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Effects of Sleep in Competitive Esports Performance – Case EXEN Esports

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Abstract

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This thesis was conducted to examine the effects of sleep in player performance in competitive esports. The research aimed to gather qualitative data on esports athletes' sleep and its effects and provide answers whether the amount of sleep influences the competitive esports performance.

The research was conducted with a case study on a Finnish esports organisation *EXEN Esports'* CS:GO players. A three-week monitoring phase was conducted where the players' sleep was analysed and examined, and whether it had an effect on the players' performance in competitive esports. EXEN Esports had an ongoing regular competitive season while the research was conducted.

The results showed that personality and uniqueness in a person's sleep affected player performance the most. Most positive effects were found when the players were able to sleep according to their past sleeping habits. Short time disruptions in a player's circadian rhythm caused most negative impacts. The scientifically approved sleep recommendations are a useful basis to start monitoring performance related to sleep. As sleep is an ambiguous event, it is challenging to make changes to one's sleep without considering relevant additional factors other than the numerical amount of sleep. Longer monitoring periods with constant circadian rhythms and the least number of disruptions may yield more sufficient data.

Esports	-	*Electronic sports*, a competitive form of playing video games
LAN	-	*Local Area Network* – A network of two or more computers
CS:GO	-	*Counter-Strike: Global Offensive*, an FPS videogame produced by *Valve*
FPS	-	*First-person-shooter*, a shooting game where the camera is directed from the player's own perspective – the *first person*.
NHL	-	*National Hockey League,* an ice-hockey themed sports game developed by *EA Sports*
eSML	-	*Elektroninen Suomenmestaruus Liiga* – Finnish Electronic-sports Championship league hosted by TBZ esports co. and SEUL
SEUL	-	*Suomen Elektronisen Urheilun Liitto* – The Finnish electronic sports union
ESEA	-	*Electronic Sports Entertainment Association* – A platform for global competitive games such as CS:GO

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1 Introduction

The purpose of this study is to help esports athletes to recognize that sleep is an important factor in both competitive esports performance and well-being. Insufficient scientific material for holistic well-being is provided for esports athletes to learn healthier habits in gaming. The gaming culture has been trending globally as a bad-habit lifestyle where the gamers eat unhealthily and do not exercise enough to stay fit. This can be adjusted to support the modern growing esports scene by adding relevant and easy-access scientific and academic material for the esports athletes.

In this thesis, we studied which effects sleep has on an esports athlete's performance. This topic is current in the competitive scene of esports as esports performance coaching is beginning to emerge as an important factor in the professional esports scene. An increasing number of high-tier esports organisations (i.e., Astralis, OG, Team Liquid, ENCE) are hiring performance coaches to aid their teams and their players to find the optimal player performance for competitive gaming. Both physical and mental performance are reviewed, but mental performance and mental well-being are increasingly important factors in esports. Research has been conducted and results show that by just playing many hours a player does not necessarily reach the maximum performance as there are several other factors in play (e.g., sleep, nutrition, physical activity, and mental health).

1.1 Esports and gaming history

Competitive gaming, or as we better know it today – *esports*, has existed for decades. The first steps of esports were taken in the 1960s when a game called *Spacewar*, the first computer game, was launched. In the 1970's the first Spacewar tournament was held in the US and 24 players in total partook in the tournament where the winner would receive a subscription to *the Rolling Stone* magazine (Bellis, 2019).

In the 1980's more and more companies started to develop games and several tournaments were held mainly in the US and UK. Titles such as *Donkey Kong, Pac-Man, Super Mario Brothers,* and *Tetris* were the most popular titles of the decade (Stuart, 2021). The 80s were also a big step for competitive gaming as the first broadcasts of competitive gaming were televised (Larch, 2022).

Nintendo, *Blizzard Entertainment,* and other modern and renowned gaming companies took their first steps in the 90's. Gaming was introduced to consoles and different gaming genres were created (fighting, FPS, racing etc.). The early stages internet also enabled online play and LAN tournaments took their first steps (Wiki Esports, n.Da).

As the 2000's moved on esports has already been seen on many different continents. Technology had advanced and it was a remarkable aid in the development of esports. The internet era enabled online gaming and tournaments were held online instead of being played in LAN. Prize pools had increased drastically from the 1960's single Rolling Stone magazine subscription to millions of dollars (Larch, 2022).

Nowadays the modern day esports scene is a billion-dollar industry. With online streaming services being a part of the industry, there are an estimated 30 million monthly esports viewers around the world (Insider Intelligence, 2022). Comparing the current esports business scene to traditional sports; the annual gross revenue of esports is soon to be overtaking the UEFA Champions League ($3,2 billion dollars) (Messmer, n.Da). Taking this in consideration - esports is the future we are living now.

1.2 Player performance in esports

Today's world of esports is vastly different from the earlier stages of competitive gaming in the early 1990s. The scene of esports is becoming more and more professionalized, but the academic research done around player performance enhancing is inefficient (Lee, et al., 2021). Professional esports athletes have many similarities to their traditional athlete counterparts. But unlike in traditional sports, there has been little research into the factors that affect the performance of esports athletes (Bonnar, Castine, Kakoschke, & Sharp, 2019). As Bonnar et al. research group proposed in 2019 "given that esports is a cognitive based activity, and sleep is well known to be critical for optimal cognitive functioning, sleep might be an important determinant of esports performance" (Bonnar, Lee, Gradisar, & Suh, 2019).

Performance in esports differs from traditional sports as esports athletes are not required to be fit to perform on a professional level. Playing at a professional level in esports requires the player

to have good motor skills, such as hand-and-eye coordination and reaction time, while mastering the in-depth knowledge of the game and its mechanics.

Player performance management is not a new subject in esports. Teams and organisations have been interested in the subject for years but the academic research to support the player performance is not there yet. All research done in the name of connecting esports more into the academic world is important and has a long-term effect for the ever growing scene.

2 Theoretical background

The following chapters present the theoretical background of the thesis. The theoretical sources selected support the performance relation to sleep.

2.1 Sleep

“Sleep is one of the most basic biological activities of human beings. It is a process during which the bodily tissues recover from metabolic processes operative throughout the day and prepare the body for effective physiological performance the following day. Sleep has been found to influence mood and psychological well-being of sports personnel and vice versa. Lack of energy, anger, depression, anxiety regarding winning or losing, peer group relations, coach—athlete relationship may serve as few reasons behind loss of sleep and decreased sports performance. At majority, sleep associated fatigue and anergia shall be misdiagnosed as depression or mood disorders” (Chandrasekaran, Fernandes, & Davis, 2019).

For a person to feel rested and alert it requires sufficient amount of sleep per day. Along feeling fresh and awake, sleep also helps the human body to remain well and ward off diseases. With bad sleep the human brain cannot perform. Lack of sleep will impair the brain and cognitive performances such as thinking, data processing, and short-term memory are weakened. A good night’s sleep allows the human body to slow down and start the recovery process of the previous day. Sleep enabled improved physical and mental performance are scientifically proven through academic research. (Pacheco D. , 2022). Feelings of optimism and positivity are linked to a long-term period of good sleep. (Medline, 2020). The hours spent sleeping are vital especially for the brain. During sleep numerous different processes take place in the brain, including the charging of energy reserves, the secretion of hormones that promote growth and development, and the review of things learned during the day (Haataja & Leinonen, 2022, p. 150).

2.2 Additional factors

Sleep is an ambiguous event. There are varying aspects that can affect a person's sleep which can be both personal and environmental. It must be recognized that there are additional relevant factors besides the number of hours slept that can affect a person's sleep quality and quantity.

Circadian rhythm, caffeine products (energy drinks), and personal preferences in sleep were suggested as three factors which affect the sleep of esports athletes according to sleep psychologist Theresa Schnorbach (Schnorbach, 2022). Schnorbach mentioned in her lecture at KAMK UAS in 2022 that at least these three factors should be taken in consideration when analysing a person's sleep. In the upcoming chapters I will briefly go through the aforementioned factors.

2.2.1 Circadian rhythm

Circadian rhythm means how a person works in a 24-hour timeframe – when do we wake up, eat, work, rest, and sleep (Haataja & Leinonen, 2022). Getting enough sleep, without disruptions, is key to increasing the level of attention and cognitive performance during the day. Sufficient sleep also prevents physiological changes that may affect a person's health. Sleeping under 7 hours on average shows an increasing amount of risk for weight gain, obesity, diabetes, and hypertension. Long term loss of sleep and disruptions in a person's circadian rhythm promote high levels of caffeine usage which on its own causes additional disruptions to sleep and cognitive behaviour (Goel, Basner, Rao, & Dinges, 2014).

2.2.2 Caffeine

Caffeine stimulates the adenosine production in the brain. It blocks the adenosine production of the brain which is mainly linked to controlling the feeling of tiredness and sleep. If caffeine is consumed at a late time of day, it directly affects a person's ability to fall asleep which causes disruption to the circadian rhythm (Palsdottir, 2021). Although caffeine has been found to have a positive and performance boosting effect in esports (reaction time, alertness), the after-effects are overseen (Sainz, Collado-Mateo, & Del Coso, 2022).

2.2.3 Personal sleep habits

As stated above, sleep is an ambiguous event. Psychologist and sleep scientist Teresa Schnorbach mentioned in her KAMK UAS lecture in 2022 that while some people require more than the recommended hours of daily sleep, others are able to function with fewer hours or even higher number of average slept hours. Personality and uniqueness are normal and fairly common according to Schnorbach. People tend to adapt to their daily routines and fit all their daily activities in a 24-hour window suited to their own needs. Sleep is one of these activities. This further underlines the personal need for sleep (Schnorbach, 2022).

3 Research

In the following chapter, the research part of the thesis is discussed. It covers the process of the research, shortly present the methodology and Case EXEN Esports, followed by the analysis of the data. In the analysis part, the data received from the research is connected to the theoretical material.

The players of EXEN Esports wish to remain anonymous regarding this study. The players are spoken from here onwards as *Player 1*, *Player 2*, *Player 3*, *Player 4*, and *Player 5*.

3.1 Methodology

This case study was conducted on the players of EXEN Esports CS:GO team. EXEN Esports CS:GO team consisted of five male players between ages 20 and 29 (n=5). The goal of this case study was to observe the players' sleep (amount) and how does it affect their performance in competitive esports. Each player had a personal diary to report their weekly personal feelings in. To support the data collection a weekly questionnaire was created to gather data. All players successfully answered all three questionnaires provided and all players successfully filled their sleep diaries. The diaries and interviews are not displayed in this thesis for personal matters but are referred to in the upcoming chapters.

A three-week monitoring phase began on May 2, 2022, and the players were given a sleep diary to fill for the upcoming weeks. The players were instructed to fill their weekly diaries and provide information on the number of hours they slept and how did they feel that their sleep affected their performance in competitive esports. Mental and physical symptoms were advised to be described in the diaries.

During the first week the players were asked to provide data concerning their current and past sleeping habits (e.g., circadian rhythm, average hours slept, and other relevant information for the upcoming three-week monitoring phase). A questionnaire was constructed by using control-type questions aimed to collect as much data on the players' sleep as possible (e.g., the average amount of sleep, bedtime, wake-up time, critical self-evaluation, etc.). At the end of the first week the players were also required to attend a sleep hygiene lecture. Recommendations regarding the suggested daily amount of sleep and other relevant sleep related information were discussed

(i.e., circadian rhythm, caffeine, and personal habits). This lecture supported the players' knowledge on how sleep affects their performance in competitive esports.

The players were instructed to follow the sleep hygiene lesson on their second monitoring week. During the second week the players were required to sleep according to the aforementioned sleep recommendations. This week was aimed to provide data regarding the validity of the sleep recommendations in an esports athlete's sleep habits.

Going into the third week the players were given the option to choose how they wish to sleep. The players had freedom to choose between their past sleeping habits or to continue with the newly learned recommendations and further observe if their personal performance was affected by the sleep recommendations.

3.1.1 Case EXEN Esports

EXEN Esports is a Finnish esports organisation founded in Jyväskylä in 2020 by Patrick "*Falla*" Falck. EXEN Esports holds home for competitive gaming, live streaming, and minor event management. Currently, EXEN Esports has representation in CS:GO, Fortnite, and NHL 2022. EXEN Esports' CS:GO line-up was signed in early 2022 and the team has been competing in the eSML and in the ESEA leagues.

I chose to study EXEN Esports for this research as I had close relations and personal agenda towards the players of EXEN Esports. It seemed fit during my time as EXEN's CS:GO team's performance coach to improve the performance of the players. The small sample size of EXEN Esports enabled me to conduct a close-up study on subjects that are important to me personally, and of which I can see the effects on as I have personal relations with them.

Key factors in this case study were player-filled weekly questionnaires, the players' personal sleep diaries, the sleep hygiene lesson, and interviews between the players and their coach.

3.2 Results

In the following part of the thesis, we will go through the results that was received from the research part of this study. The data for the study is shown in graph and table form. This data will later be interpreted in the analysis part of the thesis.

3.2.1 Week 1

First week's data showed a baseline of how the players slept on their own terms and it reflected how the players perceived good sleep on their own. Players had the freedom to sleep how they have been accustomed in the past. Data shows a median of 7,89 hours slept between all players. This means that on average the players were already sleeping according to *SleepFoundation*'s recommended hours (7-9 hours for ages between 18-25 and ages 26 and up).

In the first week's questionnaire the players were asked if they felt that sleep had any effect on their competitive gaming performance. All of the players (5) unanimously agreed that sleep had an effect on their performance. Alertness, awareness, reaction times, communication, ability to soak in information during games, motivation, willpower, and overall mental state were mentioned in the results when the players were asked how does sleep affect their gameplay performance. Stress was named twice as a common reason for not getting enough sleep during an intense week of official matches. Some of the players agreed that game related (performance) stress affected their ability to fall asleep normally on several occasions.

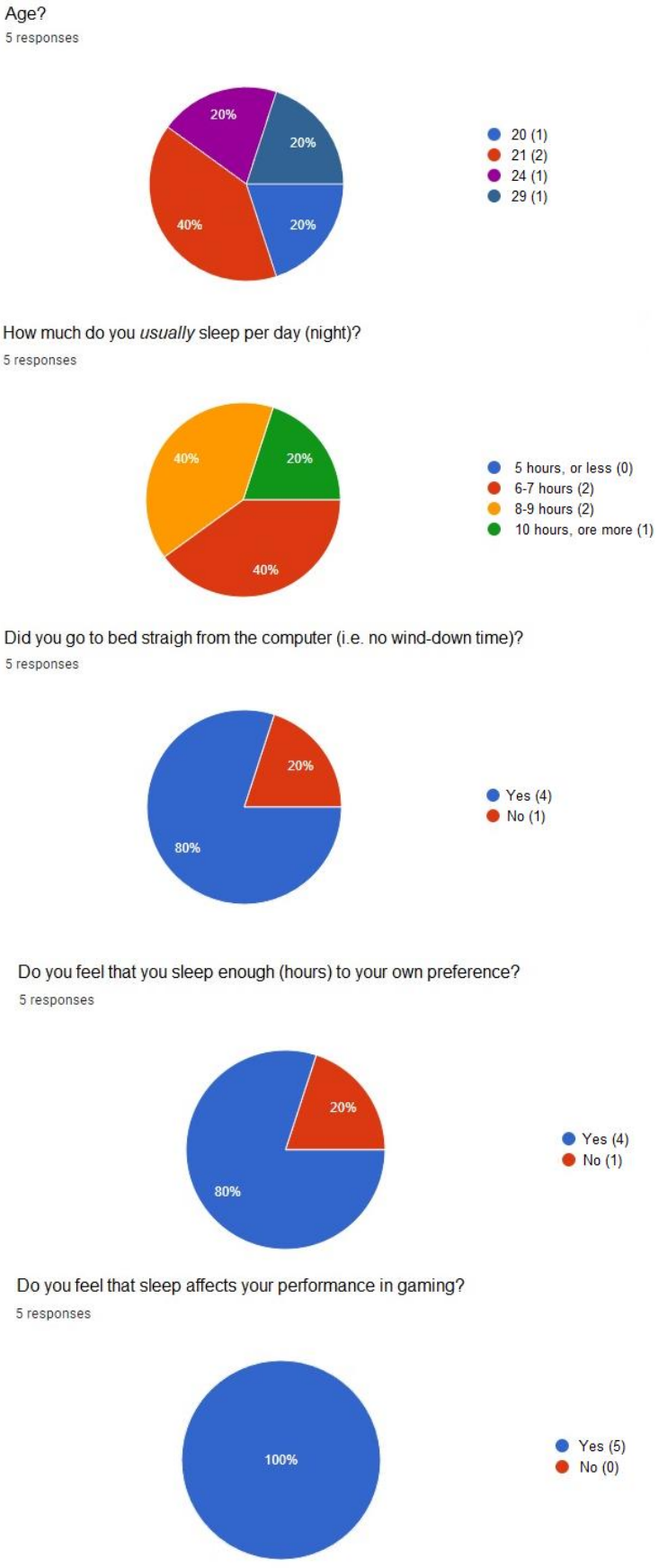

Figure 1. Case EXEN Esports – Week 1 questionnaire.

Screen-time and the ability to calm down when going to bed were also mentioned in the answers. Two players reported that computer or smart phones took time from their wind-down time when going to bed.

Players 1, 2, and 4 showed a sudden change in the hours slept during Friday and Saturday during the first week. According to weekly personal interviews with the players, the players reported that the weekend triggers an abnormality in the sleep hours and a small change in the players' circadian rhythms. Personal agenda outside of competitive gaming often drives players to adjust their circadian rhythms. The players reported that they need time for personal relations during the weekend and often that is deducted from their sleep.

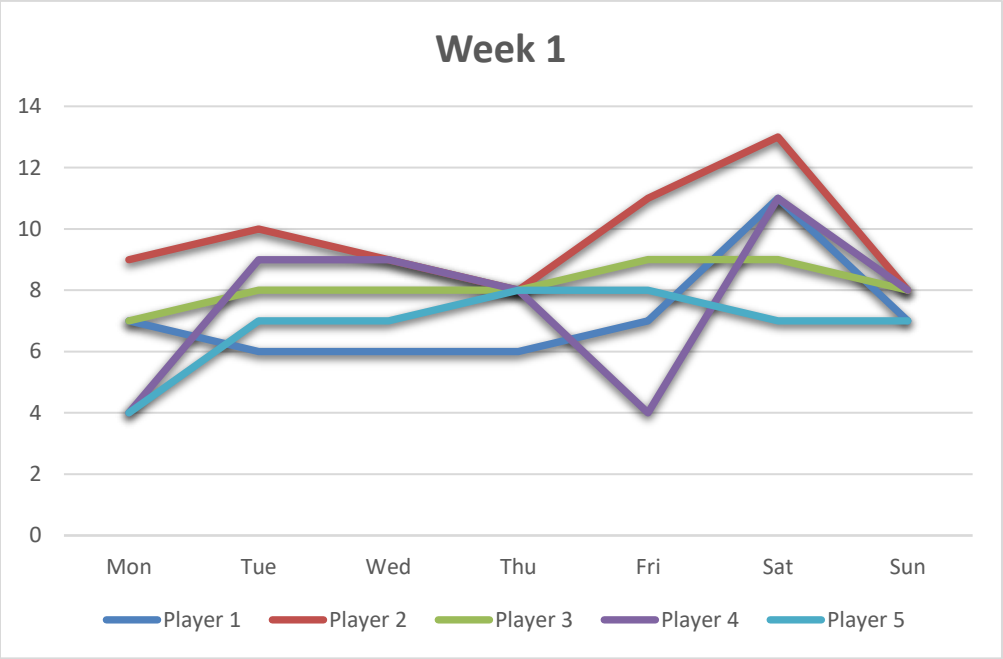

Figure 2. Case EXEN Esports – Week 1 hours chart.

Player 2 reported 9,71 hour average slept across the first week. Personal interview with the player revealed that the player had developed a personal sleep habit of sleeping more than 8 hours on average. Player 2 reported that by not reaching this minimum 8 hour daily sleep he experiences fatigue, loss of thought, slow reactions, and tendency to act irrational.

Week 1	Mon	Tue	Wed	Thu	Fri	Sat	Sun	TOT.
Player 1	7	6	6	6	7	11	7	50
Player 2	9	10	9	8	11	13	8	68
Player 3	7	8	8	8	9	9	8	57
Player 4	4	9	9	8	4	11	8	53
Player 5	4	7	7	8	8	7	7	48

Figure 3. Case EXEN Esports – Week 1 hours data.

Player 3 averaged median hours of 8,14. A solid and constant frame in the player's weekly schedules enabled the player to sleep regularly without interferences. Having constant bedtimes and wake ups for past several years have helped the player to develop a healthy circadian rhythm.

Player 4 managed to average 6,86 hours during the first week of the study. The player reported in the questionnaire and in the personal diary that he had personal life interferences. He had to adjust his circadian rhythm and it ended up interfering with his sleep.

3.2.2 Week 2

The players slept an average of 7,65 hours during the second week of the monitoring phase. The average hours dropped by 0,24 compared to the first week's average hours. Most significant changes between the players were in Player 2's and Player 5's data. Player 2 showed a drop of 1,57 hours in their average hours slept. Player 2 reported zero upsides to his performance by reducing his average hours slept. Reaction time, fatigue, and overall positivity (mental) were mentioned in Player 2's report for Week 2. Player 5 showed an average increase of 1,00 hour during Week 2. Personal report revealed that he felt no significant differences in his performance between Week 1 and Week 2.

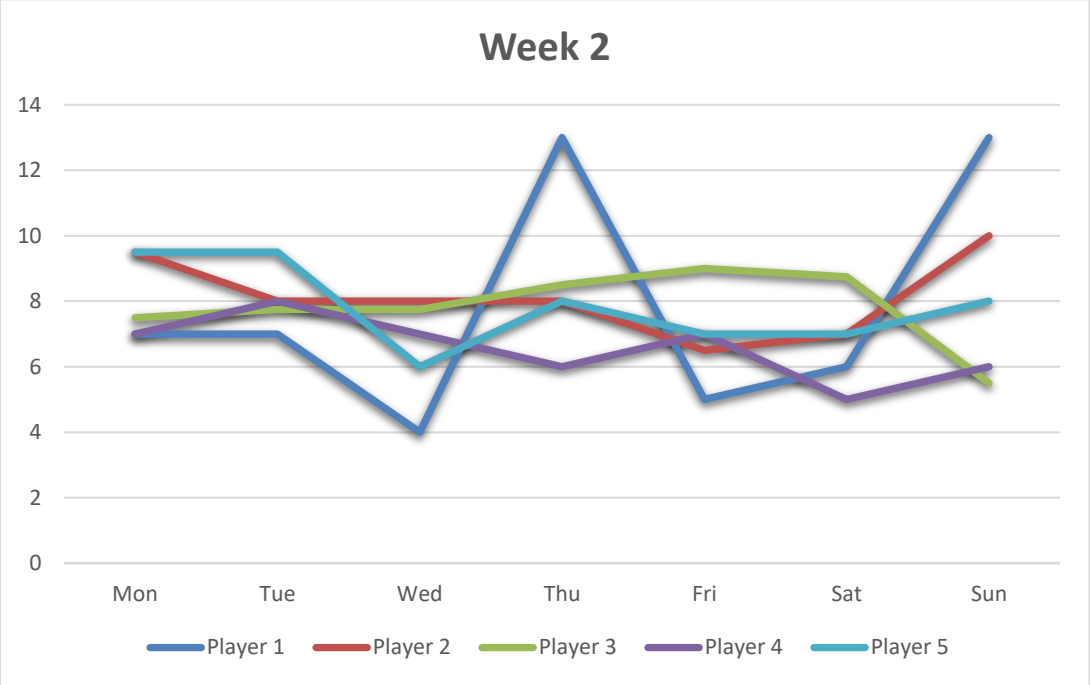

Figure 4. Case EXEN Esports – Week 2 hours data.

Week 2's questionnaire showed that 80% of the players (4) were not fully satisfied in their amount of sleep. Reports showed that the amount of sleep was insufficient. Insufficiency in the sleep was reported to have caused slower reaction times, short temper, inability to concentrate, and fatigue throughout the day. Players 1 and 5 reported to have issues sleeping as they were stressing over the sleep. Stimulant usage was mentioned in 3 of the weekly reports. Player 4 reported to have had a drastic change in his circadian rhythm. Player 4 reported in his personal interview that he had been waking up several hours earlier than what he had accustomed to causing disruptions.

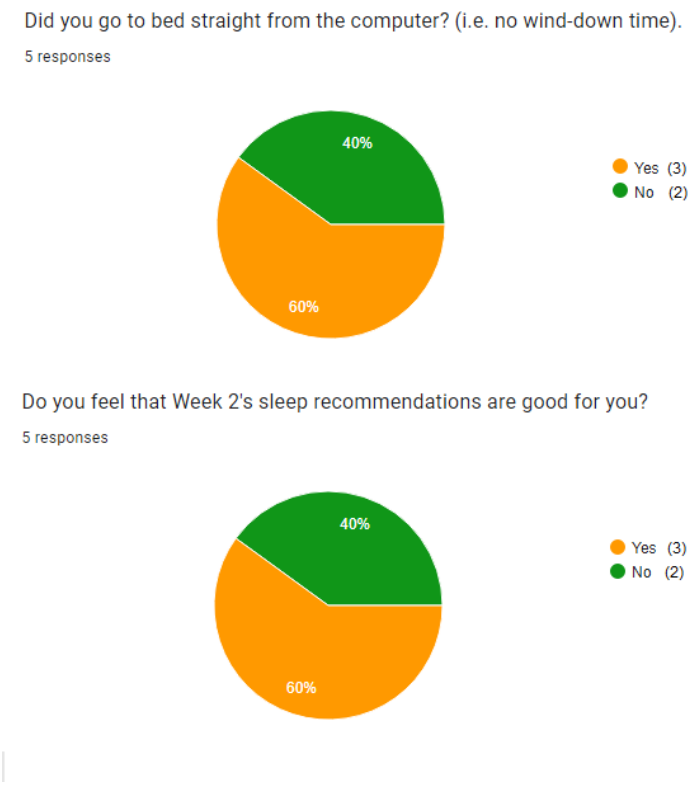

Figure 5. Case EXEN Esports – Week 2 questionnaire.

Week 2	Mon	Tue	Wed	Thu	Fri	Sat	Sun	TOT.
Player 1	7	7	4	13	5	6	13	55
Player 2	9,5	8	8	8	6,5	7	10	57
Player 3	7,5	7,75	7,75	8,5	9	8,75	5,5	54,75
Player 4	7	8	7	6	7	5	6	46
Player 5	9,5	9,5	6	8	7	7	8	55

Figure 6. Case EXEN Esports – Week 2 sleep hours chart.

3.2.3 Week 3

During the last week of the monitoring phase personality in the player's sleep showed a strong presence as the players reported needing varying hours of sleep daily ranging from under 7 hour averages to a maximum of above 10 hour averages. At the start of the week all of the players were receiving consistent hours of sleep, but as the week progressed the hours began to shift

downwards. Players 1 and 5 had a noticeable shift on Wednesday and Thursday when they reportedly slept 2,5 and 3 hours. Interviews with the players revealed that off-days from official matches in the middle of the week prompted a sudden urge to stay up late and skim on their sleep. This had a significant negative impact on their weekly circadian rhythm and both players 1 and 5 reported that they had severe difficulties in their performance during the weekend. High levels of fatigue, lack of concentration, difficulties in communication, and loss of willpower were shown in their reports and diaries.

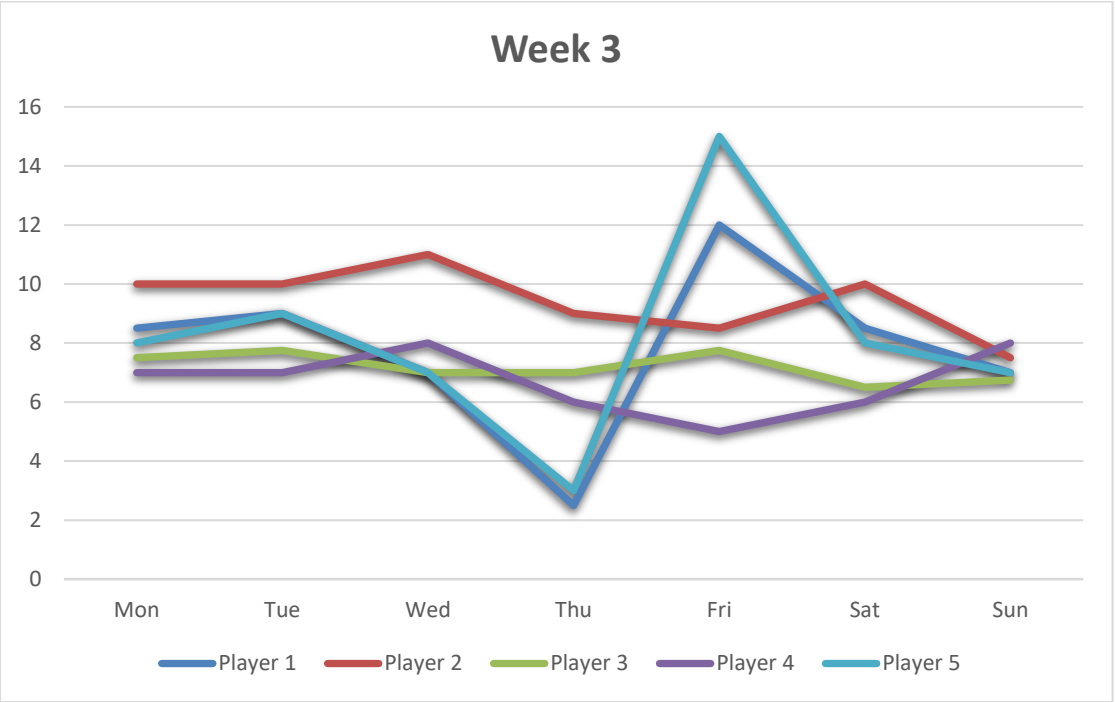

Figure 7. Case EXEN Esports – Week 3 sleep hours chart.

Week 3	Mon	Tue	Wed	Thu	Fri	Sat	Sun	TOT.
Player 1	8,5	9	7	2,5	12	8,5	7	54,5
Player 2	10	10	11	9	8,5	10	7,5	66
Player 3	7,5	7,75	7,75	8,5	9	8,75	5,5	54,75
Player 4	7	7	8	6	5	6	8	47
Player 5	8	9	7	3	15	8	7	57

Figure 8. Case EXEN Esports – Week 3 sleep hours chart.

The players unanimously reported that their own past sleeping habits were more suitable and comfortable than SleepFoundation's recommended averages sleeping hours. In the player interviews all of the player

3.3 Analysis

The first week's data showed that the players had varying sleeping habits. Average hours slept by the players ranged from 6,8 to 9,7 hours according to the data. Each player had accustomed to their personal average hours that they need to sleep to function and perform properly. Player 2 reported to be needing over 9 hours of sleep on average to perform. Stimulants were used during the first week and a stimulant caused inability to fall asleep was mentioned once in the reports. Performance related stress was named once as a reason for the inability to fall asleep after an official match. 40% of the players reported that their past sleeping habits were more suitable for them personally and that they experienced mostly negative outcomes from their newly learned sleep habit. According to the questionnaire these two players needed 1-2 hours more sleep than what the recommendation was. This change reflected positively in Week 3's reports in the players' performance.

Negative effects mentioned in the results by players exceeded the positives. Stress, mental overdrive, increased restlessness, low readiness, slower reaction times, fatigue during the day, number of mistakes made in game, short temper, reduced or inefficient communication, and lack of interest were described to be the main negative effects of having disruptions in sleep or due to lack of sleep. Players were close to unable to provide any meaningful confirmation of positive effects of following the average sleeping hours in their reports. One positive effect of following the SleepFoundation's recommended average sleep hours was reported by Player 3, as he described his current and past circadian rhythm to perfectly fit the recommendations. An interview with Player 3 also revealed that his sleeping hours mainly form from his time spent in his day-job and personal life.

	Total (h)	Average (h)
Player 1	50	7,14
Player 2	68	9,71
Player 3	57	8,14
Player 4	53	7,57
Player 5	48	6,86

Figure 9. Case EXEN Esports – Week 1 hours data.

The players reported that sleeping less than 7 hours influenced their performance. Reports of sleeping less than 7 hours affected reaction times and alertness according to the questionnaire. Some outliers (4 and 5 hours as well as 13 hours) were also recorded in Week 2. One player recorded 13 hours of sleep on two different days. According to this player's sleep diary, stimulants (caffeine) may have been the cause for the disruption in his sleep. According to the questionnaire one player had personal life interference on week 2 which affected his sleeping hours. This interference with the player's sleep resulted in abnormal sleeping hours which were significantly less than what the player was used to according to weekly personal interview. The player reported in the questionnaire that fatigue and inability to concentrate was showing later day went on and the earlier he woke up for work.

Disruptions in circadian rhythm during week 2 affected negatively in Player 3's performance. Player 3 reported mental fatigue, slow reaction times, and overall risen levels of tiredness throughout the day. These negative effects increased the caffeine consumption of Player 3, which then had a negative effect in Player 3's ability to fall asleep in the evening.

	Total (h)	Average (h)
Player 1	55	7,86
Player 2	57	8,14
Player 3	54,75	7,82
Player 4	46	6,57
Player 5	55	7,86

Figure 10. Case EXEN Esports – Week 2 hours data.

Overall, the players reported in their sleep diaries that their personal lives outside of competitive gaming (work, social life, etc.) are a big factor in their sleep. Having a stable lifestyle and constant bedtimes help to sleep the recommended hours (source?). Irregularity or imbalance in everyday life is key for bad sleep or lack of sleep which then leads to negative performance in esports (diary, questionnaires). The player reports of interferences in their personal lives and the effect that it had on their sleep and circadian rhythm seem to be a common factor. All players were experiencing disruptions in their sleep during all of the monitoring weeks.

All of the players had their own unique sleep and circadian rhythms. During the second week the players were required to make changes to their sleep habits and alter the amount of hours they slept. This change, even though it is perceived as a general recommendation to a certain age group, in a small time scale can have negative impact in one's ability to perform. The amount of hours a person has been accustomed to sleep and sudden changes to that can have negative and unwanted effects. Stability and repeatability, constant circadian rhythm, seemed to affect the sleep the most positive.

	Total (h)	**Average (h)**
Player 1	54,5	7,79
Player 2	66	9,43
Player 3	50,25	7,18
Player 4	47	6,71
Player 5	57	8,14

Figure 11. Case EXEN Esports – Week 3 hours data.

Reports also showed that if a person had a constant rhythm in their week – work, school, or other mandatory duties – it helped to create a frame for them. Player 3 had reported to have slept on average 7-9 hours daily with recurring bedtimes for several past years. Competitive esports still had room in his life.

4 Conclusions and Discussion

The players of EXEN Esports CS:GO team participated in an esports performance related sleep study in May of 2022. The aim of the study was to gather collective information about the team's sleep and its effects in player performance in competitive esports (CS:GO). A three-week monitoring phase was conducted where the players of EXEN Esports CS:GO team reported their critical personal evaluation of their sleep and performance related to competitive esports.

Before the monitoring phases began the player unanimously reported that they had a baseline of knowledge that sleep influences their performance in competitive gaming. This information proved to be correct as the players kept providing supporting data towards this claim. The players were able to provide mainly negative outcomes of lack of sleep such as: inability to concentrate, fatigue during the day, short temper, and lack of communication. The results showed that small positive effects were found in esports performance.

Personal sleeping habits and circadian rhythm seemed to be most outstanding and noticeable factors in the results of the participants. All of the players reported at some given time during the monitoring phases that their past sleeping habits were more comfortable and suitable for them than the recommendations.

4.1 Repeatability and Validity

This study was conducted on mid-to-high tier CS:GO players in Finland. If implemented on another comparable and similar tier team, the study would probably yield similar data. Players at this tier are often aged same and compete in an equal skill level. Many of the players in this tier of competitive CS:GO in Finland have the same social standing by being either students, part-time workers, or unemployed. These factors can be relevant when repeating this study. It is important to look for similarities in socio-economic standings of the players as their personal lives do play a significant role in their sleeping habits.

Before the monitoring phase of this research began it was crucial map out possible negative outcomes of what might come of the data. I had doubts of the reliability of the data that the players were about to present. This doubt was based on my personal knowledge and background of the team and the players as I had been involved with the players for the past year. I had doubts that

the players may be unable to provide reliable data based on recklessness or bad attitude towards the study because they might have had lack of interest towards the study itself. This was taken into consideration when analysing the data from the monitoring phases as it could have led to unreliable results and even jeopardized or trivialised the future repeatability of the study.

The case study of EXEN Esports CS:GO team was a success. The results exceeded my personal expectations. Far more personal performance related data was received in the interviews than I had expected. The players were open about their sleep and activities relating to this study. All of the players were able to provide reliable and valid data throughout the monitoring phases and enough data was received to form a conclusion. It would have been interesting to spend more time on this study and conduct this experiment on a larger scale with multiple teams and organizations. This study has potential to be repeatable by any esports organisation or team in the future. Caution must be had when analysing the validity and reliability of the data.

I chose this topic for my thesis subject as I am an aspiring performance coach myself. My personal goal is to help players find their optimal performance levels in competitive esports and reach their maximum potential. Sleep, in my opinion, is one of the most important factors in an esports athlete's performance as we all sleep for roughly one-third of our lives. This thesis also supports my personal career as a performance coach as I am currently, when writing this thesis, the performance coach for EXEN Esports' CS:GO team. Close relations and past experience with the players in my opinion are key factors when developing and enhancing player's performance. They bring more depth, personality, and broader aspects in performance management.

As a baseline, this intervention -type of case study in an esports team may be a reasonably valid option and could produce much needed information concerning esports athlete's sleep and its effects on the players' performance. A trained professional coach or psychologist would be of help when creating supporting material for research of this level.

4.2 Strenghts of this study

It is important that the growing esports scene has an active base of people interested in researching esports related topics. All research conducted in esports strengthens the image of the esports scene as a whole. Performance coaching is an important part of the development of the competitive esports scene as young esports athletes require guidance when progressing their professional careers. Bonnar et al. suggest that there is a gap in the current esports literature and it is

problematic because esports athletes, especially young esports athletes, can face difficulties in making accurate and scientifically supported decisions about their performance management, unlike traditional athletes. This is the moment when performance coaches step in and share their knowledge with the players. The role of a performance coach in an organisation is vital regarding the future of esports.

A good example can be drawn from case EXEN Esports as a mid-tier Finnish competitive team, where the players are not considered as professionals. Keeping this in mind all the focus should not only be directed to high-tier organisations and their teams when considering performance coaching in esports. Esport athletes who advance their careers to the very top of the world of esports will naturally progress through the lower tiers of competitive gaming to reach the top. Performance coaching can be crucial at the early stages of a player's career progression and should be implemented early on to develop a healthy gaming style. In the future, this study can work as a framework or baseline for further research conducted on the effect of sleep in esports.

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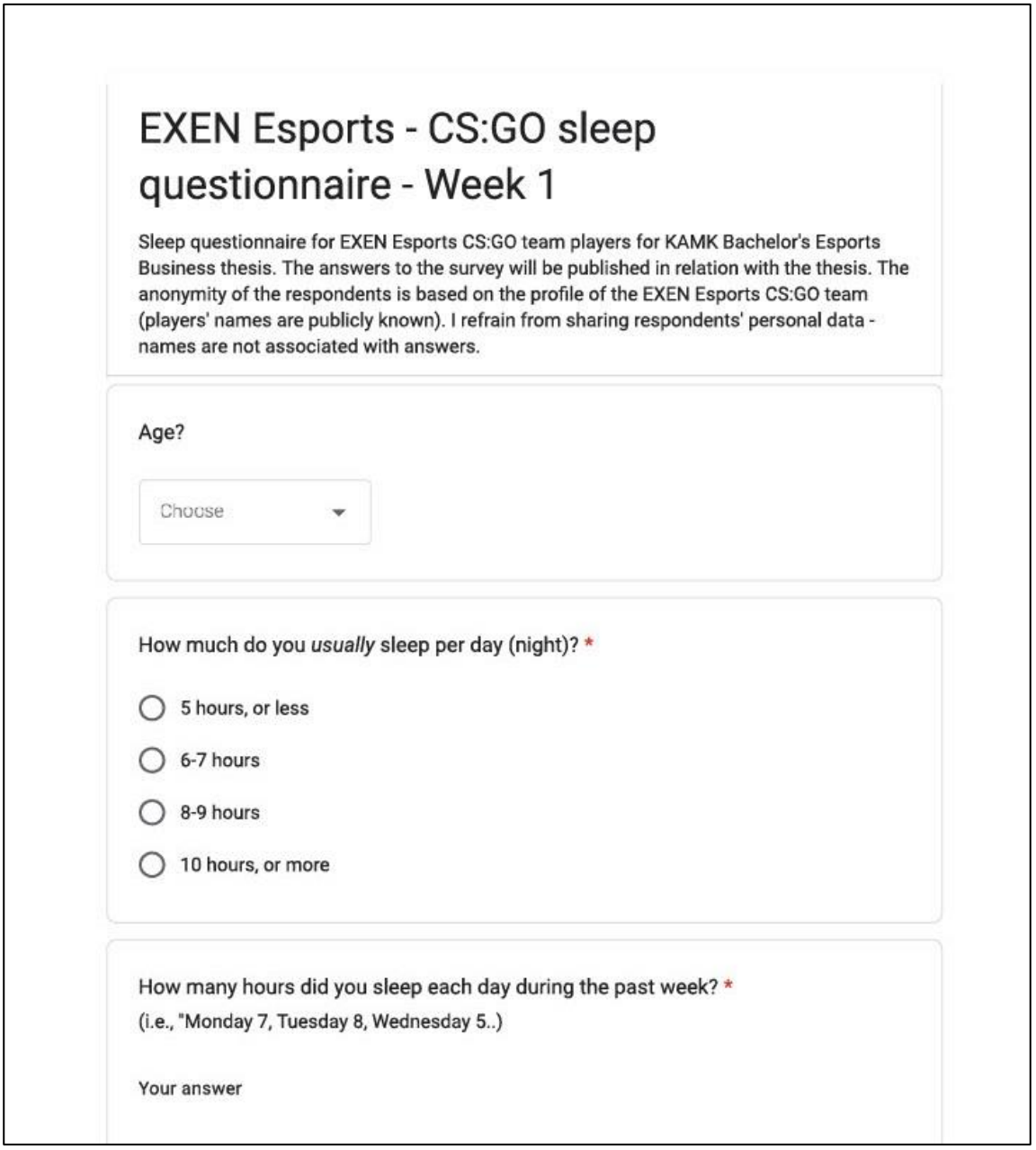
Appendices

1. Weekly sleep diaries for the players of EXEN Esports (unfilled).

Player 1				
	Hours slept:	**Time you went to bed:**	**Time you got up:**	**Personal thoughts and additional comments:**
Sunday-Monday				
Monday-Tuesday				
Tuesday-Wednesday				
Wednesday-Thursday				
Thrusday-Friday				
Friday-Saturday				
Saturday-Sunday				

2. Weekly online questionnaires for the players of EXEN Esports. (Google Docs. EXEN Esports – Sleep questionnaire Week 1 (2022)



EXEN Esports - CS:GO sleep questionnaire - Week 1

Sleep questionnaire for EXEN Esports CS:GO team players for KAMK Bachelor's Esports Business thesis. The answers to the survey will be published in relation with the thesis. The anonymity of the respondents is based on the profile of the EXEN Esports CS:GO team (players' names are publicly known). I refrain from sharing respondents' personal data - names are not associated with answers.

Age?

Choose

How much do you *usually* sleep per day (night)? *

- 5 hours, or less
- 6-7 hours
- 8-9 hours
- 10 hours, or more

How many hours did you sleep each day during the past week? *

(i.e., "Monday 7, Tuesday 8, Wednesday 5..)

Your answer

Did you go to bed at the same time each night?
(You can specify your bedtimes here.)

Your answer

Did you go to bed straight from the computer? (i.e. no wind-down time).
(No screen-time before bed, brushing your teeth or other evening activities are ok.)

- ◯ Yes
- ◯ No

Do you feel that you slept enough (hours) to your own preference?

- ◯ Yes
- ◯ No

If you answered NO to the last part, specify what affects in your sleep in your own words?

Your answer

If you feel that you get too little sleep, what aspects affect in your sleep in your own words?

Your answer

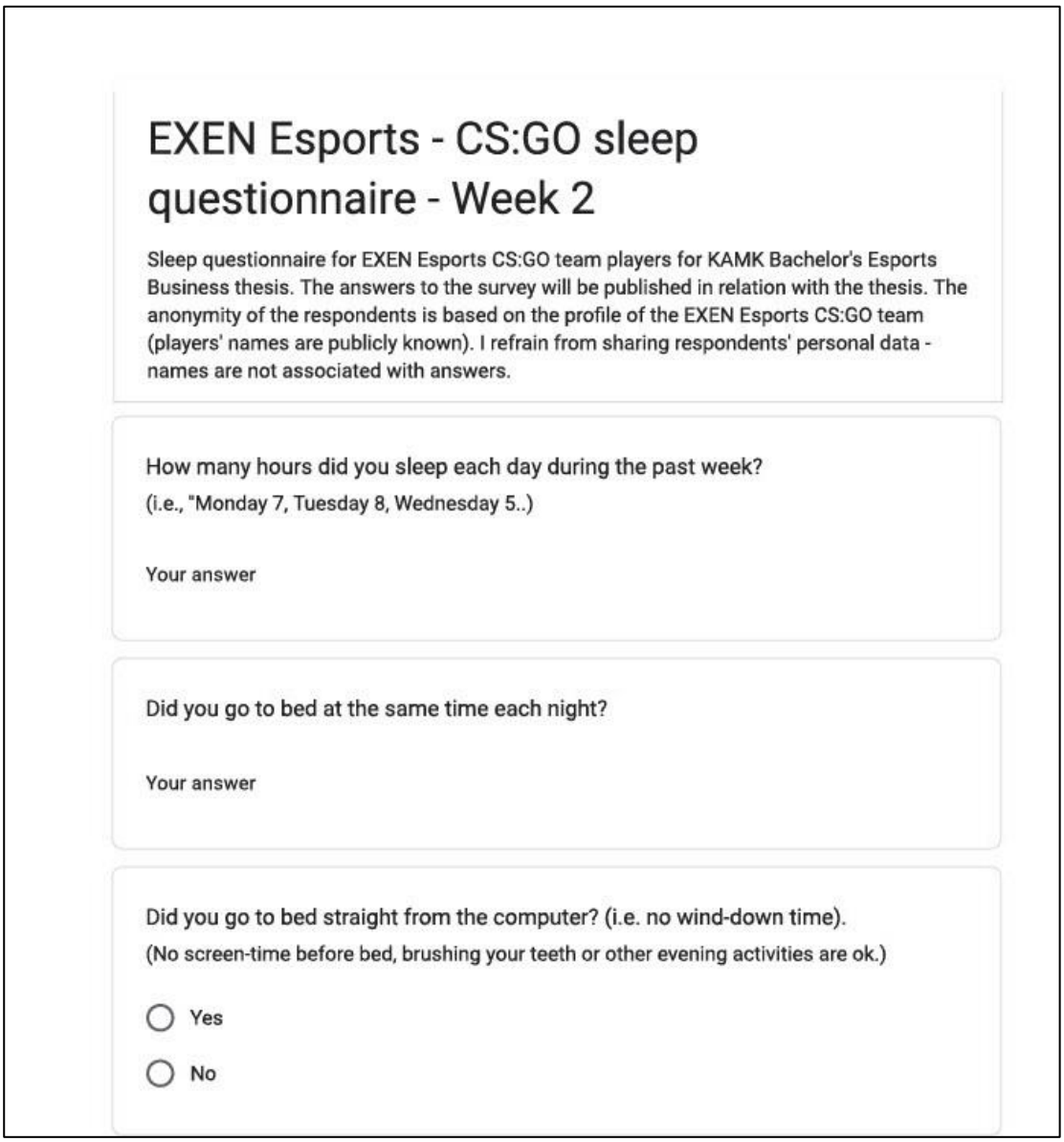
Do you feel that sleep has an effect in your performance in competitive esports?
(i.e., reaction time, coordination skills, mental state, energy levels, thinking, or something else)

- ◯ Yes
- ◯ No

If you answered YES in the last part, specify here which areas of performance do you feel that sleep has a effect for you

Your answer

3. Weekly online questionnaires for the players of EXEN Esports. (Google Docs. EXEN Esports – Sleep questionnaire Week 2 (2022)



EXEN Esports - CS:GO sleep questionnaire - Week 2

Sleep questionnaire for EXEN Esports CS:GO team players for KAMK Bachelor's Esports Business thesis. The answers to the survey will be published in relation with the thesis. The anonymity of the respondents is based on the profile of the EXEN Esports CS:GO team (players' names are publicly known). I refrain from sharing respondents' personal data - names are not associated with answers.

How many hours did you sleep each day during the past week?
(i.e., "Monday 7, Tuesday 8, Wednesday 5..)

Your answer

Did you go to bed at the same time each night?

Your answer

Did you go to bed straight from the computer? (i.e. no wind-down time).
(No screen-time before bed, brushing your teeth or other evening activities are ok.)

- ◯ Yes
- ◯ No

Do you feel that Week 2's sleep recommendations are good for you?

Recommended sleep hours: 7-9 hours a night (day)

- ◯ Yes
- ◯ No

If you answered NO to the last question, specify here why do you feel that the general sleep recommendations do not apply to you?

Your answer

Did you notice any differences between Week 1 and Week 2 in yourself?

Describe here how week's 1 and 2 differed from each other. Did you notice for example that you had more energy throughout the day, did you stress more about sleep, how did the official games go, and so on.)

Your answer

What positive, or negative, performance related did you discover in yourself during Week 2?

Did something go better, or worse, or was the overall feeling the same as during Week 1?

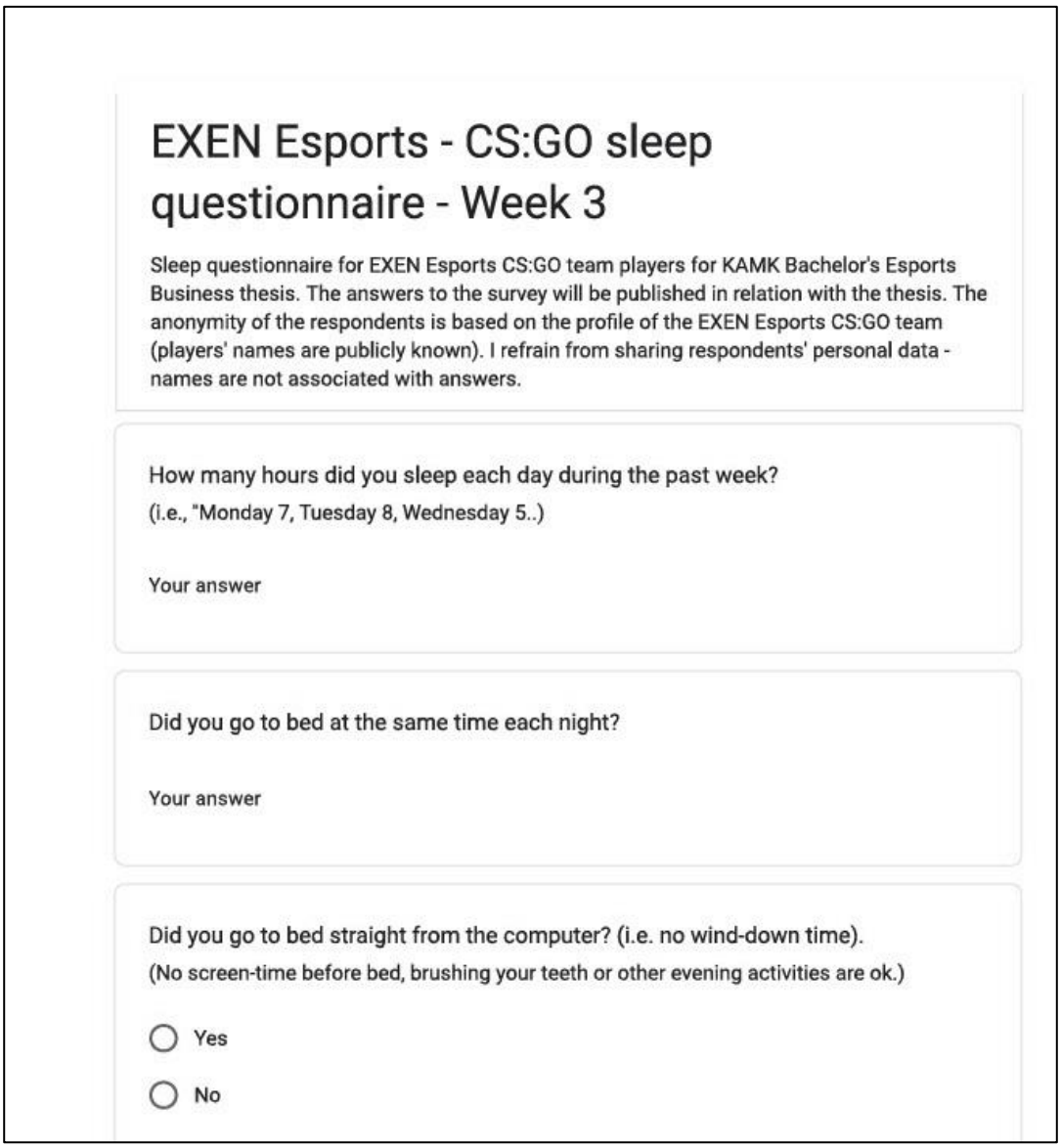
Your answer

Going into Week 3, how would you change your sleep times?

(Week 3 is a free-choice week where the players can choose themselves a better more suitable sleep rhythm for themselves.)

Your answer

4. Weekly online questionnaires for the players of EXEN Esports. (Google Docs. EXEN Esports – Sleep questionnaire Week 3 (2022)



EXEN Esports - CS:GO sleep questionnaire - Week 3

Sleep questionnaire for EXEN Esports CS:GO team players for KAMK Bachelor's Esports Business thesis. The answers to the survey will be published in relation with the thesis. The anonymity of the respondents is based on the profile of the EXEN Esports CS:GO team (players' names are publicly known). I refrain from sharing respondents' personal data - names are not associated with answers.

How many hours did you sleep each day during the past week?
(i.e., "Monday 7, Tuesday 8, Wednesday 5..)

Your answer

Did you go to bed at the same time each night?

Your answer

Did you go to bed straight from the computer? (i.e. no wind-down time).
(No screen-time before bed, brushing your teeth or other evening activities are ok.)

- ◯ Yes
- ◯ No

Did you change something in your sleep for Week 3? Describe here what were the changes:
(i.e., did you go back to your own personal sleep habits, did you lower or add hours to your sleep)

Your answer

How do you feel that weeks 1, 2 and 3 differed from each other from your perspective?

Your answer

Do you feel that Week 3 helped you to better understand your personal sleep and its effects on your performance and why?

Your answer

During the past three weeks do you feel that you received enough information about sleep?

Your answer

Feedback? Free word:

Your answer