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The Sleeping Witness

– Sleep's Effect on Memory in a Witness Situation

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Abstract

Previous studies have shown that sleep strengthens memory. The current study has put this into a real-life context and study sleep's effect on witness testimony.

The 18 participants watched a video of a fictitious assault, and after a 12-hour delay, where half stayed awake during the day, and half slept during the night. They answered a questionnaire about the video, as a memory test. The questions were divided into different categories of interest such as facts surrounding the assault, time estimation of e.g. the duration of the assault, and the aggressiveness of the perpetrators. The participants were then asked to identify a perpetrator in a picture line-up. They also reported their confidence estimation for each answer they gave.

The results showed that there was no significant difference between the groups' memory performance for fact questions, time estimations, aggressiveness estimations or the ability to identify a perpetrator in a line-up. Even though sleep did not improve overall memory performance, it made the participants who slept rate their confidence in their answers higher.

Conclusion: sleep did not improve memory, affect the perceived aggressiveness, or identification in the line-up, but it did increase the confidence estimation of the sleeping participants' answers.

Keywords: sleep, witness testimony, emotional memory, line-up

Sammanfattning

Tidigare forskning har visat på att sömn stärker minnen. Denna studie ämnade att utforska detta i en verklig situation genom att studera sömns effekt på vittnesmål.

De 18 deltagarna fick se en video av en fiktiv misshandel och efter 12 timmar, där hälften av deltagarna var vakna under dagen och andra hälften av deltagarna sov under natten. De fick svara på ett minnestest om videon. Frågorna var indelade i olika kategorier av intresse, som faktafrågor kring händelsen i videon, tidsuppskattning av t.ex. misshandeln och frågor om gärningsmännens aggressivitet. Deltagarna fick sedan peka ut en misstänkt ur en line-up av bilder. Deltagarna fick även rapportera hur säkra de var på deras svar.

Resultatet visade att det inte fanns någon signifikant skillnad mellan gruppernas minnesprestation när det kom till faktafrågor, tidsuppskattning, uppskattning av gärningsmännens aggressivitet eller deras förmåga att identifiera någon från line-upen. Även om sömn inte hade en stärkande effekt på den totala minneprestationen, så bedömde de deltagarna som sov att de kände sig säkrare i sina svar.

Slutsats: sömn förbättrade inte minnesprestation, förändrade inte deltagarnas skattning av aggressivitet eller utpekande i line-upen, men ökade de sovande deltagarnas konfidensskattning för svaren de gav.

Nyckelord: sömn, vittnesmål, emotionella minnen, line-up

1. Introduction

This study looked at the established interaction between sleep and memory by putting it in a real-life situation: witness testimony.

As will be more described later in this study, sleep is thought to play a distinct role in memory consolidation – a subprocess in which a new memory trace becomes gradually more stabilised, and integrated into pre-existing knowledge. There are many theories as to why memory consolidation is thought to take place during sleep, with one of them being the two-stage memory system. The two-stage memory system assumes that new memories are encoded in two stages; when a new memory is first learned an initial encoding into the fast learning store takes place, it is then transferred to a slow learning store where it is gradually incorporated into existing knowledge without overriding old memories. It is believed that this occur during off-line periods, such as sleep (for a review, see Rasch & Born, 2013).

Because sleep and memory are associated with each other, what could the ramifications be because of this close relationship? Studies regarding sleep and memory in a real-life situation is something that has not been done many times before, which is why that type of study would be of interest to examine. Such a situation, with somewhat high stakes, would be witness accounts. Witnesses can sometimes make or break certain criminal trials, and are often considered to be important to sentence a suspect. Criminal investigations often take a long time and witnesses might not always be interviewed directly after witnessing an event, but many days later, meaning that the witnesses will have to go to sleep in between. Because it is known that memory and sleep have a strong connection for their functioning, how does it affect witness accounts? The importance of knowing whether sleep affects memory would be very important for witness testimony - if the two-stage system of memory is correct, and memories are strengthened by sleep then maybe witness should sleep before their first interview to try and make sure that their memories are as strong and correct as possible. But maybe sleep will corrupt the memories, mix them together with other similar experiences from before? If that is the case, then witnesses should not sleep before their first interview.

Which of these outcomes are correct? That is what this current study is interested in.

1.1. Background and previous studies

1.1.1. Sleep and memory

For the current study it is important to understand what previous studies have found in regard to the relationship between sleep and memory.

A classic study by Jenkins and Dallenbach (1924) was the study that first looked at sleep and memory. Their results showed that the participants in their study remembered learned nonsense syllables better after sleeping than after being awake. Since then the area of sleep and memory research has change in their approach, and procedure, but many studies since then have replicated their results. Studies have shown that sleep has a positive effect on memory, if it is included in the retention interval (the period after encoding, and before testing). A big review article about sleep's effect on memory has been made by Rach and Born (2013). They go through old studies, and new findings in the area of sleep and memory research, with newer research characterising sleep as a brain state that helps to increase memory consolidation. Recent studies have also theorized that sleep improves memory by active consolidation of memories, which comes from the reactivation of newly encoded memory representations during sleep (for a more extensive description, see the review article by Rach and Born, 2013).

As mentioned, sleep's effect on memory has been well established by previous studies, with many studies being conducted in the same way; by letting participants memorise word lists. This is an easy, and effective way of testing memory performance but everyday remembering does not look like a laboratory study. Memory helps with everyday life, and all the complexities one might encounter. And, obviously, sleep is something inescapable for most people. Few studies have put a sleep and memory study into a real-life context, but one of the few studies that have done this is one made by Stepan, Dehnke and Fenn (2017).

Their study had a specific focus on sleep, memory, and witness testimony. Their participants watched a video of a fictive crime and after a 12-hour delay of either sleep or wakefulness were asked to identify the perpetrator in a line-up. Two versions of the line-up were made, one where the perpetrator was present (target-present line-up), and one where the perpetrator was not present (target-absent line-up). The line-ups showed 6 headshots in a grayscale simultaneously meaning, that the participants could see all suspects at the same time. The results showed that the participants who slept between watching the video, and being shown the target-absent line-up were less likely to give a false identification whereas sleep seemed to have no effect on correct identifications for the target-present line-up (Stepan, Dehnke & Fenn, 2017). By measuring sleepiness with two different methods they made sure that sleepiness did not influence working memory, leading them to the conclusion that it in fact was sleep that created the effect on line-up identification.

1.1.2. Sleep and emotional reactivity

Because the current study not only aimed to examine memory and sleep, but to put it in a witness situation, understanding how sleep affects emotional memories is needed. This is relevant to the current study because witnessing a crime might create memories filled with negative emotions, specifically. While studies made in this area shown a consensus that sleep help with the recollection of emotional memories, when it comes to emotional reactivity (a construct of emotion that can be measured along two dimensions; valance, i.e. positive to negative, and arousal i.e. calm to excited) previous studies have shown highly contrasting results. Does sleep increase or decrease emotional reactivity?

A study by Baran, Pace-Schott, Ericson and Spencer (2012) wanted to see if emotional memory and emotional reactivity are comodulated, that is if they are interconnected. Their participants were presented with images with negative or neutral valance followed by 12 hours of either being awake during daytime or 12-hour overnight sleep. They found that the recognition accuracy was greater after sleep for both negative and neutral images compared to being awake. The emotional reactivity to the negative pictures seemed to have been reduced during wake, but the emotional response to negative images was somewhat preserved after sleep, thus providing the first evidence that sleep enhances emotional memory while preserving emotional reactivity.

Even if the stimuli in the current study was not of positive valance, a study by Chambers and Payne (2014), and its results are still interesting to mention. They showed their participants 27 single-panel comic cartoons (either humorous, literal or weird) followed by a 12-hour delay in which the participants were either awake or slept. Humorous cartoons were significantly remembered better than literal or weird cartoons for both groups, but that the humorous cartoons were rated as more humorous after wake than after sleep, suggesting that sleep enhances memory, but that sleep reduces emotional reactivity.

A study that showed divisive results within itself was one made by Jones, Schultz, Adams, Baran and Spencer's (2016). Their participants were either young adults (18 to 30 years of age) or old adults (50 to 80 years of age). During encoding, they looked at positive and neutral, or negative and neutral pictures, followed by 12 hours of sleep or wake, and a recognitions test. Their results showed that sleep had an preserving effect for negative images and reactivity in the young but not the old adults, and the opposite was shown for the positive images. That is, sleep had a preserving effect on positive memories and reactivity in old, but not young adults.

Gujar, McDonald, Nishida, and Walker (2011) made an interesting study using a facial recognition task. The participants were shown pictures of the same male face but with different emotional expressions; anger, fear, happiness, sadness, and neutral in black-and-white. Those who were assigned to the nap group were then given a 90-minute sleep opportunity, while those in the no-nap group could go about their day. Later in the day the participants repeated the facial recognition task. The results showed that the no-nap group rated the anger, and fear expressions as significantly angrier, and fearful than those in the nap group. For the happy expression, those in the nap group rated them as significantly happier than those in the no-nap group. A further analysis was made, and the nap group was divided into those who had achieved REM (rapid eye movement) sleep and those who did not, which showed that REM sleep seemed to have decreased negative emotional reactivity for the angry facial expressions, whilst the emotional reactivity for happy facial expressions had increased. This suggests that not all types of sleep can give this effect, and that different types of sleep can affect different types of emotional reactivity.

Except for REM sleep there is another category of sleep called non-REM sleep or slow wave sleep (SWS). As the study by Gujar et. al (2011) suggest, studies have found that REM sleep seem to have some effect on emotional reactivity, but there are some conflicting studies which claim that their results show that SWS can strengthen memory, and affect emotional reactivity as well (Ackermann & Rasch, 2014). Although REM sleep has been argued to have a main role in memory consolidation (Stickgold, 2013), arguments has also been made that the evidence supporting REM sleep's role in memory consolidation is poorly grounded. In other words, sleep is able to affect emotional memory, but it is unclear what kind of sleep does what (Ackermann and Rasch, 2014).

The previously mentioned studies are just a selection of studies made on this subject, and as previously stated this is relevant for the current study since the stimuli used is thought to be of negative valence and high arousal. Because studies are divided when it comes to how sleep affect emotional reactivity, and which sleep state does what, the current study is aiming to examine this, and therefore will use an undirected hypothesis for this.

1.1.3. False memories, and gist abstraction

When conducting studies about memories the notion of false memories is ever present, because remembering facts and events wrong happen to everybody all the time. For the current study it is important to consider the interaction between sleep and false memories, because remembering events, and facts correctly is important in a witness situation.

Fenn et al. (2017) found in a study that participants that slept recalled less false memories than those who were kept awake, and Freda, Patihis, Loftus, Lewis, and Fenn (2014) found that not only sleep deprivation, but also restricted sleep (5 hours or less) increased false memories of the witnesses.

Sleep has also been found to be beneficial for remembering the gist of an event in the long run whereas details might disappear. Lutz, Diekelmann, Hinse-Stern, Born, and Rauss (2017) found that one year after being exposed to their experiment, gist knowledge was found but only if the participant had slept immediately after initial encoding.

These findings are interesting, as they can be used to increase the validity of witness testimony by interviewing the witness after sleep to avoid false memories.

1.1.4. Line-up procedures

Another interesting aspect of sleep's effect on witness testimony of interest for this current study was if sleep would affect the ability to identify a perpetrator in a line-up.

There are several different models used to conduct line-ups. The commonly used methods by police are the single-suspect model, the all-suspects model and a suspect-absent model (Wells, 1993). The single-suspect model only includes one suspect with the others in the line-up being innocent people, or so-called distractors, the all suspects model only uses all the suspects of the crime being investigated, and lastly the culprit-absent model which does not include any suspects at all (Wells, 1993). In addition to these models, the way a line-up is presented can vary as well as they can be either sequential or simultaneous. In a sequential line-up the witness gets to see each person in the line-up one after the other, individually, in sequence. In a simultaneous line-up the witness is presented with all the people in the line-up all at once (Wells, 1993).

Swedish police use different methods when conducting what they call witness confrontations. They use both in-person confrontations and picture confrontations. Because the police want their witnesses' identification to have a high evidence value a witness can only be shown the line-up once, due to exposing them to the same person or persons multiple times might interfere with their original memory of the crime (Rikspolisstyrelsen, 2005).

The information from the article by Wells, and report from the Swedish police were used in order to shape the current study's line-up. The aim for this was to find a good fit between the procedure that the Swedish police actually use during confrontations, but at the same time have a procedure that fits a research study.

1.2. Aim

The aim of this thesis was to examine how sleep affects witness testimony by focusing on different aspects of the experience. The focus was put on how many facts questions the two groups were able to answer correctly, their time estimation, how violent they perceived the perpetrators, and lastly how confident they were in their answers.

The results of this study could be beneficial for how the justice system handles witness testimonies, and how to judge how reliable a witness is depending on whether they slept or not. They could be important to know since this might influence the weight put onto witnesses' retelling of events.

1.3. Hypotheses

The three hypotheses for this study were:

That sleep would affect and improve memory performance for fact questions.

That the perceived aggressiveness would be affected by sleep. Because of previous studies' conflicting results the effect could be in any direction.

That sleep would improve the participants ability to correctly identify a perpetrator in a line-up.

For confidence estimates there was no hypothesis. No study has looked at this before making it hard to predict an effect direction.

2. Method

2.1. Participants

The participants in this study were 7 men and 11 women ($N = 18$) in the ages of 22-33. The mean age for the wake group was 26.1 ($SD = 3.1$) and for the sleep group 24.3 ($SD = 2.5$). The wake group consisted of 3 men and 6 women, and the sleep group consisted of 4 men and 5 women. This was the most even gender distribution possible.

Due to the violence in the video the age was restricted to adults, minimum age of 18, and due to age-related changes to memory the maximum age was set to 35. They were recruited either by flyers that were posted around the university campus or via Facebook. All participants were either native or fluent in Swedish.

The participants were randomly assigned into one of two groups; the sleep group or the wake group. This randomisation was made when they were put into the schedule.

2.2. Material

The sleepiness scale used was Karolinska Sleepiness Scale (KSS, Åkerstedt & Gilbert, 1990).

The video was provided by the Department of Psychology at Lund University, as part of a larger data collection, and has previously been used in unpublished pilot tests. The video opens up on a square during fall. A man in black clothing and sunglasses can be seen in the distance talking on a cell phone. A few people walk or cycle by. After a while, walking across the square are three young men (one with long blonde hair in a ponytail, black glasses and black outfit, one with a shaved head, green/grey sweater, and blue, ripped jeans, and one with a grey hat, and black outfit). They will from now on be referred to as Perpetrator 1, Perpetrator 2, and Perpetrator 3 respectively. At approximately the same time, a man in a green jacket, black hat, and blue jeans (the victim) comes walking from the other side of the square. The victim stops in the middle of the square, and starts to talk to the perpetrators for a while before Perpetrator 3 punches him. The victims fall to the ground, and the assault takes place with further kicks and punches. Perpetrator 1 only looks on without actively participating with kicks or punches. The perpetrators then run away, and two witnesses, one being the man with sunglasses, and a woman with short, dark hair, help the victim walk away from view. The video continued for a few seconds after the perpetrators, and victim had moved away from view before ending. For screenshots from the video, see appendix 6.1.

The questionnaire consisted of 21 questions in 4 categories: fact questions (which can be answered either correctly or incorrectly), time questions (estimations of time for an event in the video), aggression questions (estimation of how aggressive the perpetrators were as well as the severity of the victims' injuries), and mix-up questions (questions where the participants' description of people in the video could be confused). The mix-up category was excluded from this study, for more about this see section 2.4.3. The questionnaire was in Swedish.

After each question there was a scale from 0% to 100% (with intervals of twenty), which the participants used to rate how confident they felt about their answers just given. These will be referred to as their confidence estimate. At the end of the questionnaire there were three background questions concerning gender, age, and how many hours they had slept the previous night. These questions were placed at the end to prevent priming.

The model for the picture line-up used was a single-suspect model. The pictures used was provided by the Department of Psychology at Lund University, as part of a larger data

collection. The line-up consisted of 10 pictures of men (appendix 6.3) including one of the perpetrators in the video, Perpetrator 2 (appendix 6.3, picture 10). The picture line-up was made in PowerPoint with a black background, and a script that randomised the order of the pictures for every participant.

The tests were conducted in rooms at the Department of Psychology at Lund University to provide as much of a standardised environment as possible.

2.3. Procedure

The participants were recruited with the information that they were going to be partaking in a memory study with a specific focus on witness testimony. The sleep variable was hidden.

This study was divided into two phases. The morning times were 08:00, 08:20, and 08:40, and the evening times were 20:00, 20:20, and 20:40. Participants in the wake group arrived at one of the morning times for phase one, and returned for phase two and testing at the respective evening time. Participants in the sleep group arrived at the evening times for phase one, and return for phase two and testing during the respective morning time. This design made the current study a daytime wake/night-time sleep (DW/NS design).

An instructional pamphlet for the test leaders were written beforehand to make sure that the instructions given to the participants were the same, to avoid any differences between the test leaders.

In the first test phase the participants were informed about the study procedure, and then signed a consent form. In several studies by Geiselman (2010) a significant correlation between how rested the participants felt and how well they remembered the event was found, which is why the participants' level of sleepiness was self-measured on the KSS scale. When this was done they watched the video, which was displayed on the screen of a laptop. This was then followed by a 12-hour delay.

After the 12 hours the participants returned for the second test phase where they were asked to rate their sleepiness on the KSS scale once more. They were then asked to recall freely what they remembered of the video, and their recollection was recorded (the free recall was part of a larger data collection, and will be reported on elsewhere).

This was followed by the questionnaire with questions about the video they saw. Lastly, the participants were asked to identify one of the perpetrators in a line-up. They were shown pictures of suspects, only one of which was one of the perpetrators in the video (more on this to come in section 2.4.4). The participants only got to see each picture once, and could not go back and pick out a suspect in hindsight. They were also asked to rate their confidence

if they made an identification, using the same confidence scale as in the questionnaire. The two test phases were the same for both test groups except which test phase was done at what time of day.

Before testing was done, pilot tests were conducted. The pilot tests were used to determine whether the material was ready to be used or if it needed to be improved. During these pilot tests the time to complete the two phases was monitored and later dictated the amount of time set aside in scheduling further tests.

The participants were promised a light snack as a reward for their participation. They were given cookies, and fruits of varying kind.

2.4. Data analysis

2.4.1. Fact questions, and time estimates

Questions which had a right or wrong answer was put into the fact category (questions 1, 7, 9, 14, 15a-c, 16, 18, 19, 20). An example of a fact question is question 1: “How many perpetrators were there?”.) The highest correct answers a participant could get was 11.

Time estimates (questions 11, 13, 17, 21) were made into a subcategory for fact questions because the answers here are also right or wrong, only that it concerns time and not general facts. The time estimates were given in seconds or calculated into seconds, which was then made into percentage of the correct answer (i.e. if a participant answered correctly their score would be 100, if the estimation was less than the correct answer their score was less than 100, and if the estimation was more than the correct answer their score was over 100).

The mean for each question in these two categories were made into one variable each, which were used for comparisons between groups.

2.4.2. Aggressiveness

There were five questions in the aggressiveness category (2e, 3, 4, 6, and 12). Fear or other negative emotions could have affected the answers to these questions, therefore they are in the aggressiveness category. The scale used in question 2e went from 1 (not aggressive) to 7 (maximum aggressive). For questions 6 the scale used was 1 (not hurt) to 7 (maximum hurt).

When analysing this category questions 3, 4, and 12 in the questionnaire were taken out. These three questions were put into this category due to questions regarding emotional and violent parts of the video, but these questions also had a right or wrong answer. Questions 3 and 4 were not further analysed since all participants answered these correctly. Question 12 was not further analysed because all participants answered that it was one of the perpetrators

who hit first. Additionally, these questions did not deal with the subjective experience of the perpetrators' aggressiveness, or the perceived seriousness of the victim's injuries which is of interest for the current study.

The aggressiveness category was analysed by comparing the two groups' merge means for each aggressiveness question, to see if their memory of the video was more, less or the same as the other group.

2.4.3. Mix-up

This category consisted of questions about the appearance of the perpetrators, the victim, and the witnesses (questions 2a-d, 5, and 8). The participants' ability to correctly or wrongly describe the people involved in the video was what was going to be investigated in this category. The category was not further analysed due to difficulties in coding and analysing the answers to these questions, because it was impossible to know if the participant mixed up the descriptions or simply had forgotten, and just got the answer wrong. Some descriptions were also quite vague which made it hard to analyse.

2.4.4. The line-up, and coding of perpetrators

The participants descriptions of the perpetrators were matched with the help of a correction template (see appendix 6.4) so that for every participant Perpetrator 1 was the man with blonde hair, and glasses who did not participate with kicks or punches in the assault, Perpetrator 2 was the man with a shaved head, and blue, ripped jeans, and Perpetrator 3 was the man with a grey hat, and black clothes.

Perpetrator 2 was the target in the line-up. The answers, either correct, wrong or no identification, was compared between the groups.

2.4.5. Confidence estimates

The confidence estimates were included because it was deemed as interesting for the current study. The confidence scores for each question in each category were made into their own variable (i.e. one mean for one category for each group). This variable was then used to compare the difference in reported confidence estimates for the two groups in all the categories. The scale used was from 0% (don't know) to 100% (completely sure) with intervals of 20. Each question category got a mean confidence estimate which was used to compare the confidence estimates between the two groups, in the different categories.

2.5. Ethics

Participants were informed that they would be watching a video depicting an assault during recruitment, and during the introduction to make sure they were okay with this. They were also informed that the video was staged and thus fictitious. The video has been approved by the local ethics committee (ref. 2015-627). The participants signed their approval before the first test phase started. They were informed that participation was anonymous, and that they could stop their participation whenever they wanted without having to provide any reason. They were also informed that no personal information was going to be collected or distributed.

3. Results

3.1. Fact questions

The mean for correct answers for fact questions was 8.7 for the wake group ($SD = 0.71$) and 9.4 for the sleep group ($SD = 2.12$)

Because of the number of participants being low, a Mann-Whitney U test was performed. It found that there was no significant difference between the wake group ($Md = 9, n = 9$), and the sleep group ($Md = 9, n = 9$) $U = 40.000, z = -0.05, p = 0.96, r = -0.016$.

This was done to test the hypothesis that sleep would affect memory performance. These results suggest that the null hypothesis should be retained, which means that sleep did not improve memory performance for fact questions.

3.1.1. Confidence estimates for fact questions

There was no significant correlation for fact questions, and confidence estimate for the wake group was $\rho = 0.05, p = 0.9$, and for the sleep group was $\rho = 0.38, p = 0.31$. The test used was Spearman's correlation coefficient. The difference in confidence estimates between the group was significant for the fact questions category. The sleep group ($m = 80$) generally felt more confident in their answers compared to the wake group ($m = 68.11$) ($Md = 73.5, n = 18, U = 13.000, z = -2.438, p = 0.014, r = -0.574$). A Mann-Whitney U Test was used and according to Cohen's criteria this result has a large effect size. This means that while there was no significant difference in how correct the groups were, there was a significant difference in how confident they were in their answers, meaning that sleep made the participants more confident for questions in the fact category.

3.1.2. Time

The wake group's time estimation ($m = 237$, $SD = 268$) differed from the sleep group ($m = 182$, $SD = 90$) in that the wake group overestimated more, and that the sleep group had less variance. As presented below, the difference was not significant.

A Mann-Whitney U test was made and showed that there was no significant difference in time estimation between the wake group ($Md = 131$, $n = 9$), and the sleep group ($Md = 199$, $n = 9$) $U = 37.000$, $z = -0.31$, $p = 0.76$, $r = -0.179$.

3.1.3. Confidence estimates for time questions

A Mann-Whitney U test showed that there was no significant difference in confidence estimates for time questions between the wake group ($Md = 60$, $n = 9$), and the sleep group ($Md = 65$, $n = 9$) $U = 31.500$, $z = -0.81$, $p = 0.42$, $r = -0.19$.)

It was concluded that sleep did not affect how the participants' time estimate.

3.2. Aggressiveness

Descriptive data regarding ratings of aggressiveness, and the victim's injuries are presented in table 1. Perpetrator 1 was the non-violent perpetrator with long, blonde hair, and glasses, Perpetrator 2 had a shaved head, and was the target in the line-up, and lastly Perpetrator 3 had a grey hat, black outfit, and was the instigator of the assault.

| <i>Mean and standard deviation for each perpetrator and the victim's injuries</i> | | |
|---|----------------|----------------|
| Variable | Wake | Sleep |
| Perpetrator 1 | 3.56 (2.10) | 3.11 (1.27) |
| Perpetrator 2 | 4.00 (2.18) | 4.78 (1.92) |
| Perpetrator 3 | 4.22 (1.79) | 4.44 (1.81) |
| Victim's injuries | 4.33 (1.41) | 4.44 (.73) |

Table 1. Means (and standard deviations in parentheses) for each perpetrator, and the victim's injuries, for each group.

A Mann-Whitney U tests showed that the difference between the groups regarding the perceived aggressiveness of Perpetrator 1 ($Md = 4, n = 18, U = 32.000, z = -0.77, p = 0.44, r = -0.18$), Perpetrator 2 ($Md = 5, n = 18, U = 29.000, z = -1.05, p = 0.29, r = -0.25$), Perpetrator 3 ($Md = 5, U = 36.500, z = -0.36, p = 0.72, r = -0.08$), and the victim's injuries ($Md = 4, U = 33.500, z = -0.65, p = 0.53, r = -0.15$) were not significant.

These tests were done in order to test the hypothesis if sleep affected the perceived aggressiveness. The results show that sleep did not have an effect on the perceived aggressiveness of the perpetrators or the victims' injuries, thus the null hypothesis should be retained.

3.2.1. Confidence estimates for perceived aggressiveness

Descriptive data regarding confidence estimates for the questions regarding the aggressiveness of the perpetrators, and the victim's injuries are presented in table 2.

| <i>Mean and standard deviation for the confidence estimations for each perpetrator, and the victim's injuries</i> | | |
|---|------------------|------------------|
| <i>Variable</i> | <i>Wake</i> | <i>Sleep</i> |
| Perpetrator 1 | 48.89 (28.48) | 60.00 (26.19) |
| Perpetrator 2 | 52.50 (33.70) | 72.50 (18.32) |
| Perpetrator 3 | 45.71 (19.02) | 62.86 (33.52) |
| Victim's injuries | 71.11 (20.28) | 77.50 (16.69) |

Table 2. Means (and standard deviations in parentheses) for confidence estimates for perceived aggressiveness, and the victim's injuries, for each group.

A Mann-Whitney U test was used on Perpetrator 1 ($Md = 54, U = 27.000, z = -0.89, p = 0.38, r = -0.21$), Perpetrator 2 ($Md = 62.5, U = 22.000, z = -1.13, p = 0.26, r = 0.065$), Perpetrator 3 ($Md = 54, U = 16.000, z = -1.15, p = 0.25, r = -0.30$), and the victims injuries ($Md = 74, U = 29.000, z = -0.71, p = 0.48, r = -0.17$), which showed no significant difference in confidence estimation for perceived aggressiveness or the victim's injuries. This means that sleep did not affect the confidence estimate for the aggressiveness category.

3.3. The line-up

In the wake group only two participants identified a perpetrator ($m = 2.6, SD = 0.88$), whereas seven did not. In the sleep group four participants identified a perpetrator ($m = 2.1, SD = 1.1$) whereas five did not. No one made a false identification, i.e. all participants who identified someone out of the line-up identified the target, Perpetrator 2.

A Chi-square test for independence was made even though the number of participants was less than what is usually needed for this test. Therefore, one should be careful in drawing conclusions from the results of the test.

The test indicated that there was no significant association between the two groups and identifying of a perpetrator, $\chi^2(1, n = 18) = .317, df = 1, p = 0.62$. Due to the number of participants who identified a perpetrator being so low, the test showed cell violations.

The conclusion drawn from this was that sleep did not affect the participants' ability to identify a perpetrator in a line-up, and that the null hypothesis should be retained.

3.3.1. Confidence estimate for line-up identification

Because of the low numbers of identifications ($n = 6$), the confidence estimations for the line-up were not analysed further.

3.4. Sleep descriptives

Mean hours of sleep for the wake group was 6.7 hours ($SD = 1.12$), which was the same as the sleep group at 6.7 hours ($SD = 1.12$).

The mean score of the first sleepiness scale, before watching the video, for the wake group was 5.6 ($SD = 1.7$), and for the sleep group it was 4.8 ($SD = 1.5$). The mean score on the second sleepiness scale, before answering questions about the video for the wake group was 5.2 ($SD = 1.3$), and for the sleep group 5.8 ($SD = 1.6$).

The result of the Friedman Test showed no significant difference between the groups' sleepiness scores $\chi^2(1, n = 18) = 0.07, p = 0.80$. The median values showed an increase in sleepiness between the first measurement ($Md = 5$) and the second ($Md = 6$).

A Spearman's correlation coefficient test found that there was no significant correlation between the second sleepiness score and memory performance for fact questions ($\rho = 0.04, p = 0.88$).

There was no significant correlation between the second sleepiness score and time estimates ($\rho = -0.11, p = 0.65$).

There was no significant correlation between the second sleepiness score and the aggressiveness questions ($\rho = 0.02, p = -0.2$).

No statistical tests were done between the second sleepiness score, and identification of a perpetrator in the line-up because there were too few participants who identified a perpetrator.

This shows that there was no difference in sleepiness between the groups, which means that any results found should be because of sleep, and not because of sleepiness.

4. Discussion

4.1. Fact questions, and time estimates

The first hypothesis, that sleep would cause the participants who slept to remember the video and assault better, has not been confirmed. The results show that the groups did not differ significantly in how correct they were, but they differed in their confidence estimates for their answers for fact questions. The current study is unable to determine exactly why sleep made the sleep group more confident in their answers, but it is of interest to discuss the implications this result could have on witness testimony. A witness who has slept before their first interview might believe that his or her story is more correct than it actually is. This could lead them to present their testimony in a more confidence manner which could lead to police, interviewer, and jury in court to perceive this story as more reliable. This can interfere with the truth of what really happened, and worst-case scenario it could lead to a false, or a somewhat skewed testimony, which in turn could result in a wrongful conviction.

Sleep did not however affect the participants time estimates or their confidence estimations regarding time.

4.2. Aggressiveness

The second hypothesis was rejected since there was no significant difference between the groups regarding the perceived aggressiveness of the perpetrators or the victims' injuries.

The authors initially expected Perpetrator 1 (who was non-violent) to get the lowest score and Perpetrator 3 (the instigator to the assault) to have the highest score. Contrary to that, the perpetrators' aggressiveness score did not differ significantly. The aggressiveness rating for Perpetrator 2 showed a tendency to a difference between the wake and sleep group, but it was not enough to become significant. What was additionally unexpected was that the participants gave some interesting comments regarding Perpetrator 2 and his role in the assault, as he was described as being "the leader", "macho", and "a typical masculine guy". When reviewing the video after seeing these comments, it was noted that his body language, and actions might have caused this perception. When he appears, and while he is talking to the victim, he is standing in the middle of the perpetrators (appendix 6.1, screenshot 2). While not being the one to instigate the assault, during it he was positioned between the camera (from the participants view) and the victim, whereas Perpetrator 3 was stood behind the victim. This could mean that the participants had a better view of Perpetrator 2 (appendix 6.1, screenshot 3). The manner in which Perpetrator 2 kicked, and punched the victim differed from the manner in which Perpetrator 3 engaged in the assault. Most notably Perpetrator 3 only kicked the victim (after the initial punch), and did it slower than Perpetrator 2.

The fact that the aggressiveness score for Perpetrator 1 was not significantly different can be seen as something that could affect his possible sentence. Considering that he did not actively engage in the assault, one might think that he should not get the same punishment as the other two perpetrators, even if he was complicit in the assault.

4.3. Line-up

When looking at the results of the line-up it is worth mentioning that there were no false identifications. It is also interesting that only six participants overall identified the target while the rest of the participants failed to identify anyone. The reported confidence estimations that the participants gave for their identifications were either 40% or 60%, which makes one believe that none of them felt overly confident in their identification. During the line-up there were several participants who stopped for a few extra seconds while viewing the line-up picture of Perpetrator 2, the target of the line-up before continuing, and ending up not identifying anyone. While discussing the reason for why so few participants actually identified someone in the line-up, the possibility of the observer effect came up. The lack of

identifications could possibly be due to the fact that the participants were fully aware that they were being watched by a test leader, and presumably wanted to do a good job. This could have made them hesitate to identify a perpetrator. With the possible observer effect, it can be argued that those who did identify a perpetrator, regardless of their reported confidence estimate, felt confident enough to do so which might seem contradictory. Because if they felt confident enough to identify a perpetrator why did they rate their confidence so low? This is a question that the current study cannot answer.

The model and method used in the current study was chosen because it fit the aim of the study. The single-suspect model was used because it was the better choice when considering the aim of this study, to test sleep's effect on memory. A target-absent model was of no interest for the current study because no identification, and false identification could be made with a target-present model. The all-suspects model was deemed to be too small as all perpetrators were already known to the test leaders, and no one beyond those three could be deemed as a suspect because of this. When choosing method, the sequential method was chosen even though Swedish police more often use the simultaneous method. This was done because it fits better given the fact that this is a research study and according to Wells (1993) this method is better. Using the sequential method can avoid the relative-judgement process, which is when a witness sees all suspect at once, and this can lead the witness to compare the suspects against each other, and make an identification on this basis. This could possibly lead to more false identifications, especially if the target-absent model is concurrently used. The accuracy of an identification using the sequential method is larger (Wells, 1993). Swedish police use both picture, video, and in-person line-ups (Rikspolisstyrelsen, 2005), so for effectiveness, and given the limited resources of the current study a picture confrontation was chosen.

4.4. General Discussion

Considering the small number of participants, the results from the current study are not truly reliable. The design of the study can initially be seen as time consuming, because the participants have to come in twice, and at uncomfortable times, which makes it harder to convince people to participate in studies like this. Yet the actual effort put into the experiment for the participants are not that great. For test leaders, constructing, and performing a study of this design is fairly easy to do.

The recruitment was open for all people who fit the recruitment criteria, but all participants that ended up partaking in the current study were students. As they were all students, whether

their sleep patterns, memory performance or emotional reactivity reflects the society in general is questionable.

To minimize the possible effects of the participants knowing about the sleep variable, the participants were not informed of the study's purpose to examine sleep until the debriefing. The sleep variable was hidden by not being presented or emphasised to the participants in the recruitment, and introduction, as the study was presented to only be about memory and witness testimony. The explanation for the different test times was explained that the study required a 12-hour delay, and that the times used were the most sensible time, as a time later in the day would mean having to do phase one or two in the middle of the night. Regarding the sleepiness scale, and the question about sleep at the end of the questionnaire it was justified to the participants by noting that it was early morning or late evening, hence people might feel a bit sleepy. Hiding the sleep variable could have affected the study as it is possible that some of the participants in the wake group took a nap during the delay. None of the participants mentioned doing so in the debriefing when being told about the sleep variable, and asking them to refrain from napping was not thought of until after testing was already finished.

The participants' circadian rhythm could have had an influence on their ability to remember the video, and this could have affected the results. The current study chose to have a DW/NS design because being awake during the day, and being asleep during the night was seen as more accessible, and less invasive, especially as the testing was done during weekdays. A way to control for circadian rhythm would be to let the two groups do the encoding, and recall at the same time of day which could be done in future studies as a control.

The participants in this study had about the same amount of sleep, as the groups had the same mean hours of sleep (6.7) and standard deviation (1.12). They also did not differ significantly in sleepiness, based on their self-assessed scores on the KSS. This means that the amount of sleep or sleepiness was not a possible alternative explanation for the results in the current study.

As mentioned in the method, before the participants answered the questionnaire they were asked to do a free recall which was not analysed for this study but was collected as part of a larger data collection. This could have affected the participants' answers in the questionnaire, but in what manner is unclear since it was not analysed in the current study. In some cases, when the participant remembered something wrong, the free recall may have made them remember the video more falsely as them retelling their false recollection could have

reinforced the false memory. In the case of correctly recalling the assault and/or its surrounding details, the correct information could similarly have been reinforced during the free recall.

The study was conducted by either of the test leaders, with each participant having the same test leader in both test phases. In order to standardise the procedure, and the information given to the participants, an instruction manual was written before any testing was made. Even answers to possible questions that the participants might ask were discussed beforehand, and if the test leaders got unforeseen questions the agreement was to answer as accurate as possible without compromising the aim of the study. Revisions to the instruction manual were made after the pilot testing.

The quality of the video used in the study was good, the environment and people could be seen easily. Details, especially further away, were harder to see clearly. In the video, all the perpetrators', and the victim's faces could be seen clearly, but general blurriness could have made facial recognition harder (see appendix 6.1, screenshot 2). During a real crime, optimal conditions for recognitions are not always met as a crime can take place at a distance, or in a dimly lit area. Therefore, the video quality can be seen as a good imitation of real-life conditions. Furthermore, as both groups saw the same video, the quality should not have made an imbalanced impact. The participants watched the videos on two different computers which could have affected their results, but that seems highly unlikely.

4.5. Future studies

Future studies in this area have a lot left to explore as the field still has a lot of unanswered questions, and in need for further advancement. This section will give suggestions for future research, interesting angles to take, and how to improve the methods used in the current study.

First and foremost, what needs to be improved for future studies is the number of participants. Sleep studies tend to have a low number of participants as it is a research area that can be rather time consuming. But with this type of design, and aim, the possibility to recruit a large number of participants is possible, especially with a large time frame, and more test leaders able to conduct the study.

Regarding the findings for the aggressiveness category, future studies might be able to further investigate the ability to distinguish each perpetrator, their actions, and role in a crime, and whether sleep has an impact on this ability. It would be interesting to see a future study could find a difference in perceived aggressiveness or emotional reactivity. Maybe the

use of a scene from a movie, which might have more of a negative valence, and higher arousal could yield an interesting result. This could be particularly interesting for law enforcement to better understand, and handle witness testimonies. A study looking into this would also be of value because the current study might not have had enough participants, and therefore might not have been able to draw any conclusions about emotional reactivity. Since studies about sleep and emotional reactivity, as previously mentioned, is so inconclusive, it would be very interesting to see what a sleep and witness study would find in regard to this.

Further, the line-up model used in this study was the single-suspect model. Future studies might want to further investigate sleep's effect on witness testimony using other models and other materials than pictures. If a future study aims to resemble law enforcement's methods better, a suggestion would be to use an interview rather than a questionnaire. In order for this to strengthen the validity of the study, the researcher needs to be familiar with the procedure or have had contact or collaboration with the police to ensure that the interview is as close to reality as possible. To add to a more realistic experience, the crime could be enacted in real life rather than viewing a recording, depending on the crime, and ethics. It is important to consider the ethics when staging a crime, especially if one chose a violent crime such as an assault which was used for the current study. This method could be interesting, and the results from studies using these methods might also help law enforcement in making better decisions regarding witness testimony.

Future studies should also include confidence estimates because they showed a significant difference in the current study for fact questions category, and it would be very interesting to see if this result could be replicated, or extended to different question categories. It is also, as previously mentioned in section 4.1, quite important to know if sleep affect the confidence with which a witness remembers an event, since this can have consequences in how the justice systems value witness testimonies.

The relationship between a witness' confidence, and how the witness project that confidence regarding their story could be researched. This could be done by comparing the confidence estimate of the witness, and the projected confidence scored by an interviewer or independent observer. The result of such a study could be of importance to law enforcement, and the justice system as it might be able to report if a witness feeling more confident in their story correlates with the perceived confidence scored by the interviewer or observer.

The current study has shown some interesting result regarding how sleep affects the participants' confidence in their answers when it comes to fact questions. The non-significant results are also interesting, as they point to there not being a connection between sleep, and

the other question categories used in this study. But given the relatively small number of participants it is hard to draw any general conclusions. Studies like these are still of value though, as they could shed a light on how to handle witnesses, and how to judge the content of witness accounts.

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6. Appendix

6.1. Screenshots from the video



Screenshot 1: The beginning of the video shows a square in autumn. The man with sunglasses, and speaking on his cellphone will become Helping Witness 1.



Screenshot 2: Perpetrator 3, Perpetrator 2, and Perpetrator 1 talk to the Victim. The Victim is backing away from the perpetrators. Helping Witness 1 is still standing behind the four of them, currently out of sight.



Screenshot 3: Perpetrator 1 looking on as Perpetrator 2 (foreground) and Perpetrator 3 (background) are kicking and punching the Victim.



Screenshot 4: The Victim is being helped by Helping Witness 1 while Helping Witness 2 is approaching them.

6.2. The questionnaire

Instruktioner

Nedan kommer ett antal frågor som berör filmen som du såg tidigare. Du skall för varje fråga skriva ned ditt svar. Skriv ditt svar på den streckade linjen under varje fråga. Om du inte alls har någon aning om svaret, skriver du ”vet ej” på den streckade linjen. Du skall sedan skatta hur säker du är på ditt svar. Detta gör du genom att ringa in procentenheterna på konfidensskalan som följer efter varje fråga. Skalan går från 0% till 100%. 0 % betyder ”vet ej” och 100% betyder ”helt säker på att svaret är korrekt”. Med andra ord, om du skrivit ”vet ej” ringar du in ”0%”.

1. Hur många var gärningsmännen?

Hur säker är du på ditt svar?

| | | | | | |
|----------|-----|-----|-----|-----|--------------|
| 0% | 20% | 40% | 60% | 80% | 100% |
| (Vet ej) | | | | | (Helt säker) |

2. Beskriv de gärningsmän du kommer ihåg så utförligt som möjligt. Fyll alltså bara i för så många gärningsmän som du tror att det var.

Gärningsman 1

Hår/frisyr/huvudbonad:

Hur säker är du på ditt svar?

| | | | | | |
|----------|-----|-----|-----|-----|--------------|
| 0% | 20% | 40% | 60% | 80% | 100% |
| (Vet ej) | | | | | (Helt säker) |

Kläder överdel:

Hur säker är du på ditt svar?

| | | | | | |
|----------|-----|-----|-----|-----|--------------|
| 0% | 20% | 40% | 60% | 80% | 100% |
| (Vet ej) | | | | | (Helt säker) |

Kläder underdel:

Hur säker är du på ditt svar?

| | | | | | |
|----------|-----|-----|-----|-----|--------------|
| 0% | 20% | 40% | 60% | 80% | 100% |
| (Vet ej) | | | | | (Helt säker) |

Ålder:

| | | | | |
|---------|---------|---------|---------|---------|
| 16 - 19 | 20 - 23 | 24 - 27 | 28 - 31 | 32 - 35 |
|---------|---------|---------|---------|---------|

Hur säker är du på ditt svar?

| | | | | | |
|----------|-----|-----|-----|-----|--------------|
| 0% | 20% | 40% | 60% | 80% | 100% |
| (Vet ej) | | | | | (Helt säker) |

Annan detalj:

Hur säker är du på ditt svar?

| | | | | | |
|----------|-----|-----|-----|-----|--------------|
| 0% | 20% | 40% | 60% | 80% | 100% |
| (Vet ej) | | | | | (Helt säker) |

Hur aggressiv var gärningsmannen, sett i antal sparkar och slag? Ringa in i skalan nedan.

| | | | | | | |
|----------------|----------|----------|----------|----------|----------|--------------------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Inte aggressiv | | | | | | Maximalt aggressiv |

Hur säker är du på ditt svar?

| | | | | | |
|----------|-----|-----|-----|-----|--------------|
| 0% | 20% | 40% | 60% | 80% | 100% |
| (Vet ej) | | | | | (Helt säker) |

Gärningsman 3

Hår/frisyr/huvudbonad:

Hur säker är du på ditt svar?

| | | | | | |
|----------|-----|-----|-----|-----|--------------|
| 0% | 20% | 40% | 60% | 80% | 100% |
| (Vet ej) | | | | | (Helt säker) |

Kläder överdel:

Hur säker är du på ditt svar?

| | | | | | |
|----------|-----|-----|-----|-----|--------------|
| 0% | 20% | 40% | 60% | 80% | 100% |
| (Vet ej) | | | | | (Helt säker) |

Kläder underdel:

Hur säker är du på ditt svar?

| | | | | | |
|----------|-----|-----|-----|-----|--------------|
| 0% | 20% | 40% | 60% | 80% | 100% |
| (Vet ej) | | | | | (Helt säker) |

Ålder:

| | | | | |
|---------|---------|---------|---------|---------|
| 16 - 19 | 20 - 23 | 24 - 27 | 28 - 31 | 32 - 35 |
|---------|---------|---------|---------|---------|

Hur säker är du på ditt svar?

| | | | | | |
|----------|-----|-----|-----|-----|--------------|
| 0% | 20% | 40% | 60% | 80% | 100% |
| (Vet ej) | | | | | (Helt säker) |

Annan detalj:

Hur säker är du på ditt svar?

| | | | | | |
|----------|-----|-----|-----|-----|--------------|
| 0% | 20% | 40% | 60% | 80% | 100% |
| (Vet ej) | | | | | (Helt säker) |

Hur aggressiv var gärningsmannen, sett i antal sparkar och slag? Ringa in i skalan nedan.

| | | | | | | |
|----------------|----------|----------|----------|----------|----------|--------------------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Inte aggressiv | | | | | | Maximalt aggressiv |

Hur säker är du på ditt svar?

| | | | | | |
|----------|-----|-----|-----|-----|--------------|
| 0% | 20% | 40% | 60% | 80% | 100% |
| (Vet ej) | | | | | (Helt säker) |

Gärningsman 5

Hår/frisyr/huvudbonad:

Hur säker är du på ditt svar?

| | | | | | |
|----------|-----|-----|-----|-----|--------------|
| 0% | 20% | 40% | 60% | 80% | 100% |
| (Vet ej) | | | | | (Helt säker) |

Kläder överdel:

Hur säker är du på ditt svar?

| | | | | | |
|----------|-----|-----|-----|-----|--------------|
| 0% | 20% | 40% | 60% | 80% | 100% |
| (Vet ej) | | | | | (Helt säker) |

Kläder underdel:

5. Beskriv offret så utförligt som möjligt.

Hår/frisyr/huvudbonad:

| | | | | | |
|-------------------------------|-----|-----|-----|-----|--------------|
| Hur säker är du på ditt svar? | | | | | |
| 0% | 20% | 40% | 60% | 80% | 100% |
| (Vet ej) | | | | | (Helt säker) |

Kläder överdel:

| | | | | | |
|-------------------------------|-----|-----|-----|-----|--------------|
| Hur säker är du på ditt svar? | | | | | |
| 0% | 20% | 40% | 60% | 80% | 100% |
| (Vet ej) | | | | | (Helt säker) |

Kläder underdel:

| | | | | | |
|-------------------------------|-----|-----|-----|-----|--------------|
| Hur säker är du på ditt svar? | | | | | |
| 0% | 20% | 40% | 60% | 80% | 100% |
| (Vet ej) | | | | | (Helt säker) |

Ålder:

| | | | | |
|---------|---------|---------|---------|---------|
| 16 - 19 | 20 - 23 | 24 - 27 | 28 - 31 | 32 - 35 |
|---------|---------|---------|---------|---------|

| | | | | | |
|-------------------------------|-----|-----|-----|-----|--------------|
| Hur säker är du på ditt svar? | | | | | |
| 0% | 20% | 40% | 60% | 80% | 100% |
| (Vet ej) | | | | | (Helt säker) |

Annan detalj:

| | | | | | |
|-------------------------------|-----|-----|-----|-----|--------------|
| Hur säker är du på ditt svar? | | | | | |
| 0% | 20% | 40% | 60% | 80% | 100% |
| (Vet ej) | | | | | (Helt säker) |

6. Hur skadad anser du att offret blev/var? Ringa in ditt svar

| | | | | | | |
|-------------|---|---|---|---|---|-----------------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Inte skadad | | | | | | Maximalt skadad |

| | | | | | |
|-------------------------------|-----|-----|-----|-----|--------------|
| Hur säker är du på ditt svar? | | | | | |
| 0% | 20% | 40% | 60% | 80% | 100% |
| (Vet ej) | | | | | (Helt säker) |

7. Var det någon som hjälpte offret efter misshandeln?

Ja

Nej

Vet ej

Hur säker är du på ditt svar?

0%

20%

40%

60%

80%

100%

(Vet ej)

(Helt säker)

8. Om ja, beskriv personen/personerna så utförligt som möjligt. Fyll endast i för så många som du minns.

Person 1

Hår/frisyr/huvudbonad:

Hur säker är du på ditt svar?

0%

20%

40%

60%

80%

100%

(Vet ej)

(Helt säker)

Kläder överdel:

Hur säker är du på ditt svar?

0%

20%

40%

60%

80%

100%

(Vet ej)

(Helt säker)

Kläder underdel:

Hur säker är du på ditt svar?

0%

20%

40%

60%

80%

100%

(Vet ej)

(Helt säker)

Kön:

Hur säker är du på ditt svar?

0%

20%

40%

60%

80%

100%

(Vet ej)

(Helt säker)

Annan detalj:

Hur säker är du på ditt svar?

0%

20%

40%

60%

80%

100%

(Vet ej)

(Helt säker)

Hur säker är du på ditt svar?

| | | | | | |
|----------|-----|-----|-----|-----|--------------|
| 0% | 20% | 40% | 60% | 80% | 100% |
| (Vet ej) | | | | | (Helt säker) |

Kläder underdel:

Hur säker är du på ditt svar?

| | | | | | |
|----------|-----|-----|-----|-----|--------------|
| 0% | 20% | 40% | 60% | 80% | 100% |
| (Vet ej) | | | | | (Helt säker) |

Kön:

Hur säker är du på ditt svar?

| | | | | | |
|----------|-----|-----|-----|-----|--------------|
| 0% | 20% | 40% | 60% | 80% | 100% |
| (Vet ej) | | | | | (Helt säker) |

Annan detalj:

Hur säker är du på ditt svar?

| | | | | | |
|----------|-----|-----|-----|-----|--------------|
| 0% | 20% | 40% | 60% | 80% | 100% |
| (Vet ej) | | | | | (Helt säker) |

9. Vilken färg hade skåpbilen som åkte förbi i bakgrunden?

Hur säker är du på ditt svar?

| | | | | | |
|----------|-----|-----|-----|-----|--------------|
| 0% | 20% | 40% | 60% | 80% | 100% |
| (Vet ej) | | | | | (Helt säker) |

10. Verkade det som om gärningsmännen och offret kände varandra sedan innan?

Ja Nej Vet ej

Hur säker är du på ditt svar?

| | | | | | |
|----------|-----|-----|-----|-----|--------------|
| 0% | 20% | 40% | 60% | 80% | 100% |
| (Vet ej) | | | | | (Helt säker) |

11. Hur länge, uppskattar du, att gärningsmännen och offret pratade med varandra innan misshandeln började? Ange i sekunder.

Hur säker är du på ditt svar?

0%

20%

40%

60%

80%

100%

(Vet ej)

(Helt säker)

12. Vem slog första slaget? Kryssa i numret som motsvarar den gärningsmannen du beskrev innan.

Gärningsman 1

Gärningsman 2

Gärningsman 3

Gärningsman 4

Gärningsman 5

Offret

Hur säker är du på ditt svar?

0%

20%

40%

60%

80%

100%

(Vet ej)

(Helt säker)

13. Hur länge, uppskattar du, att misshandeln pågick? Ange i sekunder.

Hur säker är du på ditt svar?

0%

20%

40%

60%

80%

100%

(Vet ej)

(Helt säker)

14. Tog gärningsmännen något från offret?

Hur säker är du på ditt svar?

0%

20%

40%

60%

80%

100%

(Vet ej)

(Helt säker)

15. Åt vilket håll, sett från din vinkel flydde gärningsmännen efter misshandeln? Fyll i för så många som du tror att det var

Gärningsman 1: _____

Hur säker är du på ditt svar?

0%

20%

40%

60%

80%

100%

(Vet ej)

(Helt säker)

Gärningsman 2: _____

Hur säker är du på ditt svar?

0% (Vet ej) 20% 40% 60% 80% 100% (Helt säker)

20. Vilken årstid utspelade händelsen sig? Kryssa i ditt svar.

- Vinter
- Vår
- Sommar
- Höst

Hur säker är du på ditt svar?

0% (Vet ej) 20% 40% 60% 80% 100% (Helt säker)

21. Hur lång skulle du uppskatta att hela filmen var? Ange i sekunder.

Hur säker är du på ditt svar?

0% (Vet ej) 20% 40% 60% 80% 100% (Helt säker)

Till sist vill vi ha lite bakgrundsinformation om dig som deltagare

Kön: _____

Ålder: _____

Uppskatta hur länge du sov natten till idag. Avrunda till hela timmar. _____

Tack för din medverkan!

Om ni har några frågor angående denna undersökning så kan ni kontakta Lizah Nicolaisen eller Annamaria Sjöberg.

6.3. The line-up pictures



The last picture is of Perpetrator 2, the target of the line-up.

6.4. Correction template

1. Hur många var gärningsmännen?

Rätt svar: 3 stycken

Rätt: 1

Fel: 2

2. Beskriv de gärningsmän du kommer ihåg så utförligt som möjligt.

(GM = Gärningsman)

GM1:

- Hår: Långt, blont hår. Hästsvans/ uppsatt.
- Kläder: Svart tröja, svarta byxor. Svarta skor.
- Ålder: Runt 20.
- Annan detalj: Glasögon, en beskrivning utöver det vi har skrivit här som är korrekt ger rätt.
- Aggressivitet: Slog inte offret. Skala på 1-7.

GM2:

- Hår: Kort, snaggat hår. Blont/brunt.
- Kläder: Grå/grön tröja med ett vitt märke på. Jeansen är blåa och vita, slitna. Blågula skor.
- Ålder: Runt 20.
- Annan detalj: en beskrivning utöver det vi har skrivit här som är korrekt ger rätt.
- Aggressivitet: Slog offret aktivt. Skala på 1-7.

GM3:

- Hår: Ser ej, grå mössa.
- Kläder: Svart tröja, svart jacka. Svarta byxor. Svarta skor med vita skosnören.
- Ålder: Runt 20.
- Annan detalj: en beskrivning utöver det vi har skrivit här som är korrekt ger rätt.
- Aggressivitet: Slog offret aktivt. Skala på 1-7.

3. Använde gärningsmännen någon form av vapen/tillhygge?

Nej: rätt, 1

Ja: fel, 2

4. Om ja, vad för vapen/tillhygge?

Rätt: inget svar, 1

Fel: 2

5. Beskriv offret så utförligt som möjligt.

Hår: Ser ej, svart mössa.

Kläder: Blå jeans, grön jacka, grå tröja. Bruna skor/boots.

Ålder: Runt 20.

Annan detalj: en beskrivning utöver det vi har skrivit här som är korrekt ger rätt.

6. Hur skadad anser du att offret blev/var?

Skala 1-7, vi vill jämföra grupperna för att se hur sömn påverkar minnet av aggressiva händelser.

7. Var det någon som hjälpte offret efter misshandeln?

Ja: rätt, 1

Nej: fel, 2

Vet ej: 3

8. Om ja, beskriv personen/personerna så utförligt som möjligt?

Person 1:

- a. Svart, mörkt hår
- b. Svart jacka
- c. Jeans med slitning/blå och vita. Svarta/mörkbruna skor
- d. Man
- e. Annan detalj: solglasögon och mobiltelefon. En beskrivning utöver det vi har skrivit här som är korrekt ger rätt.

Person 2:

- a. Mellankort/lång svart/mörkbrunt hår.
- b. Svart tröja, röd/brun kofta/jacka.
- c. Svarta byxor. Svarta skor.
- d. Kvinna.
- e. En beskrivning utöver det vi har skrivit här som är korrekt ger rätt.

9. Vilken färg hade skåpbilen som åkte förbi i bakgrunden?

Vit (med rött tryck): rätt, 1

Annat svar: fel, 2

10. Verkade det som om gärningsmännen och offret kände varandra sedan innan?

Ja: 1

Nej: 2

11. Hur länge, uppskattar du, att gärningsmännen och offret pratade med varandra innan misshandeln började?

Rätt svar: 44 sekunder

Deras svar räknas i sekunder och det är den procentuella skillnaden från rätt svar som är det intressanta.

12. Vem slog första slaget?

Jämför med signalement för fråga 2.

Rätt svar: GM3, 1

Fel: 2

Alla deltagares GM har blivit inkodade på samma sätt.

13. Hur länge, uppskattar du, att misshandeln pågick?

Rätt svar: 7 sekunder

Deras svar räknas i sekunder och det är den procentuella skillnaden från rätt svar som är det intressanta.

14. Tog gärningsmännen något från offret?

Nej: rätt, 1.

Ja: fel, 2.

15. Åt vilket håll flydde gärningsmännen efter misshandeln

a. Vänster: rätt, 1

b. Vänster: rätt, 1

c. Vänster: rätt, 1

Fel: 2

16. Var det någon som jagar efter gärningsmännen?

Nej: rätt, 1

Ja: fel, 2

17. Hur länge låg offret på marken efter misshandeln?

Rätt svar: 21 sekunder

Deras svar räknas i sekunder och det är den procentuella skillnaden från rätt svar som är det intressanta.

18. Åt vilket håll gick offret efter misshandeln?

Rätt: höger, 1

Annat håll: 2

19. I bakgrunden fanns ett café, hur många satt vid borden framför caféet?

Rätt: inga, 1

Fel: 2

20. Vilken årstid utspelade händelsen sig?

Rätt: höst, 1

Andra: fel, 2

21. Hur lång skulle du uppskatta att filmen var?

Rätt svar: 179 sekunder

Deras svar räknas i sekunder och det är den procentuella skillnaden från rätt svar som är det intressanta.

Rättning för tidsfrågor:

11. 44 sek

13. 7 sek

17. 21 sek

21. 179 sek

Om de inte ger exakt tid: medelvärde av den lägsta och högsta angivna tiden.

Om de skriver: ca. typ eller kanske så använder vi tiden som blivit angiven.

Svaret på dessa avrundas till heltal i procent.

Konfidensskattningar: Kodas in som de är.

Hur frågorna ska läggas ihop/analyseras

- Faktafrågor: 1, 7, 9, 14, 15, 16, 18, 19, 20
- Hopblandning: 2a-d, 5, 8
- Tidsfrågor: 11, 13, 17, 21
- Aggressivitet: 2e (fråga om aggressivitet), 3, 4, 6, 12