



MASTER THESIS

Doing homework or going to sleep? An application of the Theory of Planned Behaviour in high school students

Lisanne Haan

Health Psychology & Technology
Faculty of Behavioural Management and Social Sciences

Examination Committee
Dr. C.H.C. Drossaert
Dr. E.J. de Bruin

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UNIVERSITY OF TWENTE.

Abstract

Background. Doing homework before bedtime is a barrier for good sleep among high school students. Although a few studies gave some insight into the relation between sleep and late night homework, underlying determinants of this behaviour are unknown. The Theory of Planned Behaviour has found to be useful in understanding and predicting intention and behaviours related to sleep. Therefore, this study uses the TPB as a framework to investigate the determinants of doing homework before bedtime. The aim of this study is to get insight into which determinants are predictive for doing homework late at night (one hour before bedtime) and how this is related to sleep difficulties among high school students.

Methods. A questionnaire was developed on the basis of seven qualitative interviews and spread among social media and the youth panel of TeamAlert. The final sample consisted of 452 high school students with an average age of 15.4 years ($SD=1.40$). Besides descriptive statistics and correlations, regression analyses were conducted to predict sleep (sleep quality, perceived sleep quality and sleep quantity), the behaviour (late night homework) and the intention of that behaviour.

Results. The majority (87%) of high school students reported to do homework late at night, one hour before bedtime, at least once a week. About half of the people did this three or more times per week. Late night homework was a significant predictor for sleep difficulties, leading to poorer sleep quality, poorer perceived sleep quality and less sleep quantity. After controlling for demographics, late night homework accounted for 8.6% of the variance in sleep quality, 8.4% of the variance in perceived sleep quality and 19.1% of the variance in sleep quantity. The behaviour (late night homework) was significantly predicted by perceived behavioural control and intention, the first being the strongest predictor. After controlling for demographics, those two determinants of the TPB accounted for 31.2% of the variance in late night homework. Adding the other determinants of the TPB in the regression model barely increased the explained variance of late night homework ($R^2 = .326$) and none of them were significant predictors. Intention to finish homework before late night was significantly predicted by all determinants of the TPB, except for injunctive and descriptive norms and rules about sleep. After controlling for demographics, the determinants of the TPB significantly accounted for 46.3% of the variance in intention.

Conclusion. This study shows that late night homework, which many high school students often do, is a significant predictor for sleep difficulties, leading to poorer sleep quality, poorer perceived sleep quality and less sleep quantity. The results showed that late night homework was most strongly predicted by perceived behavioural control, and not by intention, which indicates that doing homework might be a behaviour over which people have lower volitional control. Future intervention programs that aim to reduce late night homework among high school students should mainly focus on increasing people's feeling of control to finish homework in time. Further research is needed to gain insight into how this can best be done.

Keywords: high school students, sleep difficulties, late night homework, determinants, Theory of Planned Behaviour

Samenvatting

Achtergrond. Huiswerk maken voor het slapen gaan is een barrière voor een goede nachtrust bij middelbare scholieren. Hoewel sommige studies inzicht geven in de relatie tussen slaap en huiswerk maken, zijn de determinanten van dit gedrag niet bekend. De Theorie van Gepland Gedrag (TPB) is geschikt voor het voorspellen van intentie en gedrag gerelateerd aan slaap. Deze studie gebruikt daarom de TPB als model om de determinanten te onderzoeken van huiswerk maken voor het slapen gaan. Het doel van deze studie is inzicht krijgen in welke determinanten voorspellend zijn voor het maken van huiswerk 's avonds laat (één uur voor het slapen gaan) en hoe dit is gerelateerd aan slaapproblemen bij middelbare scholieren.

Methode. Een vragenlijst is opgesteld op basis van zeven kwalitatieve interviews en verspreid via sociale media en het jongerenpanel van TeamAlert. De uiteindelijke steekproef bestond uit 452 middelbare scholieren met een gemiddelde leeftijd van 15,4 jaar ($SD=1,40$). Naast de beschrijvende statistieken en correlaties, zijn regressie analyses uitgevoerd om slaap (slaapkwaliteit, ervaren slaapkwaliteit en slaapkwantiteit), het gedrag ('s avonds laat huiswerk maken) en de intentie van dat gedrag te voorspellen.

Resultaten. De meerderheid (87%) van de middelbare scholieren gaf aan dat ze minimaal één keer per week 's avonds laat huiswerk maken. Ongeveer de helft deed dit drie keer per week of vaker. 's Avonds laat huiswerk maken was een significante voorspeller voor slaapproblemen, waarbij het leidt tot slechtere slaapkwaliteit, slechtere ervaren slaapkwaliteit en minder slaapkwantiteit. Na gecontroleerd te hebben voor demografische kenmerken, zorgde 's avonds laat huiswerk maken voor 8,6% van de variantie in slaapkwaliteit, 8,4% van de variantie in ervaren slaapkwaliteit en 19,1% van de variantie in slaapkwantiteit. Het gedrag ('s avonds laat huiswerk maken) werd significant voorspeld door waargenomen gedragscontrole en intentie, waarbij de eerstgenoemde de sterkste voorspeller was. Na gecontroleerd te hebben voor demografische kenmerken, verklaarden deze twee determinanten 31,2% van de variantie in 's avonds laat huiswerk maken. Na het toevoegen van de andere TPB determinanten nam dit percentage amper nog toe ($R^2 = .326$) en geen van deze determinanten waren significante voorspellers. De intentie om huiswerk af te hebben voor 's avonds laat werd significant voorspeld door alle TPB determinanten, behalve door injunctieve en descriptieve normen en regels over slaap. Na gecontroleerd te hebben voor demografische kenmerken, verklaarden de TPB determinanten 46,3% van de variantie in intentie.

Conclusie. Deze studie toont aan dat 's avonds laat huiswerk maken, wat veel middelbare scholieren regelmatig doen, een significante voorspeller is voor slaapproblemen waarbij dit leidt tot slechtere slaapkwaliteit, slechtere ervaren slaapkwaliteit en minder slaapkwantiteit. De resultaten lieten zien dat 's avonds laat huiswerk maken het sterkst werd voorspeld door waargenomen gedragscontrole, en niet door intentie, wat aangeeft dat huiswerk maken wellicht geen beredeneerd gedrag is. Toekomstige interventies die als doel hebben om 's avonds laat huiswerk maken te verminderen bij middelbare scholieren, moeten zich voornamelijk richten op het versterken van het gevoel van controle om huiswerk op tijd af te hebben. Verder onderzoek is nodig om inzicht te krijgen in hoe dit het beste kan worden gedaan.

Table of Contents

Introduction	5
Methods	9
<i>Participants</i>	9
<i>Data collection</i>	9
<i>Data analysis</i>	12
Results	14
<i>Sleep difficulties</i>	14
<i>Homework practices</i>	14
<i>Relation between homework and sleep</i>	15
<i>Determinants of late night homework</i>	18
Discussion	23
<i>Implications for further research</i>	25
<i>Practical recommendations</i>	26
<i>Strengths and limitations</i>	26
<i>Conclusion</i>	27
References	28
Appendix I: Results of the interviews	30
Appendix II: Questionnaire	31

Introduction

Sleep is very important, especially for adolescents. Good sleep is, among other things, determined by good sleep quality which means, for example, needing less than half an hour to fall asleep or waking up rested in the morning (Stevens et al., 2018). Another indicator of good sleep is sleep quantity and therefore it is important to achieve the recommended hours of sleep (Hirshkowitz et al., 2015). However, when it comes to adolescents, research shows that 65.2% of adolescents in the Netherlands between the ages of 12 and 24 years old have a bad sleep quality and that 42.4% also experience a bad sleep quality. Furthermore, 42.7% do not achieve the recommended hours of sleep, which is at least 9 hours for the 12- and 13-years old, 8 hours for the 14- till 17-years old and 7 hours for the 18- till 24-years old (Hirshkowitz et al., 2015; Timmermans, 2019). Another study, conducted among Dutch adolescents between the ages of 12 and 16 years old, shows that 21.6% experience a bad sleep quality and that 29.2% do not achieve the recommended hours of sleep (Stevens et al., 2018). Although these percentages differ from the ones found by Timmermans (2019), it can be concluded that sleep difficulties are very common among adolescents like not getting enough hours of sleep and having or experiencing a bad sleep quality.

Inadequate sleep has significant consequences on various key aspects of health and function among adolescents, including somatic and psychosocial health, school performance and risk taking behaviour (Medic, Wille, & Hemels, 2017; Shochat, Cohen-Zion, & Tzischinsky, 2014). Poor sleep among adolescents is for example associated with unhealthy dietary habits, being overweight or obese, less physical activity and a higher number of illnesses (Tambalis, Panagiotakos, Psarra, & Sidossis, 2018; Tanaka et al., 2002). Furthermore, sleep is related to mood disturbances and the development of depressive symptoms and an improvement in sleep may lead to improvement in mental health functioning (Medic et al., 2017; Owens, 2014). In the long-term, inadequate sleep can even lead to hypertension, cardiovascular disease, type 2 diabetes mellitus and an increased risk of cancer (Medic et al., 2017). To prevent adolescents from these consequences, it is important to motivate them to change their sleep behaviour.

Research shows that many adolescents already want to improve their sleep behaviour. For example in the study of Gruber, Somerville, Paquin and Boursier (2017), half of the participants said they intended to try to sleep more and 43% wanted to go to bed earlier. Also in the study of Paterson, Reynolds, Duncan, Vandelanotte and Ferguson (2019), the majority of participants mentioned they actually want to improve their sleep behaviour, however, few reported previous success. The low rate of success can partly be explained by the fact that there are many misconceptions among adolescents about strategies to improve sleep. For example, the following methods are wrongly seen as a good way to improve sleep behaviour: watching TV to fall asleep, exercising before bed, taking naps to reduce sleep deprivation and drinking alcohol to promote sleepiness (Díaz-Morales, Prieto, Barreno, Mateo, & Randler, 2012; Noland, Price, Dake, & Telljohann, 2009; Owens, Stahl, Patton, Reddy, & Crouch, 2006; Quante et al., 2019). Furthermore, many adolescents do not know about the negative effects of using the bed for non-sleep activities, trying to fall asleep without having a sleep sensation, going to bed two hours earlier than usual and recovering lost sleep by sleeping for a long time.

They also do not know the positive effect of getting up when it is difficult to fall asleep (Díaz-Morales et al., 2012; Digdon, 2010). These findings indicate that a lack of knowledge is a barrier for improving sleep behaviour among adolescents.

However, an increase in knowledge will lead to only modest improvements in sleep and knowledge on its own is insufficient to motivate adolescents to get adequate sleep (Digdon, 2010; Noland et al., 2009; Peach, Gaultney & Ruggiero, 2018). This is shown by, among other things, the finding that many adolescents know they should spend more time on sleeping, however they often do not succeed (Paterson et al., 2019). For example, many adolescents use mobile phones during bedtime while they are aware of its negative effects on sleep (Quante et al., 2019). Furthermore, many adolescents know the negative effect of worrying in bed and thus they want to ‘switch off’ their brain to improve their sleep, however this is seen as very difficult (Digdon, 2010; Paterson et al., 2019). In addition, many adolescents do not succeed to spend more time on sleeping because of doing homework (Paterson et al., 2019). Especially the latter seems to be a primary barrier to good sleep among adolescents and therefore more attention is needed for this topic (Gaarde et al., 2018; Noland et al., 2009).

Different studies show that doing homework before bedtime is an important barrier for good sleep, mainly influencing sleep quantity and perceived sleep quality (Gaarde et al., 2018; Noland et al., 2009; Timmermans, 2019). The time spent on doing homework cuts into sleep on a daily basis (Gillen-O’Neel, Huynh, & Fuligni, 2013) which is also mentioned by the following person: “I can’t sleep earlier or else I won’t have my homework done” (Gaarde et al., 2018). Examples of reasons for doing homework before bedtime are starting too late due to full schedules or afterschool activities (such as sports) or due to poor time management (Gaarde et al., 2018). However, concern of greater importance is that some adolescents find homework more important than their sleep and thus prioritize this over sleep (Quante et al., 2019). Parents also play a role in this, shown by the study of Gaarde et al. (2018) in which 47% of the participants mentioned that their parents do not care how much sleep they get as long as they get good grades. A 18-year old mentioned the following: “They like seeing me work hard all night on school work” (Gaarde et al., 2018). These findings suggest that adolescents consciously prioritize homework over a good night of sleep which results in doing late night homework. To motivate adolescents to change their sleep behaviour, reasons for doing late night homework should be investigated.

Theoretical framework

One of the most widely applied models for predicting and changing health behaviours is the Theory of Planned Behaviour (TPB) (Ajzen, 1991; Zhao, Feng, Garg, & Kelly, 2019). The application of this theory to a particular health behaviour provides a host of information that is useful to understand this behaviour or to implement interventions aimed at changing this behaviour (Ajzen, 1991). The TPB states that the proximal determinant of behaviour is intention, which is an indication of how hard people are willing to try to perform the behaviour (Ajzen, 1991; Knowlden, Sharma, & Bernard, 2012; Kor & Mullan, 2011; Zhao et al., 2019). As a general rule, the stronger the intention to engage in a certain behaviour, the more likely a person will perform that behaviour (Ajzen, 1991). Intention is predicted by three variables:

attitude, subjective norm and perceived behavioural control. Attitude refers to the degree to which a person has a favourable or unfavourable evaluation or appraisal of the particular behaviour, subjective norm refers to the perceived social pressure to perform or not to perform the behaviour and perceived behavioural control is about the perceived ease or difficulty of performing the behaviour which is assumed to reflect past experience as well as anticipated barriers (Ajzen, 1991). Generally, the more favourable the attitude and subjective norm with respect to a behaviour, and the greater the perceived behavioural control, the stronger should be the intention to perform the behaviour (Ajzen, 1991). Not only intention but also perceived behavioural control directly predicts behaviour performance. This can be explained by the fact that if perceived behavioural control increases, although intention remains the same, the more likely a person will perform the behaviour (Ajzen, 1991). A schematic overview of the TPB is given in Figure 1.

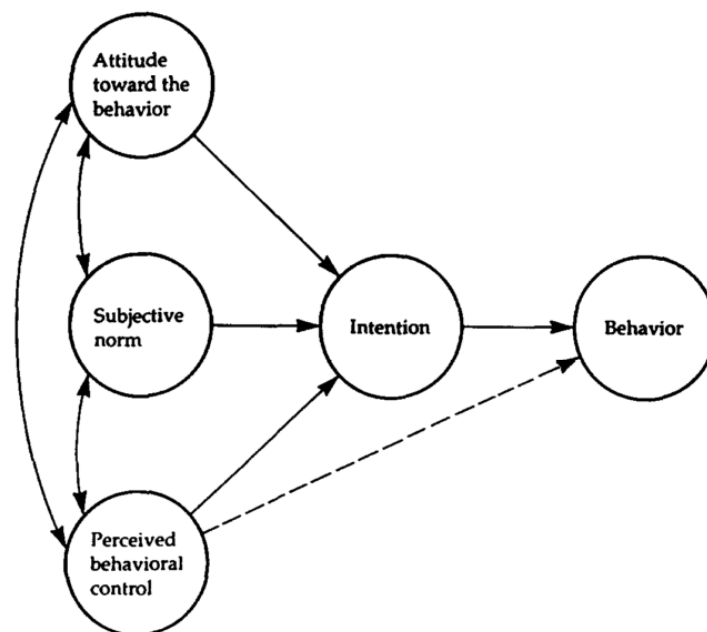


Figure 1. Theory of Planned Behaviour (Ajzen, 1991).

Although the TPB is widely used, its constructs are expected to vary across behaviours (Ajzen, 1991). Focusing on sleep related behaviours, Knowlden et al. (2012) found that perceived behavioural control was the strongest predictor, followed by attitude and finally subjective norm. In the opposite, Kor & Mullan (2011) found subjective norm as the strongest predictor for sleep intention. However, this could be explained by the fact that the majority of their participants (79%) still lived at home with their parents while in the study of Knowlden et al. (2012) no one lived with their parents anymore. Despite these different findings, the TPB has found to be a useful framework for understanding and predicting intention and behaviours related to sleep (Knowlden et al., 2012; Kor & Mullan, 2011).

However, as mentioned earlier, many adolescents already have the intention to improve their sleep behaviour (Gruber et al., 2017; Paterson et al., 2019) but often do not succeed. Looking at the TPB, this indicates a discrepancy between intention and behaviour. This is also known as the ‘intention-behaviour gap’ suggesting that not all intentions are translated into behaviour

(Kor & Mullan, 2011). This gap can be explained by the fact that intention leads to behaviour only if the particular behaviour is under volitional control (i.e. if the person can decide at will to perform or not perform the behaviour). When the behaviour is under volitional control, intention alone should be sufficient to predict behaviour. However, when volitional control declines, the addition of perceived behavioural control should become increasingly useful (Ajzen, 1991).

To use the TPB as a framework for predicting and/or changing behaviour, the behaviour to be investigated should be concrete and specific (Francis et al., 2004). As mentioned above, doing homework before bedtime is an important barrier for good sleep (Gaarde et al., 2018; Noland et al., 2009; Timmermans, 2019). Although some studies investigated the relation between homework and sleep, they often are more focused on the influence of doing homework on sleep rather than on the behavioural determinants of doing homework before bedtime. Studies that, for example, focused on the role of parents, as described earlier, are scarce and have not been conducted in the Netherlands yet. Therefore, this study will be the first one in the Netherlands that will investigate the determinants of doing homework before bedtime on the basis of the TPB. Because the findings about homework as a barrier for sleep mainly apply to younger adolescents (Gaarde et al., 2018; Noland et al., 2009), this study will focus on high school students (aged about 12-18 years). The aim for this study is thus to get insight into which determinants are predictive for doing homework before bedtime and how this is related to sleep difficulties among high school students. Furthermore, because previous research showed that experienced school pressure is higher for girls than boys and that this pressure increases by age and educational level (Stevens et al., 2018), demographics will also be taken into account in this study. This leads to the following research questions:

- How often do high school students make their homework (less than) one hour before bedtime?
- To what extent is there a difference in sleep difficulties (quality, perceived quality and quantity) between high school students who do and do not make their homework less than one hour before bedtime?
- Which determinants of the Theory of Planned Behaviour are predictive among high school students for doing homework (less than) one hour before bedtime?
- To what extent are sleep difficulties, the behaviour (late night homework) and its determinants influenced by demographics (age, gender and educational level)?

Methods

In this study, a cross-sectional survey design was used.

Participants

The study was conducted among Dutch adolescents. Participants had to be in high school to be included. They all participated voluntarily and were recruited through social media channels, such as Facebook and Instagram. Furthermore, the questionnaire was spread among high school students from the youth panel of TeamAlert ($n=1740$). Participants gave their informed consent by filling in the questionnaire. A total of 481 participants completed the questionnaire. Some participants were excluded because of the following reasons: they were not in high school ($n=20$) or they gave a wrong answer on the control question ($n=8$), which was added to check whether respondents paid attention when filling in the questionnaire. Furthermore, one participant was excluded because of reporting an age of 23 years which is very unlikely for a high school student. In total, 29 participants were excluded. The final sample consisted of 452 participants with 375 girls, 73 boys and four people who did not identify with these gender categories. The average age was 15.4 years ($SD=1.40$) ranging from 11 till 19 years. All demographics can be found in Table 1.

Table 1
Demographics

	Mean (<i>SD</i>)	n (%)
Age ($n = 449$)	15.4 (<i>1.40</i>)	
Gender ($n = 452$)		
Boys		73 (16.2%)
Girls		375 (83.0%)
Neutral		4 (0.9%)
Educational level ($n=452$)		
Practical education		1 (0.2%)
VMBO ¹		80 (17.7%)
HAVO ²		116 (25.7%)
Combination HAVO/VWO		11 (2.4%)
VWO ³		244 (54.0%)

¹ Voorbereidend Middelbaar Beroeps Onderwijs; ² Hoger Algemeen Voorgezet Onderwijs; ³ Voorbereidend Wetenschappelijk Onderwijs

Data collection

The questionnaire was developed in accordance with the guidelines for constructing a TPB questionnaire (Azjen, 2006; Francis et al., 2004). Seven qualitative interviews were conducted of which the results were used as input for the questionnaire. An overview of the most important results of the interviews can be found in Appendix I.

The questionnaire consisted of two main parts, one about homework and one about sleep. Assuming that high school students mainly get homework during the week, questions were

focused on schooldays and not on weekends. The final questionnaire can be found in Appendix II.

Homework

The first part of the questionnaire focused on homework. First of all, people were asked about the average number of hours they spend on homework each school day and at what moments of the day they mainly make their homework. The behaviour of interest, late night homework, was assessed by the following question: “On average, how often are you still working on your homework in the hour before you go to bed on weekdays?” where the answers varied from zero times per week till five times per week.

Thereafter, the determinants of the TPB were assessed: attitude, subjective norm, perceived behavioural control and intention. All determinants were measured on a 5-point Likert scale.

Attitude towards late night homework was subdivided into three different constructs: direct attitude, advantages of doing late night homework and disadvantages of late night homework.

Direct attitude towards late night homework was assessed by four single items which were supposed to measure direct beliefs (e.g. “Doing homework late at night is... unhealthy versus healthy”). The mean of the four items was calculated resulting in a final score varying between 1 and 5, with a score above 3 indicating a positive attitude towards late night homework and a score below 3 indicating a negative attitude. The four items had good internal consistency ($\alpha=.72$)

Advantages of late night homework were measured by four single items (e.g. “If I make homework late at night, I like that I can first relax in the afternoon after school”). An overview of wording of all items can be found in Table 7. A higher final mean score (1-5) indicated more experienced advantages of doing late night homework and thus a stronger positive attitude. The four items had poor internal consistency ($\alpha=.50$), therefore one item (“If I make homework late at night, I can ask questions to my parents because they are home”) was omitted from the scale and thus not included in statistical analyses except for descriptive statistics. Omitting this item from the scale led to acceptable internal consistency ($\alpha=.60$).

Disadvantages of late night homework were measured by five single items (e.g. “If I make homework late at night, I have too little time to finish the homework”). A higher final mean score (1-5) indicated more experienced disadvantages of doing late night homework and thus a stronger negative attitude. The five items had acceptable internal consistency ($\alpha=.69$).

Subjective norm was supposed to be assessed by five single items, however these items had unacceptable reliability and the scale was therefore subdivided into two constructs: injunctive norms, which reflect what important people think a person should do and descriptive norms, which reflects what important people actually do (Francis et al., 2004).

Injunctive norms were assessed by four single items (e.g. “My parents/guardians think that I should do my homework in the evening if I do not finish it during the day”). A higher final mean score (1-5) indicated stronger experienced injunctive norms to do homework late at night. The four items still had unacceptable reliability and Cronbach’s alpha could only become acceptable by omitting two items from the scale (“My parents/guardians think it is better for me to do my homework in the afternoon instead of late at night” and “My teachers think it is better for me to do my homework in the afternoon instead of late at night”). The two remaining items had thus acceptable internal consistency ($\alpha=.60$). Because of the finding that parents play

an important role in the homework behaviour of their children (Gaarde et al., 2018), one omitted item (“My parents/guardians think it is better for me to do my homework in the afternoon instead of late at night”) was expected to still be an important one and was therefore taken further in statistical analyses as a single item. This item was labelled as parents’ preference for moment of homework. After recoding this item, a higher score (1-5) indicated a stronger experienced norm from parents/guardians to do homework late at night. The other item that was omitted from the scale was not further included in statistical analyses, except for descriptive statistics.

Descriptive norms were assessed by one single item (“Most classmates and/or friends do their homework late at night”). A higher final mean score (1-5) indicated a stronger experienced descriptive norm to do homework late at night.

Perceived behavioural control to finish homework before late night was assessed by three single items (e.g. “I get too much homework from school to finish it in the afternoon”). A higher final mean score (1-5) indicated a stronger feeling of control to finish homework before late night. The three items had acceptable internal consistency ($\alpha=.61$).

Intention to finish homework before late night was measured by three single items (e.g. “I want to finish my homework at least one hour before bedtime in the forthcoming month”). A higher final mean score (1-5) indicated a stronger intention to finish homework before late night. The three items had good internal consistency ($\alpha=.73$).

Finally, as a control variable, rules about homework were measured by one single item (“I made clear agreements with my parents/guardians about when to do my homework”) with a higher score (1-5) indicating stricter rules.

Sleep

The second part of the questionnaire focused on sleep which was subdivided into sleep quality, perceived sleep quality and sleep quantity.

Sleep quality was assessed by the shortened Pittsburgh Sleep Quality Index (PSQI) which contains thirteen items (Famodu et al., 2018). Most of the original items of the shortened PSQI seemed appropriate to use for adolescents, however some items were simplified to make them easier to understand. Furthermore, based on the study of de la Vega et al. (2015), in which the original PSQI was modified to make it more appropriate for adolescents, one item (i.e. “During the past month, how often have you had trouble staying awake while driving, eating meals or engaging in social activity”) was replaced with text referring to making homework instead of driving because the latter does (mostly) not apply to high school students. This study showed appropriate reliability ($\alpha=.72$) and adequate psychometric properties for using a modified version of the PSQI in adolescents (de la Vega et al., 2015).

The thirteen items of the PSQI were based on five components: sleep latency (e.g. “During the past month, how long has it taken you to fall asleep?”), sleep quantity (i.e. “How many hours of sleep did you get per night during the week?”), sleep disturbances (e.g. “During the past month, how often did you wake up in the middle of the night or early morning?”), daytime disfunction (e.g. “During the past month, how often did you have difficulties to keep up enthusiasm to get things done?”) and sleep efficiency which was calculated by dividing the hours of sleep by the hours spent in bed. These components were scored according to the guidelines of the shortened PSQI, based on a Likert scale from 0 till 3 (Famodu et al., 2018).

Because of the fact that recommendations about sleep quantity are different per age, this component was scored differently for each age group (12-13 years, 14-17 years and 18-24 years), based on the recommendations from the National Sleep Foundation (Hirshkowitz et al., 2015).

Finally, the five components were added to yield one score with a range of 0-15 points, with a higher score indicating poorer sleep quality. The five components of the PSQI together had appropriate reliability ($\alpha=0.70$), just like in the study of de la Vega et al. (2015).

Perceived sleep quality was assessed by one single item (“During the past month, how would you rate the quality of your sleep?”) from the original PSQI (Buysse, Reynolds, Monk, Berman, & Kupfer, 1988), that was not included in the shortened PSQI. Participants could rate their sleep quality with “very good”, “fairly good”, “fairly bad” and “very bad” to get a score on a scale of 0 till 3, with a higher score indicating poorer perceived sleep quality (Buysse et al., 1988).

Sleep quantity (in hours) was assessed by one single item from the shortened PSQI which was already included in the questionnaire as a component of sleep quality.

Finally, as a control variable, rules about sleep were measured by one single item (“I made clear agreements with my parents/guardians about what time I go to sleep”) with a higher score (1-5) indicating stricter rules.

Data analysis

All data was prepared and analysed in IBM SPSS Statistics 26. Some problems arose while preparing the data, i.e. sleep duration could not be scored for a few participants ($n=3$) because their age, which was needed for scoring on the basis of the recommendations from the National Sleep Foundation (Hirshkowitz et al., 2015), was not known. Furthermore, to calculate sleep efficiency, total hours spent in bed per night needed to be calculated based on bedtime and time of waking up. However, a few participants mentioned they went to bed earlier than 19.00 hours ($n=1$) or later than 02.00 hours ($n=3$) and therefore sleep efficiency could not be calculated. Also some participants ($n=12$) reported more hours of sleep per night than hours spent in bed, which is pretty unrealistic and this led to a sleep efficiency of more than 100%. If scores of sleep efficiency could not be calculated or if a score was higher than 100% then those scores were defined as missing values.

Because sleep duration and sleep efficiency were both components of sleep quality, a missing value for one of these components also led to a missing value for the final score for sleep quality. In total, 19 respondents did not get a final score for sleep quality.

For educational level applies that the levels practical education and combination HAVO/VWO were excluded further in the data analyses and defined as missing values because of the fact that only few participants ($n=12$) did one of these levels. The same applies for gender, where only four people reported to feel neutral and therefore this category was excluded further in the data analyses and defined as a missing value.

All cases with a missing value ($n=35$) were deleted pairwise in the analyses.

Relation between homework and sleep

First of all, descriptive analyses were conducted. For descriptive analyses, the three continuous variables of sleep (sleep quality, perceived sleep quality and sleep quantity) were recoded into

categorical ones to get insight into the percentage of people with sleep difficulties. A score of higher than 4 on sleep quality indicated poor sleep quality and a score of higher than 1 on perceived sleep quality indicated poor perceived sleep quality (Famodu et al., 2018). Furthermore, a score of 1 or higher on sleep quantity indicated insufficient sleep quantity, according to the recommendations from the National Sleep Foundation (Hirshkowitz et al., 2015).

After the descriptive analyses, a *correlation matrix* was prepared to check the correlation between sleep, demographics, late night homework and rules about sleep. In addition, a *hierarchical regression analysis* was conducted for predicting each component of sleep with demographics as predictors in model 1 and late night homework and rules about sleep added as predictors in model 2.

Determinants of late night homework

After the descriptive analyses, a *correlation matrix* was prepared to check the correlation between late night homework, demographics and the determinants. Thereafter, a *hierarchical regression analysis* was conducted for predicting intention with demographics in model 1 and the determinants in model 2. Finally, a *hierarchical regression analysis* was conducted again to predict the behaviour (late night homework). After controlling for demographics in model 1, the TPB was followed by entering intention in model 2, perceived behavioural control in model 3 and the other determinants in model 4.

Results

Sleep difficulties

Descriptive statistics for sleep can be found in Table 2. Although only one third of the people reported to perceive their sleep quality as poor, nearly three out of four actually had poor sleep quality. Focusing on sleep quantity, about two third of the people did not achieve the recommended hours of sleep per night. Overall, almost four out of five respondents had difficulties on at least one of the three components of sleep. This means that only 22% of the people did not have any sleep difficulties at all. In addition, almost one third had difficulties on all three components of sleep.

Table 2

Descriptive statistics for sleep

	Mean (SD)	n (%)
Sleep quality (0-15 ^a , n=433)	6.57 (2.93)	
People with poor sleep quality ^b		312 (72%)
Sleep efficiency	89.48 (11.10)	
People with poor sleep efficiency ^c		130 (30%)
Time in bed (hours)	8.26 (1.16)	
Perceived sleep quality (0-3 ^a , n=452)	1.25 (0.89)	
People with poor perceived sleep quality ^d		159 (35%)
Sleep quantity in hours (n=452)	7.34 (1.25)	
People who do not achieve the recommended hours of sleep (n=449)		276 (62%)
People with difficulties on at least one of these three components		339 (78%)
People with difficulties on all these components		127 (29%)

^a Higher scores mean more difficulties; ^b Scored higher than 4; ^c <85% (Famodu et al., 2018); ^d Scored higher than 1

Homework practices

Descriptive statistics for homework practices can be found in Table 3. Most people reported to spend between 1 and 2 hours per day on homework. The majority started homework in the afternoon and finished it in the evening. About one third reported the evening as their main moment of making homework. In total, 80% of the people made their homework in the evening, either as the main moment of making homework or as a moment of finishing homework. When it comes to late night homework, (less than) one hour before bedtime, the majority (87%) reported to do this at least once a week. About half did this three or more times per week.

Table 3*Descriptive statistics for homework practices (n=452)*

	Mean (SD)	n (%)
Time spent on homework per day		
Less than 30 minutes		70 (16%)
30 minutes till 1 hour		125 (28%)
Between 1 and 2 hours		169 (37%)
More than 2 hours		88 (20%)
Main moment of homework		
Never		7 (2%)
In the morning before school		4 (1%)
In the afternoon after school		83 (18%)
Starting in the afternoon and finishing in the evening		197 (44%)
In the evening		161 (36%)
Late night homework^a	2.54 (1.62)	
Never		59 (13%)
1 time per week		80 (18%)
2 times per week		79 (18%)
3 times per week		93 (21%)
4 times per week		72 (16%)
5 times per week		69 (15%)

^a (Less than) one hour before bedtime***Relation between homework and sleep****Descriptive statistics*

Table 4 shows the percentages of high school students with sleep difficulties broken down by homework practices. The results show that the percentage of people that reported sleep difficulties was higher, for all three components of sleep, in high school students who made homework in the evening compared to the ones who made homework in the afternoon. When it comes to late night homework, the percentage of people with sleep difficulties increased for all three components of sleep when they did homework late at night more often.

Table 4*Descriptive statistics for sleep difficulties broken down by homework practices*

	Sleep difficulties		
	Poor quality ^a (n=422)	Poor perceived quality ^b (n=441)	Insufficient quantity (n=438)
Main moment of homework^c			
In the afternoon	61%	24%	40%
Starting in the afternoon, finishing in the evening	70%	40%	59%
In the evening	80%	35%	76%
Late night homework, times per school week			
	Poor quality ^a (n=433)	Poor perceived quality ^b (n=452)	Insufficient quantity (n=449)
0	51%	19%	42%
1	62%	28%	49%
2	70%	34%	55%
3	82%	37%	68%
4	83%	46%	76%
5	80%	46%	77%

^a Scored higher than 4; ^b Scored higher than 1; ^c Because only few people responded with 'never' or 'in the morning before school', those were removed from the analysis

Correlations

Table 5 shows the correlations of sleep with demographics, late night homework and rules about sleep. Late night homework was significantly correlated with all components of sleep, but most strongly with sleep quantity. People who did homework late at night more often scored higher on sleep quality and perceived sleep quality, which indicates more difficulties, and they reported lower sleep quantity. Rules about sleep were only significantly correlated with sleep quantity where people with stricter rules reported more hours of sleep. Furthermore, older people reported less sleep quantity than younger people and girls reported more sleep quantity than boys. Last, higher educated people scored lower on perceived sleep quality which indicates less difficulties.

Table 5*Correlations of sleep with demographics, late night homework and rules about sleep*

	Sleep quality^a	Perceived sleep quality^a	Sleep quantity^b
Age	.04	.05	-.24***
Gender ^c	-.01	.01	.11*
Educational level ^d	-.09	-.17***	.08
Late night homework ^c	.27***	.22***	-.32***
Rules about sleep	-.09	-.04	.23***

^a Higher scores mean more difficulties; ^b In hours; ^c Point-biserial correlation (0 = boy, 1 = girl); ^d Spearman's rho (0 = VMBO, 1 = HAVO, 2 = VWO); ^e Times per school week

* $p < .05$; ** $p < .01$; *** $p < .001$

Predicting sleep

The results of the regression analysis on sleep are given in Table 6. The first model, including the demographics, did not significantly predict sleep quality. Adding late night homework and rules about sleep led to a significant model which predicted 8.6% of the variance in sleep quality ($R^2 = .086$, $F_{6,414} = 6.47$, $p < .001$). However, only late night homework was a significant predictor. Late night homework positively predicted sleep quality which indicates that an increase in the frequency of late night homework leads to a higher score for sleep quality (which means more difficulties).

Focusing on perceived sleep quality, model 1 significantly predicted 3.5% of the variance ($R^2 = .035$, $F_{4,431} = 3.92$, $p < .01$). Only VWO was a significant negative predictor, implying that people from VWO score lower on perceived sleep quality compared to VMBO, which indicates that they experience a better sleep quality. Model 2 significantly predicted 8.4% of the variance of perceived sleep quality ($R^2 = .084$, $F_{6,429} = 6.52$, $p < .001$) with late night homework as a significant positive predictor. This indicates that an increase in times of late night homework per school week leads to a higher score for perceived sleep quality (which means more difficulties). Just like in model 1, VWO remained a significant predictor in model 2.

Looking at sleep quantity, model 1 significantly predicted 8.3% of the variance ($R^2 = .083$, $F_{4,431} = 9.76$, $p < .001$) with age and gender as significant predictors. Age negatively predicted sleep quantity indicating that older people sleep less hours per night. Gender was a positive predictor implying that girls sleep more hours per night than boys. Model 2 significantly predicted 19.1% of the variance in sleep quantity ($R^2 = .191$, $F_{6,429} = 16.87$, $p < .001$), both late night homework and rules about sleep were significant predictors. Late night homework was a negative predictor which indicates that an increase in the frequency of late night homework leads to lower sleep quantity. Rules about sleep positively predicted sleep quantity implying that stricter rules about sleep lead to more hours of sleep per night. Just like in model 1, age and gender remained significant predictors in model 2.

Table 6
Hierarchical regression analysis predicting sleep

	Sleep quality ^a		Perceived sleep quality ^a		Sleep quantity ^b	
	Model 1 (β)	Model 2 (β)	Model 1 (β)	Model 2 (β)	Model 1 (β)	Model 2 (β)
Age	.04	.01	.07	.06	-.24***	-.18***
Gender (ref: boys)	-.01	-.02	-.01	-.01	.11*	.13**
Educational level (ref: VMBO)						
HAVO	-.02	-.01	-.10	-.09	-.02	-.02
VWO	-.10	-.10	-.23***	-.23***	.10	.10
Late night homework ^c		.27***		.22***		-.30***
Rules about sleep		-.05		.01		.11*
<i>F</i>	.96	6.47***	3.92**	6.52***	9.76***	16.87***
<i>R</i> ²	.009	.086	.035	.084	.083	.191

^a Higher scores mean more difficulties; ^b In hours; ^c Times per school week

* $p < .05$; ** $p < .01$; *** $p < .001$

Determinants of late night homework

Descriptive statistics

Direct attitude had a mean scale score of 2.2 ($SD = 0.8$) indicating that high school students had a negative direct attitude towards late night homework. In general, most high school students had the intention to finish homework before late night (mean = 3.5, $SD = 0.9$). About two third reported that they want to finish homework at least one hour before bed and that they are going to try to finish homework during the day.

An overview of the indirect determinants is given in Table 7. Although having a negative direct attitude of late night homework and intending to finish homework before late night, high school students also reported advantages of late night homework. Especially the possibility to first relax in the afternoon after school was reported as an advantage of late night homework. The main disadvantage of late night homework was going to bed later. Furthermore, more than half reported that they sometimes still worry about homework in bed after doing homework late at night. Most people reported that both their parents/guardians and their teachers think it is better to do homework in the afternoon. More than half reported that they think that most classmates and/or friends do their homework late at night. Although one third of the people reported to make clear agreements about bedtime, almost nobody made agreements about homework.

While having the intention to finish homework before late night, people reported that this is difficult. Three out of four reported that they find it difficult to do homework in the afternoon after a long school day. The majority also reported to get too much homework from school to finish it in the afternoon.

Table 7*Descriptive statistics for indirect determinants and scale items (range 1-5, n=452)*

	(Totally) disagree	Neutral	(Totally) agree	Mean (SD)
Advantages				
If I make homework late at night...				
1. I like that I can first relax in the afternoon after school	11%	15%	74%	3.9 (1.1)
2. I can do other things before, like sports	16%	21%	63%	3.6 (1.1)
3. I can concentrate better than in the afternoon	43%	19%	38%	2.9 (1.3)
4. I can ask questions to my parents because they are home	40%	27%	33%	2.8 (1.2)
Scale score ($\alpha=.60$) ^a				3.5 ^a (0.9)
Disadvantages				
If I make homework late at night...				
1. I go to bed later	12%	10%	78%	3.9 (1.0)
2. I do not like it that I do not have time to do other things	15%	18%	67%	3.7 (1.1)
3. I have too little time to finish the homework	17%	25%	58%	3.5 (1.0)
4. I am too tired to concentrate well	23%	23%	54%	3.5 (1.1)
5. I sometimes still worry about homework in bed	32%	14%	55%	3.3 (1.3)
Scale score ($\alpha=.69$)				3.6 (0.7)
Injunctive norm				
1. My parents/guardians think it is better for me to do my homework in the afternoon instead of late at night*	12%	24%	64%	3.7 (1.0)
2. My teachers think it is better for me to do my homework in the afternoon instead of late at night*	7%	42%	51%	3.5 (0.9)
3. My parents/guardians think that I should do my homework in the evening if I did not finish it during the day	41%	28%	30%	2.7 (1.2)
4. From my parents/guardians I have to finish my homework before I can go to bed	69%	18%	13%	2.1 (1.1)
Scale score ($\alpha=.60$) ^b				2.4 ^b (1.0)
Descriptive norm				
Most classmates and/or friends do their homework late at night	9%	33%	59%	3.7 (0.9)
Rules				
I made clear agreements with my parents/guardians about what time I go to sleep	42%	28%	30%	2.8 (1.2)
I made clear agreements with my parents/guardians about when to do my homework	76%	15%	9%	1.9 (1.0)
Perceived behavioural control^c				
1. After a long school day, I find it difficult to do my homework in the afternoon instead of in the evening*	14%	13%	74%	3.9 (1.1)
2. I get too much homework from school to finish it in the afternoon*	21%	20%	59%	3.6 (1.2)
3. Because I have other things to do after school (e.g. exercising or cycling home), I can only do my homework late at night*	28%	18%	54%	3.4 (1.2)
Scale score ($\alpha=.61$)				2.4 (0.9)

^a Item 4 omitted from scale; ^b Item 1 and 2 omitted from scale; ^c To finish homework before late night

* Items that are recoded before calculating scale scores

Correlations

Table 8 shows the correlations between late night homework, the determinants and the demographics. Late night homework was significantly correlated with all determinants except for disadvantages and the constructs of subjective norm (parent's preference for moment of homework, injunctive norm and descriptive norm). Late night homework was most strongly correlated with perceived behavioural control and intention.

Intention to finish homework before late night was significantly correlated with all determinants except for injunctive and descriptive norm. Intention was most strongly correlated with direct attitude, advantages, disadvantages and with parents' preference for moment of homework.

None of the demographics were significantly correlated with late night homework or intention. However, they did have significant correlations with some other determinants. The strongest correlations were found between age and rules about sleep and between age and rules about homework where older people reported less rules about both sleep and homework.

Table 8

Correlations between late night homework, determinants and demographics

Variables	1	2	3	4	5	6	7	8	9	10	11
Age	.06	-.02	.04	.12	.12	-.17**	.14*	-.24**	-.39**	-.18**	-.12
Gender ^a	.05	-.01	.05	.07	.03	-.14*	-.00	-.05	-.01	-.05	.12
Educational level ^b	.03	.13*	.11	-.05	.02	-.13*	-.00	-.15*	.02	-.11	.09
1 Late night homework ^c	-										
2 Direct attitude	.14*	-									
3 Advantages	.28**	.41**	-								
4 Disadvantages	.09	-.45**	-.31**	-							
5 Parents' preference for moment of homework	.08	.26**	.25**	-.20**	-						
6 Injunctive norm	-.03	-.05	-.08	.07	-.21**	-					
7 Descriptive norm	.09	-.09	.04	.15*	-.02	-.01	-				
8 Rules about homework	-.14*	-.12	-.17**	.05	-.26**	.34**	-.06	-			
9 Rules about sleep	-.13*	-.09	-.16*	.04	-.29**	.31**	-.03	.42**	-		
10 Perceived behavioural control ^d	-.52**	-.02	-.30**	-.28**	-.13**	.05	-.20**	.17**	.16**	-	
11 Intention ^d	-.32**	-.45**	-.44**	.37**	-.35**	.10	.00	.26**	.26**	.26**	-

^a Point-biserial correlation (0 = boy, 1 = girl); ^b Spearman's rho (0 = VMBO, 1 = HAVO, 2 = VWO); ^c Times per school week; ^d To finish homework before late night

* $p < .01$; ** $p < .001$

Predicting intention to finish homework before late night

The results of the regression analysis on intention are given in Table 9. Model 1, including the demographics, significantly predicted 3.9% of the variance in intention to finish homework before late night ($R^2 = .039$, $F_{4,431} = 4.33$, $p < .01$). Only age and gender were significant predictors where older people had less intention to finish homework before late night and where girls had a stronger intention than boys. Adding the determinants in model 2 led to an increased explained variance of 46.3% in intention ($R^2 = .463$, $F_{13,422} = 27.99$, $p < .001$). All determinants were significant predictors of intention, except for injunctive and descriptive norm and rules

about sleep. Direct attitude, advantages of late night homework and parents' preference for moment of homework were all negative predictors. This indicates that a stronger positive attitude of late night homework, more experienced advantages thereof and a stronger norm from parents/guardians to do homework late at night leads to less intention to finish homework before late night. Disadvantages of late night homework, rules about homework and perceived behavioural control were all positive predictors. This implies that more experienced disadvantages of late night homework, stricter rules about homework and stronger perceived behavioural control to finish homework before late night, leads to a stronger intention to finish homework before late night. Just like in model 1, gender remained a significant predictor in model 2. An interesting finding is that age is not a significant predictor in model 2 anymore. Furthermore, VWO was not a significant predictor in model 1 but it is in model 2. These findings may indicate a confounding effect.

Table 9
Hierarchical regression analysis predicting intention

	Intention^a	
	Model 1 (β)	Model 2 (β)
Age	-.12*	-.05
Gender (ref: boys)	.12*	.12**
Educational level (ref: VMBO)		
HAVO	-.02	.02
VWO	.09	.20***
Direct attitude		-.23***
Advantages		-.17***
Disadvantages		.26***
Parents' preference for moment of homework		-.12**
Injunctive norm		-.01
Descriptive norm		.02
Rules about homework		.10*
Rules about sleep		.07
Perceived behavioural control ^a		.25***
<i>F</i>	4.33**	27.99***
<i>R</i> ²	.039	.463

^a To finish homework before late night

* $p < .05$; ** $p < .01$; *** $p < .001$

Predicting behaviour

The results of the regression analysis on late night homework are given in Table 10. The first model, including the demographics, did not significantly predict late night homework. Model 2, in which intention was added, significantly predicted 11.5% of the variance in late night homework ($R^2 = .115$, $F_{5,430} = 11.22$, $p < .001$). This percentage increased when perceived behavioural control was added in model 3. This model significantly predicted 31.2% of the variance in late night homework ($R^2 = .312$, $F_{6,429} = 32.37$, $p < .001$). Intention and perceived behavioural control were both negative predictors which indicates that a stronger intention or a stronger feeling of control to finish homework before late night leads to a decrease of actually doing homework late at night. The explained variance of late night homework barely increased when all determinants were added in model 4 ($R^2 = .326$, $F_{14,421} = 14.53$, $p < .001$). None of the added determinants were significant predictors. Just like in the models before, intention and perceived behavioural control remained significant predictors in model 4.

Table 10

Hierarchical regression analysis predicting late night homework

	Late night homework^a			
	Model 1 (β)	Model 2 (β)	Model 3 (β)	Model 4 (β)
Age	.06	.02	-.04	-.06
Gender (ref: boys)	.04	.08	.05	.04
Educational level (ref: VMBO)				
HAVO	-.03	-.04	-.09	-.09
VWO	.01	.04	-.04	-.05
Intention ^b		-.34***	-.21***	-.22***
Perceived behavioural control ^b			-.47***	-.43***
Direct attitude				.06
Advantages				.06
Disadvantages				.10
Parents' preference for moment of homework				-.07
Injunctive norm				.01
Descriptive norm				-.00
Rules about homework				-.03
Rules about sleep				-.03
<i>F</i>	.78	11.22***	32.37***	14.53***
<i>R</i> ²	.007	.115	.312	.326

^a Times per school week; ^b To finish homework before late night

* $p < .05$; ** $p < .01$; *** $p < .001$

Discussion

This is the first study that provides insight into which determinants of the TPB are predictive for doing homework late at night (one hour before bedtime) and how this is related to sleep difficulties among high school students. The main findings are that (1) sleep difficulties are very common in high school students, (2) high school students regularly do homework late at night which significantly predicts sleep quality, perceived sleep quality and sleep quantity and that (3) perceived behavioural control is the strongest predictor for doing late night homework, followed by intention. These findings will be discussed below.

Sleep difficulties

The results show that sleep difficulties are very common in high school students, which is in line with earlier studies conducted in the Netherlands. In this study, the majority (78%) had sleep difficulties on at least one of the three components of sleep (sleep quality, perceived sleep quality or sleep quantity). A total of 72% had poor sleep quality, 35% perceived their sleep quality as poor and 62% had insufficient sleep quantity. Interesting is the big difference in percentages of people who actually had poor sleep quality and who perceived their sleep quality as poor. This may imply that high school students do not see that they actually have a problem. However, it could also be that poor sleep quality is not experienced as a problem by high school students themselves and that it is just seen as a part of puberty where one must simply go through.

The percentages found in this study for poor sleep quality and poor perceived sleep quality are in line with the findings from Timmermans (2019), who found that 65% of the adolescents between the ages of 12 and 24 years old had poor sleep quality and that 42% perceived their sleep quality as poor. However, another study conducted in the Netherlands among people between 12 and 16 years old, found that only 22% perceived their sleep quality as poor (Stevens et al., 2018). This difference may be explained by the fact that, compared to the study of Stevens et al. (2018), the majority of the respondents in this study were girls (83%), which was also the case in the study of Timmermans (2019). Because of the finding that girls perceive their sleep quality as worse than boys (Stevens et al., 2018), it could be that the percentage of people with poor perceived sleep quality in this study would have been lower when boys were more represented.

The percentage found in this study for people with insufficient sleep quantity is higher than the one found by Timmermans (2019) and twice as high as the percentage found by Stevens et al. (2018). The big difference between the percentage of this study and the one from Stevens et al. (2018) can be explained by the fact that in the last study, sleep quantity was determined on the basis of bedtime and time of waking up. However, it is unlikely that people immediately fall asleep when they go to bed and therefore sleep latency should be taken into account. This was not included in the study of Stevens et al. (2018) and could thus explain the difference.

Last, it is good to mention that the current study focused on high school students (ranging from 11 till 19 year olds) which is not exactly the same age group as in the study of Stevens et al. (2018), who focused on 12 till 16 year olds, and Timmermans (2019), who focused on 12 till 24 year olds. This may also explain some of the differences in the findings above. Although the

findings of this study slightly differ from earlier studies, it can be concluded that sleep difficulties are very common in high school students and that it is a problem that needs attention.

Homework practices

The results of this study show that many high school students (80%) do their homework in the evening, either as a moment of finishing it or as their main moment of making homework. When it comes to late night homework, 87% reported to make homework in the hour before bedtime at least once a week. About half of the people did this three or more times per week. It is surprising that such a large group reported to spend their evening on homework. Where working people usually are finished when closing the door at work, this is apparently not the case for high school students when leaving school.

Although this study gives insight into the frequency of late night homework, it is not clear how much time is spent on homework late at night. Furthermore, it is not known how many times high school students exactly spend on homework at all. Further research might be useful to get insight into this.

Relation between late night homework and sleep

This study found that, after controlling for demographics, late night homework was a significant predictor for sleep quality, perceived sleep quality and sleep quantity. Doing homework more often late at night leads to poorer sleep quality, poorer perceived sleep quality and less sleep quantity. These findings are in line with earlier research in which homework was also found to be a barrier for good sleep (Gaarde et al., 2018; Noland et al., 2009; Timmermans, 2019). These studies showed that adolescents mentioned (late night) homework as a barrier for good sleep, however the relation of those two factors has never been studied. The current study did investigate the relation between late night homework and sleep and found that late night homework is a significant predictor for sleep, leading to more difficulties when doing homework late at night more often.

Although this study assessed the frequency of doing late night homework, it is not known how homework practices exactly look like among high school students. It might be that more factors play a role in the relation between homework and sleep, for example technology use which is also associated with sleep difficulties (Bartel et al., 2016). If high school students actually spend time on other things when doing homework, the relation between late night homework and sleep might be influenced. Therefore, further research is needed to gain more insight into the actual homework practices of high school students and to get a thorough understanding of the relation between late night homework and sleep.

Determinants of late night homework

As mentioned by Gaarde et al. (2018), some reasons for doing homework in the evening are starting too late due to full schedules or due to poor time management. This implies that it might not be in high school students' power to finish homework in the afternoon. This also seems to be confirmed in this study, shown by the result that high school students find it difficult to finish homework before late night while intending to do so. More than half agreed that they can only do homework late at night because they have other things to do after school. In addition, 59% reported to get too much homework from school to finish it in the afternoon. However, what

also needs to be mentioned is that many people in this study also reported advantages of late night homework such as the possibility to relax in the afternoon and to do other things before, like sports. It might be that the disadvantages of late night homework, such as going to bed later, do not outweigh these advantages which could indicate that late night homework is not necessarily seen as something negative and that people may even consciously choose to do so. Focusing on intention to finish homework before late night, this study shows that, after controlling for demographics, all determinants were significant predictors except for injunctive and descriptive norm and rules about sleep. All determinants together accounted for 46.3% of the variance in intention to finish homework before late night. Intention was most strongly predicted by direct attitude and disadvantages of late night homework and by perceived behavioural control to finish homework before late night. Looking at the demographics, higher education was associated with a stronger intention to finish homework before late night and girls had a stronger intention than boys.

The behaviour, late night homework, was significantly predicted by intention and perceived behavioural control, where the latter was the strongest predictor. Although the TPB assumes that the central determinant of behaviour is intention (Ajzen, 1991), intention on its own predicted only 11.5% of the variance in late night homework. This may indicate that intention is not completely translated into behaviour, also known as the 'intention-behaviour gap' (Kor & Mullan, 2011). This gap, in general, can partly be explained by the direct influence of perceived behavioural control on behaviour. This also seems to be the case in this study because adding perceived behavioural control as a predictor led to a significant model that predicted 31.2% of the variance in late night homework. Furthermore, it is known that intention can only predict behaviour when the behaviour in question is under volitional control, i.e. if the person can decide at will to perform or not perform the behaviour (Ajzen, 1991). As mentioned in the study of Knowlden et al. (2012), the less volitional control an individual has over a behaviour, the more significant perceived behavioural control will be in the prediction of that behaviour. In this study, perceived behavioural control was a much stronger predictor for late night homework than intention. This finding suggests that doing homework might be a behaviour over which people have lower volitional control.

Because of the finding that experienced school pressure is higher for girls than boys and that this increases by age and educational level (Stevens et al., 2018), it would have been logical that demographics also had some influence on the frequency of late night homework. However, none of the demographics were found to be significant predictors.

In conclusion, this study shows that perceived behavioural control is the main predictor for doing late night homework, followed by intention. Future intervention programs that aim to reduce late night homework among high school students should therefore mainly focus on increasing people's feeling of control to finish homework in time. Further research is needed to gain insight into how this can best be done.

Implications for further research

Further research is needed to get more insight into how much time high school students exactly spend on homework late at night. Besides the frequency of late night homework, what has been assessed in this study, the hours spent on homework late at night are also likely to have an influence on sleep and therefore this is important to investigate. Furthermore, it might be

interesting to investigate the total time spent on homework each day, and not only late at night. Because more than half of the participants reported to get too much homework from school to finish it in the afternoon, it could be that high schools actually ask too much from their students which makes it difficult to finish homework in time. Quantitative research, e.g. a diary study, may be appropriate to gain more insight into how much time is spent on homework in general, how much time is spent on homework late at night and to what extent this is in proportion with the rest of the day, e.g. with leisure time.

In addition, it is useful to investigate what doing homework exactly looks like among high school students. Nowadays, people are easily distracted by, for example, their mobile phone. It would be useful to investigate if high school students actually make homework when they say to do so or that they are mainly spending time on other things such as their mobile phone. It is no surprise that technology use on its own is also associated with sleep difficulties (Bartel et al., 2016). If it turns out that high school students mainly spend time on other things when doing homework, it could be that the relationship between late night homework and sleep difficulties is less strong or even does not exist. Qualitative research, e.g. in-depth interviews or focus groups, may be appropriate to gain more insight into the actual homework practices of high school students.

Last, it can be useful to investigate what high school students need to increase their feeling of control to finish homework in time. Although this study shows that perceived behavioural control is the strongest predictor for doing late night homework, it is not clear how this feeling of control can be strengthened. Qualitative research, e.g. interviews or focus groups, can be useful to obtain more insight into this.

Practical recommendations

Some practical measures may be taken to decrease the frequency of doing homework late at night among high school students. First of all, this study shows that rules about homework positively predicts the intention to finish homework before late night. However, only few people in this study reported to make clear agreements about making homework. Therefore, it might be a good idea that parents/guardians and high school students will be stimulated, for example by schools, to make agreements with each other over when to make homework. This will strengthen the intention to finish homework in time which might lead to a decrease in actually doing late night homework.

Furthermore, the results of this study indicate that future intervention programs with the aim to reduce late night homework should mainly focus on increasing people's feeling of control to finish homework in time. However, as mentioned earlier, research should be done first to investigate how people's feeling of control can best be strengthened.

Strengths and limitations

Several strengths and limitations of this study need to be mentioned. One strength is that this study is, as far as is known, the first that investigated the psychological determinants of doing homework late at night among high school students. Although there are some studies that investigated the relation between (late night) homework and sleep, none of them focused on the underlying reasons for doing homework late at night. Furthermore, as mentioned earlier, these studies did not assess how often it actually occurs that high school students do their homework

late at night. Because this study investigated the psychological determinants of late night homework and assessed how often this behaviour actually occurs, it has a valuable contribution to existing literature.

Another strength of this study is the large sample size which increases the external validity and thus makes the results more generalizable. However, at the same time it needs to be mentioned that the sample size mainly consisted of girls. This decreases the external validity and is therefore a limitation of this study.

Another limitation of this study is that the shortened version of the PSQI was translated into Dutch and was worded more easily to make it appropriate for high school students. This means that this version was not validated. Although the shortened PSQI originally is a validated instrument and the version in this study showed appropriate reliability ($\alpha=.70$), this is something that needs to be mentioned.

Furthermore, the scales that were supposed to indirectly measure the determinants (all determinants except for direct attitude and intention) did not have high internal consistency. Especially subjective norm had unacceptable internal consistency at first. Although Cronbach's alpha became acceptable by rescaling and omitting items from the scale, it could be questioned if the constructs of subjective norm were measured correctly. The fact that internal consistency was not that high for indirect measures may also be due to the logical reason that people can hold both positive and negative beliefs about the same behaviour (Francis et al., 2004). For example, people might agree with finding it difficult to do homework in the afternoon after a long school day while in the same time they disagree with getting too much homework from school to finish it in the afternoon. If this is the case, internal consistency of a particular scale (perceived behavioural control in this example) will be lower.

A final limitation that requires attention is the fact that this study is based on self-reported data. Although the questionnaire in this study was carefully framed to avoid response bias as much as possible, it is something that should be kept in mind when drawing conclusions.

Conclusion

This study showed that sleep difficulties are very common in high school students. Doing late night homework, which many high school students often do, is a significant predictor for sleep difficulties, leading to poorer sleep quality, poorer perceived sleep quality and less sleep quantity. In this study, late night homework was most strongly predicted by perceived behavioural control, followed by intention. This finding suggests that doing homework might be a behaviour over which people have lower volitional control. The lack of literature regarding this topic may indicate that doing homework, and the experienced pressure that comes with it, is underestimated and should be further explored. Future intervention programs that aim to reduce late night homework among high school students should mainly focus on increasing people's feeling of control to finish homework in time. Further research is needed to gain insight into how this can best be done.

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Appendix I: Results of the interviews

Table 11

Results of the interviews

Onderwerp	Quote
's Avonds huiswerk maken	De respondenten besteden gemiddeld tussen de 1 en 2 uur per dag aan hun huiswerk. Zes van de zeven respondenten geven aan weleens huiswerk te maken 's avonds. De andere respondent doet dat (bijna) nooit meer, maar maakte vorige jaren weleens huiswerk 's avonds laat of 's nachts.
Attitude tegenover het maken van huiswerk 's avonds (laat)	<p><u>Voordelen</u></p> <ul style="list-style-type: none"> + Eerst kunnen uitrusten na school (4x) + Minder snel afgeleid, betere concentratie (4x) + Eerst andere dingen kunnen doen, zoals sport (1x) + Vragen kunnen stellen aan ouders die dan thuis zijn (1x) <p><u>Nadelen</u></p> <ul style="list-style-type: none"> - Geen/minder vrije tijd 's avonds om andere dingen doen (5x) - Minder tijd voor huiswerk/kortdag (2x) - Moe/minder concentratie (2x) - Geen vragen meer kunnen stellen aan docenten als je iets niet snapt (1x) - Later slapen (1x)
Subjectieve norm	<ul style="list-style-type: none"> • Ouders (7x) • Docenten (6x) • Klasgenoten/vrienden (2x) • Broer en/of zus (1x) <p>'Heel veel andere kinderen maken ook 's avonds huiswerk dus dan ben ik minder afgeleid omdat ik minder berichtjes binnen krijg.'</p> <p>'Mijn ouders vinden het laat als ik het 's avonds maak. Dat maakt ze wel uit, want in die tijd kun je ook gewoon slapen.'</p>
Waargenomen gedragscontrole voor het maken van huiswerk 's middags i.p.v. 's avonds	<ul style="list-style-type: none"> • Hele dag al bezig met school/lange schooldagen (4x) • Andere bezigheden zoals hobby's/sport/werk (4x) • Moe/geen concentratie 's middags (3x) • Veel/moeilijk huiswerk (2x) • 's Middags huiswerk vergeten te maken (1x) <p>'Ik ben overdag eigenlijk niet thuis, dus dan is er nog maar één mogelijkheid en dat is dat ik het 's avonds of 's nachts maak'</p> <p>'Ik heb niet veel keus om mijn dag anders in te plannen, als ik vrij ben moet ik werken of trainen.'</p>
Intentie om huiswerk 's middags te maken	Vier van de zeven respondenten gaven aan het liefst hun huiswerk op school of 's middags te maken zodat ze 's avonds niks meer hoeven te doen. Deze vier gaven ook allemaal aan dat dit niet altijd lukt.
Slaap	<p>Drie van de zeven respondenten slaapt minder dan de aanbevolen uren per nacht. Eén iemand gaat weleens later naar bed door huiswerk. Diegene gaf aan dan wel sneller in slaap te vallen omdat het huiswerk af is en de spanning daarover dan weg is. Iemand anders gaf aan dat, ondanks dat diegene niet later naar bed ging, in slaap vallen meer tijd kost na 's avonds huiswerk maken omdat dit tot meer stress leidt.</p> <p>'Als ik mijn huiswerk af heb, dan val ik sneller in slaap. Dan heb je geen spanning meer op je staan. Als ik het niet af heb, dan kan ik ook wel slapen'</p> <p>'Ik slaap met meer stress als ik de volgende dag een proefwerk heb, ik ga dan in bed over alles nadenken en over of ik misschien een onvoldoende haal. En dat heb ik dan meer als ik 's avonds mijn huiswerk nog maak, omdat ik dan korter de tijd heb.'</p>

Appendix II: Questionnaire

Thanks dat je mee wilt doen aan dit onderzoek over slaap en huiswerk maken! Als je de vragenlijst helemaal hebt afgerond, maak je kans op een cadeaubon naar keuze t.w.v. €25,-. Het invullen van de vragenlijst duurt max. 10 minuten.

De vragenlijst bevat algemene vragen (bijvoorbeeld over je opleidingsniveau), vragen die gaan over huiswerk en vragen die gaan over slapen. Bij elk onderwerp krijg je een korte uitleg, zodat je precies weet wat je kunt verwachten.

Er wordt gevraagd naar jouw ervaring, er zijn dus geen goede of foute antwoorden. Je antwoorden worden volledig anoniem verwerkt. Door het afronden van deze vragenlijst geef je toestemming dat we jouw antwoorden mogen gebruiken voor het onderzoek. Hiermee hopen we meer inzicht te krijgen in het huiswerk van middelbare scholieren en hoe zij slapen.

Klik hier om naar de vragenlijst te gaan!

Er volgen eerst een paar algemene vragen.

1. Welke niveau van de middelbare school volg jij?

- ☐ Praktijkonderwijs
- ☐ Vmbo (basis/kader/GL/TL)
- ☐ Havo
- ☐ Combinatie havo/vwo
- ☐ Vwo (atheneum/gymnasium)
- ☐ Ik ga niet naar de middelbare school.

Indien 'ik ga niet naar de middelbare school' → 'Helaas val je niet binnen de doelgroep van dit onderzoek. Volgende keer beter!'

2. Ik ben ... jaar oud

Vul jouw leeftijd in cijfers in

3. Wat is jouw geslacht?

- ☐ Man
- ☐ Vrouw
- ☐ Ik pas niet in een hokje

De volgende vragen gaan over huiswerk maken. Als je een antwoord niet precies weet, maak dan een schatting.

4. Hoeveel tijd besteed jij per dag gemiddeld aan je huiswerk buiten schooltijd?

- ☐ Minder dan 30 minuten
- ☐ 30 minuten tot 1 uur
- ☐ Tussen de 1 en 2 uur
- ☐ Meer dan 2 uur

5. Op welke momenten maak jij meestal jouw huiswerk?

- ☐ Nooit
- ☐ In de ochtend voor school
- ☐ In de middag na school
- ☐ In de avond
- ☐ Ik begin in de middag en maak het in de avond af

6. Hoe vaak komt het gemiddeld voor dat jij doordeweeks nog huiswerk maakt in het uur voordat je naar bed gaat?

- ☐ Nooit
- ☐ 1 keer per week
- ☐ 2 keer per week
- ☐ 3 keer per week
- ☐ 4 keer per week
- ☐ 5 keer per week

Hieronder staan een aantal uitspraken over 's avonds laat huiswerk maken. Met 's avonds laat bedoelen we 1 uur voor dat je naar bed gaat. Geef hieronder aan wat je van deze uitspraken vindt.

's Avonds laat huiswerk maken is...

- | | | | | | | |
|-----------------|---|---|---|---|---|------------|
| 7. Ongezond | 1 | 2 | 3 | 4 | 5 | Gezond |
| 8. Stom | 1 | 2 | 3 | 4 | 5 | Fijn |
| 9. Onverstandig | 1 | 2 | 3 | 4 | 5 | Verstandig |
| 10. Slecht | 1 | 2 | 3 | 4 | 5 | Goed |

Hieronder staan een aantal mogelijke voordelen van 's avonds laat huiswerk maken. Geef aan in hoeverre deze voordelen voor jou gelden als je 's avonds laat huiswerk maakt of zou maken.

Stel, ik maak 's avonds laat huiswerk dan...

	Helemaal oneens	Oneens	Neutraal	Eens	Helemaal eens
11. Vind ik het fijn dat ik 's middags na school eerst lekker kan uitrusten	1	2	3	4	5
12. Kan ik me beter concentreren dan 's middags	1	2	3	4	5
13. Kan ik voor die tijd andere dingen doen, zoals sporten	1	2	3	4	5
14. Kan ik vragen stellen aan mijn ouders die dan thuis zijn	1	2	3	4	5

Hieronder staan een aantal mogelijke nadelen van 's avonds laat huiswerk maken. Geef aan in hoeverre deze nadelen voor jou gelden als je 's avonds laat huiswerk maakt of zou maken.

Stel, ik maak 's avonds laat huiswerk dan...

	Helemaal oneens	Oneens	Neutraal	Eens	Helemaal eens
15. Vind ik het stom dat ik dan geen tijd heb om andere dingen te doen	1	2	3	4	5
16. Heb ik te weinig tijd om het huiswerk af te maken	1	2	3	4	5
17. Lig ik soms nog over het huiswerk te piekeren in bed	1	2	3	4	5
18. Ben ik te moe om me goed te kunnen concentreren	1	2	3	4	5
19. Ga ik later naar bed	1	2	3	4	5

Hieronder staan een aantal uitspraken over de mening van anderen over jouw huiswerk. Geef aan in hoeverre je het eens of oneens bent met deze uitspraken.

	Helemaal oneens	Oneens	Neutraal	Eens	Helemaal eens
20. Mijn ouders/verzorgers vinden dat ik mijn huiswerk beter 's middags kan maken in plaats van 's avonds laat*	1	2	3	4	5
21. Mijn ouders/verzorgers vinden dat ik 's avonds mijn huiswerk moet maken als ik het overdag niet af heb	1	2	3	4	5
22. Van mijn ouders/verzorgers moet mijn huiswerk af zijn voordat ik naar bed mag	1	2	3	4	5
23. Mijn leraren vinden dat ik mijn huiswerk beter 's middags kan maken in plaats van 's avonds laat*	1	2	3	4	5
24. De meeste klasgenoten en/of vrienden maken hun huiswerk 's avonds laat	1	2	3	4	5
25. Ik heb duidelijke afspraken met mijn ouders/verzorgers over wanneer ik mijn huiswerk maak	1	2	3	4	5

Hieronder staan een aantal uitspraken over wat het moeilijk of makkelijk maakt om je huiswerk op tijd af te hebben. Geef aan in hoeverre je het eens of oneens bent met deze uitspraken.

	Helemaal oneens	Oneens	Neutraal	Eens	Helemaal eens
26. Na een lange schooldag vind ik het moeilijk om mijn huiswerk 's middags te maken in plaats van 's avonds*	1	2	3	4	5
27. Doordat ik andere dingen moet doen na school (bijvoorbeeld sporten of naar huis fietsen), kan ik mijn huiswerk pas 's avonds laat maken*	1	2	3	4	5

28. Ik krijg teveel huiswerk van school om het 's middags af te kunnen maken*	1	2	3	4	5
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<i>Even testen: let je nog op? Klik hier op 'Eens'</i>	1	2	3	4	5
--	---	---	---	---	---

Hieronder staan een aantal uitspraken over wanneer jij jouw huiswerk zou willen maken. Geef hieronder aan of deze uitspraken voor jou gelden.

	Helemaal oneens	Oneens	Neutraal	Eens	Helemaal eens
29. Ik ben van plan om de komende maand mijn huiswerk 's avonds laat te maken*	1	2	3	4	5
30. Ik wil de komende maand mijn huiswerk af hebben minstens 1 uur voordat ik naar bed ga	1	2	3	4	5
31. Ik ga proberen om de komende maand mijn huiswerk overdag af te maken in plaats van 's avonds laat	1	2	3	4	5

De volgende vragen gaan over slaap, bijvoorbeeld hoelang je gemiddeld slaapt. Let op: de vragen gaan steeds over de afgelopen maand. Als je het antwoord niet precies weet, maak dan een schatting.

32. Hoe laat ben je meestal naar bed gegaan doordeweeks?

Kies het tijdstip dat op jou van toepassing is:

Eerder dan 19 uur – 19 uur – 19.30 uur – 20 uur – 20.30 uur – 21 uur – 21.30 uur – 22 uur – 22.30 uur – 23 uur – 23.30 uur – 24 uur – 00.30 uur – 1 uur – 1.30 uur – 2 uur – Later dan 2 uur

33. Hoe laat ben je meestal opgestaan doordeweeks?

Kies het tijdstip dat op jou van toepassing is:

Eerder dan 5 uur – 5 uur – 5.30 uur – 6 uur – 6.30 uur – 7 uur – 7.30 uur – 8 uur – 8.30 uur – 9 uur – 9.30 uur – 10 uur – Later dan 10 uur

34. Hoe lang duurde het voordat je in slaap viel doordeweeks?

- 15 minuten of minder
- 16 tot 30 minuten
- 31 tot 60 minuten
- Meer dan 60 minuten

35. Hoeveel uur slaap heb je per nacht gekregen doordeweeks?

Kies het antwoord dat op jou van toepassing is:

3 uur – 3,5 uur – 4 uur – 4,5 uur – 5 uur – 5,5 uur – 6 uur – 6,5 uur – 7 uur – 7,5 uur – 8 uur – 8,5 uur – 9 uur – 9,5 uur – 10 uur – 10,5 uur – 11 uur – 11,5 uur – 12 uur

36. Hoe zou je de kwaliteit van jouw slaap beoordelen?

- ☐ Erg goed
- ☐ Een beetje goed
- ☐ Een beetje slecht
- ☐ Erg slecht

De volgende vragen gaan over jouw ervaringen van de afgelopen maand. Geef aan hoe vaak de volgende situaties op jou van toepassing waren.

Hoe vaak kwam het voor dat je...	Nooit in de afgelopen maand	Minder dan 1 keer per week	1 of 2 keer per week	3 of meer keer per week
37. Niet kon slapen binnen 30 minuten?				
38. Wakker werd midden in de nacht of vroeg in de ochtend?				
39. Niet fijn kon ademen tijdens je slaap?				
40. Moest hoesten of snurken tijdens je slaap?				
41. Het te warm had tijdens je slaap?				
42. Nare dromen had?				
43. Pijn voelde tijdens je slaap?				
44. Je moeite had om wakker te blijven tijdens huiswerk maken, het eten van een maaltijd of bij sociale activiteiten?				
45. Het moeilijk vond om enthousiast te blijven over dingen die je moest doen?				

De volgende uitspraak gaat over welke regels er bij jou thuis zijn met betrekking tot slapen. Geef aan in hoeverre deze uitspraak voor jou geldt.

	Helemaal oneens	Oneens	Neutraal	Eens	Helemaal eens
46. Ik heb duidelijke afspraken met mijn ouders/verzorgers over de tijd waarop ik ga slapen	1	2	3	4	5

47. Wil je kans maken op een cadeaubon t.w.v. €25,-? Laat dan je e-mailadres achter!

....

48. Wil je nog iets kwijt? Brand maar los!