulin sensitivity and blood lipids, among other things. Sleep is an anabolic, restorative and building process. In children, insufficient sleep can lead to lapses in concentration, mood swings and impulse control problems during the day (Kryger et al. 2011).

In puberty, many students become "night people" who dislike getting up in the morning. Puberty entails both a huge hormonal readjustment and a period of accelerated growth. Night people accumulate a "sleep deficit" during

the school week, as they stay up late but still have to get up early to go to school. It is common for night people to skip breakfast and to feel tired at school. On average, students who eat breakfast get higher grades (Adolphus et al. 2013). Even if this relationship may be influenced by other factors such as the family's socio-economic status, it is nevertheless a useful argument for improving children's breakfast habits. Many teenagers end up with a delayed circadian clock which can create problems with their school work. A delayed circadian clock does not automatically mean you have problems falling asleep or have other sleep problems; it means you have moved your sleep period out of sync with society at large. One example is Erik in the first grade of upper-secondary school. He plays computer games at night with friends in other parts of the world. As a result, he falls asleep in the early hours of the morning at around 4 or 5 a.m. Then he sleeps for 7 hours and wakes up refreshed at around 11 a.m. or 12 noon. Erik therefore misses a large part of the school day and, as a result, risks getting poor grades.

In a controlled study (Wahlstrom 2010) in Minnesota, US, students in one part of the school district were given one hour of extra sleep in the morning, while students in the other part observed the regular times. The children who were allowed to 'sleep in' made better grades, had less irregular sleep habits, felt less tired at school, felt better and were less prone to depression and antisocial behaviour. Furthermore, the teachers said that their own working conditions improved: there was more time for planning and classes were more orderly. Parents too reported positive changes with the extra sleep. The students ate breakfast more frequently. But the question is this: By shifting the start of the school day by one hour, do we actually affect the students' tendencies to stay up late at nights? It is possible that the successful results in these studies indicate that youngsters simply got more sleep while the study was in progress. The real question is whether they continued to go to bed at reasonable times when the study was finished, or whether they delayed the 'clock' even more.

## AIM

The aim was to investigate how sleep, television use and texting and computer habits affected overweight, enjoyment and feelings of tiredness at school in school-age children and adolescents.

# METHODS

## Study Setting and Participants

Survey I was conducted in 2008-2009 in association with school health services in southern Sweden. In accordance with national policy, all students enrolled in the primary class (6 years) and in grades 1, 4, 8, and 10 (ages 7, 10, 14, and 16 years, respectively) are offered an individual health visit with the school nurse. In October 2013, survey II was conducted in grade 10 (16 years) in one school.

## Instruments

Students wearing light clothing were weighed to the nearest 0.1 kg on a standard digital scale. Their height without shoes was measured to the nearest 0.1 cm using a manual height board. BMI (body mass index) was calculated and assessed using the international age- and gender-specific BMI cut-off points for children and adolescents to define overweight and obesity (Cole et al. 2000). Those with BMI of at least 25 $kg/m^2$ were classified as overweight, and those with a BMI corresponding to at least 30 $kg/m^2$ as obese.

To record sleep, television and computer habits of school-age children, a questionnaire was developed and its validity and reliability tested (Garmy et al. 2012[a]). The questionnaire's validity was evaluated on three aspects: face validity, content validity and construct validity. To assess the stability of the questionnaire, it was distributed to 138 respondents once, and again after two weeks. The questionnaire was found to be valid and reliable (ibid). The eleven questions on the questionnaire recorded whether the child had a television set in the bedroom (yes/no), how many hours/minutes the child spent watching television per day, the same for computer use, how much the child enjoyed school (very much, fairly well, not much at all), how often the child felt tired at school (never, seldom, often, every day), how often the child had difficulty getting up in the morning (never, seldom, often, every morning), and how many hours/minutes the child slept per night. Gender and year of birth were also recorded. In survey II, two questions regarding texting at night (never, approximately 3–10 times a year, at least once a month, at least once a week) and use of social media such as Facebook (never, every week, every day, > 10 times a day) were added.

## Ethical issues

Informed consent was obtained, and the students and their parents were informed that participation was voluntary. The study was approved by the Advisory Committee on Research Ethics in Health Education (VEN 34-09) at Lund University.

## Data Collection

### *Survey I*

Height and weight measurements were collected by school nurses (n=32) during students' regular health visit at school health services, at which the nurses also distributed the questionnaire. All students filled out their own questionnaires, except the youngest students (ages 6 and 7), whose parents filled out the questionnaires. The questionnaire was distributed to 3011 out of a total population of 4692 students (64.9%). Lack of time on the part of school nurses resulted in the questionnaire not being distributed to all students. In primary and grade 1 classes, 569 students participated, in addition to 635 from grade 4, 782 from grade 8 and 1025 from grade 10. Girls comprised 49.7% of the cohort. Only 1.3% of students given the questionnaire declined to participate. Weight and height measurements were recorded for 2891 (95.9%) participating students.

### *Survey II*

All students in grade 10 (n=260) at a science and technology high school were asked to answer the questionnaire. The response rate was 78.5% (n=204). Girls comprised 42% of the cohort.

## Data Analysis

Children were classified as overweight or obese if their BMI values exceeded the international age- and gender-specific BMI cut-off points developed by Cole et al. (2000). All other independent variables, such as tiredness at school, difficulty in falling asleep, and difficulty in waking up, were treated as dichotomous with scores of 0 (seldom or never) and 1 (often or every day). For the question regarding enjoyment of school, answers were scored as 0 (very much) or 1 (moderate or no enjoyment). Daily television and

computer use were dichotomised at 2 hours, in line with recommendations of the American Academy of Pediatrics (2001). Sleep length was dichotomous with scores of 0 (sleeping at least the median length of time) or 1 (sleeping less than the median). Relationships between factors associated with being overweight or obese were analysed using multiple logistic regression (enter) (Norman and Streiner 2008). Quality of the regression model was measured using the Hosmer and Lemeshow goodness-of-fit test and the Nagelkerke $R^2$ test. P-values of $\leq 0.05$ were considered statistically significant. All statistical analyses were performed using SPSS (version 17.0).

## SYNTHESIS OF THE RESULTS FROM SURVEY I

### Overweight

Overweight and obesity were found in 16.7% of the study population (Garmy et al. 2013), with age groups broken down as follows: ages 6–7, 17.6%; age 10, 18.4%; age 14, 16.9%; age 16, 15.1%. Obesity alone was found in 2.8–3.8% of the population, depending on age group, with an average of 3.2%. Overweight was associated with having a bedroom television (OR 1.26) and television use exceeding 2 hours per day (OR 1.55) but not with computer use exceeding 2 hours per day, sleep duration less than the median, low enjoyment of school, tiredness at school or difficulties in sleeping and /or waking up (ibid).

### Sleep

Each consecutive age group was found to have a later median bedtime: 8:00 PM for ages 6–7, 9:00 PM for age 10, 10:30 PM for age 14, and 11:00 PM for age 16 (Garmy et al. 2012[b]). The children took 0.5–1 hour to get ready for bed. The median length of sleep per night decreased for each consecutive group: 10 hours for ages 6–7, 9.5 hours for age 10, 8 hours for age 14, and 7.5 hours for age 16. All ages slept an average of 10 hours a night on weekends. The youngest group generally showed stable sleep patterns every night, but the three older age groups showed increased sleep on weekends compared with weekdays: 0.5 hours more for age 10, 2 hours more for age 14, and 2.5 hours more for age 16 (Table 1).

**Table 1. Length of sleep in schoolchildren, weeknights (n=3011), (Garmy et al. 2012[b])**

| Age | Sleep length (median) | Bedtime (median) |
|---|---|---|
| 6–7 (n=569) | 10 hours | 20:00 |
| 10 (n=634) | 9.5 hours | 21:00 |
| 14 (n=782) | 8 hours | 22:30 |
| 16 (n=1026) | 7.5 hours | 23:00 |

Falling asleep with difficulty was reported in fewer than 10% children in the youngest group (ages 6–7) but nearly 20% children in the older age groups. Often being tired at school was reported by few (2.5%) children aged 6–7, nearly 20% of children aged 10 and over 40% of adolescents. Waking up with difficulty was experienced by close to 19% of children aged 6–7, 39% of children aged 10, and the majority of the adolescents. Although most of the children and adolescents stated that they enjoyed school very much, adolescents aged 14 reported that they enjoyed school the least. Less than 60% of this group enjoyed school very much, compared with more than 70% of all the other age categories.

The participants in each age group were categorised according to sleep duration: short (those sleeping less than the median for their grade) and long (those sleeping the median or longer). Children with short sleep duration reported enjoying school to a significant lesser extent. Multiple logistic regression analysis revealed significant correlations between short sleep duration and being tired at school, falling asleep and waking up with difficulty, having a television in the bedroom, and television or computer use exceeding 2 hours.

## Television and Computer Habits

Having a television in the bedroom was more prevalent among consecutively older age groups: 21% of children aged 6–7, 31% of children aged 10, 49% of children aged 14 and 58% of children aged 16. The youngest two age groups (ages 6–7 and age 10) reported 1 hour of television use per day, whereas the oldest two groups (age 14 and 16) reported 1.5 hours of daily television use. Television use exceeding 2 hours per day was found in 21% of children aged 6–7, 30% of children aged 10, 44% of children aged 14, and 41% of children aged 16. Computer use started at 0.5 hours per day among

children aged 6–7 and rose to 1 hour for age 10 and 2 hours for ages 14 and 16. Computer use exceeding 2 hours per day was found in only 2% of children aged 6–7 but in 20% of children aged 10, 53% of children aged 14 and 62% of children aged 16 (Garmy et al. 2012[b]).

## RESULTS FROM SURVEY II

In a survey of 204 students in grade 10 (aged 16), 61% reported checking Facebook or other social media sites at least once a day. About 27% reported checking it more than 10 times a day. Although 38% reported that they never sent or received text messages on their cell phone at night, 28% did so at least once a week (see Table 2). Length of sleep, television, computer, social media and texting habits, feelings of being tired, feeling of enjoying school, and difficulties in falling asleep and in waking up are presented in Table 3. Median length of sleep on weeknights was 8 hours, compared with 10 hours on weekends. About 24% of the students spent two hours or more each day watching television, but 66% spent two hours or more at the computer each day (not school-related). About 17% reported often having difficulties falling asleep, and 49% were often tired in school.

**Table 2. Prevalence of checking Facebook or social media and texting at night in grade 10 (students aged 16, n=204)**

| | | | | | |
|---|---|---|---|---|---|
| I check Facebook or social media | 18 (9%) Never | 5 (2%) Every week | 155 (34%) Every day | 55 (27%) > 10 times a day | 11 (5%) other |
| I send or receive text messages on my cell phone at night | 79 (38%) Never | 30 (15%) About 3–10 times a year | 23 (11%) At least once a month | 57 (28%) At least once a week | 15 (7%) other |

Those sending or receiving text messages at night at least once a week reported having shorter sleep on weeknights, being tired in school more frequently, enjoying school to a lesser extent, having greater difficulties both sleeping and waking up, later bedtimes (both on weekdays and weekends), waking up later on weekends, and more frequently checking Facebook or other social media sites (Table 4). In the multiple logistic regression analysis carried out, texting at night at least once a week was found to be significantly related

to checking Facebook or social media more than 10 times a day, and late bedtime on weekends (Table 5).

Those checking Facebook or other social media sites more than 10 times a day reported being tired in school more frequently, having more difficulties in falling asleep, having shorter sleep, and going to bed later on weeknights (Table 6).

**Table 3. Length of sleep in school grade 10 (students aged 16), and their television, computer, social media and texting habits, feelings of being tired, feeling of enjoying school, and difficulties in falling asleep and in waking up (n=204)**

| | |
|---|---|
| Median length of sleep on weeknights (IQR) | 8 h (1 h) |
| Median length of sleep on weekends (IQR) | 10 h (2 h) |
| Median time spent getting ready for bed (IQR) | 9:15 p.m. (1 h 45 m) |
| Median bedtime weekdays (IQR) | 10:30 p.m. (1 h) |
| Median waking time weekdays (IQR) | 6:30 a.m. (1 h) |
| Median bedtime weekends (IQR) | 12:00 p.m. (2½ h) |
| Median waking time weekends (IQR) | 10:00 a.m. (2 h) |
| Median time in hours watching TV (IQR) | 1h (1½ h) |
| Median time at the computer (IQR) | 2½ h (3 h) |
| Two hours or more watching TV each day | 47 (24%) |
| Two hours or more at the computer each day | 131 (66%) |
| Often has difficulties falling asleep | 35 (17%) |
| Enjoys school very much | 130 (65%) |
| Often tired in school | 98 (49%) |
| Often has difficulties waking up | 123 (61%) |

## DISCUSSION

The factors found to be associated with less sleep were having a television in the bedroom, television or computer use in excess of 2 hours per day, and having difficulty going to sleep and waking up. Children who slept less than their peers reported significantly less enjoyment of school (Garmy et al. 2012[b]). Overweight was associated with having a bedroom television and television use of more than 2 hours per day (Garmy et al. 2013). Overall

prevalence of overweight and obesity, which were found in about 18% of the children aged 6–10, is consistent with other studies (Sjöberg et al. 2011; Sjöberg et al. 2008; Sundblom et al. 2008; Lager et al. 2009).

**Table 4. Sending or receiving text messages at night at least once a week (n=204)**

| | Texting at night (at least once a week) n=57 (28%) | Not texting at night (less than once a week) n=147 (72%) | p value[a] |
|---|---|---|---|
| Tired in school | 33 (61%) | 61 (41%) | 0.028* |
| Difficulties falling asleep | 18 (33%) | 20 (14%) | 0.010* |
| Difficulties waking up | 41 (76%) | 75 (51%) | 0.019* |
| Enjoying school very much | 30 (55%) | 93 (63%) | 0.033* |
| Short sleep (less than 8 h) | 32 (56%) | 37 (25%) | 0.001* |
| Late bedtime on weeknights (after 10:30 p.m.) | 27 (47%) | 41 (28%) | 0.034* |
| Waking up late on weekends (after 10 a.m.) | 30 (55%) | 48 (33%) | 0.031* |
| Late bedtime on weekends (after 12 a.m.) | 37 (65%) | 50 (34%) | 0.001* |
| Checking Facebook or social media >10 times a day | 27 (47%) | 23 (16%) | <0.001* |
| Being female | 27 (47%) | 42 (29%) | 0.019* |

[a] Chi-square test.

Children aged 6 and 7 slept for a median of 10 hours on weeknights. This corresponds with the sleep recommendation for children aged 6–12, which is 10–11 hours. However, children aged 10 only slept a median of 9.5 hours, which is less than the recommendation. Students aged 14 and 16, who slept for a median of 8 and 7.5 hours respectively, likewise did not achieve optimal sleep length, which for adolescents aged 10–17 is recommended to be 8.5–9.25 hours per night (Carskadon and Acebo 2002). Children's sleep periods were around 30–40 minutes shorter in our study than in a previous study by Klackenberg (1982) with children born in the 1950s. Studies show that adults today have a shorter period of sleep, and the same seems to apply in our

children. It is important to point out that our study is based on a subjective evaluation of sleep periods; we have not conducted any objective measurements using EEG or actigraphy, for example. The youngest students went to bed at 8 p.m. and the eldest at 11 p.m. In my school health office, I have an old poster showing a mother saying goodnight to her children after tucking them into bed. The clock shows a time of 7 p.m. And these were school-age children!

In survey II, carried out among 204 students aged 16 in 2013, the median sleep length was one half hour longer than in survey I, carried out in 2008-2009. The median bedtime on weeknights was one half hour earlier as well in survey II. We do not have any explanation for this fact, but the hypothesis is that this falls within the margin of error.

**Table 6. Checking Facebook or social media more than 10 times a day (n=204)**

| | Checking Facebook or social media more than 10 times a day n=55 (27%) | Checking Facebook or social media less than 10 times a day n=149 (73%) | P value[a] |
|---|---|---|---|
| Tired in school | 35 (64%) | 62 (42%) | 0.010* |
| Difficulties falling asleep | 16 (29%) | 24 (16%) | 0.049* |
| Difficulties waking up | 38 (69%) | 84 (56%) | 0.172 |
| Enjoying school very much | 30 (55%) | 94 (63%) | 0.056 |
| Short sleep (less than 8 h) | 27 (49%) | 43 (29%) | 0.011* |
| Late bedtime on weeknights (after 10:30 p.m.) | 27 (49%) | 44 (30%) | 0.016* |
| Waking up late on weekends (after 10 a.m.) | 25 (45%) | 53 (36%) | 0.211 |
| Late bedtime on weekends (after 12 a.m.) | 29 (53%) | 62 (21%) | 0.223 |
| Being female | 26 (47%) | 45 (30%) | 0.046* |

[a]Chi-square test.

**Table 5. Factors associated with sending or receiving text messages at night at least once a week (n=204) in the logistic regression analysis carried out**

| Variables | Odds ratio | 95% CI for OR | P values |
|---|---|---|---|
| Tired in school | 0.828 | 0.322-2.132 | 0.696 |
| Difficulties falling asleep | 0.935 | 0.318-2.749 | 0.935 |
| Difficulties waking up | 2.663 | 0.933-7.602 | 0.067 |
| Enjoying school very much | 1.834 | 0.740-4.542 | 0.190 |
| Short sleep (less than 8 h) | 2.228 | 0.740-6.704 | 0.154 |
| Late bedtime on weeknights (after 10:30 p.m.) | 0.578 | 0.187-1.792 | 0.343 |
| Waking up late on weekends (after 10 p.m.) | 1.229 | 0.476-3.169 | 0.670 |
| Late bedtime on weekends (after 12 a.m.) | 4.683 | 1.677-13.080 | 0.003* |
| Checking Facebook or social media >10 times a day | 4.156 | 1.674-10.313 | 0.002* |
| Being female | 1.550 | 1.128-2.130 | 0.007* |

Note: Hosmer and Lemeshow goodness-of-fit test, p= 0.101. Nagelkerke $R^2$= 0.348.

Texting at night is a sleep disturbing activity. Sending or receiving text messages at night was associated with late bedtimes on weekends and often checking Facebook or other social media sites. It was also significantly more common in individuals with short sleep, with irregular sleep patterns (i.e., differences between weeknights and weekends), having sleep problems, and enjoying school to a lesser extent.

Frequent checking of Facebook or other social media sites (>10 times a day) seems to be negatively related to sleep problems. In survey II, adolescents who reported checking Facebook or other social media sites more than 10 times a day significantly more often had short sleep and difficulties falling asleep, were often tired in school, and went to bed later on weeknights. However, in a cross-sectional study, it is not possible to draw conclusions about causality. Individuals with sleep problems might use social media and texting more frequently because of their problems.

**Fact box 1. How to fight sleep disruption**

| |
|---|
| Is there sufficient motivation? |
| Sleep journal |
| Parental involvement |
| Media habits (TV, computers, mobile phone). Avoid TV in your room. |
| Outdoors, 1 hour a day |
| Training, when? |
| Coffee/alcohol/tobacco/energy drinks |
| Regularity (even weekends…) Strict wake-up times. |
| Hot footbath in the evening (affects distal skin blood flow) |
| Hope and patience! |

## IMPLICATIONS FOR PRACTICE

To start off, it must be stressed that there are rarely any simple solutions. My primary piece of advice is to be patient and instil hope in the children/adolescents and their families. There are many different ways to tackle the problem and they usually work. Motivational talks are often effective in these situations (Miller et al. 2008). Begin by asking the child what motivation he/she has for sleeping better, going to bed earlier, not skipping school or whatever the problem may be. A student who, for example, has made every effort to stay up until 2 a.m. and is proud of it is probably not very motivated to go to bed early. One effective way of determining sleeping habits is to ask the children to keep a sleep journal. This is usually a good way for the family to become aware of the problem, and sometimes you may discover that there *is* no problem, or it is not as serious as initially anticipated. As is usually the case, parental involvement is a common success factor. Make it clear to your children that you make the rules about bedtime and TV/computer times. Tell them that sleep disruption is more common among students with TV in their rooms and those with long 'screen times'. Mobile phones are another common disruptive element for many teenagers. Tell the teenager about the different stages of sleep, what happens where we are woken from a deep sleep by an SMS alert and how long it takes for the body to return to the all-important deep sleep. Talk about the importance of daylight for a good melatonin balance. It is easier to sleep when we have high content of melatonin in the body, but that only occurs if the body is exposed to plenty of daylight during the day and darkness at night time. A good exercise could be

to make sure your children go outdoors for one hour a day. Although training is good for your health and sleep, it can sometimes be difficult to wind down directly after training. Doing ten push-ups delays sleep by one hour. Ask them if they drink coffee, cola, energy drinks or alcohol or use tobacco and tell them about these substances' negative effects on sleep. Perhaps the most important (but perhaps also the most boring) piece of advice concerns regularity. It is important to be disciplined and keep strict wake-up times, even at weekends, if you have a sleep problem.

## CONCLUSION

Children who slept less than the median length of time reported enjoying school to a lesser degree. Fewer hours of sleep were found to be associated with having a bedroom television, using the television or computer more than 2 hours a day, being tired at school, and having difficulties in sleeping and waking up. Overweight and obesity were found in 15.8% of the study population; obesity alone was found in 3.1%. Relationships between lifestyle factors and overweight were studied using multivariate logistic regression analysis. Having a bedroom television and using the television more than 2 hours per day were found to be associated with overweight, but using the computer more than 2 hours a day was not. About 61% of the students aged 16 reported checking Facebook or social media at least once a day, and 27% reported doing so more than 10 times a day. One fourth of the students aged 16 had a habit of sending or receiving text messages at night at least once a week. Texting at night, and frequent checking of Facebook and social media sites were related to sleep problems. Educating schoolchildren and their parents regarding matters of optimal sleep and how media habits affect sleep, overweight and learning is considered an important task.

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