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Benefits of a Racing Simulator to a Real-life Racing Driver



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Abstract

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This thesis investigated whether simulator racing provides tangible benefits to real-life racing drivers. Using qualitative methodology, in-depth interviews were conducted with four racing drivers who have achieved success in both sim racing and real-life motorsport. The research was based on interpretivist philosophy, employing narrative analysis to explore the drivers' experiences, motivations, and perceptions.

Key findings reveal that simulator racing aids drivers in multiple areas, including track memorization, car handling techniques, mental imagery training, and strategic decision making. The interviews also highlighted the role of the motivation theories – such as McClelland's Three Needs theory and Maslow's Hierarchy of needs – in shaping the drivers' engagement with simulators. A notable case includes a driver transitioning from sim racing to real-life motorsport, exemplifying the practical value of sim training.

Sim racing is particularly beneficial for cost-effective practice and preparation, allowing drivers to refine their skills in a controlled, risk-free environment. While limitations such as absence of physical feedback were noted, the overall findings confirm that sim racing is a valuable training tool for improving competitive motorsport performance.

Forward

At first it was hard to choose a topic for this thesis, but as soon as I realized that everything has been in front of my eyes all the time, I combined two things that I like, and voilà, the recipe was ready!

I have been a competitive sim-racer five years now and one of my favorite hobbies of all time have been rally driving in every aspect of that. I used to do co-driving back in the days. I have been a co-driver in fifty different rallies during my career as a rally competitor. I've also been marshalling in several rallies and of course I have been spectating rally events almost 40 years now. This year's World Rally Championship event held in Jyväskylä, at the start of August, will be my 40th anniversary competition as a spectator. With all these things as a base, it was easy to start building a thesis that includes two things that I like: simulator driving and motorsports.

I would like to thank two of my teachers, Janus Pitkänen and Jani Vattula, for being the lighthouse for me to guide my ship away from the rocky dangers that this study period has put in front of me. Thanks for all the guidance!

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I also would like to thank my family for being so supportive during this study period. Countless times that I asked for a little help, they always answered and helped. I love you all!

This thesis is a small view into the soul life of a racing driver. A view to understand the things that driver needs to learn to be a better competitor and a view to those methods that racing drivers use to practice.

And reader, remember Steve McQueen's quote: "Racing is life. Anything before or after is just waiting."

List of Symbols

Esport – Electronical Sports, usually played with computers

FIA – Fédération Internationale de l'Automobile. Non-profit making association that brings together 244 international motorsport organisations from 146 countries. FIA's member clubs represent millions of motorsport enthusiasts

AKK - The Finnish national central organization of motorsports. Autourheilun Kansallinen Keskusliitto in Finnish

F1 – Formula One circuit racing series

WRC – World Rally Championship

ERC – European Rally Championship

RBR – Richard Burns Rally game. Published in 2004 and many racing game players still think that this is the best rally game ever made.

iRacing – On-line racing simulation game that offers many kinds of competitions to drive in every hour of day. Many circuit racing game players think that iRacing is the best circuit racing game ever made.

V1600 class race car – A racing car based on a 1600cc standard car.

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1 Introduction

The purpose of this thesis is to research can simulator racing benefit a real racing driver. We get to know the racing driver's mindset regarding training and competition. Most importantly what is the motivation factor behind all this. We also get a view on what kind of simulator equipment is needed for training.

This topic is a relevant study of the disadvantages and benefits of simulator racing in normal life and in real life racing. I have a background in competitive sim-racing and in real life rally co-driving, so I can share my own experience and knowledge to back up my research results.

Racing with different kind of vehicles always include speed. You need to have quick vehicle to be able to win races. This has risen concerns for safety by governing bodies and this has prevented a steady climb in speeds. At the early stages of racing the speed was about 120 kilometres per hour, and now the speed has risen to be over 300 kilometres per hour in Grand Prix racing and close to 200 kilometres per hour in rally racing. This has evolved the safety equipment of racing cars a lot. There are rollbars on every racing car, safety harnesses have evolved from plain one point seat belt to five- or even six-point seat belts. Racing car seats have evolved a lot and the whole chassis of a car has changed to suit more to racing. Suspension, brakes, throttle, and such has also seen evolution. But still there is a lot of bad accidents on racing, sometimes these accidents lead to death also.

Just because the lack of speed, it is a known fact that there are much less injuries involved on sim racing than in real-life racing. Sim racers are only prone to some sprain injuries with high torques on sim gear such a wheelbase. Excessive sitting is also one of the problems in esports, in every scene of esports. Mental side is also in a danger on sim racing as in real sports also. Competitors must have a good mental strength to be on top on their game. Digitalization has made it possible to compete with simulators.

For a fact I know that Formula One drivers use sim racing as a practice method. It is beneficial for a newcomer driver to F1 just to practice track layouts from simulation games. As modern sim racing games have really detailed, laser scanned tracks, it is known that drivers use those games to learn every detail from the track surface, corners, etc. This is really good way for new

drivers to get knowledge about track layouts during the 14-event long season where you must be quick every time when you go to track with your car. You cannot use valuable track time for learning the track layout. F1 teams also have simulators in their factories, where they use those to make new improvements to the cars. Most of the teams even have their own simulator driver just for the use of car part development testing on simulators.

It is also a known fact that current F1 world champion, Dutch Max Verstappen has his own simulator on board wherever he is competing during the F1 season. Max uses the simulator to memorize the tracks and to try to find if there are some places on the tracks where he can improve his driving a bit.

The background for the benefits of sim-racing to real racing drivers is there on the circuit racing side, but what about for rally drivers? It is much more difficult to accurately model the entire long rally special stage compared to a circuit track. Even though there is a couple of exceptions. For example, on European Rally Championship event Barum Czech Rally Zlin in 2019, Russian rally driver Nikolay Gryazin used his Richard Burns Rally game experience during the rally. He was able to practice the Semetin stage in-game, and while driving it on the actual rally he was able to set the fastest times in both runs while the stage was driven during that event. Surprisingly this is done by the fact that he was able to beat top Czech driver and multiple Czech champion Jan Kopecky on both of those runs with a big 4 second gap. (Traxion.GG, 2021.)

And all this was made possible by the huge fan-base of the Richard Burns Rally Game that still tends to do modifications on that god-tier rally game. There is a handful of good special stage makers on the community that has already made some really accurate stages from the real life to the Richard Burns Rally game.

My own point of view from one angle is that rally drivers, for example, can learn the skill of driving with pacenotes from sim racing rally games. Pacenotes means that when you drive a rally car, you have a co-driver sitting beside you, and he/she tells you the pacenotes for every rally stage you are competing in. Most of the rallies are done with pacenotes. Every driver makes their own pacenotes before the rally. That means that they describe the rally stages from the rally route, by using various ways to give them the "picture" of how the road leads from corner to corner and crest to crest. For a newcomer to rally driving, it is never easy to use pacenotes and my point is that rally games may be helpful for such a driver.

My plan is to research is there any benefits for real racing driver to drive simulator racing also. The focus of my research will aim to those helps that racing drivers have got from seating time on simulators. I will also research the motivation behind all this. I will find out what makes racing drivers to drive simulators and vice versa.

But before we venture further, let's find out a little bit about the history of automobile racing, sim-racing, and the simulation racing equipment.

1.1 Explanation and history of Automobile racing

The main point of racing is to beat other competitors on a race from start to finish. This means you must be faster than others. Term automobile racing contains amateur and professional racing driven by race car on roads, tracks, and closed circuits. Racing includes a lot of different style racing, for example Grand Prix racing, stock- and sports-car racing, rally racing, drag racing, karting, demolition derby, off-road racing, and club man racing.

First organized automobile competition was held soon after the invention of the internal-combustion engine. Engine was invented in the 1880s, and the first organized race was held 1894. It was a reliability test from Paris to Rouen, France. The route of the race was about 80 kilometres in length, and it was won with 16,4 kilometres per hour average speed. For the winning competitor it took about 4,8 hours to drive 80 kilometres. (Encyclopaedia Britannica, 2024.)

The most famous car races are Le Mans that was first time held in 1906, Monte Carlo Rally first time in 1911, Indianapolis 500 first time in 1911, Pikes Peak Hill Climb first time in 1916, Monaco Grand Prix first time in 1929, and the list goes on. Races are still happening even we are changing from internal-combustion engine to electric engine. Technology is changing, but if there is a car, some of the humans have a behaviour to race with it. (Encyclopaedia Britannica, 2024.)

At first the race cars were usually car manufacturers prototypes of the following year's models, but after the First World War the racing car style changed to use production cars as base, those cars were stripped of their extra things and fitted with special seats, racing tires and fuel tanks. Now there is all kind of racing cars, some of them based on the production models, and some of them are concept cars. (Encyclopaedia Britannica, 2024.)

1.2 History of simulation racing

Racing games was one of the first genres in game industry history. One of the first racing games that was published was Gran Trak 10. Atari released this game on July 24 in 1974. Surprisingly, for us that play racing games in 2024, it was also the first game that used steering wheel, pedals, and gear shifter as a controller. Gran Trak 10 was in form of the arcade machine. (HandsOn Performance, n.d.)

First racing game that used First-Person Perspective was Night Driver, also published by Atari. The year was 1976 when the game saw the light of day. Racing games back in the days were simple, your car was programmed to be on the same location of screen all the time, but when you accelerate, the track and obstacles was drawn in front of your car and the goal for the game was only to avoid the obstacles and steer your car through the track. (Atari, n.d.)

First ever racing game that used a track that is based on a real racing circuit was Namco's Pole Position. It was racing arcade game that was published in 1982. Track that was used in the game was Fuji Racetrack. (Namco Fandom, n.d.)

It has been said that the designer Geoff Crammond's Formula One Grand Prix is the grandparent of every modern racing game. It was published first for Amiga in 1991 and then for Disk Operating System (DOS), more familiarly Personal Computer (PC), in the 1992. Geoff Crammond's Grand Prix contained all the team liveries and accurate driver helmets to represent the 1991 season. Only the driver names were fictional, because the game itself was not affiliated officially with the FIA or the F1 drivers. Game also contained all the tracks that were driven on the F1 season 1991. These were the first major steps on game sector of the sim racing history. (Euro-gamer, 2020.)

On my opinion, the most realistic rally simulator game was made by Sci Games. Richard Burns Rally released on 3rd of September 2004, and it is still the most realistic rally simulator by modeling the rally driving in all its brutality. Swedish game studio Warthog Games was behind of all this. Community all around the Richard Burns Rally game is still huge after 20 years of the game release date, and it is getting bigger and bigger every day, just because of the modern modders that are allowed to make their own improvements to the game. Game's physics and car-handling are top-notch quality compared to more modern rally games. (Traxion.GG, 2021.)

1.3 History of simulation racing equipment

When the games evolved, also the game controllers evolved. A sim racing wheel is a control device that is meant to be used in racing games and driving simulators. First steering wheel, intended to PC mass sale, was introduced in 1993 by Thrustmaster, it was called Thrustmaster Formula T1. There was no force feedback on this wheel, there was only some spring-based resistance for the steering wheel centring. This package also contained basic sequential shifter and a pair of pedals. Wheel was featuring 270 degrees of turning rotation. (Turnkey Simulators, 2022.)

Modern sim racing steering wheels contains important thing called force feedback. This means that steering wheel device contain motor that applies force to the controller over an axis. On a sim racing wheel, it is a rotational force that turns the wheel to simulate what happens in-game while driving. For example, if you drive over bumps on game, the steering wheel vibrates as you hit the bumps. Force feedback was first time seen on mass marketed wheels in 1997. Microsoft and Logitech both released a steering wheel which were equipped with force feedback.

First steps to move sim racing towards professional way was to equip steering wheels with force feedback. At consumer point of view, the first force feedback wheel to buy is usually either cogwheel-driven, or belt-driven. Cheapest wheels, and usually the first that consumers get, are cogwheel driven. Cogwheel-driven wheel means that there is a small motor that generates the force feedback, and the series of cogwheels transfers the force to the wheel rim.

Belt-driven wheels work a similar way than belt-driven. Small motor creates the force that is transferred to the wheel rim with the help of pulley. Belt-driven wheels cost bit more than belt-driven ones.

More professional step for sim racers is to get direct drive wheel to his or her sim setup. Direct drive wheels connect the wheel rim directly to the motor. Direct drive motors usually are much bigger than belt-, or cogwheel-driven ones. This usually means that the direct drive steering wheels are much expensive than the earlier models. When the cogwheel/belt driven steering wheels usually lost some of the force feedback through the connections, the direct drive does not do that. (Sim Racing Setup, n.d.)

Differences of the different models are usually counted by the power of the motors. On cog-wheel-driven systems the strength of the motor is approximately between 2 to 3 newton meters. Belt-driven system generates 3 to 7 newton meters force, and the direct drive forces can rise to over 30 newton meters. This means that every feeling the steering wheel gives you when you drive over the bumps, potholes, and track edges, is more accurate with direct drive than cogwheel-, or belt-driven ones. Most known steering wheel manufacturers are Swiss located Logitech, Thrustmaster that operates from United States, Germany based Fanatec and Finnish company Simucube.

First ever racing simulator was built already in 1966 by Lotus. The design used Lotus 31 chassis, and it was attached to sensors. Those sensors measured steering, throttle, and brake inputs. Technology of the simulator was 3-dimensional disc that laid out the circuit, and a camera that, by the amount of throttle given by the driver, tracked the disc to show where the driver was driving. This all was reflected in front of the Lotus chassis on a screen by using light and shadows. (Sim Racing Cockpit, 2022.)

Since then, simulator cockpits have evolved during the years. At the early stages in the 1993 there was only normal chair beside your computer table where the steering wheel is fastened with different kind of a clamp. Sim racing cockpits evolved during the years. Equipment manufacturers started to build different styles of cockpits that included racing seat and supports for sim-racing wheel and pedals. Now there is companies that sell specific kind of aluminium profiles for the customers to build their own sim-racing cockpits. Business around of the sim-racing is constantly growing. There is a lot of cockpit manufacturers in the business. To name a few, Trak Racer is an Australian company that builds racing simulators, Sim Lab is a British manufacturer and Overpower is a Finnish sim-racing cockpit manufacturer. All these companies sell other sim-racing related stuff too.

Now as we know a little more about the background of motorsport and simulation racing's history, we shall step forward on my thesis topic.

2 Theories and learning methods

I use five different theories to support my thesis. Three of these are different motivation theories. Because all the interviewees were motorsport athletes, it was easy to choose motivation-based theories to proof the points. Two other theories that is used here are learning theories. This part will shortly walk through the base of these theories.

2.1 Social Learning Theory by Albert Bandura

Albert Bandura developed social learning theory in 1977. Bandura (1901 – 1994) was a psychologist, and his studies showed that children imitate and observe the actions of others and copy them. This process is called observation learning. Bandura's theory explains human behaviour through observation and imitation. This theory states that individuals learn socially by following other people's actions, not just intellectually from books. We learn from our friends, parents, coaches, etc.

Bandura's theory work led him to develop the concept of self-efficacy. Self-efficacy means that if individual has confidence in his or her abilities, that means that person can perform a task easier. This influences behaviour. When you are confident, the more likely you will try new things. This theory works well on my research because three of the interviewees come with motorsport backgrounds in family. There is clearly seen the attention phase when the interviewees were paying attention to their closest model's. Then there is the phase of retention, when the observer tries to memorize the witnessed behaviour. Reproduction phase comes when the observer tries to mimic the things that he or she has seen the model does. And on this case, the interviewees have had a motivation to be a racing driver as they were young. (Structural Learning, 2023.)

Bandura's theory is a comprehensive framework for understanding how people learn through observation, imitation, and modelling. The theory bridges behavioural and cognitive psychology, emphasizing the interplay between environment, behaviour, and cognition in shaping learning and development.

In the digital age that we are living now, individuals have access to wide selection of learning models through online content. There is many online teachers, YouTubers and virtual mentors. These platforms create digital observation space where users can learn from people that they might never meet in real life.

Digitalization has expanded the role of social influence. Online communities such as Facebook groups, or Discord groups promote peer-to-peer learning where individuals can model their behaviour and ideas based on group interaction. There is always a risk that the influence of influencers or viral challenges, for example, can lead to imitative behaviours without a realistic understanding of risks or consequences.

Digitalization has transformed Social Learning Theory into a highly adaptable framework for understanding how we learn and model behaviour online. Through gamified reinforcement, AI-driven customization, increased access to models, and virtual social influence, digital environments not only expand the reach of observational learning but also complicate it. There is both new opportunities for skill acquisition and learning, as well as challenges related to influence, ethical concerns, and the potential reinforcement of problematic behaviours.

Bandura's Social Learning Theory offers profound insights into how individuals learn from their environment, shaping behaviours and beliefs through observation, cognitive processing, and reinforcement. Its emphasis on modelling and self-efficacy has made it one of the most influential theories in education psychology. It is also a cornerstone for understanding human development and behaviour in social contexts.

2.2 Three Needs Theory by David McClelland

Other theory that is used to prove the points of view is Three Needs Theory: Power, Achievement, And Affiliation by David McClelland. Power, achievement, and affiliation are the things that each person is motivated by. One of the three traits most likely is the dominant one, but the others are also present in a person. Athletes usually have high need for achievement, they have strong will to win, and that drives them to be better than the competitors. While the interviews for this thesis were conducted, it was noticed that most of interviewees were strongly motivated by desire to win. In the motorsport world, drivers who aim to become champions are trained in various styles.

One style involves training with a simulator. Success is sought to be overseen by these athletes. (Education Library, 2022.)

This theory is also known as the Acquired Needs Theory. These needs are not innate but are shaped by individual experiences, culture, and upbringing. The need for achievement refers to an individual's desire achieve goals and attain a standard of excellence. The need for affiliation is the desire to form meaningful interpersonal relationships and be part of a group. The need for power reflects an individual's desire to influence or control others.

When combined McClelland's Three Needs Theory with digitalization, it highlights how digital tools, platforms, and ecosystems cater to fundamental human motivations in new and innovative ways. While digital environments provide expanded opportunities to fulfil these needs, they also introduce complexities that require careful navigation to ensure that these motivational drives lead to meaningful and positive outcomes.

McClelland's Three Needs Theory provides a framework for understanding motivation based on individual differences in achievement, affiliation and power. By recognizing and catering to these needs, leaders, organizations, and educators can create environments that foster productivity, growth, and satisfaction. Although the theory has limitations, its practical applications in work-force management, personal growth, and leadership development make it a valuable tool for understanding human behaviour.

2.3 Hierarchy of needs by Abraham Maslow

The last part of the motivational theoretical part is an idea that was created by Abraham Maslow, an American psychologist in 1943. Maslow's hierarchy of needs is a theory of Human Motivation. This theory is used to study how people inherently engage in behavioural motivation. Theory itself construct from five different layers that are arranged in a hierarchy. First are physiological needs, second is safety needs, third is love and belongingness needs, fourth is esteem needs, and fifth, the highest level, is self-actualization needs. Maslow stated that person must satisfy his lower-level needs before he or she can satisfy the higher needs. (Simply Psychology, 2020.)

Foundational level is the Physiological Needs. These are the most basic and essential needs for human survival and living. Without fulfilling these needs, higher-level motivations become irrelevant. Examples of Physiological Needs are biological needs like food, water sleep and air. Then there are health needs like rest and physical activity. One of the needs is Environmental Needs that means that every individual needs shelter to protect themselves against weather and danger. Meeting these needs allows individuals to shift their focus to higher psychological and social concerns.

Once physiological needs are met, individuals seek safety in their environment. Second level needs are Physical safety, Financial security, Health and well-being, and Predictability. Satisfying safety needs gives individuals a sense of security and that helps them to focus on social connections and esteem.

Third level includes Love and Belonging. Individuals have the human desire for interpersonal bonds and community, such as family bonds, friendships, romantic relationships, and group and community belonging. When these needs are fulfilled, there is a foundation for self-esteem and emotional well-being.

Fourth level includes Esteem needs. This level focuses on gaining recognition, respect, and self-worth. Esteem needs drive individuals to seek personal growth and societal contributions. A person who feels confident and respected is more likely to strive for self-actualization.

Final level, top of the pyramid in Self-Actualization. This refers to realizing one's full potential and pursuing personal growth, creativity, and fulfilment. Unlike previous levels, self-actualization represents growth needs. Self-actualization is the pinnacle of personal development. People at this stage are driven by purpose and meaning, contributing to their own lives and society.

Maslow's Hierarchy of Needs provides a framework for understanding human motivation and development. While not without limitations, it remains a valuable tool for exploring how people strive to fulfil basic, psychological, and self-fulfilment needs, ultimately sharpening their behaviour choices in life.

Digitalization plays a crucial role in meeting these needs indirectly by improving access and efficiency. There is a lot of different applications for example Online delivery services that helps individuals to fulfil their needs, such as Wolt for food delivery, and for example cybersecurity tools

to provide online safety. There is also all kinds of online dating apps and social media platforms that helps individuals to seek social needs as love and belonging.

Maslow's Hierarchy of Needs combined with digitalization illustrates how technology has redefined the ways we encounter basic human motives.

2.4 Deliberate Practice Theory by Anders Ericsson

Fourth theory that is involved here is Anders Ericsson's Deliberate Practice Theory. On this theory Ericsson focuses on how purposeful, structured, and repetitive practice leads to development of expertise in sports.

Deliberate practice involves Specific Goals where there is a clear objective for improvement in each practice session. Focused Attention that is full concentration on the task to avoid un-purposeful repetition. Immediate Feedback where coaching or self-assessment is used to correct errors. Incremental Challenges that mean gradual increase in difficulty to push beyond current capabilities. Purposeful repetition is a tool to strengthen neural connections associated with a skill. It must involve active problem-solving and adjustment to be effective.

Deliberate exercise characterized by focused effort, good feedback, and progressive challenges, transforms repetition from a mechanical task into a powerful tool for achieving expertise. In sports, this approach helps athletes not only master basic skills but also achieve peak performance under pressure. (Ysamphy.com, n.d.)

2.5 Learning by doing by John Dewey

American philosopher and psychologist John Dewey (1859-1952) developed Learning by doing theory that is used as the fifth theory here. According to Dewey, learning is an active activity, it is not just receiving information.

John Dewey's Learning by doing theory is a significant foundation for experiential education and progressive pedagogy. It emphasizes the role of active participation and experience in the learning process and argues that education should not be a passive transfer of knowledge but an active process in which learners interact with their environment. (Structural Learning, 2023.)

2.6 Learning methods

One learning technic that is involved here is utilization of imagery training. Satu Kaski, a Finnish psychologist specializing in psychotherapy, has written about imagery training in the book on the psychology of training. Imagery training is well suited to motorsport, because racing drivers do not have competitions that often. With imagery training, the athlete increases the sense of familiarity of the competition situation and thus the feeling of security and mental strength. On the side of motorsport, with digitalization, practicing with simulator has brought completely new dimensions to mental image training. When driving the simulator, steering the vehicle, using the pedals and fast situations are similar to those in real motorsport.

Good quality imagery training combined with physical training is known to be more effective than physical training alone. The results are better, and the individual gets enough rest for her/his body. Imagery training in motorsport can be practiced, for example, by driving the track of the next race on the calendar in a simulator. Racing driver gains confidence in the competition situation with imagery training. Driver has the feeling that he has experienced this before, as well as confidence in his skills, so simulator driving on this occasion is not just for memorizing tracks. (Kaski, 2006, pp.136-138.)

3 Methodology

As the topic is can simulator racing benefit a real-life racing driver, for research method I used qualitative interview method. I asked multiple questions from the taken specific sample racing drivers that are succeeding in both real car racing and in simulation racing. Questions are shown on the appendices section.

One of my interviewees is especially interesting subject, because he has moved to real car racing from simulators, all the other interviewees have a bit different background to be a racing driver. I am using micro-level theory on my interviews to get more specific answers. (Council of Australian University Librarians, 2023.)

3.1 Research philosophy

Because this is qualitative research, my research philosophy is interpretivism. Four different racing drivers are interviewed in depth, and those answers will be the base for the research. Also, different motivation theories will be used to prove the points. I chose to interview especially people who have success both in real motorsport and in simulators. One of the interviewees has won Finnish rally sprint championship on four-wheel drive category twice, one of the interviewees has won multiple events in track racing and in ice-track racing, and one of the interviewees has won Finnish junior rally championship event and finished on 2nd place of the championship itself. Last, but not least, one of the interviewees has jumped from simulator racing to real track racing, and he is succeeding in real life racing also. He gives us valuable information about the benefits of sim-racing to real racing. All these interviewees have also great success on sim-racing.

My approach for this research was inductive. First, I plan the questions and presented them to the interviewees. Then I conducted the interviews.

3.2 Research and sampling strategy

My strategy was to use qualitative interviews for data collection. With three of the interviewees, I involved face-to-face interaction while doing the interview and one of the interviews was done online with Discord application call. With this strategy I was able to gather detailed in-depth information from the interviewees, and it helped me to understand more about their experience during their motorsport career. My sampling strategy was non-probability sampling, just because when I started to plan this kind of research, I already have these interviewees in mind, and I was sure to get good answers from them.

3.3 Data analysis methods

Narrative analysis is used to get the results from interviews. I listened to real-life racing drivers point of views to justify my results to this thesis. I explored not only what was said, but also why it was said, considering the structure, content and context of the narratives. These answers have given me rich in-depth insight into the soul world of a racing driver.

Narrative analysis is a versatile and interpretive approach in my research enabling deep engagement with racing driver's experiences and the cultural, social and temporal forces shaping them. This has provided me with a valuable insight into how these individuals construct meaning in their lives and navigate their worlds.

3.4 Reliability and Validity

There is no specific relationship between the interviewer and the interviewees. The interviewer sent the interview questions to the interviewees in advance to reduce the threat of this being biased. While analyzing the data, the interviewer has been thorough, honest and careful. On this occasion the researcher is slightly biased towards sim racing to be a beneficial thing for real-life racing.

During the interviews the researcher recorded all the material so there is an audit trail. All the interviewees gave an honest answer to the questions.

3.5 Methodology Summary

The research explores whether simulator racing benefits real-life racing drivers using a qualitative interview method. Four successful racing drivers were interviewed.

The research follows an interpretive philosophy and adopts an inductive approach. Questions were designed beforehand and presented to the interviewees. Data collection involved face-to-face interviews for three participants, while one interview was conducted online via Discord. A non-probability sampling strategy was used, selecting interviewees known for their expertise and success in both areas.

Narrative analysis was employed to interpret the data, focusing on the content, structure, and context of the responses to understand the experiences of the racing drivers. This approach provided a deep engagement with their perspectives and the cultural and social forces influencing their narratives.

To ensure reliability and validity, the questions were shared with the participants in advance to minimize bias, and interviews were recorded to maintain an audit trail. Despite acknowledging a slight bias favoring simulator racing, the researcher aimed for thoroughness and honesty during data analysis.

4 Results

Research methods for collecting the data from the interviews were first to find similar answers to the questions to prove the motivational aspects of these interviewees to start their motorsport career. As I previously mentioned, there were kind a similar family backgrounds with majority of the interviewees. All the interviewees that started the motorsport traditional way, meaning that they start driving real-life competitions before the sim racing, have been observing the motorsport already during their childhood.

Here are the individual results from each interview.

4.1 Interview #1 Tuukka Hallia

First of the interviewees, Tuukka Hallia, is 22 years old rally sprint driver from Kellokoski, Finland. He told me that when he was young, he was drawn to motorsport by his father, Tomi Hallia, who is 3 times Finnish champion in rally sprint. His skills dazzled Tuukka, and the young boy thought that the motorsport seemed great. By following his father doing, Tuukka mastered the rally driving skills.

Tuukka has been practicing for motorsport as soon as he turned 2 years old. Following in his father's footsteps, Tuukka gradually moved from the wheel of ATVs to the wheel of cars. The training has been purposeful and the will to win has driven him to look for new ways of training, as sim racing. From sim racing Tuukka told that he learns some aspects of car handling and he also tend to try different types of car setups on games and then bring those similar setups to the real-life rally car. Only aspect that Tuukka is missing while driving simulators, is the driving feeling brought by the movements of the car, so called "the ass feeling" in directly translated.

Tuukka has been participating in many of sim rally series and he has managed to win several of those.

4.2 Interview #2 – Tommi Viitala

Second interviewee is really interesting one. Tommi Viitala from Ylöjärvi has started his racing career from the simulators. During the interview Tommi has only driven six real-life race events with Legends category track-car. During the first season he once finished fourth on Alastaro circuit. On the Legends class, there is always over 20 drivers competing, so it was a really good result from the novice driver.

The motivational factor for Tommi is that he always wants to win every competition that he is participating. On the motorsport there is also some kind of danger present all the time, and it fascinates the interviewee, but the main thing is that he has so strong will to win everything.

Tommi has driven sim racing about 3 years now, and he has won the iRacing Äijäsarja once. That series has over 200 participants. Tommi appreciates that win a lot. As he has shown the great speed at simulators the fellow competitors encouraged Tommi to try the Legends car in real-life.

Benefits from the sim racing to the real-life racing has been priceless to Tommi. He said that he has learned all the basics of race driving from the simulators, driving lines, places to brake, ways to do proper setups for the car and the actual racing against others. Sometimes on the online races there is over 60 opponents to drive against, so the benefits of learning every kind of competition situations is great. Here you can see Dewey's theory in practice.

Tommi also said that you don't need to have high-end simulator equipment to start the sim racing. He said that when you drive sim racing for a long time, the work takes you with you, and after that you start looking for a little comfort in driving and doing things, this usually means that you buy newer and better equipment.

Tommi mentioned that he has made a bunch of new friends from Äijäsarja. Community in there is really supportive. Tommi also told that for the newcomers it is relatively easy to jump aboard. There is always someone to help you and giving advice.

Comparing sim racing to real-life racing the only thing that Viitala is missing while sim racing is some kind of lack of speed because there is the lack of physical movement of the sim racing rig, and he also mentioned that in real-life racing it is not possible to "press ESC and restart" when something bad happens.

4.3 Interview #3 – Toni Lähteenmäki

Toni Lähteenmäki is a long-time motorsport enthusiast. He has a strong motorsport tradition from his family background, his father has raced, his father's father has raced and his father's father's father has also participated for the first two 1000 Lakes Rally Jyväskylä, previous name of the rally championship event held in Jyväskylä. Toni started his motorsport career from Go-Karts, as many of the Finnish top-drivers have done. After his father stopped racing, Toni followed his footsteps to the circuit racing with V1600 class race car.

Toni has been competing in many different racing series in Finland and participated in North European championship series in circuit racing. On that series there were competitions on Sweden, Latvia and Estonia. Toni said that it was much easier to participate on those events with the help of sim racing. He said that he tended to practice the tracks on games before he went to drive real-life event.

On earlier stages of his career Toni said that he has a dream that he maybe can get living with competitive racing driver, but now racing is only a good counterweight to all the work and more. But of course, when Toni is racing, he has a strong will to win. Being successful in both sim racing and real-life racing causes Toni similar feelings.

Lähteenmäki said that sim racing benefits his real-life racing with the training and memorizing the different racing tracks, that helps a lot when competing abroad. You don't have to spend time on the track to memorize it, you can straight jump to the phase of making suitable setups for that track. Today, in Toni's opinion, the tracks are modelled so precisely that all the bumps and the different stages of the track can be found in computer games as well. Beneficial things on sim racing, especially circuit racing games, is the way to practice mental side of things, and you can also practice the so-called "eye for the game", how to drive in any situation, where to go in battles and which battles can be sacrificed, so to speak.

When asked about the sim racing equipment, Toni also agrees with the other interviewees that it is possible to be a good sim racer with cheap market equipment, but all the authenticity and other things come from good quality devices.

4.4 Interview #4 – Tommi Mäkinen

It is a funny coincidence that the fourth interviewee has the same name as the four-time rally world champion Tommi Mäkinen. My interviewee is 28 years old, originally from Mänttä-Vilppula, and now living in Tampere. He has real-life rally raced four years between years 2016 and 2020. During that time Tommi managed to finish second in Finnish Junior Rally Championship series in 2017. He managed to win one event on the SM4 class on Finnish rally championship and win his class on one Finnish rally sprint championship event also.

Tommi has been a sim racer for 15 years now. He has plenty of success on sim racing. The crown is the victory of the AKK Digital Rally Cup from 2022. He also won the qualifying series for iRacing Finnish Rallycross championship in 2022. He also competed on FIA Rally Star competition on 2021. That competition searched the next possible rally champion. Qualifying was 12 events long, and it was held with WRC9 -game. Tommi was so fast on European sector that he was selected for the final competition stage in Germany. That competition was held following the elimination stages. There were many days in the final competition and the best from each day always got up to the next day to continue. Tommi's road stood up on the second day of the competition in a race driven on Cross-Karts, where chicanes made of cones and barrels were obstacles on the track proved to be fate. If you spilled a pin or hit a barrel you got a 5 second penalty to your competition time. Tommi hit two cones and got 10 second penalty. That punishment barely dropped him from the next day. Competition winner, Estonian Romet Jürgenson, has succeed on world rally championship events. He is Junior World Rally Champion 2024. (Dirtfish.com, 2021.)

Inspiration and motivation to be a racing driver Tommi got through his family. His father took him to watch rallies, and his grandfather served as competition director of the Mänttä-Rally for many years. Tommi's enthusiasm for rallying has remained from those times. Tommi's competitive nature, strong will to win and interest in driving fast have motivated him to try competing himself.

Tommi said that driving with simulator has helped him to practice driving style that suits for V1600 rally cars. Because practicing with real rally car is so expensive, it is much easier to jump on your simulator and practice different kinds of driving styles with it. Tommi also mentioned that driving with simulators develops concentration and reflexes, and different kind of techniques of how to use the pedals.

Considering the simulator equipment, Tommi also says that starting to drive does not require top-quality equipment, but with better equipment it is easier to reach your maximum speed faster. Better equipment guarantees better training.

5 Conclusion

While doing this research I already build few more smaller research targets on my mind. One for example is to learn how much different is the lap time of a racing driver who uses a simulator as aid to be compared to one who does not use a simulator in his/her training.

Motorsport drivers with strong motivation towards the succeed tend to practice by any ways it is possible. All my interviewees use sim-racing as a practice method for their real-life racing. Toni Lähteenmäki and Tommi Viitala, who both drives circuit racing, said that it is a beneficial to train with simulator for different kinds of situations. When driving against other human competitors, that improves so called 'driving senses' as the competitive driver needs to be aware of every kind of situation that can happen on track while driving door to door against other competitors. While driving against Artificial Intelligence (AI) that games use, it is seen that nowadays AI tend to drive in a natural manner, but there usually is a pattern that AI uses. That's why both Toni and Tommi tend to drive against human opponents on motorsport games.

Modern day Artificial Intelligence is constantly learning new things and ways of doing things, so it might be that in the future we have such racing games that have AI opponents that can learn to improve their driving from the same old patterns.

Real life racing drivers tend to practice and learn new tracks with simulators. This is usual for circuit racing drivers. This helps them a lot when they go to the track with real racing car as they have already learned the track layout from simulator, they remember the corners better than without any simulator training. Both Tommi Viitala and Toni Lähteenmäki mentioned this benefit on their interview. This means that circuit racing drivers learns by doing according to Dewey's theory. For Tuukka Hallia and Tommi Mäkinen the rally games have not been so great help for them to learn the new special stages.

Just as Albert Bandura's social learning theory proofs that individuals learn socially by following closest people's actions. Tuukka and Toni are a living proof of that. Because Tuukka has won Finnish championship in rally sprint, also 3 times as I am writing this thesis, like his father. He has silver medal from Finnish Rally Championship front wheel drive category from 2001.

It is seen that on all interview occasion David McLellands Three Needs theory suits well as interviewees has high need for achievement. They want to be the best on every event that they participate. That is why they have started to use sim racing as a practice tool to get better results. And the will to win is present while they race on sim racing also.

Tuukka mentioned during the interview that he sometimes tests different kinds of car setups on game before he tries those in real life, and he said that many aspects of those setups work in real life also. Nikolay Gryazin also mentioned during the Eye of the Expert -interview that he tends to do rally setups in games and use those in real life rallying also. I can say that Gryazin has made a good gravel setups for the Skoda Fabia R5 evo car on the Richard Burns Rally -game. I've driven with those setups and those makes the car relatively easy to handle on gravel stages compared to the default car setups.

Tommi Viitala told me that it was difficult to start racing as a lone entrepreneur in the construction industry, but many friends in the construction industry then went to support him, and this aspect is filling few levels from the Maslow's hierarchy of needs. Social contacts from the sim racing and real-life racing have enriched Tommi's life.

Motorsport is not a cheap hobby, so almost all the competitive drivers have at least three of the layers from Maslow's Hierarchy of needs filled. They have filled the physiological needs with food and water to feed them, they also have some kind of shelter where they live. Drivers also have filled their safety needs with health and resources to get by and to drive a racing car every now and then. Usually, these drivers also have filled the need for love and belonging with enough friends to help them compete with mechanical help and so on. Circuit drivers that use simulators as training methods usually always save a little money also, because they can practice many of the tracks in simulators and not have to pay expensive track time to do so in real life. And because of the strong will to win, some of the drivers have the fourth level, esteem needs, also satisfied.

Driving with simulators has helped all these athletes to be better competitors. The aspects that are sucked up from the simulator training have improved their skills. The circuit drivers know how to drive in tough situations, like bumper to bumper when there are more cars involved. They all can react to unexpected quick situations more quickly and the driving lines are in possession.

The interviewees agreed that sim racing hardware requirements are not hard, but good quality equipment brings certain things to driving, so that driving feels close to driving a real racing car. That helps them to practice and learn by doing.

Nikolay Gryazin, the Russian rally driver, has used Dewey's theory, Bandura's theory and imagery training well during the Barum Czech Rally Zlin in 2019. His imagery training with computer game proved to be really beneficial on the Semetin stage. Two stage wins there in a high-level competition tells us about the benefits of imagery training and simulator driving.

There is also another example of the help of simulator games in real life, this is also related to Gryazin. On 2020 Nikolay Gryazin's then co-driver Yaroslav Fedorov has been encountering visa issues, and that means that Nikolay was forced to change his co-driver for a new one. He chooses Konstantin Aleksandrov to be such. They participate in one of the Lithuanian national championship events and won that event. But the story before the race went like this. The rally pairing was playing the Richard Burns Rally game before the race in Lithuania, and while gaming, Konstantin was reading the pacenotes to Nikolay. Gryazin used to hear Aleksandrov's voice while gaming, and that's how they started their co-work on rallying. (DirtFish.com, 2024.)

From the interviews it is clearly seen that all the interviewees use sim racing as imagery training for the real-life racing. Circuit racers Viitala and Lähteenmäki uses simulators to help them to memorize different racing tracks and to gain confidence to compete in the multi-car tight battles during the race. All interviewees use simulators to do a lot of practice repetitions for example using the pedals and handling the car in high-speed situations, this helps them to be more prepared during the actual racing. Repetitions helps them to expertise the doing. By using simulator repetitions in training, racing drivers gain confidence in their performance.

When practicing, the simulator equipment should resemble the cockpit of a real racing car so that the imagery training becomes perfect. Sometimes it is not possible to make a copy of real-life racing cars cockpit, then it is important that the position of pedals, steering wheel, gear stick, and handbrake so that the locations resemble a real racing car as much as possible. That helps the drivers to be more familiar when it comes to the real racing car.

Based on these facts I can easily say that it is beneficial for a real-life racing driver to drive simulator racing.

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Appendices

All the interviews were conducted in Finnish.

Interview Questions:

1. Tell me who you are?
2. What thoughts does esports racing evoke?
3. How long have you been involved in motorsports?
 - Has motorsport bring you any success, and if so, what?
4. How long have you been doing simulator driving, and have you had any success with it?
5. How did you get into motorsport?
6. What motivates you in racing?
 - What motivates you in sim racing?
7. What would you possibly do if you weren't involved in motorsports or sim racing?
8. How do you practice for motorsport?
9. How many hours a week are spent on the simulator?
10. How driving a simulator benefits real-life racing?
 - What qualities simulator driving develops?
 - Are commercial devices suitable for this purpose? (for example, cheapest equipment)
 - What is your own requirements for devices?
11. What are the disadvantages of driving a simulator compared to real car racing?
12. How do driving simulators hinder the practice of real motorsports?
13. How do you see the disadvantages of simulator driving in normal life?
14. How do you see the benefits of simulator driving in normal life?

15. Has it ever happened during a race that you noticed that something about simulator driving would be useful?