

Gender differences in nightmare and bad dream frequency and emotional changes after dreaming

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Preface

This bachelor thesis marks the end of the three-year bachelor program of Psychology at NTNU. The theme of the study is gender differences in nightmares and bad dreams, and the research question is directed towards gender differences in nightmare frequency and emotional changes after nightmares and bad dreams. I chose this line of research because of a personal interest in emotional changes after nightmares, especially after learning how nightmares can influence the mental health of frequent sufferers I felt that this is a research area which deserves more attention. The writing process has been challenging at times, but it has also been fun. I have learned a lot about this area of research which I find very interesting, how to write a thesis based of research oneself has contributed to, and I have learned how I work when given a lot of freedom and independence. I would like to thank my supervisor Torhild Anita Sørengaard, she stepped in in April and gave very good guidance regarding choice of analysis, the wording of the research question, and she was always available for small or big questions. I would also like to thank my other supervisor Wei Wang who was responsible for the research study, without him this line of research wouldn't have been possible. Lastly, I would like to thank the scientific assistants Tiffany Lussier and Eline Eyde Lüder-Larsen, without their hard work to finish the questionnaire and seeking approval from NSD this bachelor wouldn't have been possible. They were also very helpful by always answering questions and hearing our feedback.

Abstract

The aim of this study was to examine the relation between nightmares, bad dreams, and emotional changes after dreaming through the research question “*Are there gender differences in nightmare/bad dream frequency and emotional change after dreaming?*”. Frequent nightmares can inflict several negative effects on emotions and emotional regulation abilities which can lead to the development of different psychopathologies. Women is seemingly at a higher risk of experiencing these effects because of higher nightmare frequencies, higher emotional impact from dreams, and poorer emotional regulation abilities. 87 participants responded to an electronic survey every day over a 4-week period, the survey addressed different factors which can influence or be influenced by dreaming. The results demonstrate no significant gender difference in nightmare frequency. However, gender differences in emotional change after dreaming was found. Both genders experiences negative emotional change after nightmares and bad dreams, while only women reported significant positive emotional change. Meanwhile, no gender differences in mean amount of emotional change were discovered. Without accounting for gender differences there was only a relation to negative emotional change. To conclude, the present results demonstrate that there were no gender differences in nightmare/ bad dream frequency, but there were gender differences in emotional change after dreaming. Future studies should take inspiration from the current study and include measures for both positive and negative emotional change. However, the measure for emotional change was not ideal therefore more comprehensive measures should be implemented in future studies.

Previous research has shown that nightmares can influence the emotions and mental health of frequent sufferers. The inversed continuity hypothesis demonstrates that nightmares can exhibit an influence on post-sleep emotions, and people who suffer from a higher nightmare frequency generally experience more negative emotions after a nightmare (Antunes-Alves & De Koninck, 2012). Frequent nightmares also increase the risk of developing psychopathology like anxiety, depression, self-harm and suicidal thoughts or behaviors (Antunes-Alves & De Koninck, 2012). It was also found to affect emotional regulation abilities, in fact several studies show that the largest mediator between nightmares, suicide and self-harm was emotional dysregulation (Andrews & Hanna, 2020). Several gender differences have been documented related to nightmares. Compared to men, women experience a higher nightmare frequency, suffer a higher emotional impact from their nightmares (Wang et al., 2021), as well as being more prone to experiencing negative emotions during their nightmares (Chen et al., 2014). Gender differences related to emotional regulation abilities in general have also been documented where women seemingly is more sensitive to emotional stimuli and this sensitivity extends towards emotional regulation (Gardener et al., 2013). Women also report more depressive emotions as well as anxiety, and this is seemingly related to nightmare frequency (Chen et al., 2014). Because a lot of research traditionally only have been conducted on men it is important to invest in further research on gender differences (Holdcroft, 2007). The goal of the current study is to see whether there is a gender difference regarding nightmare and bad dream frequency, and emotional changes after nightmares and bad dreams. Specifically, if women experience nightmares, bad dreams, and emotional changes after nightmares and bad dreams more than men, and whether this change is in a negative direction.

Dreams

To better understand nightmares and bad dreams, one should first have a general understanding of dreams. Dreams are defined by the American psychology association as “*physiologically and psychologically conscious state that occurs during sleep and is often characterized by a rich array of endogenous sensory, motor, emotional, and other experiences*” (American Psychological Association, 2022). Dreams is a phenomenon that have interested humans for a long time, and during the 1950’s a more scientific approach to dreams began (Boccaro, 2021). They discovered that most of dreaming occur during REM sleep, but it can also occur during non-REM sleep (Boccaro, 2021). REM is short for rapid eye movement, this is a light sleep and equals about a fifth of the total sleep amount (Boccaro,

2021). Non-REM sleep is all the other kinds of sleep, it is characterized by a deep sleep (Boccaro, 2021). Everyone dreams, but many have trouble with remembering their dreams. A study found that the mean number of recalled dreams during one month was 10 dreams (Schredl et al., 2004). Another study found that during two nights with eight awakenings the mean number of reported dreams during the eight awakening was 5.19 dreams (Malinowski & Horton, 2021), this means that it is normal to have 2-3 dreams each night. Newer research has discovered a difference in the dreams we exhibit early and late in the night. Dreams that occur early were found to be more relatable to waking life, while late night dreams were more emotional important (Malinowski & Horton, 2021). We still to this day don't fully comprehend why we dream though there are many different theories. Some believe dreaming is for memory consolidation, others think it's for desensitization of negative emotions, a guardian of sleep, or a simulation of possible threats and social challenges to be better prepared if one encounters them during waking life (Siclari et al., 2020).

Nightmares and bad dreams

Nightmares refers to a dream that is experienced as frightening and/or disturbing where the emotional content consists of a combination of fear, sadness, despair, and disgust, when experiencing a nightmare the dreamer wakes suddenly and alert to their surroundings (American Psychological Association, 2022). Approximately 2-6% of healthy adults report nightmares once a week or more (Wang et al., 2021). Bad dreams refers to a disturbing vivid dream with intense negative emotional content which usually consists of anxiety and/or fear, bad dreams do not cause a sudden awakening (Siclari et al., 2020). Nightmares and bad dreams is mainly separated by the sudden awakening from nightmares (Zadra & Donderi, 2000). There is however some disagreement about how these two terms should be separated, and whether they should be separated at all. Some researchers choose to not use the waking criterion, and in that case bad dreams and nightmares is defined the same (Zadra & Donderi, 2000). Studies have however found that there is a difference in content between bad dreams and nightmares where nightmares contain more negative dream imagery with more references to death, aggression and hostility, and bad dreams have more emotional references (Fireman et al., 2014). Because of the blurred lines between the two dream types I choose to merge nightmares and bad dreams into one variable, however nightmares is the main focus of the assignment. Impactful dreams is a term that was first invented by Kuiken and refers to emotionally charged dreams which exhibit an influence on the dreamer, they can influence waking thoughts and/or emotions, and they can be spontaneously remembered (Nixon et al.,

2017). Seeing that nightmares is highly emotionally charged one might argue that it can be classified as an impactful dream. The etiology of nightmares is poorly understood, however one study on Finnish adults found that depression and insomnia were the strongest predictors for nightmares (Park et al., 2021). Other factors like psychological well-being, sociodemographic factors and low life satisfaction were also related to nightmare occurrence (Park et al., 2021). Furthermore, nightmares is associated with poorer overall psychosocial well-being (Shao et al., 2020), as well as bad concentration and daytime functioning (Park et al., 2021).

Nightmares and emotions - The inversed continuity hypothesis

Previous research dedicated to understanding the relationship between emotions and nightmares have discovered that nightmares exhibit an influence on emotions and emotional regulation. Emotions refers to a complex reaction pattern which is activated when an individual is trying to handle a significant personal event or case, it consists of behavioral, psychological, and experiential elements (American Psychological Association ,2022). There has long been a conception that there is continuity between waking life and dreams. The continuity hypothesis was originally articulated by Calvin Hall and A. Bell in 1971 influenced by Sigmund Freuds ideas of continuity in his book “interpretation of dreams” published in 1900. In 1982 G. William Domhoff articulated the continuity hypothesis we are familiar with today, it states that “dreaming is continuous with waking life. That is, people will manifest in their dreams the concerns and preoccupations of their waking life” (Erdelyi, 2017). A broader interpretation of the theory states that dreaming and waking life influence each other and this might be manifested through dream content, themes, and emotionality. It is one of the most dominant theories within this field of research, and is supported by numerous empirical evidence (Nixon et al., 2017). For our study we will look at an inversed form of the continuity hypothesis where dreams, or in our case nightmares and bad dreams, exert an influence on emotions after dreaming and thereby change the emotional state (Antunes-Alves & De Koninck, 2012). The inversed continuity hypothesis is supported by empirical findings, and several previous studies. One previous study demonstrates that people who experience nightmares frequently, meaning once a week or more, experience more negative emotions like anxiety and fear in their dreams (Antunes-Alves & De Koninck, 2012). They also experience higher levels of stress during the preceding evening and the following morning, as well as reporting more negative morning moods compared to those who do not suffer from nightmares (Antunes-Alves & De Koninck, 2012). Another study found that people who have

more pleasant dreams generally experience more positive emotions, while people who frequently have less pleasant dreams generally experience more negative emotions (Yu, 2007). It was also discovered however that even though the emotions one experience during dreaming can influence the emotions one has while awake it is usually far less intense. However the intensity of the emotions one experience while dreaming was stronger correlated with the emotions one experience directly after sleep than those preceding sleep (Yu, 2007). In a study on impactful dreams they found a significant correlation between dreaming mood and morning mood (Nixon et al., 2017). They also found that when the dreamer experienced a negative mood in a negative impactful dream it was strongly correlated with negative post-sleep mood. This might be explained by the finding that that dreams that occur early in the night is more relatable to waking life, while late night dreams are more emotional important, therefore late night dreams or nightmares might exhibit a bigger influence on ones emotions the following morning (Malinowski & Horton, 2021).

Nightmares, emotion regulation, and psychopathology

As previously mentioned, there is evidence supporting the notion that nightmares influence emotional regulation, emotional regulation refers to one's ability to modulate a set of or an emotion (American Psychological Association ,2022). Many researchers theorize that dreams in general is important for emotional regulation. The theory states that regular dreaming has a fear extinction function, and when you have nightmares this demonstrates failures in emotional regulation (Levin & Nielsen, 2009). Previous findings indicate that people who experience frequent nightmares generally responds with higher emotional intensity to stimuli as well as having smaller boundaries (Antunes-Alves & De Koninck, 2012). They also found that people who suffer from higher nightmare frequencies experience more worry and stress the morning after a dream, and more worry, stress, fear, and anxiety the night before. This indicates an overall poorer psychological well-being for people with frequent nightmares compared to those who experience nightmares on an average rate (Antunes-Alves & De Koninck, 2012).

Furthermore, the influence nightmares exhibit on emotional regulation is connected to psychopathology. Studies show that people who suffer from frequent nightmares are at a five times higher risk of committing suicide (Andrews & Hanna, 2020). Previous studies have found that the connection between nightmares, self-harm and suicide is mediated by difficulties with emotional regulation, also called emotional dysregulation (Andrews &

Hanna, 2020). The same study found that people who suffer from frequent nightmares is at a four times higher risk of self-harm thoughts and behaviors compared to those that do not suffer from nightmares. This relationship was somewhat mediated by negative affect after waking, which supports the notion that nightmares decrease emotional regulation. In another analysis they found that emotional dysregulation was the mediator between nightmares and non-suicidal self-injuries (Andrews & Hanna, 2020). Research shows that the individuals who engage in self-harm and suicidal behavior do this to regulate their emotions, therefore it makes sense that the fact that nightmares contribute to emotional dysregulation is the mediator for self-harm and suicide (Andrews & Hanna, 2020). People with frequent nightmares have also been linked to higher levels of depression and anxiety (Antunes-Alves & De Koninck, 2012). Frequent nightmares can additionally be characterized as a sleep related mental disorder in itself called nightmare disorder, in addition to being part of the symptoms of other disorders like PTSD (Chen et al., 2014).

Gender differences in nightmares

Because research on nightmares and dreams is relatively new there is a lack of theories regarding gender differences in nightmares, and the influence nightmares exhibit on the emotions and mental health of the different genders. However there has been previous research studies we can use to better understand what to expect in our study. Several previous studies show that women experience a higher frequency of nightmares compared to men (Hedström et al., 2021). It also seems like this is not only dependent on gender but also age. Nightmares generally occur more frequently in younger adults over the age of 14 and women, compared to men and older adults (Hess et al., 2020; Levin & Nielsen, 2009). This gender difference however seems to disappear with old-age, where older men seemingly experience an increase in nightmare prevalence (Park et al., 2021). The same study found that this shift happens around the age of 70 where there is an increase in nightmares for both genders. Because women seemingly have a higher frequency of dream recall overall this could be a possible explanation for the perceived gender difference, however a study by Nielsen (2000) showed that even when the differences in dream recall was taken into consideration there still was a significant gender difference where women scored higher on nightmare frequency (Schredl & Reinhard, 2011). These studies tell us that women and especially young women generally experience a higher nightmare frequency and is especially at risk of the implications this might have on their mental health, emotions, and psychological wellbeing.

There have been discovered several gender differences related to nightmares and emotional impact as well. First of all women seemingly have a higher prevalence of nightmare disorder than men, as well as poorer sleep quality in general (Wang et al., 2021). Women also report more depressive emotions as well as anxiety, and this is seemingly related to nightmare frequency. In a study on Chinese university students they discovered that women generally experience more emotions than men while dreaming, and women score significantly higher on negative emotions during their nightmares (Chen et al., 2014). A study by Kahn and Hobson (2002) found that both positive and negative emotions are balanced for both genders in dreams, although they don't mention anything about this related to nightmares (Yu, 2007). Moreover the literature show that there are gender differences in emotional regulation where women seemingly is more sensitive to emotional stimuli and this sensitivity extends towards emotional regulation (Gardener et al., 2013), this might therefore put them at a higher risk of developing psychopathology as a consequence of frequent nightmares. There has also been discovered gender differences related to nightmares and psychopathology. One study by Lee and Suh (2016) found that distress during nightmares is the mediator between nightmare frequency and suicidal thoughts only in women, this is somewhat surprising seeing that suicide rates are generally higher in men (Andrews & Hanna, 2020).

The current study

Previous research presented above demonstrates why a study on whether women experience a higher nightmare/ bad dream frequency, and more emotional changes after nightmares/bad dreams compared to men is necessary. First, the study of nightmares is a relatively new research area with a lacking understanding of its functions and implications, especially regarding gender differences. Second, a lot of research has traditionally solely been implemented on men (Holdcroft, 2007), this gives us a poorer understanding about how different phenomenon's influence women, and whether there are gender differences (Cappadona et al., 2021). Thirdly, based on previous research it is likely that women are at a higher risk of experiencing a higher prevalence of nightmares/ bad dreams, more emotional changes after nightmares, and this emotional change is most likely in a negative direction. This combined with poorer emotional regulation would in that case put them at a significantly higher risk of developing mental health disorders. Previous research shows that even low levels of difficulty recognizing one's emotions combined with nightmares increases the risk of suicide attempts (Rufino et al., 2020), however with treatment one can learn strategies for emotion regulation which significantly reduces this risk (Rufino et al., 2020). If we know that

nightmares are a predictor for mental health disorders one can begin with preventive work earlier. Fourthly, it might give us a better understanding of gender differences in other mental health disorders like anxiety and depression as well (Schredl & Reinhard, 2011). Finally there is a higher likelihood of people seeking help for nightmares compared to other more severe mental health issues like self-harm and suicide (Schredl & Reinhard, 2011), this might also imply that the women who struggle with frequent nightmares gets taken more seriously when they seek help.

Research question

Due to the newness of our research area, gender differences in nightmares and bad dreams are often just a byproduct of other research, and seldom the focus area. The current study will therefore investigate gender differences in nightmare and bad dream frequency, and emotional changes after nightmares and bad dreams. The research question is “*Are there gender differences in nightmare/bad dream frequency and emotional change after dreaming?*”.

Based on the literature presented above, the following hypotheses are suggested:

H1: Women experience a higher frequency of nightmares and bad dreams.

H2: Women experience more emotional changes after nightmares and bad dreams.

H3: The emotional change is mostly in a negative direction, from positive to negative.

Method

Ethics

This study was submitted for approval by the Norwegian Center of Research Data (NSD) in January 2022. The approval took longer than expected, therefore the study had to be postponed from 1.02.22 when it initially was meant to begin, until 11.03.22. We didn't have to seek approval from anyone else because we were not collecting data related to health or sensitive information. All the participants gave their consent to participate in the study electronically.

Design

This study was based on a quantitative longitudinal data, using an electronic survey. The instruments included in the survey had previously been used in a research project on university students in China and was changed in some regards so it would fit better with our own study. First it was translated to English, then from English to Norwegian and then from Norwegian back to English to ensure that the wording was as precise as possible. Then the

wording in some questions and the measurements of different variables were somewhat changed. The new version of the survey was constructed during the period January- March 2022 by the scientific assistants Eline Eyde Lüder-Larsen and Tiffany Lussier guided by Professor Wei Wang who is responsible for the research study. The survey was available electronically during a 4-week period. The participants were informed that their submission was voluntary, the study was confidential and anonymous, and they were free to quit at any given time.

Sample

The sample was recruited through convenience sampling from all over the world, mostly from Norway. The sample consists not only of students, but people in all life situations. A total of 142 people registered their e-mail to participate in the study and received the surveys, out of these 87 answered the survey, this gives us a response rate of 61.27%. The respondents consist of 47 (54%) women, 40 (46%) men, and no participants identified as “other”. The age range was between 20 -78 years ($M = 29.27$, $SD = 12.753$).

Procedure

The students who are conducting the study for their bachelor thesis contacted people they know between January and February 2022 asking them to join the study. The respondents first registered their e-mail address in a Google forms document to communicate that they were interested in participating. The survey was online which enabled the participants to answer the surveys alone directly after they woke up. To the registered e-mail address they received two links to access the survey digitally when the study began in March. The first link they only used the first day, it included personalia and the construction of an anonymous username. The second link only contained the survey, to gain access to the survey all the other days they had to use the second link and log in using the anonymous username. They completed the survey every day over a 4-week period and committed their results daily.

Instruments

The participants were asked to fill out a survey regarding dreams, nightmares, and sexual dreams. The survey contained questions about different variables that can influence dreams, some of these variables were demographic variables like gender, age, and relationship status. They also had to answer questions about sexual satisfaction, the weather, prebedtime mood, last meal before bedtime, activities in bed before sleep, alcohol consumption, emotional state

during and after the dream, how likely it is for the dream to occur in real life, important life events and a short description of the dream. If the participant had a nightmare or a sexual dream a separate questionnaire about this also had to be filled out, here we used Sexual Dream Experience Questionnaire (SDEQ) and Nightmare Experience Questionnaire (NEQ). This study will focus on gender differences in nightmare/bad dream frequency and emotional changes after nightmares and bad dreams, therefore I will only present these variables further.

Gender

The “gender” variable is a demographic categorical variable, and it shows which gender the participant identifies as. The question is asked as a multiple-choice question where the possible answers is either female, male or other. Because the current study is interested in gender differences, it is only the “female” and “male” answers that will be included in the analysis. Due to no respondents choosing “other”, the gender variable was dichotomized into 0 (women) and 1 (men), from 1(women) and 2(men).

Total amount of nightmares and bad dreams

The “total amount of nightmares and bad dreams” variable is the nightmare and bad dream variable put together into one variable. I have chosen to use both variables and make them into one variable instead of only using the nightmare variable because a lot of the participants will likely have a hard time separating the two. The only thing that separates a nightmare from a bad dream is a sudden awakening, and it is likely that not everyone is aware of this difference. Therefore, if we include both types of dreams into one variable it will strengthen the internal validity of the study. It is also better to include the bad dream variable because both bad dreams and nightmares is intensely negatively emotionally charged, and therefore it is interesting to see whether both types of dreams influence post-sleep emotions. In the survey the participants first must answer the question “did you dream last night?”, with a yes or no multiple choice beneath. Then if the participant did dream, they will have to answer “what type of dream was it? Check all that apply”, this question is also stated as a multiple-choice question where there are 5 possible answers, ordinary dream, nightmare, sexual dream, bad dream and other. If you press other an open space will appear with “please fill out”, where the participant themselves must state what type of dream they had. There are at least two reasons why it’s important that they check all the boxes that apply and not just one box, the first is that one can remember more than one dream from one night. The second is that a dream can be classified as more than just one type, for example if you dream about being raped it can

both be seen as a nightmare/bad dream and a sexual dream. Therefore, one will get the most accurate answers according to the dreamer's subjective experience if one has more than one box available. This variable is treated as a continuous variable. To operationalize the variable "total amount of nightmares and bad dreams" we will summarize all the times the women and men had a nightmare and/or bad dream to get the complete nightmare/bad dream frequency for all the men and women over the 4- week period. We will also summarize the frequencies for both genders.

Emotional change after the dream

The last variable is "emotional change after the dream". In this question we have a little problem with the wording in the different languages. In English this question is stated as "did your emotional state change at the end of the dream", while in Norwegian it asks "Har din emosjonelle tilstand endret seg etter drømmen?", directly translated this means "did your emotional state change after the dream". There is a slight difference in wording here, which might lead to participants answering slightly differently according to which language they use, if they use English it can be seen as at the end of the dream, meaning while you are still dreaming. In Norwegian however one asks after the dream, which might be interpreted as after one woke up from the dream, or after the dream was finished. I will use the Norwegian wording as a starting point for my analysis because most of the respondents are Norwegian and therefore most of the answers are based on this wording. This question is also a multiple-choice question with 3 possible answers, either "yes from positive to negative", "yes from negative to positive" or "no change". This variable is treated as a continuous variable. To operationalize it we will summarize all the participants who chose "no change", "yes from positive to negative" and "yes from negative to positive" after choosing nightmare and bad dream as type of dream to get the total frequency of emotional changes. Then we will compare this to the gender and total amount of nightmares and bad dreams variables.

Statistical analyses

The statistical analysis was performed in SPSS, version 28. To study the research question, I first did a Pearson's correlation coefficient to see whether there is a correlation between gender, total amount of nightmares and bad dreams, and reported positive, negative, and no emotional changes after dreaming. I used this method of analysis because it is one of the most common methods for discovering if there is a linear relationship between two different variables (Ly et al., 2018). The conditions for Pearson's correlation are met, even though

gender is not a continuous variable it is possible to use it in a correlation analysis because it is a discrete variable. In this analysis the dependent variable is positive, negative and no emotional change and the independent variable is nightmare/bad dream and gender.

Thereafter I did two Pearson's correlation coefficients with a split gender variable to see whether women and men separately have a correlation between total amount of nightmares and bad dreams and reported positive, negative, and no emotional changes after dreaming. Once again, the conditions for Pearson's correlation are met, and the results needs to be interpreted with caution. In these analyses the dependent variable is nightmares/ bad dreams, positive, negative and no emotional change after dream and the independent variable is women/men. Lastly, I performed four independent T-tests to investigate the mean differences between men and women's total amount of nightmares and bad dreams, negative emotional change after dream, positive emotional change after dream and no emotional change after dream. I used this method of analysis because it is commonly used to investigate mean differences between two independent groups (Kim, 2015). The conditions for an independent t-test are met. In this analysis total amount of nightmares and bad dreams, negative emotional change, positive emotional change, and no emotional change after dream is the dependent variables, and gender is the independent variable.

Results

Table 1 demonstrates the number of people in the sample, mean, standard deviation, and the results from a Pearson's correlation analysis used to investigate whether there is a correlation between the variables gender, total amount of nightmares and bad dreams, negative emotional change after dream, positive emotional change after dream, and no emotional change after dream. There were 69 respondents who experienced nightmares and/or bad dreams, total amount of nightmares and bad dreams have a mean score of 1.74 ($SD = 1.96$). There were 64 respondents who experienced a negative, positive, or no emotional change after dreaming. Negative emotional change after dreaming has a mean score of 0.61 ($SD = 1.38$), positive emotional change after dreaming has a mean score of 0.45 ($SD = 1.13$), and no emotional change after dreaming has a mean score of 7.45 ($SD = 5.86$). There was found no significant correlations between gender and the remaining variables. Between the variables total amount of nightmares and bad dreams, and negative emotional change after dream a moderate positive correlation was found $r(62) = .46, p = <.001$. There were also a moderate positive correlation between total amount of nightmares and bad dreams, and no emotional change

after dream $r(62) = .44, p = <.001$. No significant correlations were found between positive emotional change after dream and the remaining variables.

Table 1.

Descriptive Statistics and Pearson's Correlation Coefficients For Study Variables (N=64-87).

Variable	<i>n</i>	<i>M</i>	<i>SD</i>	1	2	3	4
1. Gender	87	-	-	-			
2.Total amount - of nightmares and bad dreams	69	1.74	1.96	-.16	-		
3.Negative - emotional change after dream	64	0.61	1.38	-.15	.46**	-	
4.Positive - emotional change after dream	64	0.45	1.13	-.01	.23	.12	-
5.No emotional - change after dream	64	7.45	5.86	.02	.44**	.09	.17

** $p < .01$ level (2-tailed).

In addition to a correlation analysis for the entire sample correlation analyses for women and men were separately conducted to see whether there are correlation differences between the two genders and the remaining variables. Table 2 and 3 demonstrates the number of people in the sample, mean, standard deviation, and the results from Pearson's correlation coefficient with a split gender variable used to investigate whether there are correlations between the variables women/men, total amount of nightmares and bad dreams, amount of negative emotional changes after dreaming, amount of positive emotional changes after dreaming and amount of no emotional changes after dreaming. In table 2 we can see that there were 36 women who experienced a nightmare/bad dream, total amount of nightmares and bad dreams has a mean score of 2.03 ($SD = 2.10$). There were 32 female respondents who experienced a negative, positive, or no emotional change after dreaming. Negative emotional change after dream has a mean score of 0.81 ($SD = 1.40$), positive emotional change after dream has a mean score of 0.47 ($SD = 0.95$), and no emotional change after dream has a mean score of 7.34 ($SD = 5.79$). For women there was a weak/moderate positive correlation between total amount of nightmares and bad dreams, and negative emotional change after dreaming $r(30) = .37, p = .037$. There was also a moderate positive correlation between total amount of

nightmares and bad dreams and positive emotional change after dreaming $r(30) = .40, p = .023$, and total amount of nightmares and bad dreams and no emotional change after dreaming $r(30) = .52, p = .002$.

Table 2.

Descriptive Statistics and Pearson's Correlation Coefficients For Women (N=32-36).

Women's Variables	<i>n</i>	<i>M</i>	<i>SD</i>	1	2	3
1.Total amount - of nightmares and bad dreams	36	2.03	2.10	-		
2.Negative - emotional change after dream	32	0.81	1.40	.37*	-	
3.Positive - emotional change after dream	32	0.47	0.95	.40*	-.01	-
4.No emotional - change after dream	32	7.34	5.79	.52**	.04	.25

* $p < .05$ (2-tailed). ** $p < .01$ (2-tailed).

Table 3 demonstrates that there were 33 men who experienced a nightmare/bad dream, total amount of nightmares and bad dreams has a mean score of 1.42 ($SD = 1.77$). There were 32 male respondents who experienced a negative, positive, or no emotional change after dreaming. Negative emotional change after dream has a mean score of 0.41 ($SD = 1.34$), positive emotional change after dream has a mean score of 0.44 ($SD = 1.29$), and no emotional change after dream has a mean score of 7.56 ($SD = 6.03$). For men there was a moderate positive correlation between total amount of nightmares and bad dreams and negative emotional change after dream $r(30) = .53, p = .002$. There was also a positive weak/moderate correlation between total amount of nightmares and bad dreams and no emotional change after dream $r(30) = .38, p = .031$. No significant correlations were found between positive emotional change after dream and the remaining variables.

Table 3.*Descriptive Statistics and Pearson's Correlation Coefficients For Men (N=33-32).*

Men`s Variables	<i>n</i>	<i>M</i>	<i>SD</i>	1	2	3
1.Total amount - of nightmares and bad dreams	33	1.42	1.77	-		
2.Negative - emotional change after dream	32	0.41	1.34	.53**	-	
3.Positive - emotional change after dream	32	0.44	1.29	.11	.21	-
4.No emotional - change after dream	32	7.56	6.03	.38*	.14	.12

* $p < .05$ (2-tailed). ** $p < .01$ (2-tailed).

Table 4 demonstrates the results from four independent t-tests used to investigate the mean differences in total amount of nightmares and bad dreams, negative emotional change after dream, positive emotional change after dream, and no emotional change after dream between the women and men in the sample. For the variable total amount of nightmares and bad dreams Levene's test was non-significant, therefore equal variances were assumed. The t-test demonstrates that the 36 women ($M = 2.03$, $SD = 2.104$) compared to the 33 men ($M = 1.42$, $SD = 1.768$) did not demonstrate a significantly higher mean amount of nightmares and bad dreams, $t(67) = 1.284$, $p = .204$, $d = .31$. The effect size for this analysis did not exceed Cohen's convention for a large effect. In the variable negative emotional change after dream Levene's test was found to be statistically non-significant, therefore equal variances were assumed. The results demonstrates that the 32 women ($M = 0.81$, $SD = 1.40$) compared to the 32 men ($M = 0.41$, $SD = 1.34$) did not demonstrate a significantly higher mean of negative emotional change after dreaming, $t(62) = 1.185$, $p = .241$, $d = .30$. The effect size for this analysis did not exceed Cohen's convention for a large effect. For the variable positive emotional change after dream Levene's test was non-significant, therefore once again equal variances were assumed. The t-test demonstrates that the 32 women ($M = 0.47$, $SD = 0.95$) compared to the 32 men ($M = 0.44$, $SD = 1.29$) did not demonstrate a significantly higher mean of positive emotional change after dreaming, $t(62) = .110$, $p = .913$, $d = .03$. The effect size for this analysis did not exceed Cohen's convention for a large effect. Lastly, the variable no emotional change after dreaming, also here Levene's test was non-significant therefore

equal variances were assumed. The t-test demonstrates that the 32 women ($M = 7.34$, $SD = 5.79$) compared to the 32 men ($M = 7.56$, $SD = 6.03$) did not demonstrate a significantly higher mean of no emotional changes after dreaming, $t(62) = -.148$, $p = .883$, $d = -.04$. The effect size for this analysis did not exceed Cohen's convention for a large effect.

Table 4.

Gender Differences in Nightmares/Bad Dreams, And Emotional Changes After Dreaming (N=32-36).

Nightmares/bad dreams	Women			Men			<i>t</i>	<i>p</i>	Cohen's <i>d</i>
	<i>N</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>M</i>	<i>SD</i>			
Total amount of nightmares and bad dreams	36	2.03	2.10	33	1.42	1.77	1.284	.204	.31
Negative emotional change after dream	32	0.81	1.40	32	0.41	1.34	1.185	.241	.30
Positive emotional change after dream	32	0.47	0.95	32	0.44	1.29	.110	.913	.03
No emotional change after dream	32	7.34	5.79	32	7.56	6.03	-.148	.883	-.04

** $p < .05$ level (2-tailed)

Discussion

Summary of results

The purpose of the study was to investigate whether there are gender differences in nightmare/bad dream frequency and emotional change after dreaming. The results from the correlation analysis for both genders demonstrated a significant moderate positive relationship between total amount of nightmares and bad dreams and both negative, and no emotional change after dreaming. When the gender variable was split, and new correlation analyses were done for women and men separately one obtained a slightly different result. For women there was a significant weak/moderate positive relationship between total amount of nightmares and bad dreams, and negative emotional change after dreaming. There was also a significant moderate positive relationship between total amount of nightmares and bad dreams and both positive, and no emotional change after dreaming. The correlation analysis for men demonstrated a significant moderate positive relationship between total amount of nightmares and bad dreams and both negative, and no emotional change after dreaming. The results from the four independent t-tests demonstrated no significant mean differences between women and men on the remaining variables. Three hypotheses were formulated, each is considered in the following paragraphs.

Nightmare/ bad dream frequency

The first hypothesis states that the women in the sample experience a higher frequency of nightmares and bad dreams than the men. There was found no support for the first hypothesis. The results demonstrate no significant mean differences in nightmare/ bad dream frequency between men and women. According to previous research women experience a higher nightmare frequency than men (Hedström et al., 2021; Schredl & Reinhard, 2011; Wang et al., 2021). Therefore, our results were somewhat unexpected. The results demonstrate higher mean and standard deviation scores for women in nightmare and bad dream frequencies, however it is not significant. Thus, our results are in line with previous findings, but the possibility that the results were caused by a random error cannot be excluded. Causality cannot be interpreted from our results; however, one can hypothesize as to why our results were not in accordance with previous research. According to previous research age is a variable that might explain gender differences in nightmare/bad dream frequency, where nightmares occur more frequently in younger adults over the age of 14 and women, compared to men and older adults (Hess et al., 2020; Levin & Nielsen, 2009), however this difference is reduced when men experience an increase of nightmare prevalence during their 70's (Park et al., 2021). The participants in our study had a mean age of 29.27, which indicates that the majority of both the men and women were in early adulthood, therefore the difference were expected to have been greater. However, if we had a sample with a higher median age this might have explained why there is no significant gender difference in nightmare frequency. Another possible explanation for gender differences in nightmare frequency is dream recall frequency, where women tend to have a higher dream recall frequency than men (Schredl & Reinhard, 2011), however a study by Nielsen (2000) demonstrated that when dream recall was taken into consideration there still was a significant gender difference in nightmare frequency (Schredl & Reinhard, 2011). Therefore differences in dream recall most likely is not a factor that would account for why our results did not demonstrate a significant gender difference, however one cannot say with absolute certainty. Another factor that possibly could explain our non-significant gender difference is the fact that we merged nightmares and bad dreams together into one variable. However, a study by Schredl and Reinhard (2011) demonstrates that how one choose to define nightmares either by separating the two where nightmares includes an awakening, or not separating them seemingly does not affect gender differences (Schredl & Reinhard, 2011). This suggests that this is not why our results were non-significant. Seeing that the nightmare definition does not influence gender difference gives us an indication that nightmares and bad dreams might not be all that different.

Emotional changes after nightmares/bad dreams

The second hypothesis states that women experience more emotional changes than men after nightmares and bad dreams. There was found partial support for the second hypothesis. There were no statistically significant mean differences in emotional change between the two genders, even though there was a slightly higher mean for negative emotional change for women, and no emotional change for men. However, when investigating the relation between emotional change and nightmares/bad dreams only women had a statistically significant positive emotional change, meaning women experience more positive emotional changes than men. However, men had a slightly stronger relation to negative emotional change than women. Meanwhile, both genders had a moderate relationship to no emotional change. Our results support the inversed continuity hypothesis, which states that nightmares and bad dreams exert an influence on emotions after dreaming, and thereby change the emotional state of the dreamer (Antunes-Alves & De Koninck, 2012). This seems to be true for both men and women in our study. Another reason to expect that women experience a higher emotional change than men is the fact that women experience more emotions in their dreams, and score higher on negative emotions during their nightmares (Chen et al., 2014). Therefore, if the inversed continuity hypothesis is correct, women should have experienced more emotional changes than men after nightmares and bad dreams, for us this was only partially true. As for the correlation with no emotional change it is expected that nightmares/ bad dreams do not always exert an influence on the emotional state. Seeing that for both genders there is almost an equally strong correlation with no emotional change and emotional change. This indicates that an emotional change after a nightmare/ bad dream and no emotional change occurs together almost equally frequently. According to previous research nightmares contribute to emotional dysregulation (Andrews & Hanna, 2020), and people who experience frequent nightmares generally responds with higher emotional intensity to stimuli as well as having smaller boundaries (Antunes-Alves & De Koninck, 2012). At the same time women is more sensitive to emotional stimuli and this sensitivity extends towards emotional regulation (Gardener et al., 2013). This indicates that women should experience more emotional changes after nightmares, one factor that might explain why we did not obtain a significantly higher negative emotional change in women is the fact that these previous studies indicate that nightmares can lead to emotional dysregulation in frequent nightmare sufferers (Andrews & Hanna, 2020; Antunes-Alves & De Koninck, 2012). While in our study, we did not have a way of separating frequent vs non frequent nightmare and bad dream sufferers. We only looked at the total frequency of nightmares/bad dreams, which might be an average amount of

nightmares and bad dreams for all we know, and thereby not exerting as big an effect on emotional changes after dreaming as previous studies on frequent sufferers. A study by Brand (2011) report that the effect dreams have on post-sleep mood were only associated with the female gender, not the male (Brand et al., 2011), however our findings contradict this.

Negative emotional change

The third and last hypothesis states that the emotional change one experience after having a nightmare and/or bad dream is mostly in a negative direction, meaning from positive to negative. There was found partial support for the third hypothesis. If one look at the whole sample there is support for the hypothesis, where the results demonstrate a stronger relationship to negative emotional change. Furthermore, when the two genders are separated there is support for the hypothesis when it comes to the men. However, for women there is a slightly stronger relationship to positive emotional change. This indicates that for women it is almost equally likely to experience both positive and negative emotional change after nightmares and bad dreams. According to previous research people who suffer from frequent nightmares report more negative emotions in general (Yu, 2007), more negative emotions like stress and worry the following morning (Antunes-Alves & De Koninck, 2012), and more negative morning moods (Antunes-Alves & De Koninck, 2012). Especially negative impactful dreams are strongly correlated with negative post-sleep mood (Nixon et al., 2017). Our results are in line with this when looking at the whole sample, but for women it is only partially accurate because they experienced positive emotional changes as well. Seeing that nightmares and bad dreams is negatively emotionally charged (Siclari et al., 2020) the results for the whole sample which demonstrates more negative emotional change, gives support of the inversed continuity theory which suggests that the emotions one experience while dreaming influence emotions after waking (Antunes-Alves & De Koninck, 2012). The fact that women experienced a positive emotional change might also support the inversed continuity hypothesis. Because even though nightmares and bad dreams is negatively emotionally loaded, there have been reports of people with PTSD who experience nightmares as exciting (Solursh, 1989) as a result of boredom from a lack of emotional stimulation (Solursh, 1989). Excitement is a positive emotion, and therefore this could explain positive emotional change after nightmares. Another possible explanation is that they were relieved to be waking up from a horrible dream, which in turn caused a positive emotional change, however this is just speculations. Therefore, our results indicates that there is in fact not always a continuity between nightmares/bad dreams and post sleep emotions. The positive

emotional change in women does not support our hypothesis and was an unexpected finding seeing that it is not in line with previous research which indicates that women experience more negative emotions during their nightmares (Chen et al., 2014), and report more depressive emotions and anxiety related to nightmare frequency (Wang et al., 2021).

Strengths and limitations

The sample in our study was quite small with only 87 participants in total, and 64 responding to the current variables. Everything between 50-150 participants is considered a small sample size (Langdrige, 2006). Bigger samples offer more precision because there are fewer biases and therefore a higher probability that the results are representative for the population (Langdrige, 2006). However, there are benefits with smaller samples as well. If you get a statistically significant result it is usually more robust using smaller samples because the tests become more sensitive in bigger samples, and therefore the probability of getting significant results inclines (Langdrige, 2006). Meaning, it is easier to get a significant result with a bigger sample size, however it is important to remember that significant results does not guarantee that the results have any real value (Langdrige, 2006). Most previous studies had larger samples (Wang et al., 2021), however there were studies using smaller samples that still discovered gender differences in nightmares and bad dreams (Chen et al., 2014). One strength in our study is the even representation of men and women, we have the same amount of female and male respondents on the current variables. Many previous studies had a 50/50 representation of men and women (Chen et al., 2014), and some had more women than men (Wang et al., 2021). The age range in our study is good for a bachelor study with participants between 20-78 years, and a mean age of 29 years. Previous research on nightmares indicates that this is where the gender differences in nightmare frequency should be greatest (Sicliari et al., 2020), however our results did not support this. Convenience sampling which was used to collect the sample, is not an ideal method because you do not know if the sample is representative (Langdrige, 2006). A randomized sample is the best method because this gives the entire population the same probability of being chosen, however convenience sampling is acceptable as long as the findings only contain minor biases (Langdrige, 2006). The response rate of the study was 61.27%, which is good for a bachelor project. The delay of the data collection could explain some of the dropout that occurred. Sensitive questions is another factor which can induce dropout (Tourangeau & Yan, 2007), our survey did not contain sensitive questions, but some questions about sexual satisfaction and activity could be regarded as sensitive for some individuals. However, we did not use any of these in the

current study. The questionnaire length can also influence response rate (Sahlqvist et al., 2011), the current study included NEQ and SDEQ which increased the length of the survey considerably. These could have been taken out making room for more in-depth questioning on the other questions. Especially seeing that most of the students only used questions from our survey for their thesis, and this might have improved the response rate.

The current study used self-report which could affect the results. It was up to the respondents themselves to decide type of dream, however no definitions were provided so the choice was completely subjective which could affect our results. Self – report bias is another factor which can exhibit an effect, where women are more likely to report disturbing events than men (Schredl & Reinhard, 2011). Because the survey was answered directly after waking this might reduce self-report bias among women, thereby giving more accurate frequencies on both dream type and emotional change. Previous research demonstrates several factors which can influence frequency estimates. When using frequency scales respondents assume that the top and bottom part of the scale is extreme outer points, like never having nightmares or having nightmares all the time (Schwarz et al., 2008). They use this to estimate their own frequency which often leads to over or underestimations (Schwarz et al., 2008), this effect is seemingly strongest when estimating behavioral frequencies, like for example nightmare and bad dream frequency. Many previous studies used retrospective self-report where the respondent must estimate frequencies for time periods that has already passed, like the previous month or year (Schredl & Reinhard, 2011). In a study where they used open questions to investigate anger frequency the answers varied greatly depending on the chosen time period (Schwarz et al., 2008). If they were asked how often they were angry the last week, they reported more frequent, but less intense anger. While if they were asked during the last year they reported less frequent and more intense anger (Schwarz et al., 2008). This entails that if previous studies used different time estimates or frequency scales different results might be obtained. In our study we used neither, which might affect our results. Another factor that might have limited our study is dream recall frequency, in previous studies the researchers has given the participants more extensive guidance to better recall their dreams (Yu, 2007). We did not offer this, thus dream recall could influence our results for dream frequencies, but not gender differences (Schredl & Reinhard, 2011).

Much of the theory behind the study is based on people who suffer from high nightmare frequencies (Antunes-Alves & De Koninck, 2012). In the current study we did not separate

high, low or normal nightmare/ bad dream frequencies, or compare the different frequency levels with emotional change. We only assessed the total nightmare/ bad dream frequency. Thus, our study could be seen as representative for the normal population which is a strength, because a lot of research on bad dreams and nightmares has been conducted in clinical populations while investigating other mental illnesses (Schredl & Reinhard, 2011). However, because we did not take mental illness into consideration this could be a possible confounding variable. Especially for gender differences, seeing that there is already existing gender differences in mental illnesses like depression and trauma which might influence dreaming and the effect dreaming has on the wake mind (Schredl & Reinhard, 2011). However gender differences has been documented in studies on both non-clinical and clinical individuals (Antunes-Alves & De Koninck, 2012). Previous studies have been conducted using either a dream diary or a questionnaire (Antunes-Alves & De Koninck, 2012), one might speculate that our choice of using a survey influenced the perceived gender differences. However, research shows that whether one use a questionnaire or a diary, which can effect nightmare frequency, still don't effect gender differences (Schredl & Reinhard, 2011). Lastly some strengths in our study. First, there has never been conducted a study like this on a Norwegian population before, and studies show that nightmares are linked to low socioeconomic status (Schredl & Reinhard, 2011). Seeing that Norway has a higher standard of living compared to many other countries this might affect our results. Therefore, this study will give us further insight into nightmares and bad dreams in different cultures and societies, perhaps this I why not all our results are in accordance with previous research. Additionally, this is a new research area in need of more research, and our study is contributing with more knowledge. Lastly, women have traditionally not been included in research (Holdcroft, 2007), and the fact that our study has a focus on gender differences directed towards women will help widen the knowledge of women in general and in this field.

Implications

The present study has demonstrated that there are relations between nightmares/ bad dreams and gender differences in emotional change after dreaming. It has also demonstrated that further research is needed to provide a more thorough comprehension of the association between nightmares, bad dreams, emotional changes after dreaming, and gender differences in these areas. More specifically regarding gender differences, our results did not support all previous findings. Specifically, emotional change in women was expected to be more common than for men, and in a negative direction according to previous studies (Chen et al.,

2014). However, women had a slightly stronger relation to positive emotional change, and men had a stronger relation to negative emotional change. Therefore, further research in this area is necessary to improve the comprehension of gender differences in emotional change after dreaming. Seeing that our study did discover some gender differences that were not in line with previous studies this might inspire future research. Another area in need of further research is nightmare and bad dream frequency, which did not have a statistically significant gender difference in our results. This is not in line with previous research, which states that women have a higher nightmare frequency than men (Hedström et al., 2021). Seeing that the gender differences were smaller than previously assumed could be used as an incentive to do further research in this area. Future studies should be conducted on both clinical and non-clinical groups seeing that previous research on nightmares and bad dreams often has been in line with research on mental health disorders (Schredl & Reinhard, 2011), and in our study mental health was not accounted for.

Future studies should include a more comprehensive way of measuring emotional change. The current study used self-report and only one multiple choice question with three possible answers was included to measure emotional change after dreaming. Several participants have reported that they experienced some confusion as to what they were meant to report in this question, because there was no additional information as to what we were interested in investigating they had trouble with understanding what positive, negative, or no emotional change meant. Moreover, many previous studies have used more extensive measures of emotional change, either by including both a dream diary and a questionnaire (Antunes-Alves & De Koninck, 2012), by using questionnaires with 10-15 different measures (Yu, 2007), or by using Likert scales (Wang et al., 2021). When Likert scales are used the participants receive some guidance from the scale itself as to what they are meant to report. Additionally, if the participants experience a small emotional change it is more likely reported by using a scale. The reason for this is that respondents are more likely to report no change (Schwarz et al., 1998), especially if they do not completely understand the question. Meaning, if the participant believe that their emotional change was not big enough to be considered neither positive nor negative, they might end up choosing no emotional change. By using a dream diary, or several measures on emotional change the researchers get the opportunity to interpret whether the change was positive or negative, rather than only trusting in subjective self-reports. However, future studies should be inspired by our study to include measures on both positive and negative motional change. Some of the previous studies only investigated

negative emotional change (Antunes-Alves & De Koninck, 2012), or was done in line with research on disorders like depression, or insomnia (Andrews & Hanna, 2020; Schredl & Reinhard, 2011). This gives our study more representative results.

More longitudinal studies should be used in future research because retrospective self-report has been the most used method thus far, as discussed earlier retrospective self-report can have some downsides like self-report bias (Schredl & Reinhard, 2011), and the use of scales and different time periods can greatly influence the answers (Schwarz et al., 2008). Using a longitudinal method like in our study, the respondents report their experience immediately which might give more representative results. However, longitudinal research is expensive (Langdridge, 2006; Schwarz et al., 1998), and includes a higher risk of dropout so one must weigh the wanted response rate against the accuracy of the results. In the current study all results had weak to moderate effect sizes, which can indicate that the results have no or small value in practice (Ellis & Steyn, 2003).

Conclusion

The results from the current study indicates that women do not have a statistically significant higher frequency of nightmares/ bad dreams, even though they did have a higher mean frequency. There were also no statistically significant mean differences in emotional change between the two genders. However, when investigating the relation between emotional change and nightmares/bad dreams only women had a statistically significant positive emotional change, and men had a slightly stronger relation to negative emotional change than women. Meaning that positive and negative emotional change occur together with nightmares/ bad dreams almost equally frequently for women, while for men only negative emotional change and nightmares/ bad dreams occur together. If one look at the sample as a whole the results demonstrate a relation to only negative emotional change, meaning that emotional change is mostly in a negative direction when one does not separate between men and women. To conclude, there were no significant gender differences in nightmare/ bad dream frequency, but there were gender differences in emotional change after dreaming. Future studies should utilize better measures for self-reporting emotional change and use more longitudinal studies rather than retrospective self-report.

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