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PROFESSIONALISM IN ESPORT: BENEFITS IN SKILLS AND HEALTH & POSSIBLE DOWNSIDES

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PROFESSIONALISM IN ESPORT: BENEFITS IN SKILLS AND HEALTH & POSSIBLE DOWNSIDES

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FOREWORDS

This project report presents our findings around esports professionals, enthusiasts and fans. Specially, we have collected different views to esport and how it can affect persons health when activities in esport get closer and closer to the amounts of hours a professional esport athlete would use to stay competitive.

We would like to that Regional Council of South Karelia for funding the Nuorista voimaa e-urheiluun project (as part of the funded Alueelliset innovaatiot ja kokeilut (AIKO) projects), which has made it possible to produce this report work. Especially we would like to express our gratitude to Laura Peuhkuri, for her active participation to LUT projects funded by Regional Council of South Karelia, as this activity really shows the positive attitude towards time and care Regional council puts to development work done in South Karelia. The work and findings from esport related health aspects presented in this report are a collection of multiple sources, which can be found in the list of references presented in the end of the document.

Finally, we would like to thank LUT University for providing the possibility to work within this topic and the opportunity offered to be part of this esport related project work.

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ABBREVIATIONS

ACM	Association for Computing Machinery
AI	artificial intelligence
am	latin ante meridiem (before midday)
APAC	Asia Pacific
APM	actions per minute
b.o.	because of
BBC	British Broadcasting Corporation
bpm	beats per minute
CEO	chief executive officer
DOI	digital object identifier
e.g.	latin exempli gratia (for example)
esport	electronic sports
et al.	latin et alii (and others)
etc.	et cetera
Iss.	issue
IT	information technology
LAN	local area network
M	million
NAM	North American Region
PAX	Penny Arcade Expo
pm	latin post meridiem (after midday)
pp.	pages
US	United States
USA	United States of America
USD	United States Dollar
Vol.	volume
vs.	versus
00s	years from 2000-2009

1 INTRODUCTION

As an introduction of this project report a reader is presented with, firstly, the esport background highlighting the actuality of the current project and, secondly, the report scope describing the main project essentials.

1.1 Esport background

Within last years, the size of esport industry has grown to unprecedented proportions. Nowadays, the biggest esport tournaments gather millions of visitors as the actual "real" sport games do, while video online translation of esport events gets millions of viewers too. For example, in the year 2018, top 4 events gathered total of 190 million combined viewership (Takahashi, 2018). The top watched event was 2018 League of legends World championship with 81.1 million viewership (Takahashi, 2018). Comparing to traditional sports, in 2018 most watched sport event on U.S. television was Super Bowl 52: Eagles-Patriots game with 106 million viewers on 4.2.2018 (Kelly, 2018). Based on the numbers, one can clearly see, that esports is definitely anymore "just a small niche thing". Actually, esport is nowadays considered as the fastest growing sector of today's different sports "industries" (Nielsen & Karhulahti 2017). And in the near future, esport as one type of sport domain will get even more serious thing to keep an eye on it, as esports shall be included as one of the medal events in the 2022 Asian Games (Cunningham et al. 2018). In the same way, esport will be in the 2024 Paris Olympics (Polman et al. 2018). Esport presents a big economic value too, nowadays esport industry revenue globally equals to $906 million as it is visualised in the Figure 1, presenting the countries related to biggest impacts they make. The near future forecast is predicting esport industry's worth to grow $24 billion by 2020 (Polman et al. 2018).

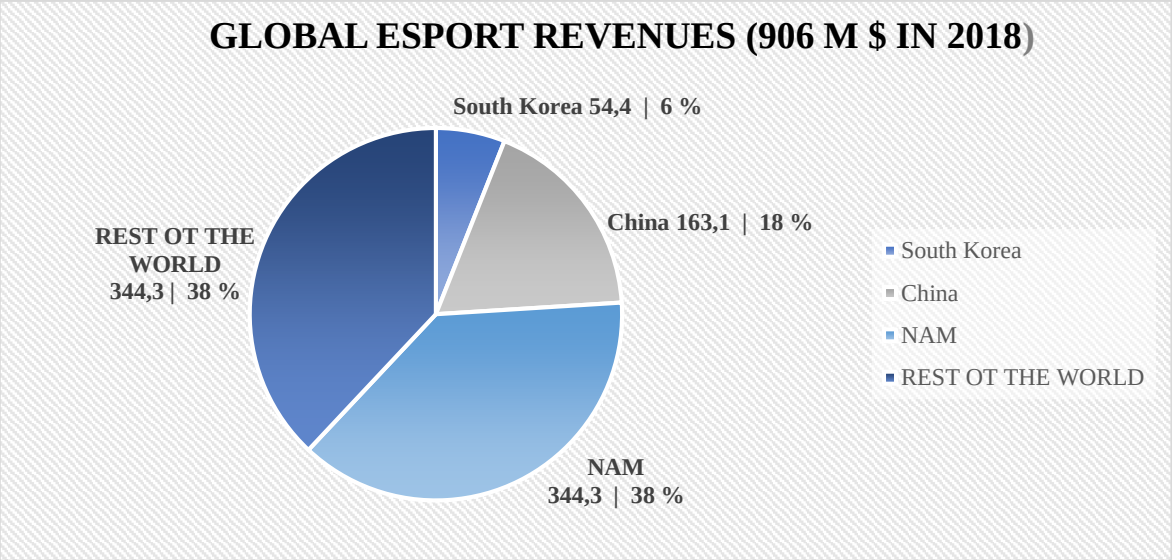

Figure 1. Esport revenue globally, adopted from Gray (2018)

But right now, esport is still not in the major mainstream category. To become something like that, it would need an independent and autonomous administration for few of different games in esports (Polman et al. 2018). It might be that esports grows naturally trough time to be so called mainstream, or it might need something special like what industry 4.0, wireless and mobile technologies (Jahkola et al., 2017) and digitalization has done for traditional industries (Kortelainen and Happonen, 2017a,b; Kortelainen et al., 2019), transforming them towards new era or how additive manufacturing (Widmaier et al., 2013; Piili et al., 2013) is changing the way global product innovation and designs are changing nowadays.

1.2 The scope of the report

For this report, the goal is to look up esport as one of the fastest growing sport regimes and, specially, the skills and health benefits what active time avocation put into esport could bring to player.

For the clarity, we would like to point out, that one should not mix casual gaming to esports. In this report, when we talk about someone in esports it means a person who puts quite a much time and efforts to that domain. To relate this to more traditional sports it would be a person who is a part of a team that is listed in the professional players category and trains

with team members together almost in daily basis, following the sport domain they participate and go to competitions. In short, when reading this report hobby or casual gaming and esports do not mean the same. And as such the potential health benefits and also the disadvantages of participating to esports, should not be related to people who “just play games”, these studies and material which are mentioned in this report relate to people who do esports and actively train and participate to the domain they are competing in.

And for the report scope, one should additionally be clear on the terms used for electronic sports. Even when the games are played in virtual, computer generated environments, it is still not fantasy sports. Esports really should not be confused to the term fantasy sports, which infect did see the first news flash already around year 1997 (Schoenke, 2017). In fact, the fantasy sports as term means something completely other than what esports / electronic games related sports mean. Fantasy sports means e.g. a game that happens virtually in online environment and in this game players will be assembling imaginary teams for some professional sport x (e.g. like football, ice hockey etc.). There a computer calculates the team’s competition performance, based on the individual virtual team members statistical performance factors. So, in short, a fantasy sports player is usually like a virtual team’s manager and computer "plays" the games. For those readers, who are interested to know more about current and past fantasy games related major events, we refer reader to look into the fantasy games timeline article (RotoGrinders, 2016). So even when the game is “played” in computer and in virtual environment, that does not make it automatically esports. In esports the player actually has to play the game him/herself. Given the typical description of fantasy sports, it would be more like sports manager simulation that electronic form of sports, considering the “field players” themselves. So, briefly, from esports point of view, currently fantasy sports and esports are not actually that much connected at all. But in the future, a real esports team manager could start building fantasy sports teams, based on data collected from real esports players. Then by using computer algorithms these teams could have matches in fantasy sports arenas to give a scenario hints what could happen with team changes and by adding new members to the team and so on. With the level of data and current AI to run the fantasy games, these is still something to wait to happen in the future, that could bring these two different fields little bit closer together. However, as we said this is a different story far from our aim to explore the role of health in esport.

2 PEOPLE IN ESPORT

The purpose of this chapter is to familiarize a reader with esport related terminologies, get deeper connected to the persons who are usually considered to be the players and how esports is generally developing currently. For example, the US government has already been treating professional gamers as 'athletes who compete in sports' for several years now (Tassi, 2013) and international players can get athlete visas when competing in US esports tournaments.

In order to continue further discussion, we would like to look at definition of esport and some typical discussions around it to give basic background starting point for the readers of this report. Esport has arisen at the crossroad of two different spheres of general interest areas. Specifically, we speak about sports and IT (Kadan et al. 2018), enhanced with computer game realms and virtual world like environments. This intriguing combination and starting point have made esports quickly popular and quite fast-growing business ecosystem environment too. For the view to this ecosystem, we collected the data how enthusiasm has changed around esports between years 2016 to 2019. Our first visualization (the Figure 2) is for the year 2016, that shows how the total of 121 million enthusiasts (based on Pannekeet (2018)) is divided between different geological areas in the world (based on percentages revealed in Newzoo (2016)). In the graph, following areas are presented: Asia-Pacific area (APAC), European Union (EU), North American region areas (NAM) and the rest of the world.

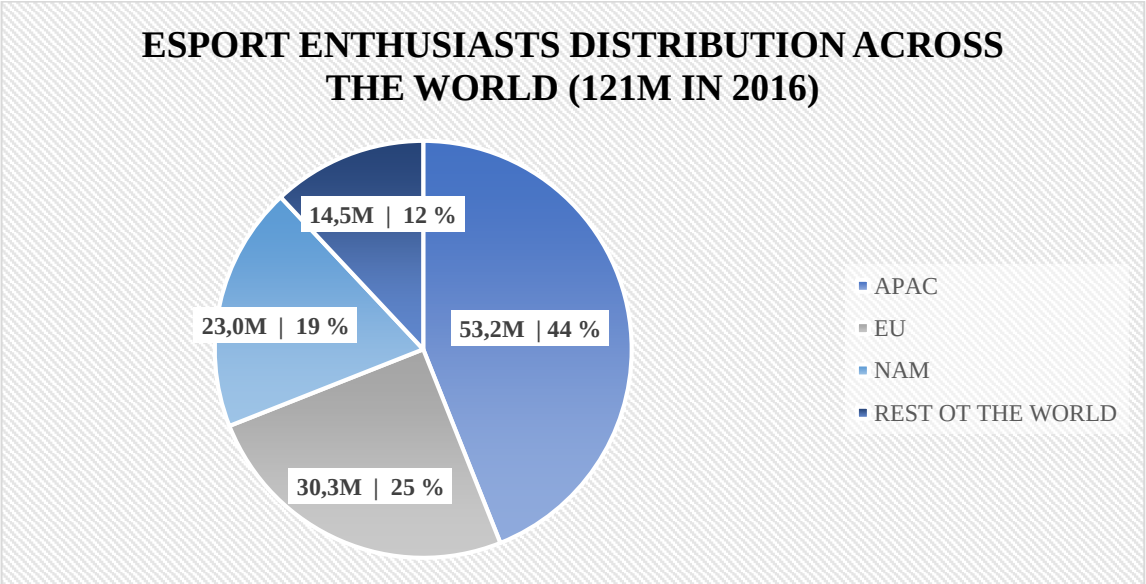

Figure 2: 2016 numbers for esport enthusiasm

Next visualization (the Figure 3) presents the numbers (based on Pannekeet (2019)) and the percentages (based on Chapman, J. (2017)) of enthusiast around esport in 2017.

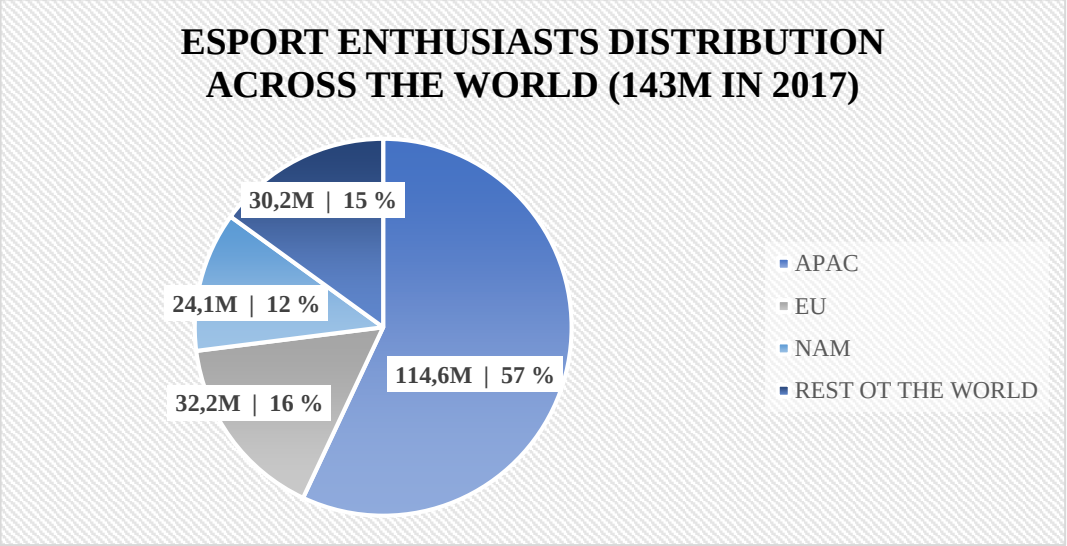

Figure 3: 2017 numbers for esport enthusiasm

Next visualization (the Figure 4) presents the numbers (based on Pannekeet (2019)) and the percentages (based on Pannekeet (2018)) of enthusiast around esport in 2018.

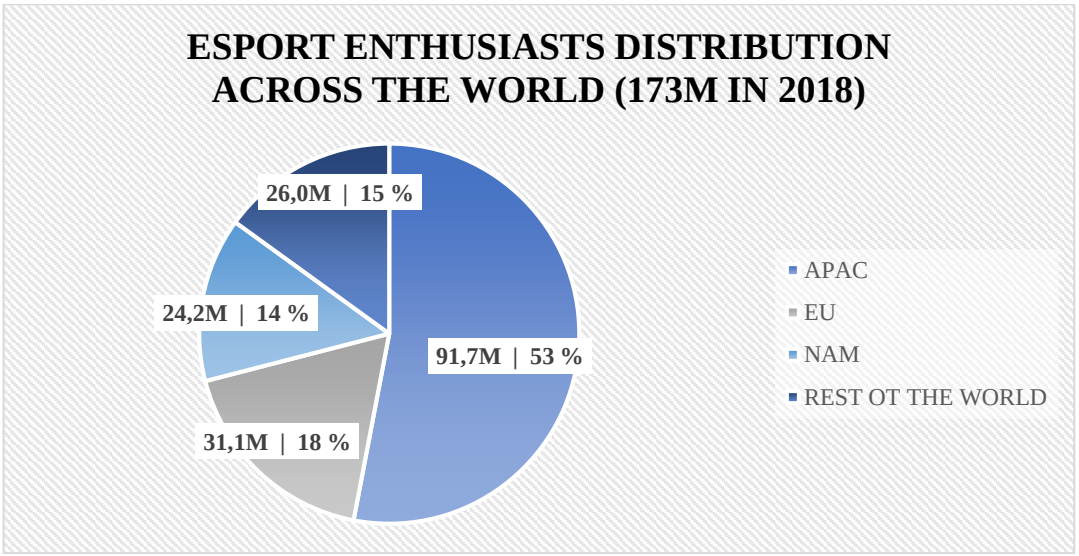

Figure 4: 2018 numbers for esport enthusiasm

Final enthusiasm global share division visualization (the Figure 5) is for the current 2019 year. This visualization is based on data provided by Pannekeet (2019).

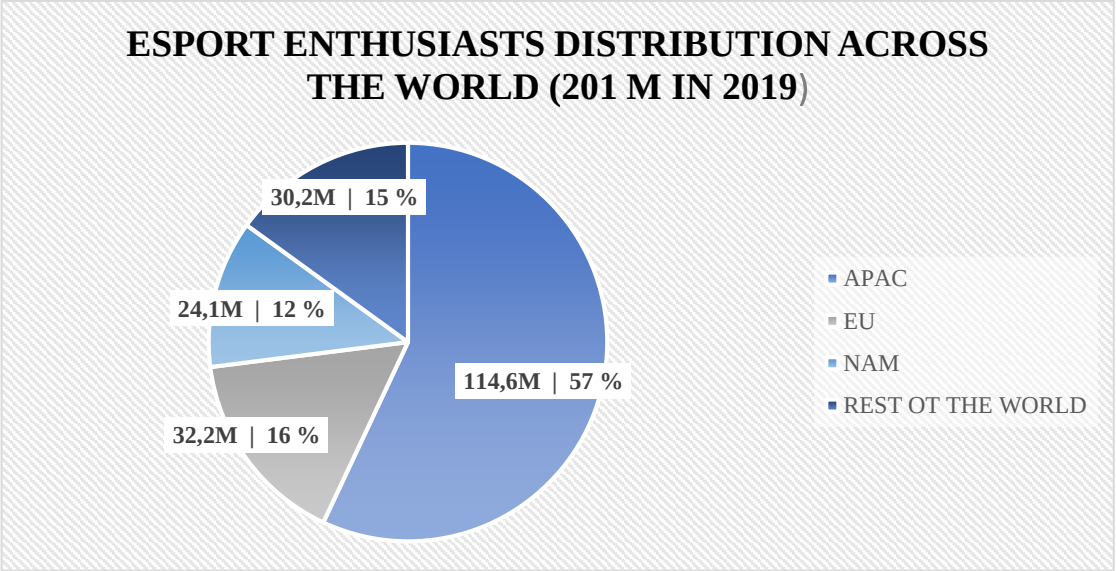

Figure 5: 2019 numbers for esport enthusiasm

For overall progress and development view, we did build a combination graph (the Figure 6) on how enthusiasm around esports has been developing between the years 2012 to 2019 and how it is suspected to continue to develop up until the year 2022. Unfortunately, the data for the year 2013 was not available, in the data sources. This visualization is a combination of data from the following sources: Newzoo (2016), Chapman, J. (2017), Pannekeet (2018), Statista (2019) and Pannekeet (2019).

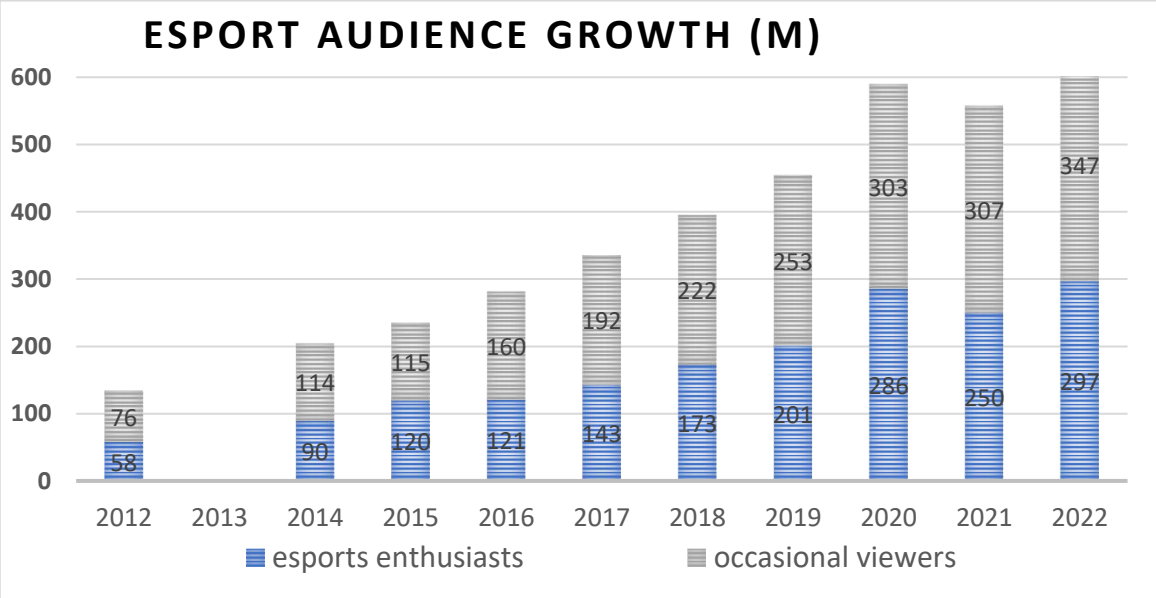

Figure 6: Esports audience growth from 2012 to 2019, including predictions until 2022

2.1 What sort of people are interested about esports?

From numbers point of view, the amount of esports fans has already surpassed 200 million people, all over the word. (Lee & Schoenstedt 2011). However, from players' point of view, the situation in numbers in esports is like in any other sports. Only just a few people in the topmost percent are capable to go into the esport gaming circles and then be able to play at the professional level (Tani 2018). By the game studies, from the current number of 1,5 billion people who play games in some or another form, only some thousands of gamers can be really accounted as professional in the esport context (Nielsen & Karhulahti 2017). If you would compare that to e.g. football, the phenomenon is quite similar. Football is really played by many people all around the world, but only minute of people play somehow in registered professional levels, and then really small number of those players actually play in top category and make their living by just for playing the game as professional. On numbers level, e.g. (Magowan, 2015) wrote that *"…There are 12,500 players in the English academy system, but only 0.5% of under-nines at top clubs are likely to make it to the first team. There are also suggestions that drop-out rate in football is similar to other sports, such as rugby union, which can lose 76% of players between the ages of 13 and 16…"*.

One thing that might come a surprise for people who are not familiar with things going around esports scenes, is the young age some esport players stop their careers. It could be basically stated, that for esport players, the career length can quite easily be really short, as it was found out that the typical age of retirement for professional esport player is averaging around 25 years of age (Tani, 2018). The best players, with good tactics and strategy eyes do turn their career path into becoming an esport analysists or coaches to apply their skills in new ways, but still stay "in game" in esport arenas. Others have found their way to stay a part of payroll workers in esports as shout casters, pro esports event organizers, commentators, personal trainers and so on. If looking for an analogue from more traditional sports, it's most likely coming from some fitness or body feature related sports, where young age (typically) gives people some clear edge over more aged competitors. Related to the younger people and how much they see themselves as gamers / players, e.g. (Yabumoto 2018) has made a study that found people at the ages 18 to 29 years to have quite a lot of video game players. In this study, men (77% of surveyed men) and women (57% of surveyed

women) confess on playing video games. But only 33% (men) and 9% (women) from the age group respectively identify themselves as actual “gamers” (Yabumoto 2018).

Given the quite untypically young age, when professionals might exit from this sector of sports, it actually sounds really good that some esport related organisations have started to already consider, how to support people to continue their lives, after esports professional careers. For example, the South Korea International e-Sports Federation has decided about organizing an "e-Sports Academy" to educate future esport gamers to better prepared for life after esport career and to support all the retired esports players.

Coming to the gender diversity of esport players, it has been found out that the majority of them are historically been men. Based on some esports related players gender studies, females are comprising less than 1/3 of all esport players and fans (Cunningham et al. 2018). In the 2017, a report named “Think With Google” (2017) indicates that more than 65% of females watch YouTube gaming videos / some form of esport video materials (Petrova 2017). However, women are not anyhow blocked and/or isolated from entering esports events. For instance, there are even special esport separate gaming tournaments for females (Ghoshal 2017). However, at the moment, we do not have any female players among the top esport 300 prize earning players (Ruvalcaba et al.2018). Also, comparing the highest esport earning for men and women, which are $2.6 million and $156 thousand respectively (BBC 2016), there is a huge difference in numbers because of gender relative players amount. At the same time, the number of women involved in any working role in the esport industry is approximately 5%, rephrasing in every 20 women gaming only 1 woman can be found in the esport sphere (League of Professional esports 2018). Statistics tells that in playing video games (e.g. on consoles, tablets, smartphones), the percentage share of genders is nearly equal (48% for females and 52% for males) (Ruvalcaba et al. 2018, League of Professional esports 2018). However, form this number only 15% of adult males define themselves as gamers vs. 6% of adult female claim this (Yabumoto 2018). The difference also lies in the video playing games type preferences. Men likes hard-core games (traditional video games with fighting and shooters) and women does more casual games (mobile games such as candy crush, Pokemon Go) (Ruvalcaba et al. 2018).

2.2 Why people play?

Bányai et al. (2018) explain their empirical research studies concerning esport from the psychological perspective, based on multitude of research material published between 2000 and 2017. Total of eight empirical studies met inclusion requirements for their actual detailed research work, after rigorous filtering. These eight studies comprised three main topics such as the process of becoming an esport player, the characteristics of esport players (e.g. mental skills and motivational reasons to play) and the motivations to be esports spectators.

So why do people play and participate into computer gaming? Vorderer and his colleagues (Vorderer 2000; Vorderer et al. 2003) found the most essential elements of gaming motivations are interactivity and competition. Opportunity to communicate, cooperate, have competition and comparison between players themselves and each other. The motivation was different for younger gamers and older gamers. Younger were motivated by competition and challenge and older gamers by challenge and social interactions and distraction.

Then, by analysing the esport players reasons and motivation sources to play, Lee & Schoenstedt (2011) have shown interesting data, based on over 500 participants. Their study discusses the key 14 motivational factors influencing esport gaming time duration (the Figure 7 below).

Figure 7. Esport players motivational factors, adopted from Lee & Schoenstedt (2011)

These motivational factors have been gathered to the following Table 1. In this table, the data is presented so that the highest motivation sources are presented first, then moderate and finally the factors that do not correlate to the motivation at all. The most significant result impacting into the reasons to participate to actual esport games, by the players, has been found to come from these 3 factors: competitive spirit, skill building and gamers feeling of peer pressure.

Table 1. Factors influencing esport play times, adapt. from Lee & Schoenstedt (2011)

FACTORS	POSITIVE EFFECT	MODERATE EFFECT	NEGATIVE EFFECT
Social interaction with others		✓	
Application of game and sport knowledge	✓		
Fantasy development		✓	
Competition	✓		
Entertainment/ fun			
Diversion/ break from routine	✓		
Identification with of a game with real sport		✓	
Raise of adrenalin, excitement, emotions	✓		
Ability to control game settings			✓
Peer pressure	✓		
Skill learning	✓		
To pass time		✓	
Game playing availability			✓
Enjoying realistic design and graphics			✓

Now if we compare the table and findings of Lee & Schoenstedt (2011) to other gaming and motivation related studies, we can see little bit different picture forming up. For example, Weiss and Schiele (2013) has done survey study for 360 participating players of esport. With their data, they did demonstrate the main hedonic and competitive needs that work as the main drivers for continuous stay around esports. They used the uses and gratifications theory by Katz et al. (1973) for their study. With this theory framework and the data, they used, they identified that escapism, challenge games offer, and the aspects of competition were need like gratifications obtained through participation to esports and that motivates the players to stay in game. In this context, escapism means a way of using video games as a tool to avoid thinking about real-life problems. This happens by mentally putting yourself into the played character's shoes and sort of becoming the persona the player prefers to be. Unfortunately, this is also critical motivations for playing games that relate to directly problematic video game play habits. More about this motivation source and how it can be a

predictive factor for problematic video game usage, can be found from following sources (Király et al. 2015, Yee 2006).

Yet another view to esport players and casual gamers has been revealed by Martončik (2015). This study looked for gaming motivations (esport players in study 108, casual gamers 54. With this study they were able to highlight some aspects explaining why professional esport players actually paly and how that can satisfy some of their life goals. As a result of the study, they concluded that affiliation (readiness to help others) and focus diversion (e.g. look for new experiences and excitement) does motivate the professional players quite differently than casual players. Professional esport players are building more relationships that can be classified friendly (e.g. as being part of a team and by playing in LAN championships). Esports also gave the team leaders the possibility to satisfy their need for power

2.3 How much time active esport training actually takes?

Firstly, let's start from some the most obvious things, like how long a professional / semi-professional esport player actually "plays games" typically / daily basis. By the popular press sources, it seems that esport players daily playing time is heavily exaggerated. On average the time professional and high-level esport players spent on actual playing is only 5,28 hours (Kari et al. 2019). Another source agrees with this esport actual playing time and tells that to upgrade for an esport professional players from just esport player it takes at least around 6 hours of deliberate rational esport practice, done in daily basis, for several consequence years. And that time doesn't account distractive absent-minded gaming, that can easily be in the same hours playing amount. (Nielsen & Karhulahti 2017). If some sources do state about 12–14 daily hours, taken up by esport activities, the additional hours seem to really come from time spent in esport related activities such as participation in team meetings, video / recording based game tactics analysis, strategic discussions, sponsored events and so on (Kari et al. 2019). Basically, like in any high-level athlete sports or e.g. top-level music skill building etc., one must put lot of effort to be part of the best of best group, but it does not mean to do just one thing. Efforts must be but in many different skills, knowledge and networking related aspects too.

Nevertheless, there are few exceptions to generic situation as it was found in the Seattle PAX West game conference discussions, related to the top of the top players and their play times. Panellists there were sharing experiences about players playing a high-pressure competitive game about 16 hours per day and for them it seemed quite possible this is typical / usual amount for top esports competitors. According to Devin Nash, CEO of esports organization Counter Logic Gaming, says following about playing in the esport industry *"... if you don't perform you die. There's no other way out of it; you have to go as fast and as hard as you can for as long as you can…"*. Steph Loehr, a Twitch broadcaster and highly ranked player in Heroes of the Storm, adds that even practicing extra couple of hours in mousepad can give a bit of advantage in competitive gaming and as people are up against the best of the best, they feel that every extra bit is highly needed. (PAX panel 2017)

If we look esports from the history point of view, study made by (Seo, 2016) noted that many international esports lovers and fans believe the South Korea to be a motherland of professionalized gaming. Game enthusiasts seem to put specially StarCraft as the one game, that has built the international media coverage and attention of gamers to the direction of esports, when it was originally "invented". *"Esports initially started in Korea where they had StarCraft tournaments and that's where it really took a hold of companies like Samsung were sponsoring individual players to play in the competitive scene and that's where it sorts of started off, and then obviously this game came out."* – said by Laxus, 23 years old gamer. Nowadays sponsorships are quite typical, like in any other more traditional sports and sponsorship activities have in effect mane gaming to become more commercialized. (Seo, 2016)

Analysing recorded Counter Strike tournaments games, Kadan et al. (2018) concluded common factors indicating victory in this game where the higher features values will lead to higher winning potential. These common victory indicating factors were: "The amount of money the team had in the early round", "percentage of active movement time", "Number of shots, hits & grenades used", "percentage of time in the zone of middle-range visibility". These indicators are also tight up to the realities how one can e.g. have more active movement time compared to other players? By the studies study (Funk et. al. 2018) it was mentioned that in game play, average person does roughly 50 actions per minute (APM), whereas professional player can achieve a rate of 400 to 500 APM. Given the previously

mentioned indicators for possible victory, it makes sense to predict that the enhanced eye hand coordination and skill to make decisions faster, develop during esport training times, could also help people to be more efficient in other careers where fast actions and decisions are needed (e.g. in air traffic control related jobs).

2.4 Who watches esport and why?

Referring to the following Figure 8, one can find out the reality that about esport audience. With this data, it is clear that not only the number of esport players is growing, but also the number of esport fans is going up too. This brings us to the thought that in addition to esports players health, we might want to take a look, in the future, to the health of esports fans too and then compare it to the traditional sports fans' health. Looking the current numbers of esport audience size, the number of fans is growing fast and as it seems to have already overpassed the active esport enthusiasts' numbers (Pannekeet 2018).

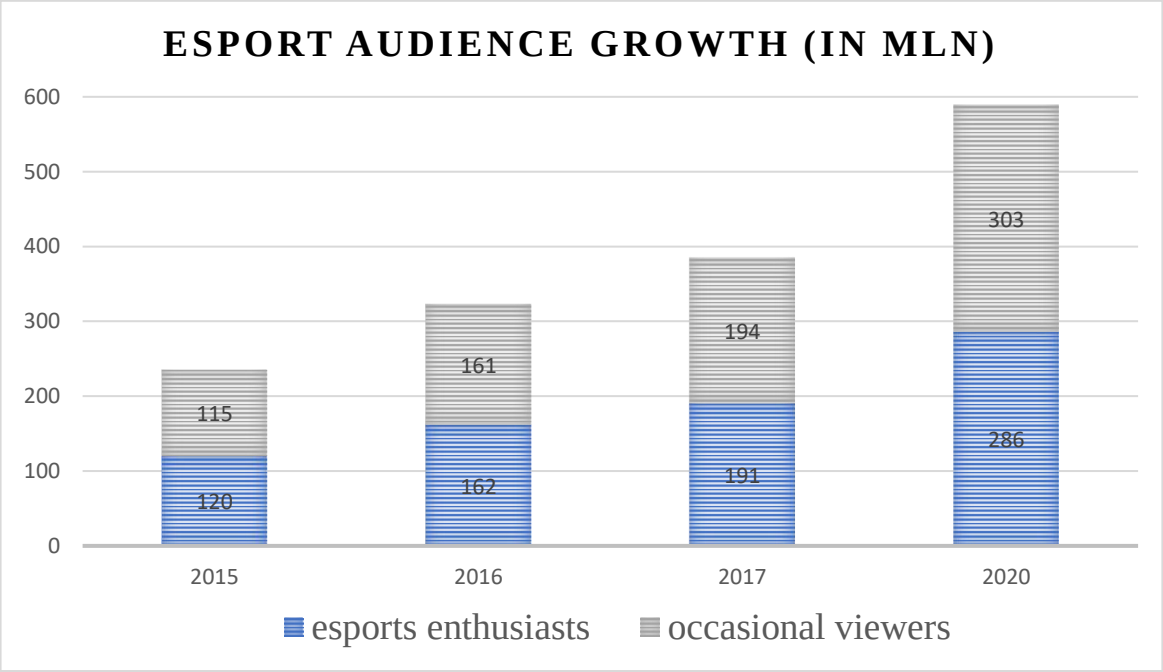

Figure 8. Esport audience distribution, adopted from Chapman (2017)

Considering the motivation of being a part of esport audience, Lee et al. (2014) examined 103 spectators of esports and their characteristics in the group of the 2013 League of Legends World Championship Finals. Their research focused on the motivation sources for esport viewing and they also did assessment of the effect of motivation sources, into the viewing

satisfaction experience. First of all, based on their research findings, people watch esports for the drama enjoyment. Also, the experience recreation, the lively game time commentary, and pure playing skills that were displayed by the top of the line professional players were seen s real motivation sources to keep watching esports.

3 ESPORT HEALTH ASPECTS

This chapter will cover the background of this report material collection. Then it will proceed to discuss esport related health aspects in general level. After which both the positive and possible negative ill effects of active esport activities participation can bring for the esport player, separately discussing on how gaming and gambling might be connected to each other, as these terms seem to be somewhat mixed by people outside of esport scene. By reading this chapter, we hope to show the reader why esport professionals probably act the way they do and also to give some light to the current setting in which becoming a professional esport player appears to be similar to the process of becoming a professional athlete in any other given sport (Bányai et al. 2018).

3.1 Background study and material review on esports and health

In this chapter, we will discuss shortly about esport and different health related topics and context areas scientific literature seems to be discussion nowadays. Before we go there, just a short reminder of common sense. Whatever consumable, sport, activity etc. we look, we should always remember that esports and games can be compared to many other things in life, and sensible amount per given time units is always something to look for. Too much is always too much for everything (wine, coffee, sudokus or even water). So as good practical example, esport is often misunderstood to correlate somehow with addictive game usage, but it really should be associated to excessive gaming, which are to different things (Griffiths 2010). And, one needs to be really carefully with the ideology of excessive gaming too (even within the top esport professional context), as not all the hours people put into esport, go into gaming itself.

As for this report, from the overview point of view, the following data presented in this report is a short overall review into this interest areas, but still it should give reader a good

basic knowledge what is discussed around esports currently in the scientific context. Looking the overview picture point of view of building this report, we wanted to add the background part of text into this project report, to give the reader understanding why the material sources revealed in this report discuss on the topics the way that they do. Also, this part of this report should give the readers some hint what sort of research results to expected to see more also in the near future. Particularly, as one should note that the majority of the publications that study both, the esports and health benefits and possible issues are mostly published inside last few years.

In this project report, we present 22 different studies, that were deeply analysed to deliver this report the value for the reader, related to the shared context of esports and health topics. Thus, these sources were gotten from process, in which we did narrow down into the literature based on author's interpretation of different keyword combinations and how they produced meaningful and relevant content. The selected publications were clearly informational within the topic of how esports affect to players and what are the potential health influences. Consequently, the selected articles do highlight, specially, esport and health effects with different point of views.

For example, Griffiths (2017) discusses the psychosocial impact of esport events that are growing in popularity. Specifically, he mentions the addictive potential caused. Nielsen & Karhulahti (2017) identify their research with esport gaming disorder. Another publication Griffiths has been writing earlier (Griffiths 2010) covers results from a pilot study of game playing and what sort of social anxiety it might generate. As in topic level, the topic of social networking and bonding in esports context seems quite popular. For example, in association with esport e.g. Khoo (2012) did his own social aspect studies and others studied esport as a phenomenon in a family environment to demonstrate esport players social issues and behaviour (Choi et al. 2018). From these social issues, one could e.g. mention the mental barriers, that can stop esport professional from performing optimally. These barriers related to the elements of optimal performance, such as confidence issues, coping strategies with anxiety, past achievements and mistakes, harassment, lack of self- and team development and difficulty in separating life and gaming (Bányai et al. 2018).

Additionally, we found studies discussing about health management in esport. Quite typical way of doing these studies seemed to be surveys, like a survey among esport players to report the health-related problems in actual numerical way the players have been facing in their gaming history (DiFrancisco-Donoghue et al. 2019), survey among high-level and professional esport players about what sort of physical exercises and training they have (Kari et al. 2019). Other studies did take more philosophical route, e.g. by paying attention of policy makers and discussion on implications of other academics studies around esport and the influence into health of the players (Polman et al. 2018) and others were proposing initiatives to bring esport management discussion to the next level with the ways the management is actually handled (Cunningham et al. 2018).

As for players, e.g. Seo (2016) has stated that participating to esports teaches the individuals skills to treat other people in online environment better and also to play game more fairly. Given what Josep (2018) stated about gaming and gambling to be changed in nature in last few years (Internet sessions have been turning from man vs. machine towards human vs human games), it is probably good for people to stay on more fair gaming tactics, not be shut out from the community they play in. If the relationship between gaming and gambling is something the reader prefers to know more, we advise to look into work done by Grove & Krejcik (2015). And them as from the research and education point of view, those who want to look at some history on mand and games studies (based on 1958 publication), look at Caillois (2001). More reasend work on the reality of games (fun vs life goals) can be found e.g. from the works of Martončik (2015). As for future, we found authors who believed for positive future in esports at recreational context and they looked for new educational potentials esports would reveal in near future too (Hallmann & Giel 2018, Funk et al. 2018). And finally we also found studies (Kadan et al. 2018) that were about of esport tournament and players' key success factors in the tournament themselves and also studies that were trying to explain the ways the esport top player / esport athletes were attended into the events and what were the main motivation factors and their explanation for the participations (Lee & Schoenstedt 2011).

Given the previously mentioned finginds and how widely they touch different aspects of people life in esport vs health benefits a following table was combined to give better picture on different studies in this context. The Table 2 the positive and negative effects, mentioned

on different reference sources have been mapped into a view that combines similar aspects as lines and crosses these against the publications which were found for this report. The visualisation of this table has been added to appendix 1 (as rotated view into the table context).

Table 2: A synopsis of collected studies and their connections to esport health issues

		Caillois (2001)	Griffiths (2010)	Lee & Schoenstedt (2011)	Khoo (2012)	Grove & Krejčik (2015)	Martončik (2015)	Rudolf et al. (2016)	Seo (2016)	Schütz (2016)	Griffiths (2017)	Nielsen & Karhulahti (2017)	Choi et al. (2018)	Cunningham et al. (2018)	Bányai et al. (2018)	DiFrancisco-Donoghue et al. (2018)	Funk et al. (2018)	Hallmann & Giel (2018)	Josep (2018)	Polman et al. (2018)	Kadan et al. (2018)	Karí et al. (2019)	Rudolf et al. (2019)
ADVANTAGES	*therapeutic & medical effect*		x											x			x						
	teamwork				x				x									x			x		
	problem-solving				x						x				x		x						
	strategy & tactics				x						x				x		x	x			x		
	actions speed							x		x							x	x					x
	hand-eye coordination							x		x							x	x					x
	visual & spatial		x	x	x						x												
	ability to sustain high level of attention																			x			
	quick&right decision-making				x															x			
	psychological&emotional stability										x							x			x		
	cognitive behavior improvement				x						x			x						x			
	motivational & emotional benefits				x						x			x									
	social bonding & interactions		x	x	x				x		x	x		x	x		x	x					
	physical activity owareness of being healthy and fit		x											x			x	x		x		x	
	growth mindset						x		x						x		x			x			
	pattern recognition										x									x			
	task switching efficiency										x												
	enhanced short-term memory										x												
	self control										x							x		x			
DISADVANTAGES	*addiction*		x		x	x					x	x	x	x					x	x			
	depression												x	x						x			
	incresed agressiveness		x		x								x	x						x			
	physiological stress & strains																	x		x			
	self-control decrease												x										
	poor physical/inactive life style and pain & injuries b.o. sedentary behavior												x	x		x				x			
	social skills anxiety	x	x		x										x					x			
	poor motor skills												x										
	poor cognitive development												x							x			
	adiposity													x						x			
	mental iiness												x										

3.2 What is in the heart of esport related health aspects?

Health is the keystone for sport and esport is not an exception since it is also accounted as a sport even not so much people still do believe so. Let's draw an analogy with the golf sport historical development. The physical trainings to be fit athletic in the professional golf sphere have appeared as a phenomenon and escalated in 1990s after one of players, Tiger Woods, begun to take a closer look at his physical body conditions. As a result, the most golf players nowadays have their own personal fitness trainers and spend their time in gym shaping their body strengths (Polman et al. 2018). In the same way to traditional sports, in order to be the best of the best in esport, the professional esport players should be physically health to be able to be quick in their decision under the time pressure and stay focus on the game process. The general portray of a typical esport player is badly intensified by many people who for them looks like *"an unhygienic, overweight, pasty-faced boy sitting in the*

dark in front of a computer screen" (Khoo 2012). What is far from the reality because esport has turned into extensively publicized social activity.

As it was concluded in Seatle West game PAX panel (2017) by panellist that initiatives towards *"better mental health in eSports has to start with leagues and game publishers*" to be engaged in taking care of players' heath to give players a competitive advantage, namely, *"rested player would have an advantage over someone who has been practicing too much"* playing in the computer. Other esport gamers vs non gamers advantages concern with fast decision making, particularly, playing action games can help a person to solve the brain conflicts associated vision and objects tracing more quickly. In addition, gamers usually do have better grey scale vision than non-gamers and better object rotation feelings. In their games related training study, (Bavelier and Davidson, 2013) found that game based training allowed young adults to be able to see more small visual details within a middle of clutter. Also, they found out that the training can help people to be more accurate in distinguishing between different shades of grey colour.

The importance of health to esport is also brought up by Stuart ".ficks" Cameron who could be easily described as an esports veteran because he was already competing in esports at early 00s and still continues to game a lot and follow the changes in esport scene. Stuart Cameron keeps up the esports special web domain CyberAthletiks.com and keeps publishing newest (personal) views into the scene of esports. One of the latest works in 2019 was the start of the year blog posts from him. In these blog posts, he was discussion on 10 different benefits and negative effects that happen around esports. The following Figure 9 is a combination view into these articles (Cameron, 2019a; Cameron, 2019b), visualizing the mentioned health specific aspects. This combination view should open up the real esport participant and former active esport players opinion on esport heath related benefits and issues. The figure presents a picture, in which esport positives overweight negatives what, in turn, might be influenced by this person background. But in short, by looking the possible negative effects, most of them can be tackled by proper education and team level training, which levels huge benefit for the positive health aspects.

Figure 9. Professional esport player views to positive and negative effects esports can affect to player.

3.3 Esport health advantages

We have found out that esport can provide physical and psychological health gains and advantages. In one of the previous chapters we spoke about the actual playing time esport professionals are using in front of computer. While speaking about health, it seems by the data, that such players averagely exercise physically nearly 1.08 hours per day pursuing the goal of improving their health and revitalizing to gain a competitive advantage among other players in esport but not so much for their own desire to exercise and awareness of the healthy lifestyle benefits. This is verified with the data, where 55.6% of surveyed professional esport players do some physical exercises to contribute to their esport career performance and, actually, it helps them both mentally and physically, while 47% of then do some sport just to stay healthy. (Kari et al. 2019) Speaking about players' mental health benefits from esport, we have found that the main purpose of esport game trainings is for development of technical skills and psychological stability in playing mode (Kadan et al. 2018). Other technical skills include advanced visual-spatial abilities (Griffiths 2010, Lee & Schoenstedt 2011) and high motor skills such as including hand-eye coordination and speed of (responsive) action (Funk et al. 2018, Hallmann & Giel 2018).

Whereas serious games are generally developed with altruistic and humane motives to, e.g. help with the rehabilitation of stroke patients or improve the learning of children with cerebral palsy, esports have been developed to gain commercial success. Even though some

authors still notice, esport educational tool providing therapeutic and medical effect to copy and learn physical activities (Griffiths 2010, Cunningham et al. 2018, Funk et al. 2018). Current & future skill requirements in esport will necessitate players (or athletes) to be fit, healthy and movement competent in order to perform at the highest level of competition, just like in the physical environment during the Olympics. So, esport requires certain physical skills development from players as a core element of esport (Cunningham et al. 2018, Funk et al. 2018, Polman et al. 2018). Hallmann & Giel (2018) also refer to a study where it was noticed that esport players competing in tournaments *"have a balanced body which is not mimicking the movements of their virtual avatar and are haptically engaged through the use of their keyboard and mouse to steer their avatar*". Moreover, esport players develop executive control self-regulatory/monitoring skills (Polman et al. 2018) to keep themselves top of their game and be emotionally stable (Griffiths 2017, Hallmann & Giel. 2018) and to show high level of concentration (Polman et al. 2018) during competitions. Esport stimulates growth mindset as cognitive skill development (Polman et al. 2018) and life goals achievement (Funk et al. 2018). Given this focus, a professional player usually has within their selected game, it is not too surprising to hear that playing also improves esport athletes pattern recognition, and task switching efficiency (Griffiths 2017).

Professional esport players also demonstrate enhanced short-term memory compared to novice video game players (Griffiths 2017). Additionally, esport professionals can boast of enhanced strategical problem-solving skills (Khoo 2012, Griffiths 2017, Funk et al. 2018) and quick decision-making skills too (Khoo 2012) under game time-pressure (Polman et al. 2018). Well-defined strategy and tactics for esport players is needed to overplay an opposing player or a team (Funk et al. 2018, Hallmann & Giel 2018, Kadan et al. 2018). Esport can also give improvement of spatial cognitive, motivational and emotional benefits (Khoo 2012, Griffiths 2017, Cunningham et al. 2018).

One of the most noted esport related benefit, mentioned directly or indirectly in most of the publications was the idea of gaming being highly publicized activity which stimulated prosocial behaviour of players and overall did help with their social environment wellbeing (Griffiths 2010, Lee & Schoenstedt 2011, Khoo 2012, Griffiths 2017, Nielsen & Karhulahti 2017, Cunningham et al. 2018, Funk et al. 2018, Hallmann & Giel 2018) declining an esport player's feeling of aggressiveness and loneliness (Cunningham et al. 2018) with developing

teambuilding skills (Khoo 2012, Hallmann & Giel 2018, Kadan et al. 2018). The esport players did receive these gains e.g. because they formed multiple different communication models between each other in games, they formed new relationships with other players (for example in games like the Everquest, World of Warcraft and etc.), what, in turn, helps to decrease players loneliness and even help to deal with increased aggressiveness, that might relate to some esport game contexts. The following Figure 10 visualizes these previously mentioned different advantages activity in esport scene can give for long term participation and focusing on the selected game with good training program.

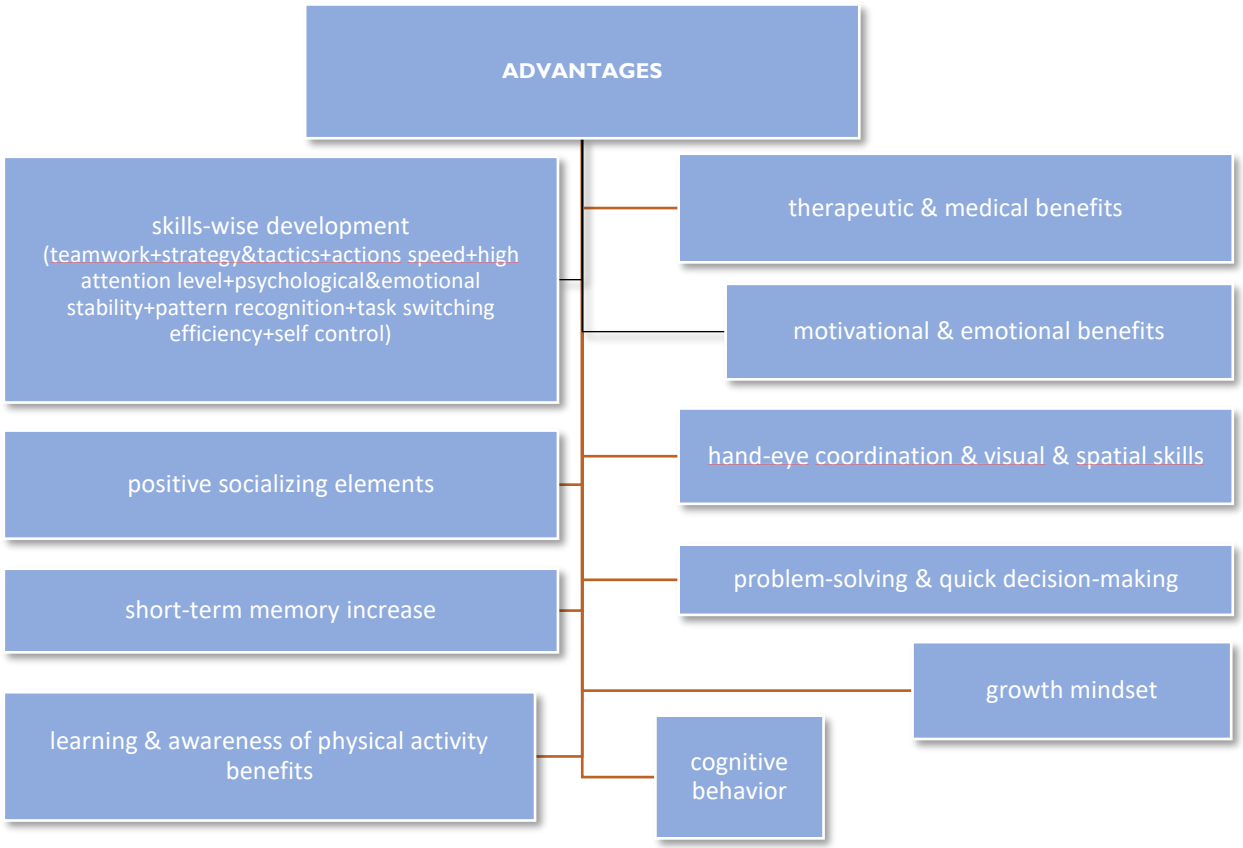

Figure 10. Esport health advantages.

Based on Bányai et al. (2018), professional esport players have been claiming, that the main elements that attracted them as players, to pursue a career in esports were the celebration of mastery skills, the pursuit of self-improvement, equity, mutual respect and the importance of fairness. In this particular context, the professionalized gamers are defined to be individuals who "practice esports as a form of work and earn their living from it". For them, the "journey" to become a professional esport player and to have career as professional, has

given them opportunity to experience high self-esteem, feeling of accomplishment and social recognition. In short, these esport professionals feel to receive a lot of mental health gains from their professional esport career. Seo (2016) also found that professionalized gamers usually share common ideas and values and they also sort of treat each other like family members.

Finally, looking at actual skill achievements professional esport players might gain for themselves, we can see e.g. Professor Ingo Froböse (Saedler, 2014) and similar esports studies to understand what long term effort in esport can give to a person. The list below is based on findings from the following sources: Schütz (2016), Rudolf et al. (2016), Rudolf et al. (2019).

- in esports the needed hand-eye-coordination goes far beyond table tennis as both hands work asymmetrically which supports brain development
- in physical and mental level esports athletes are exposed to physical strains similar to other sports with similar positive gains from the strain
- clear training and stimulus gains for many simultaneously used parts of brain
- can play at up to 400 movements on the keyboard and mouse per minute
- finally, body gets it is a share of endurance training too as in league level competitions, the pulse of player can be as high as 160-180 bpm
- the resistance to endure stress is imposed as the amount of cortisol produced in esport is about the race-car driver levels

As for personal level mental growth, (Bányai et al. 2018) wrote that to be a successful performing esport play, athletes need to have great knowledge about the game itself. The players have to think strategically and make fast and smart decisions. Professionals also have to be motivated and to keep moving forward. In mental level, to be professional one also has to balance the work life and personal life by separating daily life from performance goals in professional live. Basically, they need a strong will to avoid being distracted and stay focused, cope adaptively with the harassment, maintain a growth mindset, and warm up before performance either physically and/or mentally. This means that to achieve professionalism, one will gain a lot of mental skills and lifestyle directions, that are generally considered as healthy.

3.4 Esport health disadvantages

Evaluating health means that the possible downsides of being part of active members of esport players should be considered too. It was actually little bit surprising, that the topic of inactive physical lifestyle, as part of typical esport players "life-style", because of long sedentary times is actually not the first one mentioned in papers as a negative health effect reasons in esport (Choi et al. 2018, Cunningham et al. 2018, Polman et al. 2018). Even when the author claims that too much sitting can lead to obesity, vein thrombosis, chronic conditions, mental illness, poor fundamental motor skills and low cognitive development (e.g. language) (Choi et al. 2018, Cunningham et al. 2018, Polman et al. 2018). DiFrancisco-Donoghue et al. (2019) measure esport players complaints about physical health, where eye fatigue, pain in neck and back scored more than wrist and hand (visualized in the Figure 11).

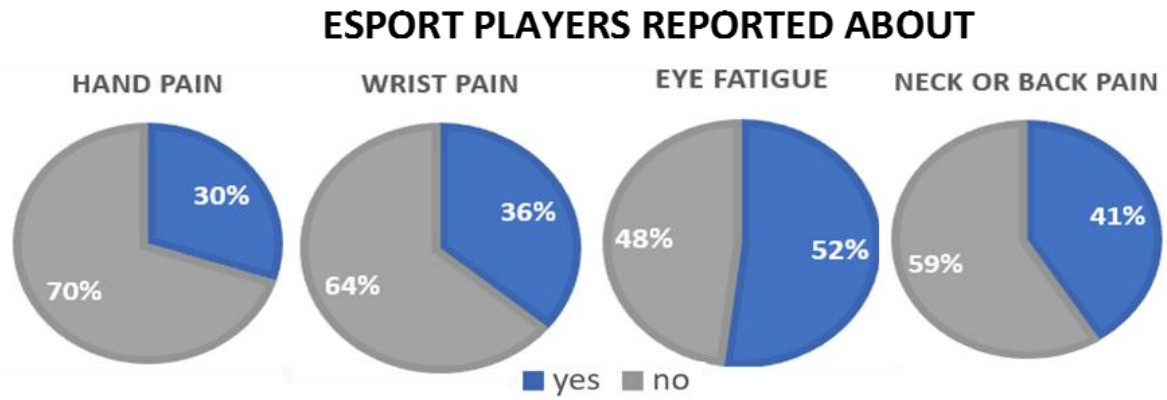

Figure 11. Pain & injuries esport professional reported, adopted from DiFrancisco-Donoghue et al. (2019).

When we are speaking about esport effects into health, we need to talk about the possible psychological disadvantages too, such as potential "addictive" video game usage or gaming disorder mentioned nearly in all papers (Griffiths 2010, Khoo 2012, Griffiths 2017, Nielsen & Karhulahti 2017, Choi et al. 2018, Cunningham et al. 2018, Polman et al. 2018). Unfortunately, this sort of addictive gaming can be analogically compared to gambling, alcoholism or smoking addiction. Related to the elevated risk of gambling addictions, it should be quite understandable that esport players can experience additional stress & strains during their competition events (Hallmann & Giel. 2018, Polman et al. 2018) what can impact in self-control decrease (Choi et al. 2018).

Related to gambling and gaming studies, it has been said that both the gaming and the gambling have little bit changed to a new form in the few past years (Josep 2018). The change has happened from player vs. machine to more player vs. player context, using over the internet sessions. In this new context, Grove & Krejcik (2015) investigate relationships between the consumption of video games, esports and three different forms of gambling: offline, online, and video game related gambling. In this study, it was found out that the esport and video game related gambling includes activities such as betting on esports matches, playing fantasy esports game events, paying to access randomly generated in-game items, using in-game items or currencies as wagers in third-party gambling sites and social network gambling games. Additionally, based on Grove & Krejcik (2015) studies, video gaming habits are at least moderately strong predictor for esports content consumption. The study was able to show, that there is clearly significant positive correlation relationship between problem gambling (of from esport context) and video game-related gambling habits and online gambling habits. Basically, it means, that the consumption of esports is highly likely associated with increased gambling in contexts of video games and the gambling happening trough internet. But on another hand, the study did not find correlation between gambling to gaming or from gaming habit to escalate also to gambling habits, which is quite positive news for e.g. families where one member puts lot of time to e.g. to esports. The study did not have scientific explanation for this result, but they did suspect it might be related to the limited resources people have per day. In short, Grove & Krejcik (2015) suspected that most people are unable to participate in both of those activities.

Also, excessive and compulsive (gambling addiction like) gaming can be the reason for aggressive/violence behaviour tendency (Khoo 2012, Choi et al. 2018, Cunningham et al. 2018, Griffiths 2010, Polman et al. 2018). In this matter, Khoo (2012) introduces the term of cyber bullying associated with online players' vulnerability that exist on the Internet. Such activity can lead to other people's negative emotions, that can result in even a worse form of depression (Cunningham et al. 2018) and worse form of suicidal ideation (Polman et al. 2018). Unfortunately, there is other antisocial aspects connected to esport too as when we look at the ways esport could influence social health, it is said that playing computer games prevents the social skills development causing social skills anxiety (Griffiths 2010, Polman et al. 2018) what results in antisocial behaviour (Khoo 2012). Now in this context, it must be mentioned, that most likely this ill effect is highly related to the games the esport player

is playing. If the game is highly team oriented, it is quite possible that this ill effect should not ever surface. To put these different health disadvantages to similar visualization structure as the positives were earlier shown, following the following Figure 12 has been generated for the reader.

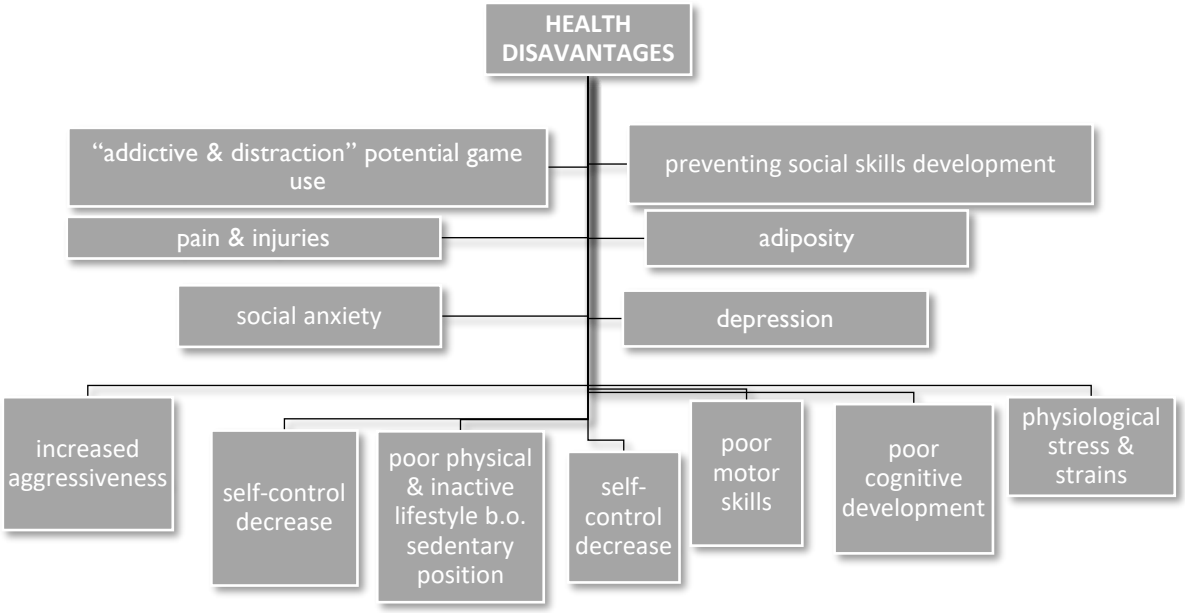

Figure 12. Esport health disadvantages.

The last point that we would like to mention here, was actually sort of unexpected and as such worth to talk about. One would probably assume, that when a person builds profession for themselves, that would be in base nature a good thing to achieve. But at least in esport context, there are conditions, that might pop up some not so wanted results too. In this regard, according to Caillois (2001), competitive gaming in general can have a negative impact on people and society when gaming that was started as free activity engagement, then later on becomes a work activity for that same person.

When playing becomes a part of working life it can affect negatively the concept of playing as free activity. Playing video games in a more competitive way does not help define it as a work or leisure activity. It would appear that esport is a serious leisure activity that players enjoy and that some players can develop themselves during the process of becoming professional gamers (Martončik 2015; Seo 2016).

4 CLOSING WORDS AND CONCLUSION

This report has been written for general public and wide audience in mind, to give a reader some base understanding about current situation around esports and health related aspects, specially the aspects connected to professional playing and/or highly active esport games participation. The goal was to show that esports is more like any other traditional sports, than many might think. And this is especially true from the skill building point of view. One can find lot of similarities in health benefits and possible ill effects from putting large amount of time to one form of a sport or pushing lot of productivity stress on a person, in relatively short time frame (Salmela et al., 2015).

There are multiple skills, training effects for brains and social positive aspects related to professional esport gaming among other esport essentials one should get familiar before judging esports based on just some casual gaming related image and maybe even some sort of miss believes about esports in general. In this sense, we also wrote little bit about difference in terminology, how one might mis relate esports to fantasy sports, which is not the same thing at all.

Finally, we would like to point out, that whatever personal view one might have towards esports, it should really be noted that this is a phenomenon which has a high promise for growth, both in the commercial and in the non-commercial context. Esports has lot of promise as one of the future form of newest and digital forms of sports, that will inspire new generation of young people towards sports in general, help them to build their team and social skills, like inclusive hackathons do in educational side (Happonen and Minashkina, 2018; Porras et al., 2018; Porras et al., 2019) and transform sports to new form, whatever that might be. All in all, the number of enthusiasts and occasional viewers are growing fast and amount of money invested to esports by different investors starts to be in the similar range as in the traditional sports, which is clear sight of future to come. Additionally, we are expecting huge growth of different sorts of data-based markers around esports, as it is so natural to collect data from the games and activities the professional players do in digital environment. It will be business models based on data (Kärri et al., 2017), like we have already seen in platform and ecosystem level in different context previously.

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APPENDIX 1: ROTATED VIEW TO TABLE 2

		Caillois (2001)	Griffiths (2010)	Lee & Schoenstedt (2011)	Khoo (2012)	Grove & Krejcik (2015)	Martončik (2015)	Rudolf et al. (2016)	Seo (2016)	Schütz (2016)	Griffiths (2017)	Nielsen & Karhulahti (2017)	Choi et al. (2018)	Cunningham et al. (2018)	Bányai et al. (2018)	DiFrancisco-Donoghue et al. (2018)	Funk et al. (2018)	Hallmann & Giel (2018)	Josep (2018)	Polman et al. (2018)	Kadan et al. (2018)	Kari et al. (2019)	Rudolf et al. (2019)
ADVANTAGES	*therapeutic & medical effect*		X											X			X						
	teamwork				X				X									X			X		
	problem-solving				X						X				X		X						
	strategy & tactics				X						X				X		X	X			X		
	actions speed							X		X							X	X					X
	hand-eye coordination							X		X							X	X					X
	visual & spatial		X	X	X						X												
	ability to sustain high level of attention																			X			
	quick&right decision-making				X															X			
	psychological&emotional stability										X							X			X		
	cognitive behavior improvement				X						X			X						X			
	motivational & emotional benefits				X						X			X									
	social bonding & interactions		X	X	X				X		X	X		X	X		X	X					
	physical activity awareness of being healthy and fit		X											X			X	X		X		X	
	growth mindset						X		X						X		X			X			
	pattern recognition										X									X			
	task switching efficiency										X												
	enhanced short-term memory										X												
	self control										X							X		X			
DISADVANTAGES	*addiction*		X		X	X					X	X	X	X					X	X			
	depression												X	X						X			
	incresed agressiveness		X		X								X	X						X			
	physiological stress & strains																	X		X			
	self-control decrease												X										
	poor physical/inactive life style and pain & injuries b.o. sedentary behavior												X	X		X				X			
	social skills anxiety	X	X		X										X					X			
	poor motor skills												X										
	poor cognitive development												X							X			
	adiposity													X						X			
	mental ilness												X										

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